The Federal Ministry
for the Environment,
Nature Conservation
and Nuclear Safety

Conservation status and protection of migratory species in Germany

Document submitted to the 7th COP to CMS and the 2nd MOP to AEWA

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September 18-27, 2002, Bonn, Germany

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A Word of Welcome

by the Federal Minister for the Environment, Nature Conservation and Nuclear Safety, Jürgen Trittin

From our stationary vantage point, migratory birds are regular – but restless – guests that leave us again after just a short time.

The bird's eye sees things somewhat differently: the red knot, for example, a 26 cm long sandpiper, sees the world, stretching from Iceland, Alaska and Siberia down to the west coast of Africa, as its rightful dwelling. In the north, it has its nursery, on the North Sea coast it has its dining room (September), and in the Mediterranean and in Africa it has its winter quarters.

For the red knot and other migratory birds, and for seals and whales, there is only one world – and thus no boundaries for species protection. We humans are somewhat more limited, unfortunately: We have to sit down together and reach international agreements. For this much is clear: if we Germans do not stop common-cockle fishing, to ensure that the red knot finds enough to eat in September in the east Friesian Wadden Sea, then people down in west Africa will wait in vain for their guests from the far north.

Enhancing protection for migratory animal species – especially migratory birds – is thus a project that I consider extremely important, both politically and personally. It is simply fascinating and breathtaking: how reliably migratory birds find their way back to their familiar places, and what distances these small animals cover, with no more supplies than tiny reserves of fat on their bodies!

The protection we are discussing at the 7th Conference of the Parties to the Bonn Convention and the 2nd Meeting of the Parties to AEWA has to do with migratory routes, and with feeding, breeding and resting areas.

But I would also like to remind all of us of another form of protection that is urgently needed: we must limit climate change, each and all of us, in our own countries. Shifting of climate and rainfall zones under climate change will especially threaten migratory animal species. Climate protection and species protection should thus be seen as a common concern and moved forward in the same direction.

In 1979, we signed the Convention on the Conservation of Migratory Species of Wild Animals (CMS) here in Bonn. Within its framework, the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA) has been concluded, an agreement oriented especially to protection of waterbirds, storks, ducks and geese along their west and east Atlantic flyways. The Secretariats of both agreements are located in Bonn, and I am delighted that they are now also holding their conferences of the parties here as well (7th CoP CMS 18-24 September 2002; 2nd MoP AEWA, 25-27 September 2002). Hopefully, with good results – for the birds. And thus also for us.

Jürgen Trittin

Federal Minister for the Environment,
Nature Conservation and Nuclear Safety

A Word of Welcome

by the President of the

Federal Agency for Nature Conservation,

Professor Dr. Hartmut Vogtmann

In 2002, Germany again has the honour of hosting the conferences of the parties to the Bonn Convention and the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA) – and thus of continuing its long tradition of contributing to international efforts to protect migratory animal species. I welcome you, also on behalf of my staff, very cordially here in Bonn, and I wish you not only very successful conferences, but also very pleasant stays in our country.

I'm sure I do not have to remind you of how Germany has worked to protect migratory animal species – and of how very hard it has worked to protect them. In spite of a challenge here and there in interactions between official and volunteer commitments, the Federal Government and the Länder have accomplished a great deal. The report you now hold in your hands, a work to which the Federal Agency for Nature Conservation has contributed substantially, gives eloquent testimony to much of this effort and its resulting achievements. Needless to say, it was possible to present only a small selection of the great many activities concerned.

Our achievements to date give us no reason for complacency. In the past few years, many new challenges for nature conservation have arisen. The Convention on Biological Diversity has recognised protection and use – as long as use is sustainable – as pillars of equal importance along with equitable compensation for use of biodiversity resources. The Bonn Convention and its regional agreements – and I would especially like to mention AEWA – offer the opportunity to specify protection of animal species in this light and to shape their use, within the foreseeable future, in such a manner that it truly can be called "sustainable".

The Federal Agency for Nature Conservation sees itself as a force driving refinement of these international requirements, in keeping with scientifically founded nature conservation requirements, and implementation on the national level. To these ends, over the past few years we have held two workshops, with broad participation by representatives of the science and research sectors, authorities and associations, that have led to consensus on principles of sustainable use of wild animals, the criteria for such use and means of implementing such use. We must continue on this path – not only is it required by the Convention on Biological Diversity and AEWA, it is also a core aspect of both the EU Bird Directive and CITES. Practical results from this process are also useful for refinement of the Federal Government's national sustainable development strategy. Nonetheless, further efforts must be made before initiatives supported by the Federal Agency for Nature Conservation, calling for sustainability criteria to be applied to taking and using of animal species in Germany, are implemented in relevant legal provisions and in specific action. The BfN's "classic" tasks – inventorying and describing species and communities and determining the key biological and ecological factors affecting relevant populations – have thus again come to the forefront of nation-wide animal species conservation. The Federal Agency for Nature Conservation provides these findings as a basis for nature conservation policy decisions at the national and international levels.

Inventories of individual species, of communities and of ecological valuable habitats are also becoming increasingly important with regard to use of renewable energies, especially in offshore areas. Many open questions remain regarding the potential conflicts between wind energy use and protection of the marine environment, especially as habitats for wild animal species. With a tightly scheduled strategy, the Federal Government is aiming to reconcile both protection and use aspects and to initiate the relevant necessary research. The amendments to the Federal Nature Conservation Act and the Ordinance on Sea Installations (Seeanlagenverordnung), which came into force just a few months ago, have created the framework for controlled expansion of wind energy use in the North Sea and Baltic Sea. In this context, the Federal Agency for Nature Conservation is called on to make a scientific contribution to ecologically optimised expansion of offshore wind energy installations.

The Agency has a wide range of instruments with which to fulfil its tasks, some of which are described at many points in this report. Under the aegis of AEWA, a number of research and development (R+D) have been, and are being, designed and carried out, in order to develop transferable threat analyses, design model protection concepts and support survey and monitoring programmes. Integration of external experts, co-operation with species conservation experts of the Länder and of relevant associations and public information are all key features of the work of the Federal Agency for Nature Conservation. All increase the chances that new findings and requirements in nature conservation will not only be provided to policy-makers – but will also wind up where they belong – in use in actual practice.

In this sense, I sincerely hope that the conferences here in Bonn help enhance international species protection and conservation. The Federal Agency for Nature Conservation will continue to shape and scientifically implement the Bonn Convention and its regional agreements, within the framework of its competence. I would be particularly delighted if you found this report an inspiring invitation to participate in an important task – protecting our common natural heritage.

Professor Dr. Hartmut Vogtmann

President of the Federal Agency for Nature Conservation

Introduction

The Federal Minister for the Environment, Nature Conservation and Nuclear Safety, Jürgen Trittin, has invited the 7th Conference of the Parties to the Bonn Convention on the Conservation of Migratory Species of Wild Animals (CMS; Bonn Convention of 23 June 1979), and the 2nd Meeting of the Parties to the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA; agreement of 16 June 1995) to Bonn during the period 14 – 27 September 2002.

This invitation was the occasion for the present report, which provides detailed information about the conservation status of migratory species in the Federal Republic of Germany.

Instead of remaining in one and the same location throughout their lives, a great many animal species migrate at regular intervals over long distances, from their birthplaces to other locations and back again. Migratory birds are the largest group of such migrants: storks, cranes, geese, ducks, ibises and flamingos, to mention just a few. Other migrating animals include marine mammals, such as whales, dolphins, seals and seacows; land mammals, such as bats and antelopes; migrating reptiles, such as sea turtles; fish, such as eels and salmon; and butterflies, such as the monarch butterfly in North America and the Apollo butterfly in western Europe. Species cover thousands – in some cases, tens of thousands – of kilometres between their summer and winter areas or between their birthplaces and adult habitats. In these habitats, and on their migrations, such species are subject to a great many threats, including habitat changes (for example, caused by irrigation or drainage), persecution by humans or barriers to their movements (dams). This was the reason why in 1972 the German Federal Government accepted a mandate, from the United Nations Environmental Programme, to prepare an international convention with the aim of protecting migratory species, and to organise international cooperation to this end. The first drafts of the convention were presented in 1975, and in the years that followed, these were intensively discussed, through correspondence and at small working meetings, with interested countries. The negotiation conference then took place from 11 to 23 June 1979, at the invitation of the German government, and it led to the signing of the new Convention. The Convention on the Conservation of Migratory Species of Wild Animals (CMS), the "Bonn Convention", entered into force on 1 November 1983, as international law, after 15 states, the minimum number, had ratified it. Since then, the number of parties to the conference has grown continually; at present, there are 79 parties.

The Convention's declared aim is to protect all migratory animal species (whether they migrate in the air, in water or on land) throughout their entire habitats. Where species' populations are threatened or have an unfavourable conservation status, suitable protection measures should be taken to enable the populations to recover to an extent at which they can again be sustainably used. To this end, the Convention contains the following instruments:

- Strict protection, in the relevant range states, for all migratory species that are facing an immediate threat of extinction and are listed in Annex I of the Convention;

- Development and signing of agreements, between the various relevant range states, to protect migratory species that, while not necessarily facing extinction, will soon be facing extinction unless international or internationally co-ordinated efforts are made to protect them. The species for which such special regional agreements are to be concluded are listed in Annex II of the Convention.

The following animal species native to Germany are listed in Annex I and thus are strictly protected: sea eagle, great bustard, ferruginous duck, sedge warbler.

Germany is a party to the following regional agreements that have to do with Annex II species:

- Agreement of 16 October 1990 on the Conservation of Seals in the Wadden Sea
- Agreement of 4 December 1991 on the Conservation of Bats in Europe (EUROBATS)
- Agreement of 31 March 1992 on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS)
- Agreement of 16 June 1995 on the Conservation of African-Eurasian Migratory Waterbirds (AEWA)

In addition, Annex II lists a range of other migratory species that are native to Germany, and for which no regional agreements have been concluded, but which are subject to a diverse and effective range of protective mechanisms.

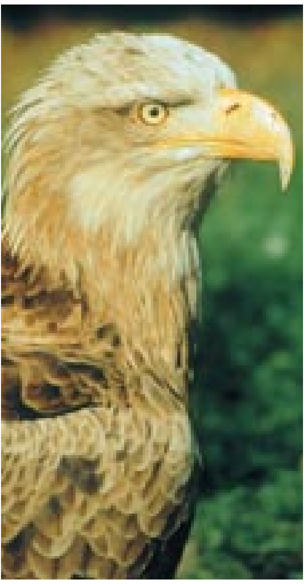
IMPLEMENTATION IN GERMANY. In implementation of the Bonn Convention, the Federal Government and the Länder co-operate within their various spheres of competence. The Federal Government manages efforts in the area of international co-operation. It prepares proposals for amendments of laws, where agreements require such amendments at the Federal level. The Federal Government also engages in certain research activities with regard to species covered by the agreements. Specific protection measures are taken by the Länder. For example, the Länder are responsible for setting aside protected areas, or for enacting other types of area-based protection, for animal species that require certain habitats – during their breeding seasons, in their wintering areas or in their resting areas along flyways. In addition, in appropriate cases they take additional conservation measures, such as carrying out species-assistance or monitoring programmes, to improve the conservation status of migratory species. The Länder are also charged with enforcing relevant Federal law. This they do either directly – for example, in the area of prohibitions on access – or in connection with relevant implementation regulations under Länder law (example: intervention regulations). The Federal Government and the

Länder also carry out efforts to enhance public awareness of the needs of migratory species.

Chapter 1 of the present work highlights exemplary efforts being made in behalf of migratory species native to Germany. It includes official nature conservation activities, at the Federal and Länder levels, as well as efforts of volunteer associations and groups. A discussion of measures to protect the white-tailed sea eagle, Germany's heraldic animal, opens these descriptions (Chapter 1.1). Programmes for surveying and studying other animal groups are presented in Chapter 1.2. The remarks on area protection in Chapter 1.3 focus on the internationally important coastal and Wadden Sea areas (the Wadden Sea has long been a focus of particularly intensive conservation efforts). Chapter 1.4 presents contributions of non-governmental organisations. In these articles, for which the organisations are themselves responsible, the organisations describe their efforts to protect migratory animal species in Germany.

Chapter 2 documents the conservation status of all CMS species that are native to Germany, and regularly occur in Germany, and provides an overview of efforts being made to protect them. This section begins with a treatment of all four Annex I CMS species that are native to Germany (sea eagle, great bustard, ferruginous duck and sedge warbler) and that are strictly protected. A description of all Annex II species follows, divided into species for which regional agreements are in place and species for which no regional agreements have yet been concluded (only bird species). On the occasion of the 2nd Meeting of the Parties to AEWA, special emphasis is placed on waterbirds. Chapter 2.3 is thus oriented to the reporting format agreed within the AEWA framework. Chapter 2.3.1 presents a first listing of all populations of AEWA species relevant for Germany. It also describes their places in international contexts and their population situations and trends in Germany, in order to publicise important basic aspects of AEWA in Germany and to promote implementation of the agreement.

The present work provides only summaries in the areas of small cetaceans and bats. Further information is available in Germany's national reports on these animal groups; the report on bat conservation in Germany has already been published by the Federal Agency for Nature Conservation (BOYE et al. 1999).



Sea Eagle

1 Selected aspects of protection of migratory species in Germany

1.1 Protection of the white-tailed sea eagle *(Haliaeetus albicilla)*

INTRODUCTION. The white-tailed sea eagle is Germany's heraldic animal; it adorns the country's federal coat of arms, federal service flags and federal seals. A large, strong bird, it also serves as a symbol for rallying efforts in nature conservation (HAUFF 1998). It figures prominently in lore, appearing in many fairy tales, sagas, tales and songs. It is a bird "most people" are aware of, even if only in a superficial way.
The white-tailed sea eagle, along with the great bustard, the ferruginous duck and the aquatic warbler, is one of the species listed in Appendix I of the Bonn Convention on the Conservation of Migratory Species of Wild Animals (CMS) that are of particular relevance for the Federal Republic of Germany. Efforts to protect the white-tailed sea eagle and increase its numbers are particularly well-documented.
Consequently, this chapter takes the logical step of describing such efforts, and findings regarding the bird's range, population and relevant threats, separately from such descriptions for other species.

Tab. 1.1-1: Numbers of breeding pairs in the European countries with the largest populations of white-tailed sea eagles (HAUFF in lit. 2001).

Country	Population
Norway	2.200
Russia (European part)	500
Poland	500
Germany	370
Sweden	250

RANGE. The white-tailed sea eagle is found throughout virtually the entire northern palaearctic. In the west, it ranges as far as the nearctic, into Greenland (HAGEMEIJER & BLAIR 1997).
Its range extends from Japan, Kamchatka and the Bering Strait, in the east, to southwest Greenland, in the west. The northern boundary of its range lies within the Barents Sea region and Siberia, at 70° north latitude. The southernmost populations are found between Croatia and the Caspian Sea, and in a band, between 30° and 40° north latitude, extending to the Pacific. The European countries with the densest populations of the white-tailed sea eagle are Norway, Poland, Russia (European part), Germany, Sweden and Finland. Tab. 1.1-1 shows the numbers of breeding pairs in these countries.
The German populations are particularly significant, in connection with the northern European and eastern European populations, because they are particularly dense. The populations in Mecklenburg – West Pomerania, Brandenburg, Saxony and Schleswig-Holstein are especially important.

DEVELOPMENT OF POPULATIONS – THEN AND NOW. According to TUCKER & HEATH (1994), at the beginning of the 19th century the white-tailed sea eagle was still found throughout Europe and was a common sight.

Beginning in 1850 and then in the early 20th century, populations in Europe decreased dramatically (OEHME 1961). They did not recover until the end of the 20th century, as a result of intensive protection efforts. Recovery began with the populations in Scandinavia and Poland. It then spread to north-east Germany and then further west.

GLUTZ VON BLOTZHEIM et al. (1971) report that only about 12-15 pairs of white-tailed sea eagles were left in Germany in 1913. In Mecklenburg, West Pomerania and Brandenburg, the total population in 1920 was 20-25 pairs. Since the range involved was 23,000 km^2, this translates into a density of 0.1 pairs per 100 km^2.

In Schleswig-Holstein, all breeding pairs of the white-tailed sea eagle were wiped out prior to the turn of the century (between 1880 and 1900). Only four breeding pairs were reliably identified in Mecklenburg – West Pomerania at the turn of the century.

Population figures for the areas in question, for the period beginning in 1935, are inconsistent. Whereas GLUTZ VON BLOTZHEIM et al. (1971) list 30 pairs, OEHME (1987a) reports a population of 60 breeding pairs. GROEBBELS, cited in HAUFF (1996), states that in 1935 Germany as a whole had a population of 42 breeding pairs, 15 of them in Mecklenburg. By the middle of the 20th century, the population of white-tailed sea eagles in Mecklenburg – West Pomerania had grown to 75 breeding pairs. Overall, a total of 120 pairs were reliably counted in the two German states in 1950.

According to HAUFF (1996), the population then stagnated over the next 30 years, remaining at a level of about 100 to 120 pairs. Only about 20% of the breeding pairs were able to raise young successfully. OEHME (1990) reports a reproduction rate of 0.23 young per breeding pair for the period between 1973 and 1978. In the years after 1978, the reproduction rate increased to 0.37 young per breeding pair.

A noticeable increase in the total population was seen as of 1980 (HAUFF 1998). In Germany as a whole, the number of pairs with breeding territories increased from 119 in 1976 to 301 in 1997. HAUFF (1998) reports a particularly strong increase for the 10-year period after 1987. According to his information, the population doubled during this period.

HAUFF (1998) provides reliable reproduction data for 1980 and for the period as of 1993. The breeding-success rate increased from 27% in 1980 to an average of 59.1% between 1993 and 1997. In Mecklenburg – West Pomerania, where nearly 50% of German white-tailed sea eagles breed, the reproduction rate in 1980 was lower than it was for all of Germany. Since then, the reproduction rate for white-tailed sea eagle in the state of Mecklenburg – West Pomerania has become more similar to that for the rest of Germany (HAUFF 1998).

In the early 1980s, following the population increases in the core-range states of Brandenburg and Mecklenburg – West Pomerania, populations of white-tailed sea eagle also grew in the states of Saxony and Schleswig-Holstein, which previously had had only sparse populations. This resulted in a considerable expansion of the bird's range.

According to HAUFF (1998), the total population in Germany in 1997 was 301 pairs with breeding territories. Of 260 pairs that actually attempted to breed, only 144 pairs (55%) bred successfully. These birds had a breeding-success rate of 0.85 young per breeding pair.

POPULATIONS OF BREEDING PAIRS BY LÄNDER. Figure 1.1-1 shows how populations of white-tailed sea eagle have developed in the various German Länder.

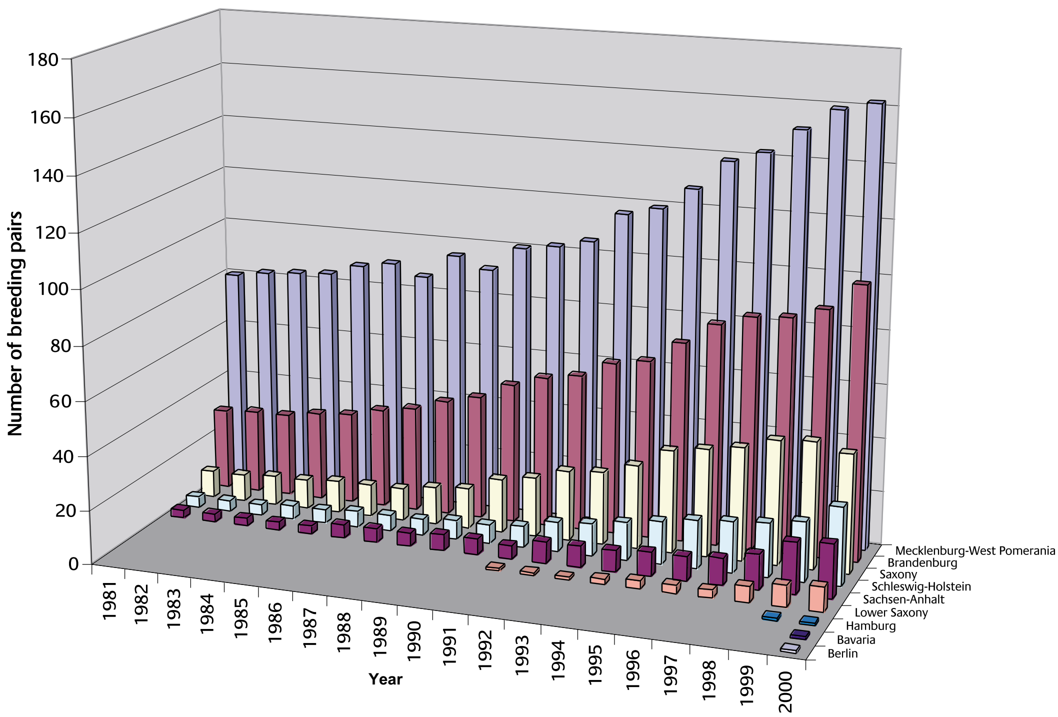
MIGRATION OF THE WHITE-TAILED SEA EAGLE. The white-tailed sea eagle's migration is confined to the European continent. In keeping with the bird's range and its habitat requirements, it takes place in the North Sea and Baltic Sea regions, as well as in the countries bordering these seas.

White-tailed sea eagles have been banded in Europe since 1976, as the result of an initiative of the Swedish Society for the Conservation of Nature. The bands attached to the birds show the birds' area of origin and year hatched. The band information can thus be used to draw conclusions regarding migration of white-tailed sea eagle. As a result, it has been discovered that the new birds seen in Denmark are young sea eagles that have left Schleswig-Holstein.

In Germany, banding of white-tailed sea eagle is organised by two stations. In Schleswig-Holstein, birds six to eight weeks old receive bands of the Helgoland ornithological station. A total of 169 white-tailed sea eagles were banded between 1977 and 1998 (GRÜNKORN & STRUWE-JUHL 1998).

In eastern Germany, banding of white-tailed sea eagles is organised by the Hiddensee ornithological station. From 1964 to 2000, this station banded a total of 936 white-tailed sea eagles (KÖPPEN

Fig. 1.1-1: Development of populations of white-tailed sea eagle (pairs with breeding territories), broken down by German Länder (states) (from HAUFF in lit. 2001).



2001). Since 1981, white-tailed sea eagles have been banded with two bands per bird. A right-leg band shows the Land (state) in which the bird was banded. It also bears an individual number for the bird. White-tailed sea eagles banded in Germany wear either orange-coloured bands (Schleswig-Holstein) or yellow bands (eastern Germany). A leftleg band, also colour-coded, shows the year in which the bird was banded.

Older birds are known to make extensive migrations, especially during winter months. During the winter, Scandinavian eagles, most of them still immature, migrate into Baltic Sea or North Sea areas in their search for food. They can also be found in lake regions further inland.

LOOFT & BUSCHE (1990) report that young, sexually immature white-tailed sea eagles wander about, looking for food. In the process, they roam extensively and cross into other Länder. Banding data for young white-tailed sea eagles in Schleswig-Holstein document this (GRÜNKORN & STRUWE-JUHL 1998, KÖPPEN 2001). For example, two white-tailed sea eagles banded in 1979 in Schleswig-Holstein were found in the fall of the same year in Gedser / Denmark and on the Dutch Island of Texel.

A total of 14 of 167 young sea eagles banded in Schleswig-Holstein died within their first two years of life. In the following years a total of five of the remaining birds were sighted in Mecklenburg – West Pomerania. One was sighted in Denmark, one was seen in Poland and one was spotted in England. Four of the birds remained in Schleswig-Holstein and bred there. The bird sighted in Poland was found dead in its 19th year of life, in a sea-eagle breeding area near Slupsk; it may well have bred there, some 430 km east of the place where it was hatched, for quite some time.

It has been found that such aimless wandering (dispersion movements) plays a decisive role in settlement of new areas. For example, all the populations of breeding pairs in Denmark have been formed by birds from Schleswig-Holstein. This behaviour also protects the white-tailed sea eagle's gene pool in any given region. This may prove to be a key factor in further protection of populations of the "white-tailed sea eagle" species, of which only a relatively small total population is left.

Tab. 1.1-2: Comparison of the causes of deaths of white-tailed sea eagles in Schleswig-Holstein before and after 1980 (from STRUWE-JUHL et al. 1998)

Cause of death	1951-1979	1980-1997	Birds discovered in other areas, 1980-1997
Shooting	6		1
Poisoning	5	4	
Trapping	2		1
Traffic	1	5	1
Power lines		3	1
(Territorial) battles		2	
Weather		1	
Hypothermia		1	
Total	14	16	4
Cause unknown	14	5	3
Total	28	21	7

LOSSES, AND THE RELEVANT REASONS. Various factors, with relative significance varying over time, have been identified as reasons for the decrease in the sea eagle's population in the period until 1980.

HAUFF (1998) reports that populations of the white-tailed sea eagle decreased as of about 1850 as a result of intensive hunting. Hunting, with all of its grave consequences, was encouraged via payment of "bounties" for birds shot (HAUFF 1993). For example, beginning in 1875 in Mecklenburg, a bounty of 1.25 gold marks was paid for every white-tailed sea eagle killed.

Hunting reduced the sea eagle's range in Germany. For example, hunting destroyed Bavaria's population by 1890. The population in Schleswig-Holstein was eliminated by 1875 (HAUFF 1998). In the areas that now make up the Länder of Saxony, Saxony-Anhalt and Lower Saxony, the white-tailed sea eagle became extinct by the turn of the century.

Pursuant to LOOFT & BUSCHE (1990), until around 1850 about 40 white-tailed sea eagles were shot annually in Schleswig-Holstein. The birds concerned were probably young birds from neighbouring countries that had come to Germany in their search for food – for example, to the Wadden Sea area. At night, sea eagles hunting in the Wadden Sea area returned to "sleeping trees", with several birds sometimes using the same tree. LOOFT & BUSCHE (1990) report that in some nights up to nine white-tailed sea eagles were shot in one session.

According to HAUFF (1993), about 412 white-tailed sea eagles were killed in Mecklenburg and West Pomerania between 1841 and 1853.

Later, the birds became prey to intensive nest-plundering, in addition to hunting. In such plundering, which occurred predominantly in Schleswig-Holstein, the birds' eggs were "removed for collection". This ultimately led to intensive efforts to guard the birds' aeries.

Since the middle of the 20th century, pesticides have been used to increase agricultural crop yields. The best-known pesticide in connection with the white-tailed sea eagle is DDT (dichlorodiphenyltrichloroethane), to which PCB (polychlorinated biphenyls) were added. These and other environmental toxins entered the food chain and were consumed by the sea eagles as part of their prey. As a result, their reproductive rate dropped sharply. Their eggs became thin-shelled and tended to break during brooding (OEHME 1987b). Use of DDT and PCB has been banned for years via relevant ordinances on use and prohibition.

STRUWE-JUHL & LATENDORF (1997), LANGGEMACH et al. (1998) and KRONE et al. (pub. pend.) provide more precise details regarding the causes of death of the white-tailed sea eagles found between 1980 and 1997.

Between 1980 and 1997, a total of 21 white-tailed sea eagles were found dead in Schleswig-Holstein. An additional seven birds banded as nestlings in Schleswig-Holstein were found outside of the state between 1980 and 1997 and included in the study. Study of the dead sea eagles included chemical analysis to help determine the causes of the deaths.

Of the 21 sea eagles, five were killed by traffic (rail and road). One bird was killed by a collision with a road vehicle. The other four birds were hit by rail vehicles as they ate carrion lying next to the rails. Four birds were found to have died through poisoning, although the poison in question *(mephinphos)* was identified in only one of the cases. An additional three birds were killed by power lines. The cause of death was not identified for five of the birds. The remaining four birds found dead died as a result of intraspecific battles.

LANGGEMACH et al. (1998) report the causes of injuries suffered by white-tailed sea eagles found either dead or injured between 1990 and 1998 in Brandenburg and Berlin. Of a total of 14 birds studied, seven also had older, healed injuries. Significantly, most of the injuries were found to have been intentionally caused.

In 1996, a preparation application was submitted for the intentionally poisoned sea eagle, listing the cause of death as the impact of a falling beech tree *(Fagus sylvatica)*. A subsequent autopsy revealed the real cause of death.
Of the four stolen dead sea eagles, two were taken directly from the death site. Another sea eagle disappeared without a trace from a zoo near Cottbus. The fourth theft remained an unsolved mystery.

To the list of causes of death or injury shown in Table 1.1-3 must be added one case of illegal keeping of a sea eagle. The bird in question was observed in flight, bearing jesses and bells. Intensive research showed that the bird was being kept illegally.
KRONE et al. (pub. pend.) carried out a Germany-wide study. They studied 120 white-tailed sea eagles from Germany that were found, between 1990 and 2000, either dead or moribund. The most significant causes of death were anthropogenic: collisions with railway vehicles and poisoning through consumption of lead particles (Tab. 4).

Although no white-tailed sea eagle died directly from gunshot wounds, lead shot was found in five of 58 sea eagles x-rayed.

The most frequent cause of death, "impact of railway vehicle", is explained in that the sea eagles' diet consists partly of carrion. While animals are often thrown from the roadway when they are struck by road vehicles, animals struck by trains often come to rest between the rails, where they attract sea eagles – who are then often killed by the next train.

Tab. 1.1-3: Causes of death, injury or loss of white-tailed sea eagles found in Brandenburg and Berlin (from LANGGEMACH et al. 1998)

Reason effective when bird found	Earlier injury	Time
Railway	Gunshot wound	08/98
Power lines	Suspicion that a steel trap was used	10/93
Railway	Suspicion that a steel trap was used	09/96
Unknown (found dead)	Suspicion that a steel trap was used	03/97
Find of a dead old bird	Suspicion that a steel trap was used	06/98
Intentional poisoning with carbofuran (insecticide)	-	11/96
Theft of a young bird from an aerie	-	05/94
Theft of a young bird from an aerie (incited)		95
Theft of a dead sea eagle		06/93
Theft of a dead sea eagle	Railway death	02/96
Theft of a dead sea eagle	Railway death	Winter 96
Theft of a dead sea eagle	-	96

As part of its "greenbelt along the tracks" policy, German Railways (Deutsche Bahn) tries to minimise train-caused deaths of wild animals by eliminating hiding places for wild mammals along railway tracks. When animals are struck nevertheless, local hunting authorities are immediately notified, so that the remains can be promptly removed (DEUTSCHE BAHN in lit. 2002).

The primary source of lead poisoning of white-tailed sea eagles probably consists of waterfowl and other game that are shot by hunters but not found and retrieved. Such animals are then eaten by sea eagles, also as carrion. The lead shot and lead fragments (from semi-jacketed projectiles) in the animals' bodies wind up in the eagles' digestive tracts.
In addition to losses resulting from hunting or traffic, white-tailed sea eagles are subject to other threats and dangers in their breeding areas.

These especially include disturbances near nests, caused by recreationers and other sources of noise. In 1992, a helicopter flew low over a nest and landed in its vicinity, causing the birds to abandon their brood

Tab. 1.1-4: Causes of death of sea eagles in Germany (pursuant to KRONE et al. pub. pend.).

Cause of death	Percentage (rounded off)
Impact of railway vehicle	14%
Lead poisoning	12%
Infections	11%
External injuries (trauma)	10%
Electrocution	9%
Landing on power lines	7%
Intraspecific battles	5%
Poisoning (other than lead poisoning)	3%
Deformities	2%
Starvation	1%
Unknown (decomposition too far along)	24%

(HEYDEMANN 1998). The noise disturbance was compounded by the air turbulence caused by the helicopter. In another case, in 2000, an overflight by a hot-air balloon caused a brood to be abandoned (STRUWE-JUHL & LATENDORF 2000). Logging and other forest-management activities in the direct vicinity of nests, during mating and nest-building periods in winter and spring, can also cause sea eagles to abandon their nests. In 2000 and 2001, two sea-eagle pairs, in Lower Saxony and Schleswig-Holstein, abandoned their broods for this reason (STRUWE-JUHL, mdl. and SÜDBECK, orally reported). In 2000, an unoccupied nesting tree was felled in Schleswig-Holstein.

In Germany, the white-tailed sea eagle breeds in areas with large numbers of lakes. On and near large lakes, it can come into conflict with recreationers engaged in water sports. Satisfactory compromises have been reached, however, by establishing protected areas and enhancing public awareness.

EFFORTS TO PROTECT THE WHITE-TAILED SEA EAGLE – THEN AND NOW. With its majestic appearance, the white-tailed sea eagle has always attracted special interest. This has significantly aided efforts to protect it.

In 1903, WÜSTNEI (1903) stated that sea eagles were "natural treasures" that should be protected. He called for strict protection and a ban on all hunting of the birds. Some states of the Reich passed ordinances mandating yearround bans on hunting (LOOFT & BUSCHE 1990).

In 1906, strong public pressure led to the suspension of bounties on white-tailed sea eagles.

As of 1934, all eagle species were placed under protection, as game subject to a yearround closed season, by the Reich Hunting Act and its Execution Ordinance (1935). Hunting then decreased as this legislation and further ordinances were implemented. On the other hand, nest-plundering, often involving complete destruction of nests and eggs, increased.

Starting in the mid-1950s, committed conservationists with a special interest in birds of prey began monitoring the small remaining populations of white-tailed sea eagles in Schleswig-Holstein. They were supported in these efforts by conservationists from England and the Netherlands. Nonetheless, in spite of the conservationists' watchfulness, thieves continued to climb up to nests and rob or destroy their eggs. On the other hand, the efforts still had the positive effect of considerably improving understanding of the white-tailed sea eagle's biology.
On the ground, nesting trees were surrounded with nets and barbed wire, to provide additional protection. Thanks to the vigilance of the "guards" and of certain institutions, forestry activities near nests decreased during breeding season; even felling of nesting trees decreased.

To the present day in Schleswig-Holstein, nests located in particularly sensitive areas are observed by conservationists encamped in trailers and tents. Such guards inform the interested public about the white-tailed sea eagle and efforts to protect it, and they guide visitors to observation points.

Other measures, in addition to nest guarding, are also carried out to protect the birds. Between 1975 and 1980, a total of four young eagles hatched in bird-station incubators were placed in existing nests, next to naturally hatched young (RÜGER 1981).
One of these birds was pushed out of the nest by naturally hatched fledglings. The other three incubated white-tailed sea eagles were able to grow and fly out of their nests. Two other white-tailed sea eagles, hatched and raised completely in captivity, were successfully introduced to the wild. Such efforts were later discontinued, however, since the genetic lines of the artificially hatched birds were not known.

In the early 1960s, a guideline on nest protection was passed for the former GDR's districts of Rostock, Neubrandenburg and Schwerin (where most of the former GDR's eagles were found) (TESSENDORF & WÖLFEL 1999). This guideline on nest protection was then subsumed within the 1992 nature conservation act of the state (Land) of Mecklenburg – West Pomerania. A second state nature conservation act, passed in 1998, strengthened protection for the birds' nests still further. Article 36 of the act establishes two nest-protection zones. In nest-protection zone I, covering a radius of 100 m from the nest, no vegetation may be cut and the area's character may not be changed in any way. Furthermore, during the period from 1 March to 31 August, all agriculture, forestry, fishing and hunting are prohibited. In protection zone II, covering the area between 100 m and 300 m from the nest, agriculture, forestry, fishing and hunting are also prohibited during the period from 1 March to 31 August.

In contrast to the situation in Schleswig-Holstein, no direct guarding of nests took place in the former GDR. Such guarding would not have been feasible, given the large number of nests there (already larger then than in Schleswig-Holstein).

For the past four decades, responsibilities for monitoring nests have been divided among three regional co-ordinators (HAUFF 1993). The nests themselves are protected by local officials – often local foresters. Monitoring takes place three times per year; in March, the nests are checked for occupation by white-tailed sea eagles, and in April and June breeding success is monitored.

Recently, new ways have been found to inform the public. From 1993 to 1995, a sea-eagle nest on the island of Kaninchenwerder, near Schwerin, was monitored with a video camera. The images were shown live in the island's nearby lodge (HAUFF 1999). All of the video footage was kept and is now being analysed at the University of Rostock, as part of a diploma thesis.

LEGAL PROTECTION FOR THE WHITE-TAILED SEA EAGLE AND ITS NESTING SITES. The white-tailed sea eagle enjoys the status of "strictly protected species" under the Federal Nature Conservation Act. At the same time, the white-tailed sea eagle has the status of a game animal under the Federal Hunting Act. No hunting season has been established for the bird, however.

The options provided by state nature conservation acts for protecting nesting sites are described in Chapter 2.1.1.
Thanks to the efforts of many conservationists, white-tailed sea eagle populations in Germany have recovered. Nonetheless, the birds will continue to require protection. Efforts of volunteer conservationists have proven to be highly effective and valuable.

1.2 Species: inventories and research

Before animal populations can be effectively protected, they must first be inventoried, since only inventories can reveal populations' real protection needs. Without knowing how a population is developing, one cannot recognise key trends – including potential threats. And inventories, paving the way for effective protective action, should include research into the latest relevant issues.

The following chapters, in section 1.2, provide examples of inventories and study that provide a basis for effective, lasting protection. The species in question are species listed in Annex II of the Bonn Convention on the Conservation of Migratory Species of Wild Animals (CMS).

Annex II lists migratory species whose conservation status is unfavourable, and for which, pursuant to Art. IV CMS, agreement are to be enacted. The "Agreement on the Conservation of African-Eurasian Migratory Waterbirds" (AEWA) and the "Agreement on the Conservation of Bats in Europe" (EUROBATS), two examples of such agreements, have a direct bearing on the species mentioned in the following chapters.

Chapter 1.2.1 provides an overview of projects initiated in fulfilment of obligations under Article III EUROBATS (fundamental obligations). Since the Federal Republic of Germany has a special responsibility for species that live in the zone of summergreen deciduous forests, the project "Ecology and protection of bats in forests" is described in detail.

In order to improve knowledge about offshore areas, a project was carried out on distribution, abundance and migrations of seabirds and waterbirds. This project, which was funded by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) and scientifically supported by the German Federal Agency for Nature Conservation (BfN), is described in chapter 1.2.2. It highlights Germany's special responsibility for protecting the Wadden Sea and the animal species living in the German North Sea area. It also especially benefits AEWA bird species – within the meaning of Article III h) and in keeping with the action plan, research must be carried out on ways to improve the habitats of such birds. In high seas areas, such birds urgently require international protection.

Chapter 1.2.3 provides an overview of research projects related to conservation of wet meadows in Germany, and initiated, in keeping with Art. III e) and h) AEWA, in order to improve the conservation status of migratory meadow limicolae in Germany. With this effort, the Federal Republic of Germany is also contributing to the maintenance of a network of suitable habitats for migratory species, as required by Art. III d) AEWA.

Chapter 1.2.4 presents the Mettnau-Reit-Illmitz programme of research into the development of populations of common songbird species. This programme also covers species in the family of flycatchers and batises *(muscicapidae)* that fall under Annex II CMS. Most songbird species are difficult to inventory with absolute reliability, and thus little is known about the large-area population trends – and, thus, the risk situation – of many species. The data obtained through the MRI programme reveal such population trends for the first time and can provide a first basis for protection concepts for *muscicapidae* as well as other species.

Establishment of the "Life-Nature" financing concept now makes it possible to carry out regional projects, within European Union Member States, for protection of endangered species. Chapter 1.2.5 provides an overview of projects carried out in Germany, with the help of Life, to protect the Eurasian bittern, an example of a species covered by Annex II CMS and AEWA. Financing of a network of habitats suitable for the Eurasian bittern supports development of the Natura 2000 European network of conservation areas, which also benefits other species.

Mouse-Earded Bat

1.2.1 BATS

This section presents special conservation efforts being made by the Federal Government and the Länder on behalf of native bat species – efforts that exemplify a broad range of activities on behalf of many different migratory species.

Bats have enjoyed special protection in Germany for decades. As a result of the Agreement on the Conservation of Bats in Europe (EUROBATS), and of the many "European Bat Night" events carried out by many associations and state organisations – also in Germany – the public has become more and more aware of the need to protect bats and their habitats.

1.2.1.1 Bat-conservation activities as part of an integrated project system – the strategy of the German Federal Agency for Nature Conservation (BfN) for implementing the EUROBATS Agreement

ABSTRACT. Bat conservation activities as compounds of an integrated project system – the strategy of the German Federal Agency for Nature Conservation to implement the EUROBATS Agreement.

The paper describes the objectives, instruments, and projects of the German Federal Agency for Nature Conservation (BfN) in the field of bat conservation since 1993. Many different projects were financed by Federal funds to implement the Agreement on the Conservation of Bats in Europe (EUROBATS) at the regional, national and international levels. The major topics included: bats in forests, conservation of roosts in buildings, research on migration, integration of bat conservation aspects within landscape management, public relations, and international co-operation. Future work should focus on monitoring of bats and transfer of information from science to amateurs and the public as well as from one language to another. The BfN's activities fit together as elements of an integrated bat-conservation project system. The success of this stepwise strategy has been due, in part, to the existence of EUROBATS, to the public's enthusiasm for bats and to the strong commitment of all cooperation partners.

INTRODUCTION. The "Agreement on the Conservation of Bats in Europe" (EUROBATS) was signed in September 1991, at the initiative of the UK. It has been in force since 16 January 1994 and now has a total of 24 parties (as of August 2001). The agreement mandates measures to protect bat species and their habitats, as well as research, public-awareness measures and regular reporting about measures taken (cf. BOYE et al. 1999).

In Germany, the new agreement raised the hopes of an informed public. Since the 1980s, bats had received increasing attention from volunteer and government nature conservation organisations. Many bat conservationists1) had banded together in groups and associations, and lower nature conservation authorities were increasingly supporting local efforts to protect the animals and their habitats. Bat researchers had begun looking for new impetus and support funding (NOWAK 1993).

[1] (Refers to "Fledermausschützer", the German from this term) In the interest of the simplicity, this text does not always use both male and female forms of nouns. It is worth mentioning that both men and women are involved in bat conservation and bat research.

The German Federal Agency for Nature Conservation (BfN), as a concerned specialised authority, welcomes any and all improvements of nature conservation in Germany. For this reason, it wanted to ensure that opportunities to improve bat conservation, as provided by the new agreement, would not go unused. EUROBATS had awakened new awareness of bat-conservation issues, among policymakers, nature conservation authorities and bat conservationists alike, and the BfN sought to exploit this awareness while it lasted. There was no reason to expect new structures or instruments especially for implementing EUROBATS. Therefore, we decided to make use of the BfN's existing resources in a way that would gradually lead to an integrated project system, via individual projects, and that would meet, or help meet, priority bat-conservation needs we identified from our informed perspective. This approach would also support efforts being made in the various German Länder. The following section describes this strategy, the various projects concerned and the tasks that remain for the future.

THE BFN'S AIMS AND INSTRUMENTS RELATIVE TO BAT CONSERVATION IN EUROPE. In 1993, the BfN derived the following priorities, from the EUROBATS agreement and experts' assessments of the situation in Germany, for bat research and bat conservation:

- Improvement of information, about bats and bat conservation, provided to certain groups of occupations that come into contact with bats or that can significantly influence protection of bats' roosts (such as forest rangers, architects, pest-control personnel, teachers).
- Study of migrations of bats in Europe, as a basis for development of international protection concepts for migratory species.
- Assessment of current dangers to bats resulting from use of wood preservatives.
- Enhancement of regard for bats in landscape and intervention planning.
- Support for volunteer and official bat conservationists, in the form of improved provision of information, measures to support conservationists' projects and means by which conservationists can take part in BfN projects.

In the late 1990s, the following additional aims, whose importance continues to grow, began receiving priority:

- Development of a bat-monitoring system that meets requirements described by bat experts, as well as EUROBATS and FFH requirements.
- Support for international exchange of knowledge and research findings relative to bat species and suitable bat conservation measures, especially among states in the EUROBATS region.

To achieve these aims, the German Federal Agency for Nature Conservation has a range of instruments that are financed via the budget of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU):

- Research and development projects. During the year before they are to begin, R+D projects are negotiated with the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) and then added by the minister to the "Environmental Research Plan" (Umweltforschungsplan - UFOPLAN) of the relevant following year, so they can receive support.

- Development and test projects. Such projects normally consist of a main project, in which investments are made, and a scientific support programme that reviews the main project's efficiency (GERMAN FEDERAL AGENCY FOR NATURE CONSERVATION 2001a).

- Major nature conservation projects. The programme for protection of areas of national, representative importance and the shoreline programme (Gewässerrandstreifenprogramm) comprise management and development plans whose preparation takes account of animal groups such as bats (GERMAN FEDERAL AGENCY FOR NATURE CONSERVATION 1999a).

- Funding for experts. A special budget item makes it possible to award contracts to specialists with know-how that the BfN wishes to apply to its own tasks.

- Funding for public awareness measures. In addition to funding and carrying out public relations efforts, the BfN issues information for the press and publishes a series of publications to inform the public and special groups of experts.

- In individual cases, special BMU funding to support tasks or projects of associations and international organisations.

In addition to using these instruments, the BfN supports bat conservation by participating in relevant bodies. Central among these are the Meetings of the Parties to EUROBATS and the Advisory Committee of EUROBATS, in both of which a BfN representative participates as expert advisor to the German delegation, and the body of experts established by the German Länder for implementing the agreement in Germany. Finally, the BfN receives, and offers, expert support via its many co-operative efforts and contacts to associations, research institutes and other institutions.

The BfN's work to transpose the European Union's Fauna, Flora and Habitats Directive (FFH) is also worthy of mention. Since some bat species are listed in Annex II of the Directive, and all are included in Annex IV, bats are receiving strong attention in transposition of the Directive (SSYMANK et al. 1998, RUDOLPH 2000).

EMPHASES AND RESULTS OF THE BFN'S WORK, BAT CONSERVATION IN FORESTS. In discussion of necessary measures for bat conservation in forests – measures from which recommendations could be derived for the forestry sector – scientific uncertainties emerged regarding what species should be considered and what threats these species face. To help answer these questions, the R&D project "Studies of bat ecology in forests, with special emphasis on migratory species and formulation of recommendations for bat conservation in forests" (1995-1999 and 2001) was approved (the results of this project are presented below). In 1995, this project was publicised among bat researchers and relevant associations, and 20 persons and institutions applied to take part. Of this number, seven were selected and requested to submit a detailed offer. Finally, the project was awarded to the German Association for Landcare (DVL), which was subsequently able to integrate many of the other applicants in the project via contracts for work and services. With participation of over 100 bat experts, from throughout Germany, this R+D project proved to be a special success, above and beyond the scientific results it produced (MESCHEDE & HELLER 2000 and this volume). Through their integration within the R+D project, many local experts and research groups received well-deserved recognition of their work and experience. Furthermore, DVL organised seminars, for exchange of interim results, that intensified dialog between all participants and initiated co-operative efforts that, it is hoped, will continue long after the project itself has ended.

BAT CONSERVATION IN SETTLED AREAS. Most problems involving bats in settled areas occur when construction poses threats to bats' roosts, in or on buildings, or when building occupants consider the animals a nuisance. Solutions to such problems must take account of three aspects: the importance of a given roost for the local bat population, building owners' cooperativeness and tolerance, and structural options for creating alternative roosts. The development and test project "Creation of a network of roosts for building-dwelling bat species, by protecting and adding to available roosts in and on buildings" (1996-2001) was designed to outline these aspects' role in nature conservation practice (DIETZ & SIMON 1999). The applicant for the main project was the working group for wild-animal biology (Arbeitskreis Wildbiologie) at the University of Gießen (Justus-Liebig-Universität). The project required applicants to provide part of the funding, and the Gießen Regional Commissioner and the Hesse Nature Conservation Foundation (Hessische Naturschutzstiftung) contributed to the working group's share of such funding. Since the Marburg-Biedenkopf district had been chosen as the project area, it was only logical for the University of Marburg (Philipps-Universität) to provide scientific support. Initially, the city of Marburg was unable to commit to participating, but then it reversed its course when the public took a keen interest in the project.

Scientifically, the project began with the hypotheses that bat colonies always use networks of roosts, that individual bats tend to move around between roosts in their network and that maternity colonies would be able to grow only if they were able to find additional suitable roosts within their radius of action. It was thus reasoned that population tallies and protection measures should always focus on roost networks. Within the first year of the study, the scientific advisors were able to confirm that serotine bats *(Eptesicus serotinus)* and pipistrelle bats *(Pipistrellus pipistrellus)* were using a network of roosts (FEYERABEND & SIMON 2000).

The main project was charged with interesting homeowners, in the project area, in bat conservation – so that they would not only tolerate roosts on or in their houses but would even take pleasure in their presence. In addition, new roosts were to be created that would meet the needs of certain bat species occurring in each community in question. Thanks to a comprehensive public-awareness programme, extensive, direct information provision and cooperation with representatives of the construction industry, the aims of the main development and test project were achieved (DIETZ & WEBER 2001). The project produced both simple information sheets as well as special, highly detailed informational folders for teachers, architects and craftsmen (DIETZ et al. 2000, DIETZ & WEBER 2000). The response of the local population in the project area shows that bat conservation is strongly supported when relevant efforts include provision of suitable information and consultation.

Use of wood preservatives in Germany, along with the resulting threats to bats, was illuminated in the framework of a specially contracted project. Publication of its findings is being delayed, however, until opinions are received from other institutions that deal with wood preservatives and the toxins they contain. The acute problems in this area are caused primarily by private use of wood preservatives, since commercially sold lumber is impregnated and does not require any additional preservative coatings.

STUDY OF BAT MIGRATIONS. For about 70 years, migratory movements of European bats have been studied by means of bat-banding with small wing clips that are attached to the animals' forearms. Data and findings are produced when individuals marked in this way are found and their marking codes are reported to a banding centre. Findings about long-distance flights thus depend on chance (cf. KIEFER & HUTTERER pub. pend.), and they provide little information about the actual routes involved or about movements of populations.

For a time, it was thought that genetics could provide an alternative to banding, if local populations could be genetically differentiated and characterised, in spite of any close kinship relationships. This approach was tested by the Friedrich-Alexander-University Erlangen-Nuremberg, within the framework of the R+D project "Population-genetic study of the structure of bat populations, using the example of the noctule bat *(Nyctalus noctula)*" (1994-1998). The study's findings provided little evidence that a genetic approach could serve as an alternative to wing banding: European noctule bats exhibit genetic mixing over large areas, because they mate during their autumnal migrations, and an individual's genetic make-up is local-colony-specific only in the genes inherited from the mother (in the mitochondria) (MAYER et al., pub. pend.). Consequently, genetic studies are no more effective than banding programmes in identifying maternity-colony areas. Nonetheless, the R&D project provided an important basis for bat conservation, since the genetic methods it developed can be used to identify kinship relationships between maternity colonies, thereby making it possible, for example, to reconstruct isolation mechanisms or settlement strategies. In addition, following the R+D project, many bat researchers and project sponsors were able to make use of the relevant equipment and experience of the Zoological Institute II in Erlangen.

Questions relative to "Biology and protection of endangered migratory central-European bat species, illustrated with the example of Nathusius' pipistrelle bats *(Pipistrellus nathusii)* and pond bats *(Myotis dasycneme)*" were discussed at a conference held at the German Nature Conservation Association's (NABU's) Gut Sunder nature conservation academy. The conference, which was supported by the BfN, served to co-ordinate international efforts to protect and study the two species, as called for in order to comply with EUROBATS and the Bern Convention on the Conservation of European Wildlife and Natural Habitats (LIMPENS & SCHULTE 2000).

BATS IN NATURE CONSERVATION AND LANDSCAPE PLANNING. If bat conservation is to be practised throughout all of Germany's territory, these flying mammals also have to be protected outside of forests and settled areas, the two important sectors in which many bat roosts conflict with intensive uses. The BfN has been studying options for bat-oriented biotope management in protected areas, along with the options' ramifications for bat studies, in the framework of many major nature conservation projects (SCHERFOSE et al. 2001). The relevant inventories and landscape assessments have not yet been standardised, however, and thus there continues to be a lack of guidelines and recommendations for optimisation of protected areas with respect to bats. This lack is also a noticeable deficit in work to establish the "Natura 2000" protected-area network.

In co-operation with two associations, the BfN has been working to integrate bat-oriented scientific input within landscape-planning projects, especially intervention planning. In December 1993, a scientific conference entitled "Standard methods and minimum requirements for mammal-research contributions to environmental and nature-conservation planning" was held in co-operation with working group for wild-animal biology at Justus-Liebig-University Gießen (BOYE et al. 1996). The topic of "Bats in physical and landscape planning" was then discussed in November 1995 at a conference at NABU's Gut Sunder nature conservation academy. The conference organisers continue to study this topic (for example, BRINKMANN et al. 1996, LIMPENS & ROSCHEN 1996), and they have since initiated several follow-on events.

PUBLIC-AWARENESS MEASURES AND ADVERTISING. In light of the many relevant informational brochures published by the German Länder and various associations, the question arose as to whether the Federal Government could make a useful additional contribution in this area. In 1995, at the request of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), the BfN then prepared a relevant internal concept for measures to enhance the public's awareness about bat conservation. The information materials described in this concept, for various different target groups, have since been developed within the framework of the aforementioned projects (R+D, development and test). Brochures about bat migrations and threats to bats from use of wood preservatives have not yet been produced.

In the 1990s, public appreciation of bats grew, and bats became an especially "fashionable" nature conservation subject. This favourable climate was promoted by specific activities and a professional approach on the part of bat conservationists (cf. JÜDES 1988). Perhaps the general zeitgeist also played a role in this trend (for example, a general fascination for microtechnology, an interest in fringe groups with a poor image); perhaps this zeitgeist enabled bats' special capabilities and habits to capture the public's imagination. In any case, nature conservation efforts certainly supported this positive trend. The public's interest was sparked and fuelled. And the existence of EUROBATS also played a significant role. For example, the EUROBATS Secretariat conceived the idea of a European-wide "Bat Night" – a night, once a year, on which bat-oriented excursions and events would be carried out at many different locations. NABU assumed responsibility for the many different local events held in Germany. In co-operation with the state of Schleswig-Holstein, NABU held a central, major event in Bad Segeberg during the European Bat Night for 2001. And since 1997 the Vespertilio e.V. association has held its own "bat festival" in Berlin's Spandau Citadel, with Federal funding contributions. This festival has been very useful in making national-level politicians and journalists aware of bat conservation.

One of the Federal Republic of Germany's contributions to the "EXPO 2000" World Exposition in Hanover was "The Green Oval", an Internet presentation of nature conservation projects (now located at **www.gruenesoval.de/sites/home.htm** and available on CD-ROM). The development and test project in the Marburg-Biedenkopf district was one of the projects selected for this exhibit. Descriptions of that project included general information about bats and problems in bat conservation.

To enhance dissemination of information to bat experts, the BfN works to make project reports, EUROBATS documents and other specialised information generally available. In addition to providing information via BfN series publications, we occasionally report about our efforts in the journal "Natur und Landschaft" [Nature and Landscape] and in the "Mitteilungsblatt der NABU-BAG Fledermausschutz" [Newsletter of the NABU's national-level working group on bat conservation]. The present contribution also serves to give interested experts further insights into the BfN's work.

Measures carried out within the framework of the "Year of the Bat 2001" campaign established by the EUROBATS organisation also help foster extensive public sympathy for bats. This year, the BfN has published a calendar with bat photos taken by GEO photographer THOMAS STEPHAN. The BfN has also produced a brochure entitled "Timely: Protecting Bats" ("Aktuell: Fledermäuse schützen") in co-operation with the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU).

INTERNATIONAL CO-OPERATION. Now that extensive knowledge has been gathered about bat ecology and possible conservation measures, and that strategies and materials are available for effective public-awareness programmes, the BfN sees another important task in exchange of existing know-how between European countries. The largest problem in this area seems to be one of language (PRIMACK 2001). In all relevant countries, bat experts seem to take note of information only when it is in their own national language. And yet translations are very expensive. As a result, we are working, through EUROBATS, to accelerate information exchange. EUROBATS countries are also interested in the findings of the R+D project on bats in forests simply because this subject is part of the agreement's work emphases, as established by no. 4 of the resolutions agreed on at the second session of the meeting of parties.

A second international work priority, pursuant to the same EUROBATS resolution, is to compile a list of all important underground bat roosts. With the help of the German Länder and many volunteers familiar with their own local areas, the BfN has been able to catalogue the sites that should be included in this list. Via a special contract for services, it has been possible to check the various reports, to catalogue the sites in keeping with standardised criteria and thus to prepare an adequate German contribution to the European list.

For reasons of budget law, the BfN is hardly able to make direct investments abroad. As a result, its measures for support of bat conservation in other countries are usually limited to logistical or staffing contributions. Nonetheless, in two projects it has been able to assist bat conservationists effectively in other countries. In the first of these projects, the BfN provided support for the EUROBATS Secretariat's initiative for "Inventory of populations of long-winged bats in south-eastern Europe and development of a conservation programme" (1997-1998). The BfN's support made it possible to initiate co-operation between experts from several different countries, co-operation that has continued to the present day and is now being managed by Bulgaria. The second international BfN project is receiving additional funding from the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU). This support is being applied toward the project's aim, "Training of bat-conservation experts in eastern and south-eastern European countries" (1999-2001), a programme that provides courses in inventorying bats with the help of detectors. On behalf of the BfN, HERMAN LIMPENS has carried out such courses in Bulgaria, Croatia, Ukraine, Slovenia, Georgia, Moldavia, Romania, Lithuania, Slovakia and Yugoslavia. Experts trained through the programme are provided with detectors with which they can continue to apply what they have learned. This support has effectively contributed to conservation efforts in Balkan countries and has been gratefully received.

MONITORING. In light of Germany's reporting obligations in connection with the EU's FFH Directive and the EUROBATS agreement, the need for a nationally standardised concept for inventorying and monitoring bat populations is becoming more and more urgent. A experts' body established by the German Länder, working in co-operation with the BfN, is developing such a concept, also drawing on the work and experience of the country's many volunteer experts (WENDT 1997). To this end, a workshop, open to all persons interested in this subject, was held during the 5th conference of the NABU working group on bat conservation, which took place in May 2001 in Prenzlau. This workshop is to be followed by another event next year that the BfN will organise. Development of bat-monitoring systems must take a range of nature conservation principles and frameworks into account, some of which are being prepared by TU Bergakademie Freiberg, within the framework of the R+D project "Model for an overall concept for Federal monitoring of animal populations, illustrated with the example of avifauna" (1997–2001).

Development of a nation-wide programme for systematic inventory of bat populations in Germany would also improve the database for the next edition of the "Red List of Endangered Mammals", which the BfN plans to publish approximately 10 years after the appearance of the current edition (BOYE et al. 1998).

CONCLUSION. Since 1993, the German Federal Agency for Nature Conservation (BfN) has been heavily involved in study and protection of bats. Since the Federal Government has not established any special bat conservation programme, relevant funding has been drawn from a range of sources, and individual measures and projects have been systematically combined to form an integrated project system. Without the "Agreement on the Conservation of Bats in Europe" and the political signals this agreement has provided, the significant levels of Federal funding devoted to bat conservation, and the many man-hours invested in relevant efforts, would not have been possible. What is more, bat conservation efforts have received an important boost from the public's interest in bats and the great willingness of many bat experts to co-operate with the BfN, willingness from which the integrated project system for bat conservation has greatly profited.

Projects within the project system were selected in accordance with the priorities of the responsible BfN department, the quality of the project proposals submitted and obligations entered into under the EUROBATS agreement. Additional Federal funding is required for study of bat migration in central Europe, for efforts to enhance awareness of pest-control agencies and companies and for a monitoring programme. Furthermore, the Federal Government should intensify its efforts to protect species threatened with extinction and other species of national priority (BOYE & BAUER 2000). Processing the flood of scientific information being produced in this area, in order to make the information available to bat conservationists in other countries and to volunteers, will be an ongoing, increasingly important task.

SUMMARY. This article describes the Federal Agency for Nature Conservation's (BfN's) aims, instruments and projects in the area of bat conservation since 1993. In implementing the Agreement on the Conservation of Bats in Europe, the Federal Government has funded many individual projects that combine to form an integrated project system for bat conservation. The most important topics have included bats in forests, roost protection in settled areas, study of bat migration, integration of bat-conservation criteria in landscape planning, public-awareness measures and international co-operation. Future priorities will include the areas of monitoring and information transfer. The BfN's efforts have profited from the existence of the EUROBATS agreement, the public's interest in bats and the commitment shown by co-operation partners.

1.2.1.2 Ecology and protection of bats in forests – with special consideration for migratory species

Presentation of the research and development project "Studies and recommendations for protection of bats in forests"

The Agreement on the Conservation of Bats in Europe (EUROBATS), a regional agreement within the framework of the Bonn Convention on the Conservation of Migratory Species of Wild Animals (CMS), came into force in 1994. The obligations it imposes on its parties include identifying important areas with regard to bat conservation, taking suitable measures to protect such areas and initiating and supporting protection-relevant research programmes.

Of the 20 bat species that regularly occur in the Federal Republic of Germany, 16 are listed on the German Red List of Threatened Mammals, while two other species are included on the early warning list (Vorwarnliste) (BOYE et al. 1998). The great majority of native bat species depend on forests as habitats for reproduction, hunting and winter roosts (see Tab. 1.2.1.2-1). Some 10.5 million hectares of Germany's territory, or nearly one-third of the country's area, are covered with forests, and about 96 % of these forests are managed for commercial purposes. Isolated stands of semi-natural forest are now left only in natural-forest reserves, national parks and biosphere reserves (GERMAN FEDERAL AGENCY FOR NATURE CONSERVATION 1999a, MESCHEDE & HELLER 2000).

These facts highlight the importance of forest habitats for conservation of bats in Germany. To date, there is still a lack of clear recommendations that would guide forest rangers and forest owners in doing more for bat conservation, in their own forest spheres, than simply installing bat roosting boxes.

For this reason, the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), in co-operation with representatives of specialised nature conservation authorities of the Länder, funded a research and development project (R+D project) aimed at intensifying research on bats in forests and deriving recommendations for protection of such bats.

This project, carried out by the **German Association for Landcare** (DVL), with scientific support from the Federal Agency for Nature Conservation, was an exemplary co-operative effort involving over 100 persons. This group carried out extensive individual studies, in over 30 study areas spread throughout all of Germany. This project organisation also was able to draw on the knowledge and experience of many local bat "buffs" and bat researchers and to acknowledge the value of these assistants' findings.

The R+D project, which took place from 1995 to 1999, was divided into a number of sub-projects. It began by surveying the relevant literature and compiling all available knowledge about forest-dwelling bats. This literature review was continued throughout the project and applied to studies of specific species.

The field research consisted largely of telemetric studies of habitat requirements and area-use behaviour of typical forest species – Bechstein's bat *(Myotis bechsteinii)*, Natterer's bat *(Myotis nattereri)*, Leisler's bat *(Nyctalus leisleri)*, Nathusius' pipistrelle *(Pipistrellus nathusii)*, barbastelle *(Barbastella barbastellus)* and Brandt's bat *(Myotis brandtii)*. It also comprised efforts to inventory bat fauna of various different forest types (riparian forests, mountain forests and other forest types), as completely as possible, with the help of various methods.

Another sub-project studied the migratory behaviour of migratory bats, using the example of the noctule bat *(Nyctalus noctula)* and Nathusius' pipistrelle.
Background information on the habitats found in relevant forests was obtained via a forest inventory and then integrated with bat-ecology data, with the help of geographic information systems.

During the course of the project, DVL carried out seminars that contributed significantly to exchange of interim findings and to intensification of co-operation between bat experts – also outside of the ongoing studies.

The project's extensive findings have been compiled by A. MESCHEDE and K.G. HELLER and published by the German Federal Agency for Nature Conservation, in the Landschaftspflege und Naturschutz series (MESCHEDE & HELLER 2000, MESCHEDE et al. 2001). Yet another important result of the project was the publication of the brochure "Bats in the Forest" ("Fledermäuse im Wald"), which summarises the project's recommendations for bat-friendly forest management (MESCHEDE 2000). This brochure has been distributed to all forest authorities and centres, and it has been made available to private forest owners. An English edition is now also available.

The present project description provides an overview of the methods used in the project and presents, by way of example, selected project findings and conclusions.

STUDY AREAS. Within the course of the project, studies were carried out in a total of 31 forest areas, throughout all of Germany. Faunistic surveys were carried out in 24 forest areas. These included seven riparian forests, of the Rhine, Danube, Elbe and Isar rivers, six mountain forests at elevations above 800 m above sea level and eleven other forest areas with various types of habitats. Tele-metric studies on habitat use by individual species were carried out in nine deciduous, mixed and coniferous forests.

FAUNISTIC INVENTORY METHODS.
In each of the various study areas, a number of complementary methods were used, in parallel, to carry out inventories of bat species. The three main methods used to show the presence of bats were as follows: roost checks, net capture and detector checks.

In the roost-check method, directly accessible bat roosts in nesting boxes were checked about three to five times per year for bats. Where roosts were located in natural tree hollows that were not directly accessible, the relevant trees were climbed and then an endoscope was used to check for bat occupancy. In some areas, bats living in natural tree hollows were captured, with various types of traps set at the roost exits, for species determination and for further studies. In still other study areas, existing buildings (forest huts, barns, etc.) were checked for bat roosts in cracks, under coverings, roofs, etc. and were also inspected for bat droppings.

Net capture was carried out with various types of nets, of varying sizes (Japan nets and so-called "dolls' hair nets").

As to acoustic procedures, various models of ultra-sound detectors to used to detect and – where possible – identify bats. Such detectors make it possible to hear bats' location calls, which are inaudible for humans and which are frequently species-specific. In many cases, species can be identified in the open on the basis of their calls' pitch and frequency. What is more, calls can be recorded in the field and then analysed sonographically with suitable computer programmes. Since the mating calls of Leisler's bat and the noctule bat are clearly audible for humans, late-summer mating colonies of these two species can be directly detected. Analysis of data gained in this manner took into account the fact that only experienced observers are able to distinguish these two species from one another.

Another, somewhat more sophisticated method consisted of using ultra-sound detectors to automatically record bat calls on tape. Such "listening boxes" also record a time signal at the same time they record a call, thereby making it possible to trace development of bats' calling behaviour, in the course of a night, with relatively precise time correlation. Most importantly, this approach makes it possible to correlate calls with specific locations and thus identify activity patterns at specific sites – for example, at entry and exit areas of roosts.

In addition to these standard inventory methods, in some study areas point and transect mappings were carried out, and exiting and hunting bats were observed directly with night-vision equipment.

TELEMETRY AND FOOD ANALYSES. During the course of the project, telemetric studies were carried out of roost and habitat requirements of Bechstein's bats in four study areas, of Nathusius' pipistrelles and Leisler's bats in two study areas for each and of Natterer's bats, barbastelles and noctule bats in one study area for each.

Telemetric radio transmitters – in each case, not weighing more than 5 to 10% of the body weight of the species in question – were attached (either glued or affixed with a collar) to the animals. In studies, the locations of radio-tagged individuals were determined with receivers and entered on maps with scales ranging from 1: 10,000 to 1: 25,000. Depending on personnel availability, triangulation was carried out two observers taking simultaneous bearings, or time-delay triangulation was carried out by a single observer. In addition, direct bearings were taken of areas where the bats spent longer periods of time (single-person method), and attempts were made to follow radio-tagged individuals as closely as possible ("homing-in-on-the-animal" method).

These methods were supported by visual observations of radio-tagged individuals and use of bat detectors. In one study area, transmitter signals were received automatically from within the roost (in keeping with the listening-box technique described above).

Telemetric data was analysed via the "minimum-convex-polygon model", in which an animal's home range is described by means of the polygon formed by the bearing points obtained during the study period. Since this method also takes areas into account that are outside of the bats' actual hunting grounds, the "harmonic-mean model" was used to identify studied individuals' activity focuses within their home ranges. By means of small lights attached to the bats for short periods of time (the lights consist of plastic tubes containing a substance that glows for several hours via an enzyme reaction), a total of seven individuals of Brandt's bat and one Bechstein's bat were tracked visually, for several hours in each case. These observations produced additional data about habitat selections of bats that hunt in forests (hunting altitude, forest layers in which the bats hunt).

In some study areas, telemetric studies were complemented by studies of the bats' diet. About once per month, samples of droppings were taken from roost areas (nesting boxes or lofts/attics) with bats identified as to species. The samples were then analysed for the presence of prey typical for the forest in question. Such studies were carried out in the Bayreuth area, with Natterer’s bat and the brown long-eared bat *(Plecotus auritus)*, and in the Upper Palatinate (Oberpfalz) area, with Bechstein's bat and mouse-eared bat *(Myotis myotis)*.

STUDIES ON MIGRATORY BEHAVIOUR OF THE NOCTULE BAT AND NATHUSIUS’ PIPISTRELLE. In 1996 and 1997, a nation-wide network of observers, organised by R. WEID, counted flying noctule bats, at specified times and using a standardised method.

Also as part of the project, in 21 different areas noctule bats and Nathusius’ pipistrelles were banded with forearm bands, in an effort to learn about the bats' migratory routes and choices of forest areas (such data is produced when the bats are recovered). In eastern Germany, the bands were issued, and resulting data collected, by the banding centre at Saxony's state environmental and geological agency (Sächsisches Landesamt für Umwelt und Geologie - Radebeul); in western Germany, these tasks were carried out by the Museum Alexander Koenig (Bonn). The banding data was compiled in a database, and recovered specimens of the two species in question were made available for study by the staff of the banding centres (Dr. ROER and Dr. HUTTERER, Bonn and Dr. ZÖPHEL, Dresden).

Natterer´s Bat

FOREST INVENTORIES. In each of 15 selected study areas, the forest biotope structure around known maternity colonies of the primary forest species Bechstein's bat, Natterer’s bat and brown long-eared bat – in each case, throughout a 1 km radius (corresponds to 314 hectares) – was mapped, using a biotope key provided by the Federal Agency for Nature Conservation, and entered on forest-management maps. In addition, in three areas the hunting grounds of telemetred bats were similarly analysed (with the areas covered defined by the bats' hunting habits, rather than by radius). The resulting data was correlated – manually and with the help of a geographic information system – with data on the ecology of the studied bats.

FINDINGS. The project produced extensive, detailed findings on the ecology and habitat requirements of the various species, findings that were reported in the project report's sections on the species. Here, we can only summarise selected, general aspects that are especially significant with regard to protection of bats in forests.

ROOSTS. All forest-dwelling bat species require shelter. To be suitable as roosts, shelters must meet a range of criteria. First and foremost, a shelter must provide protection against weather (rain, wind, frost) and predators. In addition, it must provide sufficient space for social interactions (reproduction, raising of young) and for formation of colonies (clusters) that can engage in social thermal regulation. In forests, such requirements can be met by natural caves or hollows in trees, as well as by properly placed nesting boxes or other artificial structures (such as cracks in buildings and structures located in forests).

NATURAL ROOSTS. Bats choose natural cracks or hollows in trees in accordance with the amounts of space such shelters provide for individuals and for social interactions. In most cases, hollows are created either by woodpeckers or by decay following damage to tree trunks. They normally provide more space than cracks, and thus they function especially effectively in meeting the bats' different needs that arise throughout the annual cycle: roosts for single individuals, maternity roosts for raising young, mating or resting roosts for migratory species and frost-free roosts for wintering. As a result, hollows left by woodpeckers are the most important roost type for a number of bat species. Successful protection of forest bats thus depends primarily on population densities of woodpeckers, and these in turn depend on forests' age and structure and on their percentages of deciduous trees.

Many bat species have been found to change roosts frequently – even daily, in some cases – during the course of a year. The possible reasons for such movements include avoidance of predators or parasites, changing preference for specific hollows' micro-climatic characteristics, transfer of roosts to the vicinity of favourable hunting grounds and displacement by other bat species or other animals that use hollows (birds, hymenoptera).
Furthermore, not all hollows are immediately suitable for bats, and thus the supply of hollows with potential to serve as roosts must always exceed the demand.
One of the R+D project's key conclusions is thus as follows: "To provide an adequate number of roosts for a natural bat colony, a 120-year-old commercially managed forest must contain at least 20 to 30 tree hollows per hectare. This corresponds to a density of 7 to 10 tree hollows per hectare."

NESTING BOXES. Over 100 years ago, GOGLER (1865, cited from MESCHEDE & HELLER 2000) suggested the use of artificial bat roosts in forests, as a way of compensating for loss of natural roosts, and as a means of combating forest pests biologically. To date, a total of 16 of the 20 bat species regularly occurring in Germany have been shown to use nesting boxes for roosting, and 11 of the species also regularly use such boxes for reproduction. On the other hand, it is questionable whether nesting boxes actually attract new colonies of bats, thereby increasing total bat populations, or whether they simply lure local bat populations away from natural, less convenient roosts. Furthermore, since such boxes require ongoing maintenance, they cannot serve as long-term replacements for natural roosts.

The R+D project produced a number of findings that support use of nesting boxes as temporary transitional solutions, until sufficient numbers of natural roosts are again available. Use of easily accessible boxes also plays a special role in faunistic inventories, in monitoring of bat populations, in study of specific biological questions and in efforts to enhance public awareness. Nonetheless, the aim of bat conservation in forests must be to provide an adequate number of natural roosts, via suitable measures, so that the use of artificial roosting/nesting boxes in forests can gradually be reduced. On the other hand, the boxes should be used to support bat fauna in young and middle-aged forests.

OTHER ROOSTS. In addition to natural hollows and cracks etc. and special roosting/nesting boxes, man-made structures such as huts, raised blinds (for hunting), bridges etc. can serve as substitute or additional roosts for forest-dwelling bats. This possibility should be taken into account in design and construction of structures and in any renovation.

HUNTING GROUNDS AND FOOD. Because of their small size and their highly energetic movements and behaviour, bats require large amounts of food. In a single night, they hunt and consume an amount of food that corresponds to about 20 to 50 % of their body weight. As data published by other authors shows, for example, an 800-member colony of mouse-eared bats will consume about 2,000 kg (2 tonnes) of insects in a single summer (ANTHONY & KUNZ 1977, KULZER 1989 cited from MESCHEDE & HELLER 2000).

The most important food animals for forest bats are nocturnally active butterflies and moths *(lepidoptera)* – a group that includes many forest pests – as well as flies *(diptera)*, lacewings *(neuroptera)*, mayflies *(ephemeroptera)*, beetles *(coleoptera)*, spiders *(arachnida)* and harvestmen *(opiliones)*.

Bats are known to be non-selective hunters that make efficient use of food resources as they appear (suddenly appearing large populations of insects).

On the other hand, telemetry studies show that some individuals remain true to the same hunting grounds and that different species use different horizontal and vertical structures within the forest – i.e. make use of niches in forest habitats. Such niche selection depends primarily on bats' body size, the size of bats' preferred food organisms and on the bats' resulting hunting strategy. Depending specifically on food availability, hunting grounds and radii of action can vary in size between a few hectares and over a hundred hectares.

IMPORTANCE OF RIPARIAN FORESTS AS RESTING HABITATS FOR MIGRATORY BAT SPECIES. Watercourse riparian forests are highly dynamic habitats, because of their location within flood regimes. Periodic flooding, which shifts sediment layers, washes and breaks off portions of solitary trees and forms open water areas, makes such forests particularly rich in structure and insect life. Lengthy periods of flooding often cause stands of trees to die off. At the same time, added moisture promotes decay processes – and, thus, the creation of suitable bat roosts. Consequently, such forests are suitable habitats for bat species.

In addition, riparian forests are particularly important as resting and wintering habitats for migratory bats, especially the noctule bat and Nathusius' pipistrelle.
The noctule bat is a typical forest bat. In summer months, almost all representatives of the species found in northern and north-eastern Germany (Mecklenburg-West Pomerania, parts of Brandenburg and Saxony) and Europe are females. During this period, the males live scattered throughout central Europe. Wintering colonies, comprising both sexes, are found primarily in south-western Germany (Hesse, North Rhine-Westphalia, Rhineland-Palatinate, Baden-Württemberg, Bavaria).

Beginning in the first half of May, females begin occupying their maternity roosts in order to raise young. During the females' return journey, which begins in about August, males occupy mating roosts in transit and wintering areas, in order to mate with migrating females. Suitable forests along south-western German rivers (Rhine, Danube, Lech, Isar, Main), rich in trees with hollows, clearly play a key role in this process. The special value of riparian forests probably results in that they provide both roosts and rich hunting grounds, within relatively small areas. It remains unclear whether bats actually use watercourses for orientation during their migrations, however. Additional research is needed to clarify how migratory bats carry out their migrations.

Nathusius' pipistrelle also uses riparian forests, especially as biotopes to rest in during its migrations from eastern European summer roosts (maternity roosts) to its western and south-western European winter roost areas. The populations that winter in Germany come predominantly from summer roosts in Poland and in Baltic countries. The bats' strong dependence on riparian forest habitats is highlighted in that, as experts agree, almost no Nathusius' pipistrelles can be found in forest areas just a few kilometres away from rivers. During their fall migrations, the bats also mate in their rest areas, thus then requiring a generous supply of closely spaced roosts that permits social interactions.

These examples highlight riparian forests' great importance for protection of Nathusius' pipistrelle and noctule bats in Europe, and they illustrate the need for nature conservation in Germany to have an international orientation. Above and beyond general recommendations for protection of forest bats (see below), the following objectives, based on the R+D project's findings, are proposed for protection of riparian forests:

- Protection, optimisation and enlargement of Germany's remaining riparian forests.

- Implementation of the EU's FFH Directive, which lists riparian forests as priority biotope types that are especially worthy of protection.

- Replacement of non-native trees with tree species typically found in softwood and hardwood riparian forests, and restoration of typical riparian water regimes, via shifting of dam locations and creation of retention areas.

- Protection of oxbows and natural roosts, via protection of islands with old forests and of unused land.

GENERAL RECOMMENDATIONS FOR FOREST MANAGEMENT, WITH REGARD TO BAT CONSERVATION. From a perspective of bat conservation, nature conservation efforts in the context of forest management should be oriented to forest-dwelling species' roosting, hunting and space requirements, in all phases of bats' lives. This implies that protection of forest bats must include protection of summer and winter roosts as well as improvement of their food situation. In the interest of populations' long-term survival, protection must be concentrated especially on requirements (space, etc.) of reproducing groups, i.e. of maternity colonies and maternity associations.

Table 1.2.1.2-1: Bat species that regularly occur in Germany, arranged in descending order of dependence on forests as hunting habitats (pursuant to MESCHEDE & HELLER 2000)

Red List status (BOYE et al. 1998): 1: threatened with extinction, 2: highly endangered, 3: endangered, G: assumed to be at risk, but status unknown, V: early warning list. Use of maternity roosts in forests: !!! regularly, (!) occasionally (MESCHEDE & HELLER 2000).

		Red List FRG	Use of forests as hunting areas (rank)	Use of forests for maternity roosts
Bechstein's bat	Myotis bechsteinii	3	1	!!!
Mouse-eared bat	Myotis myotis	3	2	(!)
Barbastelle	Barbastella barbastellus	1	3	!!!
Brown long-eared bat	Plecotus auritus	V	4	!!!
Nathusius’ pipistrelle	Pipistrellus nathusii	G	5	!!!
Natterer’s bat	Myotis nattereri	3	6	!!!
Brandt's bat	Myotis brandtii	2	7	!!!
Lesser horseshoe bat	Rhinolophus hipposideros	1	8	
Greater horseshoe bat	Rhinolophus ferrumequinum	1	9	
Whiskered bat	Myotis mystacinus	3	10	(!)
Leisler's bat	Nyctalus leisleri	G	11	!!!
Geoffroy's bat	Myotis emarginatus	1	12	(!)
Serotine bat	Eptesicus serotinus	V	13	
Daubenton's bat	Myotis daubentonii		14	!!!
Grey long-eared bat	Plecotus austriacus	2	15	
Northern bat	Eptesicus nilssonii	2	16	
Pipistrelle	Pipistrellus pipistrellus		17	(!)
Noctule bat	Nyctalus noctula	3	18	!!!
Pond bat	Myotis dasycneme	G	19	
Parti-coloured bat	Vespertilio murinus	G	20	

A NUMBER OF RECOMMENDATIONS FOR PROTECTION OF FOREST BATS CAN BE DERIVED FROM THE R+D PROJECT'S FINDINGS:

- For commercial reasons (optimal age of wood for harvesting), trees in managed forests are normally harvested before they reach an age at which suitable roosting hollows for bats can be created by woodpeckers or decay. For this reason, a two-level network of roosts should be developed, to ensure that older stands of trees always have least 25-30 hollows, or about 7 to 10 trees with hollows per hectare.

- In LEVEL 1, a sufficiently dense network of trees with hollows (distance between centres of hollows should not be greater than 1,000 m) should be protected and not harvested; the trees in the network should be clearly marked to show their status. At the same time, a LEVEL 2 network of younger trees that could later contain hollows should be created, at the right time to ensure availability for replacement of LEVEL 1 trees that are taken out of the system through death, harvest or loss of roosts.

- Known bat roosts should be suitably marked to protect them from harvests.

- In selection of tree species, site-adapted mixed-species forests should be given preference over conifer-only forests. Since woodpeckers normally prefer deciduous trees, and since deciduous trees normally live longer than conifers, thereby being more likely to reach an age at which they can form hollows through natural decay processes, deciduous trees tend to provide larger numbers of potential bat roosts than do conifers.

- When forest-management measures necessary for meeting safety obligations or combating pests are pending, the measures should not be carried out during especially critical periods for bats (periods when young are raised, wintering periods).

- Nesting boxes cannot take the place of natural roosts. In habitats suitable for bats, they should be used only as transition solutions until a natural roost system can be developed. Design of such boxes (materials, structure) and the choice of sites for their placement should be oriented to the needs of the locally occurring bats.

- In forest management, clear-cuts larger than 0.5 to 1 hectare in area should be avoided, since such clear-cuts can suddenly eliminate natural habitats (hunting habitats) for forest-dwelling bats.

- In the interest of improving bats' hunting biotopes and food supply, structurally rich forests, adapted to local conditions (selection of site-adapted tree species) should be encouraged. All natural phases of forest development should be permitted.

- No insecticides should be used in forests.

- Recommendations are also provided for mapping locations of bats and tree hollows, for workshops and training events for interest groups, for establishment of a network of conservationists and for use of volunteers for bat conservation.
- For protection purposes, forest areas can be set aside as national parks, biosphere reserves, natural-forest "cells", nature conservation areas, forest conservation areas and Natura 2000 areas. Because such areas account for such a small percentage of the country's total area, they cannot take the place of conservation efforts in commercially managed forests, however.

1.2.1.3 The Research Project "Development and Protection of Bat Populations in Bavaria"

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The Research Project "Development and Protection of Bat Populations in Bavaria"

Bernd-Ulrich Rudolph, Matthias Hammer and Andreas Zahn

1 Introduction

How should a species-conservation programme be carried out for an entire group of animals

- that, as a result of sharp population declines, is generally considered very rare, even though the relative importance of the causes for the declines is not understood in detail;
- when knowledge about the biology and ecology of the individual species concerned is incomplete and of varying quality;
- with a few species that, for all or part of their annual cycles, closely follow human beings, i.e. are linked with cultural landscapes;
- whose various species use large landscape sections as their habitats, in relatively unspecialised ways, with the result that specific habitat-enhancing measures are difficult to implement?

The "Bats" conservation programme in Bavaria was begun in 1985 by the Bavarian Environmental Protection Agency (LfU), on behalf of the Bavarian State Ministry for State Development and Environmental Affairs (StMLU). Because of the many open questions involved, it was established in research-project form, and entitled "Development and Protection of Bat Populations in Bavaria" ("Bestandsentwicklung und Schutz der Fledermäuse in Bayern")[1]. Two co-ordination offices for bat conservation were established, in northern and in southern Bavaria, to carry out the programme. For the regional-commissioner districts of Central, Upper and Lower Franconia, and for Upper Palatinate (Oberpfalz), the agency is located at the Institute for Zoology II of the University of Erlangen-Nuremberg, and is under the direction of Professor O. v. Helversen; the current presiding official at the co-ordination agency for northern Bavaria is M. Hammer. The co-ordination agency for bat conservation in southern Bavaria, responsible for the regional-commissioner districts of Lower Bavaria, Upper Bavaria and Swabia, was initially housed within the government of Upper Bavaria, and was under the direction of Dr. K. Richarz and then A. Schumm and A. Liegl; since 1995 it has been housed within the zoological institute of the University of Munich, in the department of Professor G. Neuweiler, and under the direction of Dr. A. Zahn[2]. The LfU is responsible for overall co-ordination and for scientific supervision of both co-ordination offices.

The most important components of the research project – and, thus, the tasks of the co-ordination offices – include:

- Inventorying and monitoring known bat roosts,
- Informing the public about the purposes of, and need for, bat conservation,
- Establishing a system within which local conservationists care for important bat roosts,
- Advising, training and updating full-time and volunteer bat conservationists and working groups that carry out bat inventories,
- Informing and advising nature-conservation authorities, other authorities and professional associations about bat conservation,
- Informing and advising private citizens and institutions who own buildings occupied by bats,
- Monitoring development of populations in roosts in which conversion and protection measures have been carried out (monitoring of success),
- Developing special protection programmes for particularly endangered species or roosts, and studying protection-relevant aspects of the ecology of such species,
- Monitoring potential bat roosts.

The co-ordination offices for bat conservation have now been in operation for 15 years, and the present overview sums up the progress achieved by the "Bats" conservation programme in Bavaria. It presents important results of the research project and discusses open questions, with regard to individual species, the overall roost situation and recent international requirements for bat conservation.

2 Organisation of bat conservation in Bavaria

2.1 Legal background

All of Germany's native bats are strictly protected under German species-conservation law, i.e. they may not be intentionally disturbed or taken, and their habitats may not be impaired or destroyed.

[1] Both names – "Bats" conservations programme ("Artenhilfsprogramm Fledermäuse") and "Develpment and Protection of Bat Populations in Bavaria in Bavaria" (research project) – are used interchangeably in this article; technically speaking, the species-conservation programme involves additional conservation aspects, however, because of the broad range of activities of nature conservation authorities that it provides for.

[2] The addresses of the co-ordination offices are included within the authors´ addresses, which are listed at the end of the article

Responsibility for enforcing species-conservation law lies with nature conservation authorities.
In July 1993, Germany signed the international Agreement on the Conservation of Bats in Europe (EUROBATS), a regional agreement within the framework of the Bonn Convention on the Conservation of Migratory Species of Wild Animals (CMS). The EUROBATS agreement mandates trans-boundary protection of bat populations in Europe and establishes the following relevant specific aims: population inventories, conservation of roosts and habitats and public relations to enhance awareness and provide a solid basis for bat conservation and basic research. The countries that have ratified the agreement have obligated themselves to work toward these aims.
Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, also known as the "Fauna, Flora and Habitats Directive" (FFH Directive), has been in force in the EU since July 1992. Six bat species that occur in Bavaria are listed in Annex II of the Directive as species of Community interest for whose protection "special areas of conservation" must be established: greater horseshoe bat, lesser horseshoe bat, mouse-eared bat, Bechstein's bat, Geoffroy's bat and barbastelle. The FFH Directive requires that concrete measures be taken to protect the roosts and habitats of these species; impaired habitats are to be restored to a more favourable condition. The special areas of conservation are to become part of Natura 2000, the European network of protected areas. The relationship between the "Bats" conservation programme and the FFH Directive is discussed below (cf. Chapter 8.2).

How do the research project and the work of the co-ordination offices fit in with these obligations, which result from national and international law? Tab. 1 presents the structure of the species-conservation programme and shows how bat conservation is organised in Bavaria.

2.2 Structure of the co-ordination offices for bat conservation

The Bavarian Environmental Protection Agency is responsible for providing scientific supervision for the research project "Development and conservation of bat populations in Bavaria". The Bavarian State Ministry for State Development and Environmental Affairs provides some 170,000 DM annually in funding for the project. This funding is earmarked for purposes such as financing two trained staff, at the two participating universities, as well as financing freelance assistants via contracts for services. At any given time, the research project has a planned duration of two years.

Since 1985, the following staff of the co-ordination offices have taken part in the research project:

Northern Bavaria: Klaus Albrecht, Bettina Cordes, Hartmut Geiger, Matthias Hammer, Georg Knipfer, Helmut Kriegbaum, Felix Matt, Angelika Meschede, Brigitte Pink, Bernd-Ulrich Rudolph, Bernhard Walk, Marc Weinkauf.

Tab. 1: Organization of the species conservation programme and bat conservation in Bavaria (from Schlapp 1996, revised)

Scientific and organizational bases of the research programme / implementation

State Environmental Protection Agency	Co-ordination offices for northern and southern Bavaria	Volunteers
• Overall co-ordination • Central data management • Scientific analysis • Scientific concepts and protection programmes • Report relative to Agreement on the Conservation of Bats in Europe (EUROBATS) • Proposal for FFH areas • Co-ordination of work for bat atlas • Contacts to specialised authorities, etc.	• Inventories • Monitoring; scientific evaluation • Consultation and support in important cases • Training • Public awareness measures • Study of protection-relevant aspects of bat ecology • Contacts to professional associations and church authorities	• Management and protection of roosts • Inventories • Individual advising • Public awareness measures on the local level

Legal enforcement and state support for bat conservation

Bavarian State Ministry for State Development and Environmental Affairs (StLMU)	Governments	Administrative authorities of rural districts; non-district cities
• Funding • International and federal affairs • Publications relative to species and biotope protection programme • Notification regarding FFH areas	• Enforcement of species protection laws, including permitted exceptions • Co-ordination of enforcement and support • Set-aside of nature conservation areas • Implementation of special species assistance programmes	• Support in specific cases (for example, for measures to improve roosts) • Protection of roosts, including designation of natural monuments and landscape features, protective closure of important winter roosts • Public awareness measures

Southern Bavaria: Barbara Dippel, Steffi Federl, Dorothea Friemel, Eva Kriner, Friedrich Kronwitter, Kathrin Krüger-Barvels, Carmen Liegl, Hermann Limbrunner, Sandra Maier,
Robert Mayer, Susanne Morgenroth, Ute Rindle, Doris Wenger, Andreas Zahn.

During this period, the following persons have had responsibility for overall direction: Klaus Richarz, Alfred Schumm, Alois Liegl, Georg Schlapp, Bernd-Ulrich Rudolph.

The co-ordination offices maintain close contacts with higher and lower nature conservation authorities and with the many bat conservationists that are active on a volunteer basis, usually through the local-district groups of nature conservation associations. The number of active bat conservationists in Bavaria has now reached about 250–300. They are often the first points of contact for the public, in rural districts and cities, and they make valuable contributions in raising the public's awareness and understanding, in taking population inventories and in protecting roosts. They also follow up on reports of newly discovered bat colonies, thereby assisting the co-ordination offices significantly, since monitoring of all reported relevant objects (which are often unsafe) for bat colonies is a very time-consuming task. It is so time-consuming, in fact, that co-ordination offices must leave most of it up to local bat naturalists / conservationists. And those involved in local bat conservation often have to serve in a "fire department" role, taking action and providing advice at a moment's notice – for example, when bats are discovered during building renovation or tree-felling.

One of the co-ordination offices' most important tasks is to train and educate active bat conservationists by means of special training events, joint tours of relevant sites, etc., and to co-ordinate methods for counting populations. The LfU considers another one of the co-ordination offices' very important tasks to be maintaining high scientific standards in bat conservation, and in inventorying and describing colonies, throughout all Bavaria. The co-ordination offices collect and analyse the data from all parts of Bavaria. Assessments of the overall development of populations are made on a regional basis and thus may differ completely from assessments based on trends for individual colonies. This is important, and it can occur, for example, when local inventories that show no declines in connection with neighbouring colonies are seen in a context that extends beyond the relevant rural district concerned.

Since co-ordination offices' staff normally carry out excursions together with volunteer staff (cf. Chapter 3.1 through 3.6), they are usually also able to discuss the reasons for local population changes with local bat conservationists.

The ties between the co-ordination offices for bat conservation and the universities of Erlangen and Munich provide a number of special benefits:

- They ensure that high scientific standards are maintained in the research project and in assessment of bat conservation requirements.
- The co-ordination offices remain independent and thus enjoy the respect of all concerned parties.
- When necessary in connection with special questions, modern field-research methods, such as telemetry (cf. Chapter 3.4) or recording of echo-location calls, can be employed, and student assistants can be used to help carry out such particularly work-intensive tasks; specific questions concerning bat populations can be answered in the framework of special events such as excursions or field workshops.
- The universities carry out applied research relative to the ecology of native species, in the framework of diploma or state-examination theses and doctoral dissertations (cf. v. HELVERSEN 1989), and relevant findings can be incorporated directly within conservation concepts. The co-ordination offices also provide proposals for diploma theses, along with advising and support for such theses (cf. Chapter 7).

3 Protection and monitoring of bat colonies

One of the research project's central tasks is to take inventories of bat populations and to carry out long-term monitoring of bat populations in order to keep track of their development.

In the early years of the species-conservation programme, staff of co-ordination offices spent much of their time checking potential roosts – primarily certain types of conspicuous buildings such as churches, cloisters and castles – and mapping their locations. Many bat-conservation groups and individual bat conservationists began their conservation work in rural districts with such mapping tasks. By now, at least basic inventories have been carried out of conspicuous potential bat roosts in Bavaria's cities and in all of its rural districts. Consequently, much is known about distribution in Bavaria of species that populate attics (cf. Chapter 3.1 through 3.4).

The situation is different with species that populate hollows in trees or fissures and gaps etc. in buildings. In any given region, the degree of accuracy with which such species are inventoried depends centrally on the efforts of local bat conservationists, on local public-awareness measures or on special studies and scientific work.

Monitoring in the framework of the research project focuses on easily counted species in their summer roosts, i.e. on the mouse-eared bat, Geoffroy's bat and the greater and lesser horseshoe bats in their maternity colonies, as well on colonies of the parti-coloured bat. It also includes bats in winter roosts, especially in

anthropogenic roosts in northern Bavaria, which are easier than karst caves to inspect and move around in (cf. Chapter 4). The Bavarian bat-monitoring programme is designed to carry out independent monitoring of population changes of various species, to review the success of measures for protecting individual colonies or roosts and to provide "early warning" regarding any threats to colonies. An important aspect of this monitoring – which is the most comprehensive, lengthy long-term monitoring project ever carried out in a species-conservation effort in Bavaria – is that its methods are standardised, thanks to the involvement of the two co-ordination offices for bat conservation. Its staff monitor the great majority of all roosts in question. Procedures with regard to roosts inventoried by local bat conservationists are co-ordinated via training.
The bat-monitoring programme in Bavaria has shown that populations of some species have been increasing, while those of other species at least have not been decreasing. On the other hand, it must be remembered that truly meaningful conclusions regarding such trends can be made only on the basis of many years of data, since bat-population sizes can fluctuate widely from year to year (cf. Chapter 3.6 and Chapter 4, for example).
Apart from its scientific value, the extensive Bavarian bat-monitoring programme has had the following important effect with regard to protection of significant bat colonies and populations: the co-ordination offices and volunteer bat conservationists maintain regular contact – at least once-yearly – with owners or administrators of structures etc. in which roosts are located. Such contacts repeatedly remind the owners, sextons or priests, etc. of the relevant bat populations' importance, and they normally yield advance warning of any plans for changes in the roosts. Renovation etc. can normally be scheduled and managed in such a way that the bats are not harmed and the colonies remain intact.


Fig. 1: Part of a maternity colony of mouse-eared bats (Photo: v. Helversen).

Examples of specific cases

3.1 Mouse-eared bat *(Myotis myotis)*

In Bavaria, as in all of central Europe, female mouse-eared bats establish their maternity colonies almost exclusively in capacious attics of churches and castles (RUDOLPH & LIEGL 1990, ZAHN 1995). By mid-July, when the young are fully fledged or will soon be on their own, the colonies tolerate disturbances and are easy to count. As a result, the mouse-eared bat (Fig. 1) is very well suited for population monitoring.
During the summer, the males live predominantly alone and are spread over large areas (ZAHN & DIPPEL 1997). In winter, mouse-eared bat colonies split up and distribute themselves among numerous subterranean winter roosts; overall, only a small portion of the animals observed in summer roosts are found in the winter (v. HELVERSEN 1989). Measures to protect the mouse-eared bat, within the framework of the research project, are thus concentrated on the maternity colonies and on well-populated winter roosts.

In 1979, 34 maternity colonies of mouse-eared bats, with a total of about 2,000–2,500 animals[3] , were known in Bavaria (ANTONI 1980). In 1985, when the research project began, the numbers had grown to 70 maternity colonies and over 10,000 individuals; by 1999, the number of maternity colonies of mouse-eared bats had reached 150 in southern Bavaria, and 134 in northern Bavaria, and the total number of bats in question was about 81,000 (cf. Fig. 2). Fig. 4 shows the distribution of maternity colonies of mouse-eared bats in Bavaria. This growth in the number of known colonies of mouse-eared bats is due to careful checking of churches, cloisters, castles and other such conspicuous buildings throughout Bavaria, since establishment of new colonies has been documented only in isolated instances in recent years. On the other hand, the growth in the numbers of individuals is due to real growth of many colonies. For example, from 1985 to 1999, the average size of northern Bavarian colonies of mouse-eared bats increased from about 277 to 485 bats (cf. Figs. 3 and 5). Southern Bavarian maternity colonies of mouse-eared

3) Most inventories of Bavarian colonies of mouse-earded bats are carried out beginning in mid-July, with the result that both females and young are counted – but are not normally counted seperately. The term "bats" in the context of maternity colonies includes both female and young; of the females, about 70% have young (Zahn 1999).

bats are considerably smaller; they number 180 bats on the average.

In most rural districts and non-district cities, a large percentage – estimated at over 70% – of roosts in conspicuous, potentially roost-harbouring buildings have been discovered. Most of the maternity colonies are visited by the staff of the co-ordination offices once a year, so broad-based monitoring of populations is assured.

Poisoning of colonies through treatments of roof timbers – presumed to be one of the main causes for declines in bat populations over the past decades – has become a negligible factor in Bavaria. On the other hand, disturbances of maternity colonies of mouse-eared bats, as a result of work on roofs or roofing frameworks, occur again and again: since 1982, for example, the roosts of 28 maternity colonies of mouse-eared bats in southern Bavaria have been renovated. In four cases, the colony disappeared, while in three roosts the number of females decreased considerably. Such damage occurs especially in cases in which

- The co-ordination offices are informed about the renovation too late,
- Completion of the work is unexpectedly delayed into the spring,
- Major structural modifications are carried out, especially in the area of openings through which the bats fly in and out,
- Building owners, architects and responsible authorities do not comply with agreements reached with co-ordination offices or with the agencies' recommendations.

The last of these problems occurs again and again, and it can be prevented only through continual vigilance by local conservationists.

In cases involving small maternity colonies (fewer than 100 bats), and in special hardship cases in which delay of renovation does not seem justified, the co-ordination offices propose that part of the attic be closed off with plastic sheeting. This enables the bats to raise their young even while renovation work is in progress. This approach has been successfully applied in six roosts in southern Bavaria (cf. Fig. 6). Normally, mouse-eared bats move to neighbouring colonies when they experience major disturbances or changes in their roost. This is also their natural response when natural enemies appear (for example, stone-martins, tawny owls or barn owls). They then reappear in their old roost sooner or later, depending on the extent of the disruption – sometimes they may not return for several years. In one case during the research project, a maternity colony in a church in Würzburg (Bavaria) largely disappeared: during the sexton's vacation in summer 1992, the window in the church's roof framework that the bats used for entry and exit was closed, and the some 200 animals in the colony starved. Since then, Kerth and Otremba have discovered another, somewhat smaller maternity colony in Würzburg

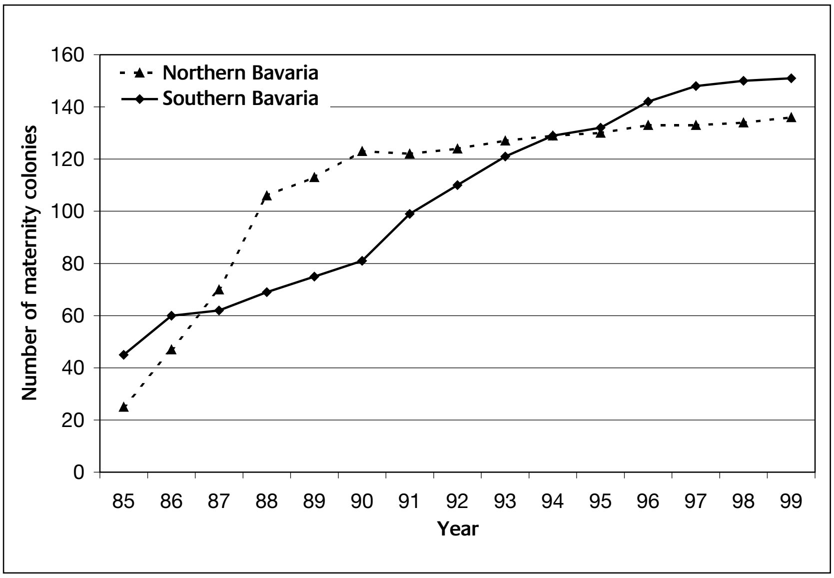


Fig. 2: Number of known maternity colonies of mouse-eared bats, from 1985 to 1999, broken down by northern and southern Bavaria

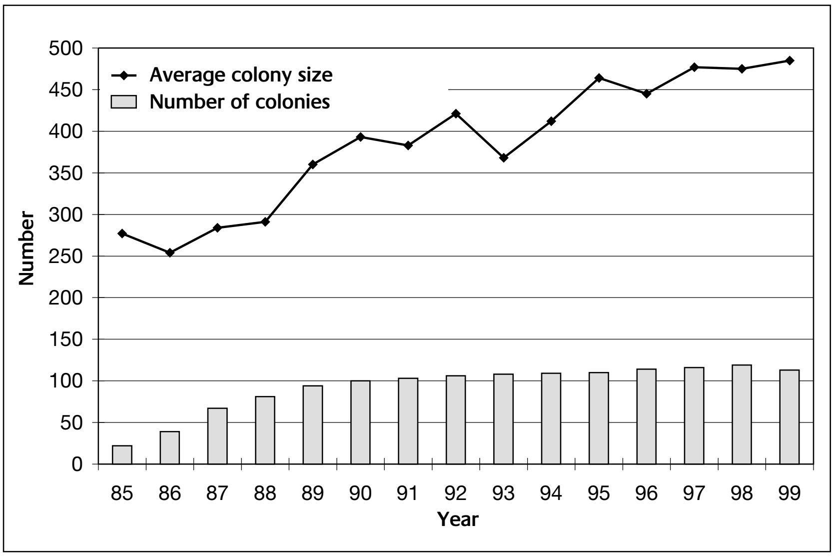


Fig. 3: Average size of annually monitored maternity colonies of mouse-eared bats in northern Bavaria, from 1985 to 1999.

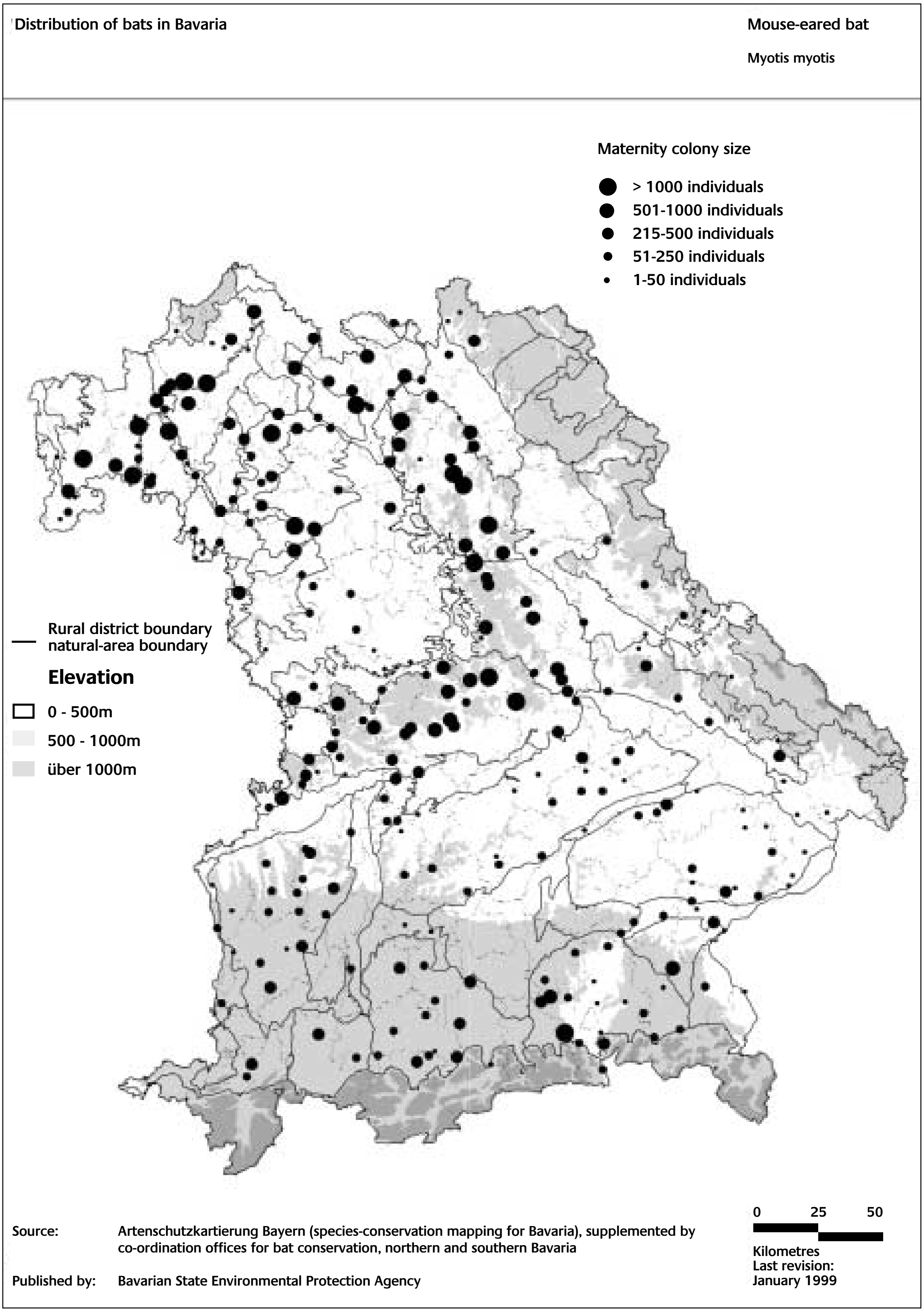


Fig. 4: Distribution of maternity colonies of mouse-eared bats in Bavaria (as of January 1999)

that may have been established by other bats belonging to the first colony.

The mouse-eared bat's preferred hunting grounds in Bavaria, in both flat areas and in the Alps, are located in deciduous and mixed-species forests and on grassland (RUDOLPH 1989, AUDET 1990). This choice of habitats for feeding, along with the bats' preference for roosts in climatically favourable locations, explains their spatial distribution (cf. Fig. 3) and the species' varying population densities in Bavaria (RUDOLPH & LIEGL 1990, ZAHN 1995). Since mouse-eared bats regularly range 15 and more kilometres from the roost during a night's hunting (GÜTTINGER 1997), large colonies require extensive roaming spaces. Over the course of a year, they cover considerably larger areas, when the distances between colonies and winter roosts are taken into account – in northern Bavaria, for example, these distances can exceed 100 km (WEBER 1988, cf. chart in v. HELVERSEN 1989).

Fig. 5: The maternity colony of mouse-eared bats in the church of Oberailsfeld (Bayreuth rural district) is one of the largest in Bavaria; between 1985 and the most recent count, the colony increased in size from 500 females to about 1,500 females. In hot weather, the bats spread themselves throughout the attic (Photo: Rudolph).

Fig. 6: Thanks to regular monitoring, mouse-eared bat maternity colonies are now rarely disturbed or driven away by renovation. In special cases, when renovation cannot be delayed until after the maternity season, plastic sheeting can be used to shield the bats from work proceeding in the colony's loft or attic. The example here is from the church of Klähham (Landshut rural district) (Photo: Zahn)

Specific, habitat-oriented measures to improve feeding areas or to increase prey-animal densities for highly mobile species such as the mouse-eared bat can only have highly local, probably not measurable impacts on populations. Consequently, measures to improve habitats over the large spaces bats cover must be integrated within general nature conservation policy, if they are to have any chance of success. The following examples of relevant efforts are worth mentioning in this context:

- The "principles for semi-natural forest management" issued by the Bavarian State Forest Administration (STMELF 1997),
- Forestry recommendations for protection and promotion of semi-natural deciduous and mixed-species forests, and for medium-term and long-term conversion of conifer-only forests, such as the recommendations formulated in the Bavarian species and biotope-conservation programme (ABSP),
- The Bavarian contract-based nature conservation programme. This programme is to apply to forests in Bavaria as of 2002.

3.2 Geoffroy's bat *(Myotis emarginatus)*

Southern Germany contains the northern boundary of the range of Geoffroy's bat. In Germany, four maternity colonies of this bat have been discovered in southern Baden (MÜLLER 1993) and 13 have been found in south-east Upper Bavaria; these colonies contain a total of 1,250 females. All of the maternity colonies are located in attics. In the southern part of Upper Bavaria, in the summer individual males can be found in attic spaces near maternity colonies and near caves in the Alps (captures with nets); it is not known where most Geoffroy's bat males live, however. Geoffroy's bat hunts in structurally rich terrain and in forests, probably throughout a radius of several kilometres from its roost (KRULL et al. 1991). There is still a lack of precise data on the sizes of areas covered by colonies, as well as on the species' preferred feeding habitats, etc.. The locations of the winter roosts of Bavarian Geoffroy's bats are unknown; presumably, the roosts are located in rock crevices and caves in the Alps. In February 1997, a Geoffroy's bat was sighted in a cellar vault in Schloss Herrenchiemsee (a castle) – this was the only instance in which a wintering bat of this species was ever observed.

The most important strategy for protecting Geoffroy's bat within the framework of the species-conservation programme is to catalogue all of the species' important roosts. Geoffroy's bat, like other bat species that inhabit buildings, faces threats from toxin use in attics and on roof frameworks, as well as from wood treatments and renovation. What is more, it is far more sensitive – than mouse-eared bats, for example – to even small disturbances such as entry by humans into attic roosts. As a result, this species especially requires disturbance-free roosts.

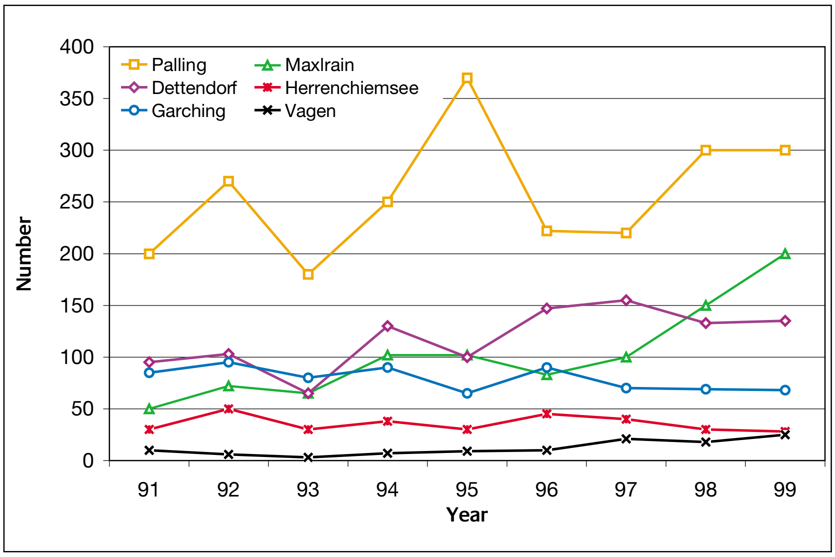


Fig. 7: Population development in six colonies of Geoffroy's bat in southern Bavaria, 1991-1999. The total colony size (numbers of females and young) is given for the Garching and Palling maternity colonies, while the figures for the other colonies represent numbers of females.

The range of Geoffroy's bat in Bavaria became apparent only gradually, during the course of the research project. In the post-war era, only one maternity colony, in Schloss Herrenchiemsee, was ever reported (ISSEL et al. 1977). The next discovery of a maternity colony occurred in 1986, in Dettendorf (Rosenheim rural district, KRULL 1988). Between that year and 1991, five additional maternity colonies were found, including the rediscovered Herrenchiemsee colony. The largest (by far) colony in Bavaria, comprising about 600–700 bats (1999: 422 females), was found in 1995, via an inventory of potential bat roosts in the Traunstein rural district. In 1999, one additional colony was found, and in 2000 two more maternity colonies were discovered.

Monitoring of Geoffroy's bat maternity colonies has turned up the usual weather-related and methods-related population fluctuations from year to year. Since 1991, the populations in the maternity colonies have remained at a constant level, however (cf. Fig. 7).

3.3 Lesser horseshoe bat *(Rhinolophus hipposideros)*

Since the Second World War, populations of the lesser horseshoe bat (Fig. 8) have declined dramatically in Bavaria (KRAUS & GAUCKLER 1980, RUDOLPH 1990) and throughout all of central Europe (e.g. ROER 1984). The population trends and situation of this species in Bavaria were described in detail sometime ago by ZAHN & SCHLAPP (1995).

In the 1950s, the lesser horseshoe bat was still common in Bavarian winter roosts. Some 50 maternity colonies were known during this period. The known main areas covered by the species were the Frankenalb region, including its foreland, and the southern foreland of the Alps.

The lesser horseshoe bat is facing an extremely high risk of extinction in northern Bavaria: the last documented instance of reproduction (a single adult animal with one offspring) occurred in 1989. Since then, a few individuals have been sighted in two caves in the Frankenalb region; one was seen during the winters from 1996/97 to 1998/99, in a cellar in the Bayreuth rural district; and two were sighted in the 1999/00 winter in two different cellars, also in the Bayreuth rural district (Koch, orally reported). In southern Bavaria, lesser horseshoe bats have been seen after 1990, at various locations, in both summer and winter. The summer sightings occurred primarily in attics and

Fig. 8: Lesser horseshoe bat (Photo: v. Helversen)

church towers, while the winter sightings took place in caves and mineshafts; one sighting occurred on an autobahn bridge and one took place in a cellar (six sightings of individual animals, one sighting of ten individuals – see below).

Protection of the lesser horseshoe bat's last known maternity colonies is of decisive importance, if the species' extinction is to be prevented. In 1983, in Peißenberg (Weilheim-Schongau rural district) a colony was discovered whose roost was about to be torn down. In 1984, the animals were moved into a neighbouring building (RICHARZ 1989a provides a detailed description of this move). The lesser horseshoe bats accepted the new building, but they failed to reproduce until about 1991, for unknown reasons. In 1991, the colony numbered 12 individuals; in 1992 it had shrunk to two, and from 1993 through 1997 it comprised only three to four individuals. In 1998, no bat was sighted (Klonz, orally reported).

In 1991, a reproducing colony was documented in the attic of Schloss Herrenchiemsee (Upper Bavaria). Possibly, the castle's location on an island in Lake Chiemsee, with mild climate and abundant food, offers the animals particularly favourable conditions. In 1953, W. Issel counted a total of 200 individuals in this roost, making the colony the largest maternity colony of the lesser horseshoe bat ever discovered in Bavaria (ISSEL et al. 1977). It is not known whether the castle harboured a colony in all of the years from 1953 to 1991.

A diploma thesis, initiated by the co-ordination agency, on bat fauna of the Upper Bavarian Alps provided an indication of the presence of another lesser horseshoe bat maternity colony in the Alpine foreland (HOLZHAIDER 1998). In summer 1997, several lactating females were captured with nets at the mouth of a cave at Lake Kochelsee. In 1998, a systematic search, by the co-ordination agency, for roosts in this area turned up four lesser horseshoe bats in the attic of an unoccupied house in Kochel (Bad Tölz-Wolfratshausen rural district). The site turned out to be an interim roost, however, and not the site of the maternity colony. The maternity colony, comprising about 30 adult animals, was discovered only in July 2000, in a church tower. Six weeks later, the co-ordination agency for southern Bavaria found yet a third colony of the lesser horseshoe bat, not far from Lake Chiemsee. This discovery had also been preceded by net-capture of a lactating female at the mouth of a cave. The colony itself was found via a telemetry experiment following the approach applied with the greater horseshoe bat (cf. Chapter 3.4). The colony occupies an unoccupied building that is slated for renovation in the near future. The telemetered female's hunting grounds were located in a mixed-species forest in a mountainous area.

The Herrenchiemsee colony has grown since 1991 (cf. Fig. 8). The roost, like the island as a whole, now lies within the care of the Bavarian state administration for castles and lakes. Although contacts between the co-ordination agency and the administration are good at the site, and the roost's importance in bat conservation is recognised, the chain of information could be disrupted if any construction becomes necessary. This occurred in July 1996, for example, when work on cables, lasting several days, was carried out near the roost and the bats promptly responsded by temporarily leaving the area. Possibly, the disturbance will also have lasting consequences, since relatively few animals were observed during the 1996 inspection, which took place about four weeks after the work on the cables (cf. Fig. 9).

In 1997, research for a diploma thesis was carried out at Herrenchiemsee, under the direction of the co-ordination agency, in an effort to improve the overall basis for protecting the colony (WEINER 1998a). This work showed that the colony remains year-round in Schloss Herrenchiemsee – in February 1998, ten bats were observed in the winter roost, which is located in the cellar. In early July 1997, the bats' young were born, and in early August they flew out for the first time.

The horseshoe bats leave the castle via a surprisingly complicated route – they fly through seven different rooms to a cellar window that opens on to the castle's northern patio, even though the castle's top storey has an opening that is easily accessible for them.

Plans call for the patio in question to be covered within the next few years. Currently, discussions are being held with the responsible construction authority to ensure that this covering, along with planned renovation on the castle's outer walls, is designed in keeping with the bats' needs. To this end, in August 1998 plastic sheeting was hung over the patio, to

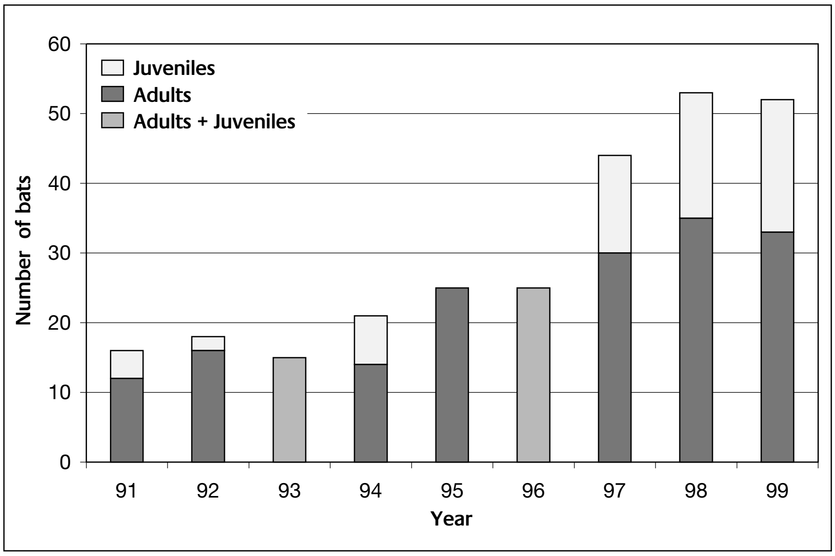


Fig. 9: Population development of the lesser horseshoe bat at Schloss Herrenchiemsee castle, 1991-1998. With the exception of 1995, the colony was always checked in early to mid-July. In some cases, numbers of adult and juvenile bats were recorded separately, as is indicated by the colour-coding. The numbers of young are minimum values, since young are easy to overlook as they cling to their mothers.

simulate the planned cover and to assess what impact a greatly reduced exit corridor would have on the animals' behaviour. Via observations of the bats' exit patterns during the simulation – following initial hesitation, the bats learned to cope with and accept the new situation – precise instructions have been formulated for the planned construction (WEINER 1998b).

Feeding analyses carried out in the framework of P. Weiner's diploma thesis showed relatively high percentages of diptera, especially mosquitoes, in the horseshoe bat colony's droppings. This is very significant with respect to conservation of the species, since mosquito populations along the banks of Lake Chiemsee explode during rainy years (for example, 1997 and 1999). Strong pressure is applied on, and by, the local communities to combat mosquitoes in flooded meadows and reed areas. This is to be carried out by means of a biological agent, a Bti preparation (Bacillus thuringiensis israeliensis), which selectively kills mosquitoes and midges. The impacts of such a campaign on the food chain, and thus on the bats – use of the agent will eliminate an entire prey-animal group that accounts for a large percentage of the biomass consumed by the bats – have not been studied, however. The southern Bavarian co-ordination agency for bat conservation and the State Agency for Environmental Protection have thus been urging nature conservation authorities to refuse permission for any such anti-mosquito campaign in bank areas of Lake Chiemsee, and especially on Herreninsel island.

3.4 Greater horseshoe bat *(Rhinolophus ferrumequinum)*

The greater horseshoe bat, which in the mid-20th century was still found throughout the climatically favourable areas of southern and central Germany, is now the rarest bat species in Germany. The current population has shrunk to a few individuals that spend the winter in the Saarland (WEISHAAR 1995) and to a small group in the Upper Palatinate (Oberpfalz) with probably no more than 50–70 individuals. The latter of these includes the only known maternity colony in Germany. The greater horseshoe bat's decline in the Federal Republic of Germany has been documented especially by the work of KRAUS & GAUCKLER (1977), NIEHUIS (1979) and v. HELVERSEN et al. (1987).

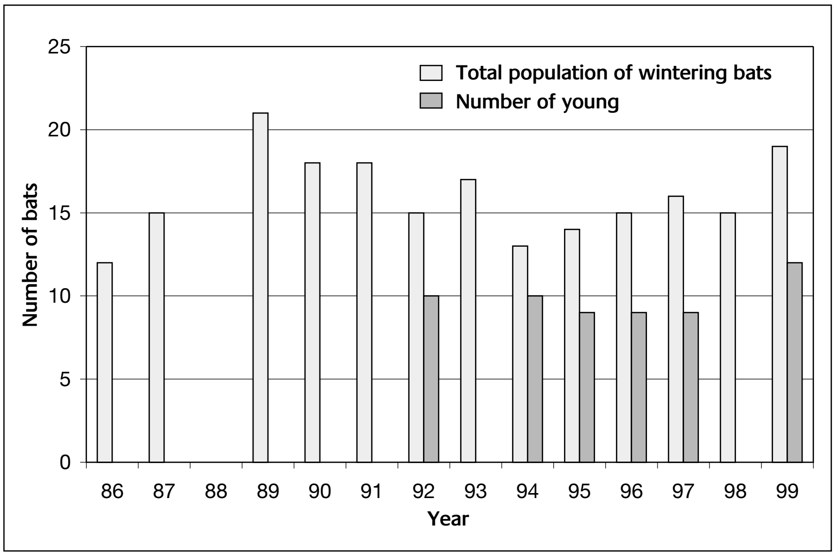


Fig. 10: Population development of the greater horseshoe bat in the Upper Palatinate area. The numbers of young were not recorded in 1993 and 1998; births did occur in these years, however.

In Bavaria, a population remains in the Oberpfälzer Jura area, between Nuremberg and Regensburg. Since the beginning of the research project, a total annual average of 16 wintering individuals have been observed, in a total of six karst caves spread over an area of about 100 km2. The population fluctuated between 12 animals in 1985/86 and 21 in 1988/89 and then gradually shrank to 15–16. In 1998/1999, the total number reached 19 again (cf. Fig. 10). Since the number of individuals in this group did not drop initially, it was logical to assume that there was a reproducing colony in the region. Apart from protection of winter roosts, protection of this – probably last – colony of will of course play a central role in the survival of the greater horseshoe bat's survival. In 1990 and 1991, G. Knipfer carried out a systematic search for the colony in potential roost buildings in surrounding villages, but was unable to find it. In 1992, following net captures in front of caves and in an interim roost, four females were then telemetered during the research project. This experiment rapidly led to the discovery of the maternity colony in an inconspicuous village outbuilding with a number of old, unused lofts (GEIGER & HAMMER 1993, HAMMER et al. 1995, GEIGER 1996). Thanks to the efforts of Dr. Stetter, the nature conservation authority of the government of Upper Palatinate was then able to lease the building immediately. As a result, the maternity colony has been largely protected from disturbances and impairments for the time being, and the building is to be purchased, as soon as possible, with funding from the Bavarian Nature Conservation Fund (Bayerischer Naturschutzfonds)[4]. The colony's size has fluctuated between 13 and 19 adult animals in the past few years; and the annual number of births has remained relatively constant, at 9 to 10 (1999: 12; cf. Fig. 10).

The telemetry experiments also provided important information about the area covered by the bats (the four bats studied ranged up to 6 km from the roost); about the colony's interim roosts, located in a number of lofts scattered throughout the village; and about the colony's hunting habitats (HAMMER et al. 1995, GEIGER 1996). It also yielded an important basis for a special conservation programme for the greater horseshoe bat in Bavaria (HAMMER & MATT 1996). The colony's hunting grounds, for example, are located almost exclusively on a nearby military training area with a structurally rich landscape, in wooded biotopes and forest periphery, as well as in wooded strips along a brook (GEIGER 1996). The landscape outside of the training area, on the other hand, while also structurally diverse, is conventionally farmed and is less important as a hunting habitat.

The greater horseshoe bat's survival in the Upper Palatinate may thus well be tied to the presence of the military training area, which has not experienced major landscape changes via land consolidation and which provides bats with food and hunting habitats not polluted by pesticides or fertilisers.

Apart from protecting the building with the maternity roost, the nature conservation authority is working to save the bats' winter roosts. The six caves mentioned above have thus been closed (although the closures have repeatedly been forced open).
Protection of the most important summer and winter roosts will not suffice to guarantee the greater horseshoe bat's survival in Bavaria, however (HAMMER et al. 1995). Currently, the region is undergoing structural changes that are transforming the old village's diverse roof "landscape", via modernisation. Many of the lofts not used by human occupants are used by the bats temporarily as interim roosts, and thus it will probably not suffice to protect the greater horseshoe bats' maternity roost. At the same time, the region's agricultural sector is undergoing profound change via merging of plots and intensification of farming, as secondary farming operations are given up. The nature conservation authorities and the local landscape management association are seeking to protect the area's landscape diversity, within the framework of an ABSP (species and biotope protection) implementation project, and via biotope-networking and management measures.

Unfortunately, it is conceivable that, in spite of all conservation efforts, the greater horseshoe bat population is already too small and isolated in order to survive in the long term.

3.5 Parti-coloured bat *(Vespertilio discolor)*

While individual parti-coloured bats are regularly found throughout all Bavaria, colonies – both maternity colonies and male colonies – are found only in southern and eastern Bavaria. Little is known about the biology of this species. The parti-coloured bat's main range areas are located in eastern Europe and Asia. It regularly makes extensive migrations and is considered quite resistant to cold. Relatively frequently, individual animals fly into buildings – often even into tall buildings in the middle of cities. This is taken as an indication that the bat's natural habitats include rocky landscapes.

In Bavaria, summer roosts of this species have been found only on buildings. Specifically, the roosts are located within wood or asbestos-cement coverings on walls, within roller-blind boxes and in window shutters. RICHARZ et al. (1989) provide an overview of sightings of parti-coloured bats in southern Bavaria in the 1980s.

More recently (1990–1999), a total of 43 summer roosts, occupied during the period from late April to late August, have been discovered throughout Bavaria. Reproduction by this species has been documented only very rarely in Bavaria: a historic find of a maternity colony comprising about 30 females, and located in the church of Landsham (Ebersberg rural district) in 1949 (ISSEL et al. 1977) must be seen in connection with four maternity-colony discoveries in the eastern Bavarian rural districts of Cham, Neustadt-Waldnaab (now disappeared following an

[4] In spring 1999, the Bavarian Nature Conservation Fund approved the applivation of the government of Upper Palatinate. The higher nature conservation authority is now negotiating with the community of heirs (Stetter, orraly repoted)

attempt to move the animals to a different roost) and Regen, and in the city of Passau. The last two of these colonies were not discovered until the summer of 1998. Overall, the colonies in these four roosts range from 15 to over 50 bats. Other summer roosts sighted seem to be only male colonies, since captures at these sites have never turned up females, and since the relevant roost owners have never reported finding dead or weak young.

The times at which parti-coloured bats use these summer roosts vary greatly. Some roosts are occupied for only a few weeks, in the early spring or early summer, while other roosts are occupied from April until August. And occupancy periods for a given roost can also vary considerably from year to year. In many cases, bats suddenly stayed away, for unknown reasons, from roosts they had occupied for several years in succession, even though no changes had been made in the roosts. Inventories and estimates of the sizes of the male colonies have produced figures ranging from at least two to 311 animals. Given the variability in the duration of the bats' roost occupancy, and the fluctuations in the numbers of bats in the roosts (cf. RICHARZ et al. 1989), it is difficult to choose the most appropriate time to count the bats. These circumstances considerably complicate monitoring of colonies, and thus the annual population fluctuations observed in some roosts (cf. Tab. 2) may be due to the underlying methods used in the studies. Reliable counts are obtained only the few cases in which committed roost owners carefully observe the bats' annual arrival and departure.

Over the past 13 years, the colony in Raisting (Weilheim-Schongau rural district), which is checked every year by the roost owner, has fluctuated in size from year to year,

and yet it is assumed that the size of the overall population has remained constant (cf. Tab. 2). Conclusions regarding population development of the other colonies are also imprecise. In light of the many documented sightings of crevice-occupying bats in which it was not possible to determine the species in question, it is assumed that the parti-coloured bat also has a number of unknown roosts in Bavaria.

The parti-coloured bats' winter roosts in Bavaria are virtually unknown. Wintering individuals have been found in a cave in the Alps, in a mine shaft, in boreholes in a concrete outer wall, in a cellar and in a vaulted chamber in a fort.

In all of Bavaria, throughout the entire year – and, most frequently, in late spring and from late fall through January – individual parti-coloured bats are found outside of the bats' typical roosts (bats that fly into offices and apartments, dead bats in buildings). Presumably, because of the lack of connections to roosts, these are either migrating bats or bats that are searching for winter roosts (cf. Fig. 11).

In sum: the parti-coloured bat is a species that especially profits, within the "Bats" conservation programme, from public-awareness efforts and from programme contacts with owners of roost sites – all of which are located in private homes. Apparently, it occupies a broad range of different types of roosts, and this is behind its sporadic appearances at many different locations.

Tab. 2: Regularly monitored roosts of male parti-colored bats (counts 1994-1999; -: not counted)

Site	Rural district	1994	1995	1996	1997	1998	1999	Remarks
Bliensbach	Dillingen	28	40	35 - 40	about 40	about 30	52	
Thannhöcking	Dingolfing-Landau	27	20	-	> 3	?	?	Droppings in 1998 and 1999
Adelschlag	Eichstätt	about 70	50 - 70	-	20	20	about 30	
Hundspoint	Landshut	180	180	-	55	0	about 10	Bats stayed away in 1998
Brachstadt	Donau-Ries	60	47	50 - 60	0	53	0	Bats stayed away in 1997 and 1999
Rappenhof	Passau	87	about 50	about 80	?	about 90	?	Fresh droppings in 1997 and 1999
Kleinthannsteig	Passau	> 30	about 80	?	?	?	about 80	Fresh droppings, 1996-1998
Mötzling	Passau	-	-	> 80	56	about 60	?	Fresh droppings, 1999
Herrenchiemsee	Rosenheim	-	-	10	about 40	?	?	Interim roost: bats leave in May; fresh droppings in 1998 and 1999
Raisting	Weilheim-Schongau	260	200	260	220	150	150	
Berg-Eurasburg	Bad-Tölz-Wolfrats-hausen	?	25	-	0	30	30	Number unknown for 1994; bats stayed away in 1997

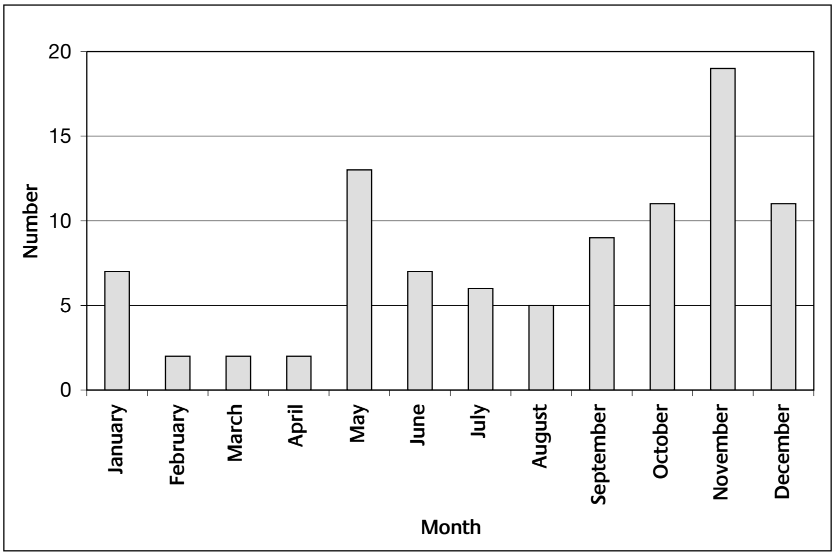


Fig. 11: Seasonal distribution of individual finds of parti-coloured bats (n = 94) in Bavaria, from the beginning of the research programme until 1999.

3.6 Barbastelle *(Barbastella barbastellus)*

The barbastelle is rare in central Europe. A major population decline has been documented in the form of complete, or nearly complete, collapse of large winter-hibernation colonies in Baden-Württemberg (NAGEL & NAGEL 1993), Hesse (AGFH 1994) and Bavaria (ISSEL et al. 1977, KRAUS in RICHARZ 1989b). The barbastelle's behaviour has hardly been studied; in all likelihood, it is a "forest bat" whose original, natural roost type is "cracks in trees" (Meschede, orally reported). Some colonies in central Europe are known, almost all of which live in or on private homes, behind wood coverings and window shutters. The maternity colonies in Bavaria have few individuals (5 to 20 females) and, according to observations made in southern Bavaria – have somewhat irregular occupancy patterns. From 1987–2000, a total of 15 maternity colonies were found in Bavaria; in addition, reproduction has been documented via capture or finds of lactating females and females well advanced in pregnancy.

The bats' hunting grounds are presumed to lie in forests or woody habitats, and their radius of action, according to a recent study in Brandenburg, is several kilometres (Steinhäuser, in preparation). It is unclear where males, females and young live following the maternity period. The known winter roosts consist of caves, forts, mine shafts and cellars. On the other hand, many barbastelles obviously spend much of the cold parts of the year outside of such roosts, since it regularly occurs that some barbastelles do not appear in their subterranean roosts until the onset of severe cold. A rather large number of winter roosts are known in Bavaria (cf. Fig. 12) that contain just a few – i.e. fewer than six – barbastelles. A number of roosts in northern Bavaria, in the Bavarian Forest and in the Alps harbour considerably larger numbers – e.g. between ten and 30, and in one case about 400 to 500 bats (KRAUS in RICHARZ 1989b). Overall, many more bats are observed in the winter roosts than are seen in summer.

Since the reasons for the barbastelle's decline are unknown, efforts in the framework of the "Bats" conservation programme are concentrating on protecting and observing the large winter roosts, on informing and instructing owners of buildings with maternity roosts, and on urging such owners to respect the bats.

Long-term population monitoring plays a major role within the species-conservation programme. This monitoring focuses especially on northern Bavarian winter roosts and on the two largest southern Bavarian winter roosts. Since the barbastelle's winter-roost populations undergo large natural annual fluctuations, inventories must continue for many years before they can reveal the bat's real trends. Populations in Bavaria have either been constant or have grown slightly.

4 Protection and monitoring of winter roosts

Some bat species cannot be inventoried satisfactorily in their summer roosts, since

- their summer roosts are hidden (for example, forest bats hide in hollows in trees),
- the animals frequently respond to disturbances by flying away (this is the case, for example, for bats in nesting boxes),
- in each case, a visible colony represents only part of the maternity colony concerned, which will vary constantly in its group composition and numbers (this is the case for Bechstein's bat, for example, WOLZ 1992, KERTH 1998),
- the animals tend to hide within their roosts, and the true sizes of their colonies can be determined only through lengthy censuses of the animals as they fly out of their roosts. This is the case for Natterer's bat, the brown long-eared bat and the grey long-eared bat in their roosts in lofts and church towers.

For some species, winter-roost counts are the only means of carrying out monitoring, at reasonable expense and effort, and thus of obtaining population-trend data. On the other hand, population-trend assessment via counts in winter roosts must take account of the fact that the observed numbers of indi-

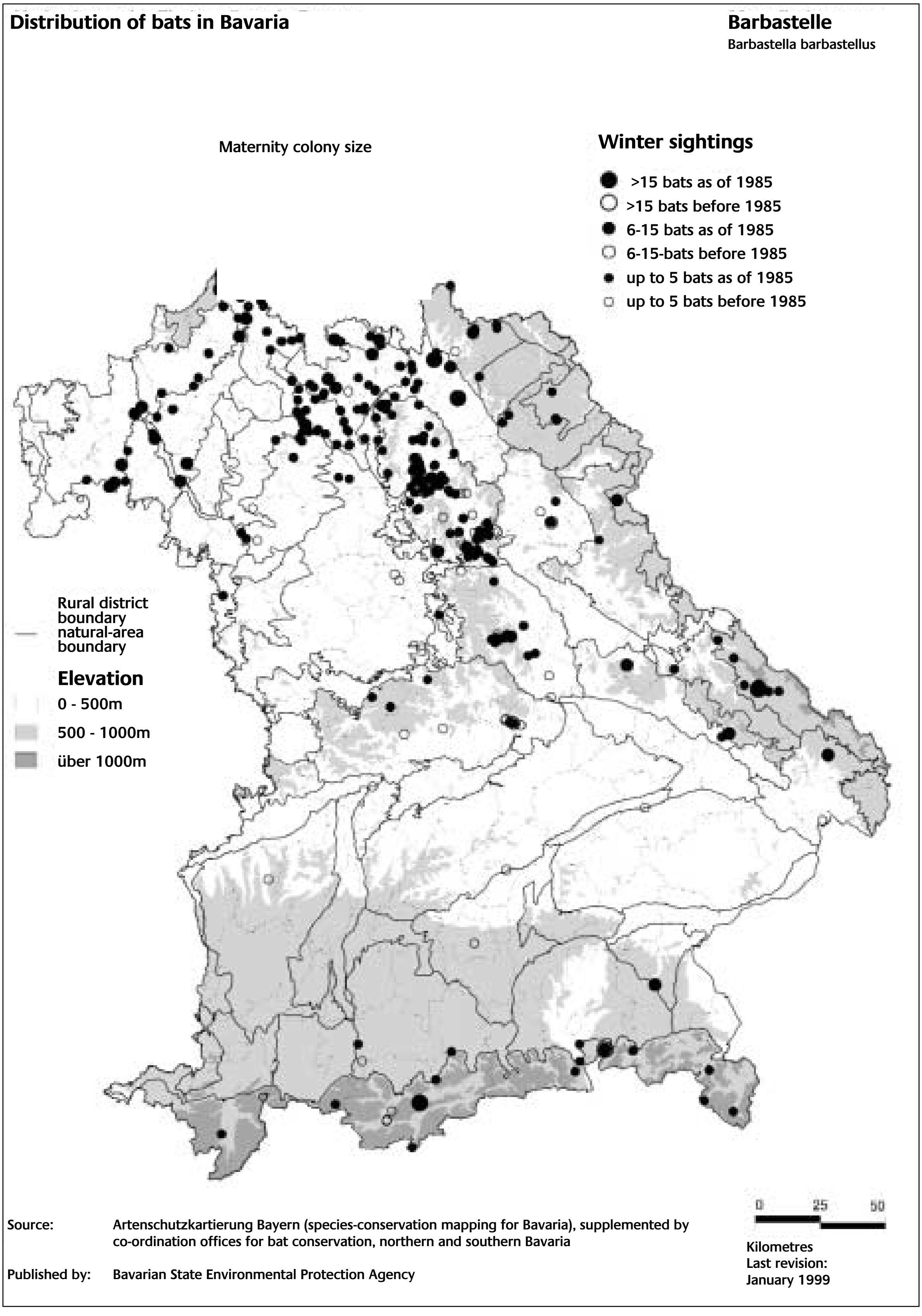


Fig. 12: Distribution of the barbastelle (as of January 2000).

viduals of any given species – with the exception of the barbastelle – are very small in comparison with the populations known in summer (v. HELVERSEN 1989). This means that the winter roosts of the great majority of the bats are not known. Even in the case of the greater and lesser horseshoe bats, which do not hide in crevices and cracks within their roosts, our winter-roost counts turn up less than half of the known summer populations. When it comes to species such as Geoffroy's bat, Bechstein's bat or particoloured bat, at present we can only speculate about the locations of the winter roosts in Bavaria.

Since 1985, the research project has included winter-roost monitoring in several natural caves, (especially) in anthropogenic roosts in the three Franconian regional-commissioner districts and in the Upper Palatinate, as well as in a few caves and mine shafts in the Alps. Of more than 1,000 potential winter roosts checked since the early 1980s in northern Bavaria, 56 roosts or roost complexes (this random check includes a number of cellar groups, in some cases with over 20 individual objects, and quarries comprising several different mineshafts) have been declared "winter roosts for long-term monitoring". These roosts are checked once a year, at about the same time each year. Observation data for some of these roosts reaches back into the period before the research project (SCHLAPP 1981); on the other hand, more and more roosts have been added to the long-term-monitoring programme over the years. In northern Bavaria alone, some 15 full-day excursions, during the period from the end of November to mid-March, are required every year to check these roosts. And about again as many excursions are required for other roost checks. In southern Bavaria, where anthropogenic winter roosts are considerably less common, one monitoring effort is carried out in winter (has been carried out since 1990), involving 57 different objects.
Apart from the winter-roost monitoring carried out by the two co-ordination offices, Bavarian cave researchers, of various associations, carry out counts in numerous caves in the Frankenalb region (PREISS 1983, STIEBLER 1997). The winter counts in karst caves are discussed in advance with the state association for cave and karst research (Landesverband für Höhlen- und Karstforschung in Bayern e. V.), to prevent duplication of efforts and to maximise the useful database.

Fig. 13 shows the results of winter-roost monitoring in northern Bavaria, within the framework of the research project, and covering the species mouse-eared bat, Natterer’s bat, Daubenton's bat, Brandt's bat (which are not differentiated in their winter roosts) and brown long-eared bat. The relevant interpretation is not trivial: the populations of these species are clearly increasing on a supra-regional basis. In general, large annual fluctuations in their numbers can occur, however, so that the trends are not always clear. The probability of finding Natterer’s bat in its roosts depends on the weather at the beginning of winter, while the probability of finding barbastelles (not included in Fig. 13) depends on temperatures throughout the entire winter: low outside temperatures prompt both species to appear in their roosts, while mild weather obviously lures them outside of their roosts.

Most of the Natterer’s bats counted have been found at the beginning of the counting season, during excursions in the Steigerwald forest and in the Haßbergen mountain area.
The populations of grey long-eared bat and Bechstein's bat appear to be shrinking, although the total numbers of individuals counted in each case, at fewer than 20, are too low to permit reliable conclusions. The same holds for the serotine bat and the northern bat (not included in Fig. 13).

Normally, bats' winter roosts are protected by maintaining the roosts and restoring them where necessary – for example, by renovating old beer cellars or restoring and cleaning cellar entrances. Another important means of protection consists of closures (screens, grates, etc.), in order to reduce possibilities for disturbances. Such protective closures are normally paid for by the local nature conservation administration, forest administration or nature-park administration. Bat winter roosts should not be closed off as a matter of course, however; closure is a necessary, effective measure for protecting the bats only under certain circumstances:

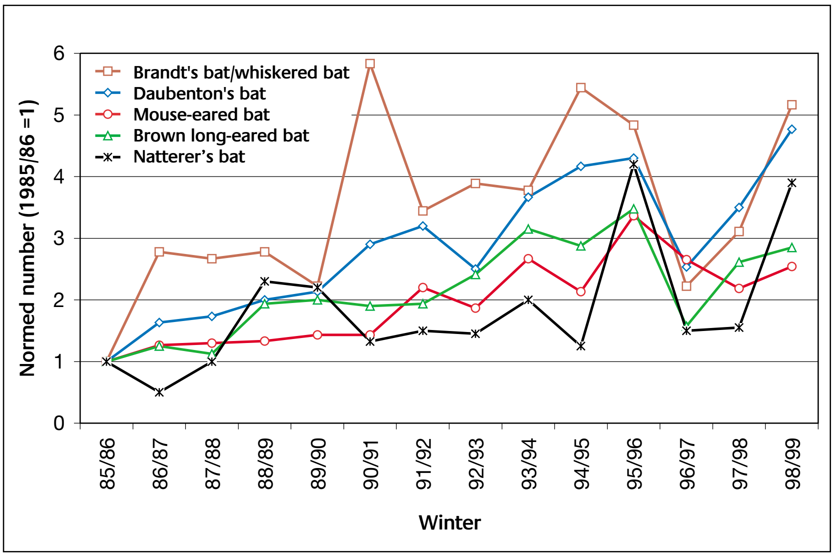


Fig. 13: Population development of Brandt's bat, whiskered bat, mouse-eared bat, Natterer’s bat, Daubenton's bat, and brown long-eared bat, in a selection of north Bavarian winter roosts ("Monitored winter roosts"). The figures are normed to the result for winter 1985/86 (=1).

- the roost contains species in danger of extinction, such as greater and lesser horseshoe bat or barbastelle,
- the roost contains a large number of individuals (more than ten animals),
- the roost is particularly subject to disturbances – for example, because it is located near a village or town, along a hiking path or in a cave frequented by spelunkers or tourists.

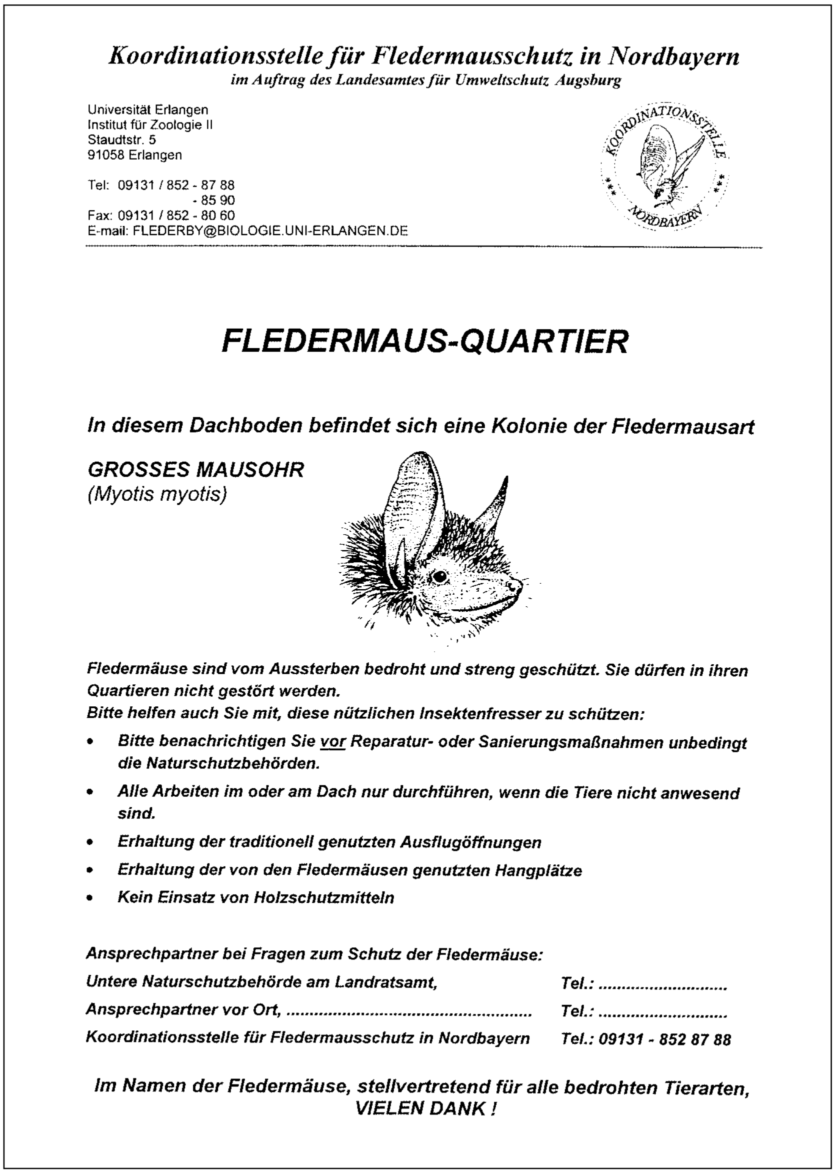
The great majority of bat winter roosts do not require protective closures, and any funding that may be earmarked for their closure can be applied to other urgent nature conservation tasks.

5 The roost-protection system

One of the aims of the "Bats" conservation programme is to establish a system of roost protection that provides the framework for close, ongoing contact with owners or administrators (such as sextons) of buildings in which roosts are located. Such contacts enable prompt exchange of information regarding any planned changes in roosts or any problems encountered by the animals. This, in turn, enables nature conservation authorities or the co-ordination offices to take action as necessary. At the same time, roost protectors can collect important data on their colonies – for example, via fly-out censuses, nightly checks of young, monitoring of mortality of young, etc.. Ideally, such checks will meet requirements for monitoring. Roost protectors' tasks include counting colonies, removing droppings and ensuring that bats' entryways remain open and easily passable in spring. Due to the size of the area covered by the co-ordination offices, and the offices' limited staff resources, this approach assigns primary importance to local volunteer bat conservationists, since only they can provide the necessary local contacts (cf. Chapter 2.2). Especially in connection with important maternity colonies of mouse-eared bats, as well as of colonies of other species (such as barbastelles or particoloured bats – see above), these persons take responsibility for continual safeguarding of colonies. In addition to their roles in protecting and monitoring roosts, they often serve as contacts regarding many other aspects of bat conservation, because they are locally known as bat specialists.

Many persons also carry out this function on behalf of lower nature conservation authorities or municipalities. For some time, the possibility of organising roost protectors within rural districts' Naturschutzwacht programmes for volunteer nature conservation workers has been discussed. This would solve a number of insurance-related issues and ensure that the protectors were reimbursed for their expenses (material, time). No specific action has yet been taken in this direction, however.

Roost support and protection is ideal in cases in which roost owners or administrators (sextons, etc.) identify with the bats, work to



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KOORDINATIONSSTELLE NORDBAYERN

FLEDERMAUS-QUARTIER

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GROSSES MAUSOHR
(Myotis myotis)

Fledermäuse sind vom Aussterben bedroht und streng geschützt. Sie dürfen in ihren Quartieren nicht gestört werden.
Bitte helfen auch Sie mit, diese nützlichen Insektenfresser zu schützen:

- ***Bitte benachrichtigen Sie vor Reparatur- oder Sanierungsmaßnahmen unbedingt die Naturschutzbehörden.***
- ***Alle Arbeiten im oder am Dach nur durchführen, wenn die Tiere nicht anwesend sind.***
- ***Erhaltung der traditionell genutzten Ausflugöffnungen***
- ***Erhaltung der von den Fledermäusen genutzten Hangplätze***
- ***Kein Einsatz von Holzschutzmitteln***

Ansprechpartner bei Fragen zum Schutz der Fledermäuse:

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Im Namen der Fledermäuse, stellvertretend für alle bedrohten Tierarten, VIELEN DANK !

Fig. 14: Notice posted to inform the public about the presence of bat colonies in attics of churches and public buildings; the notice states what species is present, provides guidelines regarding proper behaviour in order to protect the colony, and urges owners etc. to inform nature conservation authorities before carrying out any renovation. It also provides the name and telephone number of the local bat conservation representative.

ensure that no harm comes to the colony and contact the co-ordination offices or nature conservation authorities whenever any problems occur.

Even where contacts between bat conservationists and roost owners or administrators are good, there is always a possibility that unforeseen events or misunderstandings can lead to disturbances of the bats during the summer (cf. Chapter 3.3). What is more, by no means has suitable protection and support been found for all maternity colonies. For this reason, the co-ordination offices have been posting signs at roosts, calling attention to the roosts' importance and listing the address of the responsible co-ordination agency (cf. Fig. 14). Like the warning signs hung by wood-treatment companies in lofts and attics, warning of use of wood preservatives, such signs are hung where they will immediately be seen by any craftsmen or architects who visit the roost areas.

6 Public-awareness efforts and training

Another emphasis of the "Bats" conservation programme consists of public-awareness efforts and training. Both of these elements are playing an increasingly important role in the work of the co-ordination offices (cf. Tab. 3). On the one hand, they serve to acquaint the public with the purposes and concerns of bat conservation. What is more, they have the useful side-effect of giving volunteer bat conservationists and roost protectors an opportunity to publicise themselves and their work on the local level.

Press reports frequently appear – either in advance or after the fact, as effective follow-up publicity – in connection with lectures and excursions dealing with bat conservation. Thanks to such reports in daily newspapers, radio and TV stations have recently been requesting more and more assistance for productions about bats and bat conservation (cf. Tab. 3).

Other important aspects of public-awareness efforts include:

- In 1992, the co-ordination agency for southern Bavaria prepared a travelling exhibition, comprising 16 display panels, in connection with the state garden show (Landesgartenschau) in Ingolstadt. Through 1995, this exhibition visited a total of 25 other cities and towns in Bavaria.
- The co-ordination agency for southern Bavaria offers a slide show, with accompanying text, that can be borrowed or copied, for a modest fee to cover expenses. In addition, an identification course has been developed for training and further-training purposes. The course consists of an introductory lecture with slides and an exercise section in which participants have the opportunity to work with mummies, skulls and prepared specimens and to compare species.
- The co-ordination offices have become more and more well-known, and this has been driving demand for information about bat conservation. A second, fully revised edition recently appeared of a brochure entitled "Bats" that had been jointly prepared by the State Bird Conservation Association (Landesbund für Vogelschutz) and the LfU. The co-ordination offices also send out various other materials that they produce themselves, including descriptions of the agencies, guidelines for clean-up of bat roosts, a folder entitled "Bat manure as garden fertiliser" (Fledermauskot als Gartendünger") etc., as well as materials such as address lists of providers of bat boxes, and of relevant literature and media. Depending on the interests expressed in written or telephone enquiries, the agencies are also happy to send out copies of relevant scientific and popular-scientific articles.
- Work with youth: The co-ordination agency for northern Bavaria, in co-operation with the State Bird Conservation Association, assumes responsibility for the scientific part of an annual weekend seminar for young people that describes basic aspects of bat behaviour and bat conservation and communicates recent ecological research findings. In the Nuremberg–Fürth–Erlangen region, it also regularly conducts informational events at schools, events at which children have proven to be extremely interested and open listeners. There has been one opportunity to date – and more are desired – to take an elementary school class to visit a maternity colony of mouse-eared bats and show the children (in small groups) the colony at first hand (the higher nature conservation autho-

Tab. 3: Public-awareness events held by the two co-ordination offices since 1991.

Type of event	1991	1992	1993	1994	1995	1996	1997	1998	1999
Public lectures and excursions	10	15	24	24	27	15	36	>20	20
Training events for volunteer bat conservationists and/or representatives of authorities	1	5	2	5	7	16	8	11	16
Press discussions, radio/TV interviews, etc.	-	-	3	1	1	2	6	9	5
Other (for example, annual meetings of "bat buffs"*, workshops)	3	2	4	2	3	2	3	2	3

* Every one or two years, the co-ordination offices hold annual meetings of south and north Bavarian bat conservationists. These meetings, which provide a forum for exchanges of information, are attended by an average of 150-200 participants.

rity had given permission for the field trip to take place as of mid-July). The overall experience was a very positive one – all of the children were very enthusiastic and behaved appropriately.

- Since 1995, staff of the co-ordination agency for southern Bavaria have regularly carried out one-day and one-week excursions and workshops, focused on "bat ecology", for biology students at LMU Munich.
- From time to time, continuing-education events are offered for teachers, staff of nature-conservation and forestry authorities and other interested parties who can function as "multipliers". Such events are held in co-operation with the Association of German Biologists (Verband deutscher Biologen – VdBiol) or within the framework of seminars of the Bavarian Academy for Nature Conservation and Landscape Management (ANL) and the Bavarian State Agency for Forests and Forest Management (Bayerische Landesanstalt für Wald- und Forstwirtschaft). Many different occupations, such as roofers, architects and forest rangers, encounter bats in their daily work, and our public-awareness efforts aim to continually intensify dialog with such groups. Our information exchanges with one of the leading companies in building conservation and protection (wood preservation treatments) can be considered a start of such work. For years now, the co-ordination offices have regularly been informed whenever fumigations of church interiors or wood treatments in attics are planned. The co-operation began with a study, carried out as part of a diploma thesis at the University of Erlangen, of the impacts of toxins on mouse-eared bats (KRUG 1988). Early co-ordination can prevent threats to colonies, as well as avoidable work delays.
- Since 1997, the hunting and fishing museum in Tambach castle (Coburg rural district) has operated an infrared-video monitoring station, established in co-operation with the co-ordination agency of northern Bavaria (Pink, in preparation). A live transmission from the large maternity colony in the attic (about 800 females in 1998) to the museum below has made the subject of "bats" come alive for a great number of visitors, including many school classes. In 1999, Ms. Pink, working on behalf of the LfU, produced a video about the bat colony that is available for borrowing and showing during special events. The possibility of setting up a similar video station to present a bat colony in southern Bavaria is currently being considered.

7 Research

Since 1980, numerous diploma theses, certification theses and dissertations on the ecology of native bats have been written at Bavarian higher education institutions. In general, such research efforts do not focus directly on the "Bats" conservation programme in


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FLEDERMAUS-INFO

Zählergebnis vom ....

Herzlichen Dank, daß Sie auch dieses Jahr wieder mit uns zusammenarbeiten und wir die jährliche Zählung der Fledermäuse in Ihrer Kolonie der Art

BRAUNES LANGOHR
(Plecotus auritus)

durchführen konnten.

Zählergebnis: .... **Wochenstubentiere (** .... **Weibchen,** .... **Jungtiere)**
Vorjahr : .... **Wochenstubentiere (** .... **Weibchen,** .... **Jungtiere)**

Ansprechpartner bei Fragen:

Koordinationsstelle für Fledermausschutz Nordbayern Tel.: 09131 - 858788 oder
Untere Naturschutzbehörde am Landratsamt....................................Tel.: ....
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Bitte benachrichtigen Sie uns, bevor Sie Renovierungsarbeiten oder Umbaumaßnahmen am Haus im Bereich der Wochenstube planen z.B. eine Dachsanierung.

Im Namen der Braunen Langohren, stellvertretend für alle bedrohten Tierarten,

!! VIELEN DANK !!

Fig. 15: Form used in maternity colony censuses (reduced in size; original size is DIN A4). The form notes the count date, the species in question, the result (numbers of females and young) and the result for the previous year; it also thanks the property owner and provides the name and telephone number of the local bat conservation representative.

Bavaria; instead, they reflect the interests of the various relevant academic chairs in the area of bat ecology. On the other hand, some of the research has been suggested or even directed by the co-ordination offices. As a result of the link between the co-ordination offices and the universities of Erlangen-Nuremberg and Munich, subject selection has emphasised applied research – many students have had their interest in bat ecology and bat conservation awakened via contacts to staff of the co-ordination offices and through participation in relevant excursions and events.

A number of examples can be cited to show how findings of such work enter directly into efforts to protect bats. Some of these were mentioned above, such as the study of the lesser horseshoe bat colony in Schloss Herrenchiemsee or the search for the roost of another colony of the same species following capture of lactating females (Chapter 3.3). Another important example of such applied research on native bats in Bavaria consists of studies of the phenology of bats in and around caves (LIEGL 1987, WEBER 1988). Findings from this work has led to a reassessment of caves' importance as roosts for bats during the course of the year – and, thus, have been highly useful in assessing problems of increasing cave tourism in Bavaria. The summer "swarming" phenomenon has been confirmed for caves in the Alps (HOLZHAIDER 1998, Meschede & Rudolph unpublished).

As the history of discovery of the maternity colony of the greater horseshoe bat (Chapter 3.4) and, very recently, of the discovery of a colony of the lesser horseshoe bat (Chapter 3.3), shows, modern research can, and must, enter into bat conservation. While such research has not yet been able to assure the long-term survival of small populations, telemetric studies have provided some of the most important bases for protection efforts.

Even high-school research papers can contribute to our understanding of bat behaviour. For example, in Waldkraiburg (Mühldorf rural district) and in Wasserburg am Inn, work for two such papers, including regular bat counts, was able to document the presence of noctule bats in cracks of outer walls of multi-storey buildings (CHRISTOPH 1998, SCHOTT 1998, ZAHN et al. 2000). The counts proved that considerable numbers of noctule bats roost in outer walls of such buildings throughout the entire year – and not only in winter, as had previously been assumed in southern Bavaria. While an annual minimum is reached in July, the number of bats present – for example, in Waldkraiburg – during this month still represents about 20 % of the annual maximum of 300 bats that is seen in September. The noctule bats change roosts frequently, often splitting their numbers up between several different roosts. The bats use at least 11 roosts in Waldkraiburg, in a total of seven different tall buildings (including apartment buildings). Six of the roosts have been shown to be used simultaneously. In Wasserburg, eight roosts were found, on three apartment buildings. At least five of these were occupied simultaneously by noctule bats. Observations of comparable colonies of this species have also been made in Kempten, Nuremberg, Rosenheim and Munich. From these findings, it may be concluded that noctule-bat roosts on buildings can be inhabited by the bats at all times of the year, and this conclusion, in turn, must be taken into account in connection with any renovation. On the other hand, the bats proved to be so flexible in their roost selection that it is not necessary to protect every roost at all cost. Some building occupants find noctule bats, which often emit loud calls, and their droppings to be a considerable nuisance in the immediate vicinity of their residences. Where sufficient alternate roosts are present, due to the way buildings are constructed and/or grouped, closing of such problematic areas, during the animals' absence, can be accepted from a conservation perspective, since it can prevent uncontrolled "vigilante actions" that could trap and ultimately kill the bats.

Many conservationists still hold to the myth that all bat species face comparable threats of extinction, and that thus all colonies must receive the same strict level of protection. While such protection is certainly required, unconditionally, for certain rare species in Bavaria (such as the greater and lesser horseshoe bats, Geoffroy's bat, barbastelle, northern bat, Leisler's bat), we now know, thanks to many years of monitoring via the research project, and to many diploma and doctoral dissertations in the area of population ecology (for example, GEIGER 1992, WOLZ 1992, ZAHN 1995, KERTH 1998), that the populations of some species have grown and in some cases have been underestimated. Examples include the mouse-eared bat, Daubenton's bat and Bechstein's bat. Needless to say, this conclusion does not free anyone from the obligation to take conservation seriously at all times and to protect the roosts and hunting grounds of all species. On the other hand, it is also a positive result of protection efforts within the framework of the "Bats" conservation programme. It does put the importance of individual sightings, or of observations of single, little-populated roosts, into proper perspective – for example, in connection with assessments of intervention. The absence of a colony of barbastelles or pipistrelle bats in a formerly occupied crevice roost, or of Bechstein's bat in a nesting box, signals not a decline but simply normal behaviour whereby member groups of a maternity colony move around from roost to roost.

8 International obligations

8.1 The EUROBATS agreement' importance for bat conservationin Bavaria

In January 1994, the Federal Government ratified the "Agreement on the Conservation of Bats in Europe" (EUROBATS), a regional agreement within the framework of the Bonn Convention on the Conservation of Migratory Species of Wild Animals (CMS). Article III of this agreement lists the requirements for bat conservation:

- Protection: prohibitions against capture, trade, killing,
- Roost and habitat protection: identification and protection of inportant habitats and "feeding areas" for bats,
- Additional measures to protect endangered species,
- Public-awareness measures,
- Basic research,
- Consideration of potential effects of wood preservatives and insecticides on bats.

This agreement has been transposed into German law, as far as the legal aspects of protection of individual animals and conservation of colonies are concerned: all bat species are strictly protected and must not be disturbed or harmed in their habitats. On the other hand, the EUROBATS agreement would not be effectively implemented in Bavaria without the species-conservation programme (cf. Chapter 3 and 4), since the research project covers the areas of public-awareness efforts, special species-conservation programmes and – due to its links with universities – basic research. With the data collected in the monitoring programme, the LfU has an outstanding basis for reviewing success in implementing the agreement, review which is required at two-year intervals in the form of a mandatory report. On the other hand, some deficits still persist in Bavaria – for example, in protection of hunting areas and in identification of hunting habitats (for example, Geoffroy's bat, barbastelle). For some species, inventories of important roosts or population concentrations are still incomplete (for example, pipistrelle, Brandt's bat).

8.2 The importance of the Fauna, Flora and Habitats Directive for bat conservation in Bavaria

The purpose of the European Union's Fauna, Flora and Habitats Directive (Directive 92/43/EEC, cf. SSYMANK 1994) is to protect biological diversity within the European
Union; it obligates Member States to

- Carry out effective measures to protect the habitats and species listed in Annexes I and II,
- Set aside conservation areas for these habitats and species,
- Monitor development of relevant populations and of habitats, in order to be able to take countermeasures when populations and habitats are threatened,
- Carry out basic research – including research on ecology and distributions of species, and on necessary care and management of habitats.

Annex II of the directive lists seven bat species that live in Germany: pond bat, Bechstein's bat, mouse-eared bat (cf. Chapter 3.1), Geoffroy's bat (cf. Chapter 3.2), lesser horseshoe bat (cf. Chapter 3.3), greater horseshoe bat (cf. Chapter 3.4) and barbastelle (cf. Chapter 3.6). The pond bat is extremely rare in Bavaria – it has not been sighted since the 1950s. Bechstein's bat is distributed throughout deciduous forests of northern Bavaria; various deciduous and mixed-species forests in lower and upper Franconia harbour colonies with substantial numbers of individuals (SCHLAPP 1990, WOLZ 1992, KERTH 1998) and with significant population densities not seen in other parts of Germany. Bavaria has national responsibility for protection of these species, with the exception of the pond bat (RUDOLPH 2000).

Of the habitat types listed in Annex I of the directive, caves not developed for tourism have the most direct relevance for bats, as potential roosts. Forest habitats have the greatest importance as hunting habitats and roost locations for some Annex II species: Luzulo-Fagetum beech forests, Asperulo-Fagetum beech forests, montaneous and subalpine beech forests, calcareous beech forests, Stellario-Carpinetum oak-hornbeam forests, ravine forests, hardwood alluvial forests and acidophilous coniferous forests. Other Annex I habitat types that are important hunting grounds for bats include various types of natural standing waters, semi-natural running waters and oligotrophic grasslands and meadows (cf. SSYMANK et al. 1998).

One of the Member States' most important tasks in transposing the directive is to set aside adequately extensive protected areas for the various relevant habitat types and species. Bavaria's proposals for area selection, with regard to bats, are made by the LfU on the basis of findings from the species conservation programme (RUDOLPH 2000). The Bavarian state government's FFH-area notification of August 2000 lists approximately 170 specific bat habitats (buildings that serve as colony locations and winter roosts).

With the exception of Bechstein's bat, the bats listed in Annex II are the same as the priority species for Bavarian bat-conservation and bat-monitoring efforts. As a result, as described in chapters 3 and 4, a great deal is known about these species' populations and distribution, population trends in recent years, protection requirements and threats. Furthermore, scientific work over the past two decades has substantially broadened the basis for protection of the mouse-eared bat, greater and lesser horseshoe bats and Bechstein's bat. More study is required in Bavaria, however, of the behaviour of Geoffroy's bat and the barbastelle and of the distribution and commonness of the barbastelle and Bechstein's bat, with the gaps in knowledge differing in extent for different areas. The research project's monitoring programme has proven to be extremely useful with regard to fulfilment of obligations, resulting from the FFH Directive, for monitoring of species and habitats.

The real challenge resulting from the FFH Directive, however, is to protect the "favourable conservation status" of species and habitats in the long term, i.e. to implement effective conservation strategies and actively counter negative trends for relevant populations. Achievement of this objective is to be measured via monitoring of population trends and of key habitat parameters. As described above, bat monitoring must generate long continuous data sequences, if it is to reveal trends and support sufficiently precise conclusions regarding population developments. Except for Bechstein's bat (cf. Chapter 4), such a database has already been provided for the relevant bat species. The "Bats" conservation programme, along with government conservation efforts, has proven to be an effective instrument for protecting – as required by the FFH Directive – the six bat species found in Bavaria, at least with regard to roost protection and public-awareness efforts. In the area of habitat protection, co-operation of forest owners and forest administrations is especially required, due to the strong dependence of the mouse-eared bat, Bechstein's bat and barbastelle on forest habitats. This is an area in which the co-ordination offices for bat conservation must intensify their public-awareness efforts. The most important aims and measures with respect to forest-based bat conservation are listed in the results of the R&D project "Studies and recommendations with regard to bat conservation in forests" ("Untersuchungen und Empfehlungen zur Erhaltung der Fledermäuse in Wäldern") and in the brochure produced via this project (MESCHEDE et al. 2000a, b).

9 Outlook

The purpose of species conservation programmes is to improve the conditions for endangered species to such an extent that direct assistance for the species is no longer required. The "Bats" conservation programme has had obvious success, as is manifested in the positive developments in populations of a number of species and in the growing acceptance seen in various segments of the public and various professions. Nonetheless, the ultimate aim has not yet been attained. Since the "Bats" research project is one of the oldest Bavarian species conservation projects, we are required to subject the priorities for our work to continual scrutiny and to adapt them to new requirements[5] and findings as appropriate.

The primary basis of future work within the species-conservation programme will be a continuation of successful approaches to date, for example, of successes achieved in protection and monitoring of building-dwelling bats (especially mouse-eared bat, Geoffroy's bat, horseshoe bats) and in monitoring of winter roosts. In this area, contacts to owners and administrators of roosts, and to relevant professional associations and administrations, must be continually cultivated and – where necessary– improved, especially via such measures as

- Optimisation of co-operation with church-construction agencies, authorities responsible for monuments and construction, the state administration for castles and lakes, local authorities, etc.. For example, it must become obvious, standard procedure for church-construction agencies to inform co-ordination offices or nature conservation authorities, automatically and well in advance, whenever renovation of churches with bat populations is planned. At the same time, awareness must be enhanced of the need for church buildings in general to remain accessible to bats.
- Relevant information and publications for church communities, sextons, architects, chimney sweeps, roofers, gardeners, landscape architects, etc..

Co-ordination agencies must continue to remain available as points of contact for all aspects and concerns of bat conservation, especially in connection with specific cases of renovation of bat roosts. And they must remain able, along with their "everyday work" in the context of special species conservation projects, to take action as necessary on behalf of particularly endangered species or roosts (cf. the examples of the lesser and greater horseshoe bats).

Efforts to enhance the public's awareness remain an ongoing task within the framework of the species-conservation programme – especially as the co-ordination offices become better and better known and the public's acceptance and understanding of the needs of bats grow. The agencies thus continue to produce information sheets and flyers, intensify their contacts to adult-education schools, local education networks, associations, etc. and to expand and enhance their Internet presence, etc..

The co-ordination offices' efforts on behalf of public awareness also include providing roost owners/administrators and roost managers with regular data updates and information about the development of "their" colonies, as well as establishing contact with owners of structures that house crevice/crack-dwelling species. In many cases, contacts to such owners are a one-time affair, occurring in connection with identification of the species in question and inspection of the roosts. Some roost owners many thus gain the impression that the agencies have lost interest in "their" colonies following such initial contact. In light of the large number of such roosts involved (especially roosts of pipistrelles and whiskered bats), the co-ordination offices are currently unable to cultivate such contacts on a regular basis – even at two-year

[5] Recently, for example, mobile communications companies have discovered the usefulness of church towers as sites for transmission systema; a first colony of mouse-eared bats in achurch in the Kitzingen rural district has now been affected by such use.

Fig. 16: The serotine bat roosts in cracks and crevices, in both summer and winter (Photo: v. Helversen).

Fig. 17: Checking a serotine bat roost in a school in the Dillingen rural district (Photo: Zahn).

Fig. 18: Maternity colonies of the noctule bat are rare in Bavaria; this photo was taken in a rescue station where young of females rendered flightless through injury are raised and then returned to the wild Photo: v. Helversen).

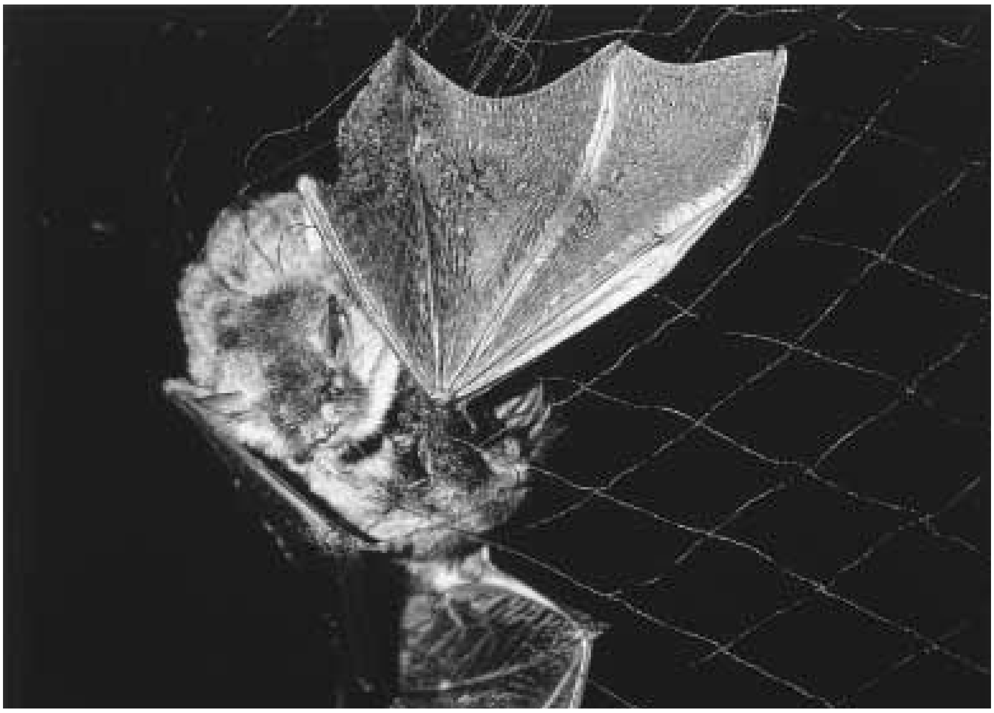

Fig. 19: Net captures play an important role in faunistic research in Bavaria – for example, in studies of caves' importance for bats throughout the course of a year; the photo shows a Natterer's bat and a barbastelle that were captured at the mouth of a cave in the Bavarian Alps (Photo: Hammer).

intervals. This is a perfect example of the sort of task that must be left up to local roost protectors/managers and local bat conservationists. It is also a task that thus far is being satisfactorily performed in only the few rural districts that have adequate numbers of volunteer staff.

Efforts to monitor small species that typically dwell in gaps and cracks etc. in private homes deserve mention in this context. At present, we lack reliable information about the population trends for such species. Conceivably, owners of buildings with such colonies, throughout Bavaria, could be convinced to carry out regular counts of their colonies. If enough samples are then involved and the participating "partners" count reliably, we might be able to assess the population situation for such species.

A central focus must thus be on strengthening, expanding and cultivating the network of local roost managers – to increase the numbers of competent local representatives of bat-conservation interests and to reduce the co-ordination offices' workload. This need seems all the more urgent in that in some rural districts the local volunteer bat conservationists are growing very old and no younger conservationists have appeared to take their place. We are hoping that notification of numerous important bat roosts, as FFH areas, will bring a major improvement on this front – also in terms of organisational and financial perspectives (for example, roost managers in the framework of the volunteer conservationists' programme (Naturschutzwacht) – cf. Chapter 6).

In the years to come, the species-conservation programme will focus more and more strongly on the species listed in Annex II of FFH Directive and on reported roosts and habitats. Additional study of habitat requirements (especially with regard to selection of hunting habitats), as required by Article 18 of the FFH Directive, is required for certain species, especially the lesser horseshoe bat, barbastelle and Geoffroy's bat; additional study of range/distribution in Bavaria is required for the barbastelle and Bechstein's bat. Implementation of habitat protection for FFH species also necessitates intensive co-operation with, and advising of, forest administrations. In the case of the "natural cave" habitat type, it also requires application of protection concepts in co-operation with spelunking associations.

Further basic research is required to help us understand the habitat requirements of the above-mentioned FFH Directive species. In addition, basic research must be a part of all special species conservation projects and protection efforts. The ecology of a number of rarer species is still poorly understood. Contacts to universities should be used to encourage further work in this area – which would also help fulfil the EUROBATS agreement's call for basic research.

To enhance bat-habitat protection, within overall conservation efforts, the ABSP's implementation projects could make greater use of findings about ecology of endangered bat species (cf. greater horseshoe bat).

Recent discussion about nature conservation has raised the question of the "right" species and habitats for protection and criticised a traditional approach often applied in central Europe: to seek to protect rare species that have only peripheral natural range areas in central Europe, at the expense of species and habitats whose ranges are centred in central Europe. Assessment of overall European distribution of most native bat species leaves considerable room for interpretation. In Bavaria, the lesser horseshoe bat, for example, is now at the periphery of its range, and this bat is still relatively common in southern Europe. And yet the current boundaries of the bat's range are not natural boundaries; they represent a line of extinction that certainly justifies any obligation to provide specific protection. The situation is similar for the isolated population of the greater horseshoe bat.

In central Europe, the mouse-eared bat follows human culture; it probably could not exist in Europe, with its current climate, if it had no buildings in which to roost. In light of the species' high population densities in parts of southern and central Germany, and of its preference for hunting habitats in beech forests – and the beech's main natural range is found in central Europe – central Europe cannot be considered to have little responsibility with respect to the species' overall range; central Europe's responsibility is large. On the other hand, only a few species – primarily Bechstein's bat – show an obvious central European concentration in their overall ranges.

While most bat species have other ranges outside of central Europe, they must still be considered part of central European fauna. The resulting consequence for bat conservation is as follows: protection efforts must give greater emphasis to Bechstein's bat and its habitats. Other species must also be given greater attention – especially those species whose distribution and behaviour are still poorly understood (such as the pipistrelle, Brandt's bat, barbastelle, northern bat, pipistrellus pygmaeus/mediterraneus). The best protection results are obtained by protecting buildings that house roosts and by carefully protecting habitats, especially forest habitats, since a majority of central European bat species use forests as a key habitat (MESCHEDE et al. 2000a, b). The call for protection and encouragement of old, structurally rich forests with locally native tree species, as bat habitats (as mentioned above, this would include primarily beech forests) thus brings this discussion full circle.

One difficulty is apparent in all such tasks: growth of tasks adds to the responsibilities of staff of co-ordination offices – in their roles as advisors, co-ordinators, organisers or executors. It is already clear that rural districts with active bat conservationists require considerably more assistance and support than do districts with few active volunteers. As the public and state administrations become more and more involved in issues of bat conservation, general interest in conservation increases – and more and more conservation problems come to light that the co-ordination offices must deal with. And the agencies' current staffs are already working at the limits of their capacity.

10 Summary

"Development and Protection of Bat Populations in Bavaria" is a special bat-conservation programme that was established in 1985, as a research programme, by the Bavarian Environmental Protection Agency. Its main purposes are to inventory and monitor bat fauna; educate the public about bat conservation; and advise and train volunteer bat conservationists, representatives of nature connection authorities and representatives of relevant occupations.

The basis for effective bat protection consists of inventorying and identifying bat roosts and assessing their condition. For this reason, one of the bat conservation programme's key initial focuses was on locating bat colonies in buildings, including supporting relevant activities of local conservationists and associations – a process that continues to the present day. At the same time, programme staff sought to make the public, nature conservation authorities and other state administrations (including church administrations) aware of the needs for, and purposes of, bat conservation. As a result, a large percentage of the bat colonies in conspicuous, potential roost-harbouring buildings such as churches or castles have been found. Thanks to this fact, and to the presence of volunteer bat conservationists in many Bavarian districts and municipalities, destruction and disturbance of large bat colonies and of roosts of building-dwelling bats is now the exception (cf. Chapter 3.1). When damage to a colony does occur, it is usually the result of failure to comply with arrangements between architects and nature conservation administrations, etc..

A much lower percentage of the less conspicuous bat roosts – such as roosts in private houses or in forests – has been found. And such roosts are frequently threatened by intentional or unintentional actions. This highlights the need for continuing, intensive efforts to enhance public acceptance of bat conservation. It also reminds us of how important it is to monitor known roosts. Ideally, known roosts should be monitored by people who live in the relevant areas. Monitoring within the framework of the bat conservation programme includes at least regular annual checks of the most important maternity roosts and winter roosts.

The present paper describes some of the most important results of the Bavarian bat research programme, and of relevant bat conservation efforts, with regard to the following species: Greater mouse-eared bat, Geoffroy's bat, barbastelle, parti-coloured bat and greater and lesser horseshoe bats.

Another important part of the bat research programme consists of monitoring of winter roosts. For many species, such monitoring represents the only way to keep track of population development. Significantly, monitoring of summer and winter roosts indicates that populations of some species have been increasing.

There are two co-ordination offices for bat conservation in Bavaria: one at the University of Erlangen-Nuremberg (Northern Bavaria), the other at the University of Munich
(Southern Bavaria). The co-ordination offices' ties to universities make it possible to include students and scientists in the bat conservation programme – for example, via research for diploma theses or dissertations. The universities also provide assistance with special methods, such as telemetry, for conservation programmes for particularly threatened bat species.

The Agreement on the Conservation of Bats in Europe (EUROBATS) (in force in Germany since January 1994) and the EU's "Fauna, Flora and Habitats Directive" (FFH Directive) have brought important progress in protection of bats at the national and international levels. Annexes I and II of the FFH Directive list habitat types that are important as bats' hunting habitats (for example, various deciduous-forest types), as well as several bat species that must be strictly protected and for which priority conservation areas must be created. With its monitoring programme, its emphases on protection of building-dwelling bats' roosts and its efforts to enhance public awareness, the Bavarian bat research programme is making an important contribution to implementation of the EUROBATS agreement and the FFH Directive – for example, with regard to proposals for area selection or monitoring of areas in the "Natura 2000" network.

Summary[6]

The research program "Population development and Protection of bats in Bavaria": this special conservation program for bats was established in 1985 as a research program by the Bavarian State Office of Environmental Protection. It is aimed at inventarizing the bat fauna, monitoring, public relations work, advising and teaching of bat conservationists and nature administrators.

The effective protection of roosts belongs to what is known about them and how to assess them. An initial emphasis of the bat conservation program was the search of bat colonies in human buildings – this process still continues. At the same time in public, the nature and other state administrations including the church offices were sensitized and interested in bat

6) Wir danken Frau S. Haynes-Huber und Herrn Y. Winter für die Korrektur der englischen Zusammenfassung

conservation. As a result there is a high degree in registration of bat colonies in conspicuous buildings like churches or castles; furthermore in many Bavarian districts and greater towns bat conservationists are present. The destruction or disturbance of larger colonies or important roosts therefore, one of the main reasons for declining of bats, has become an exception. If a colony is damaged mostly it happens because of unreliabilities at agreements between architects and nature conservation administrations (see chapter 3.1)
Much lower is the degree of registration of unconspicuous bat roosts, for example at private houses or in forests. Such roosts are threatened by intended or unintended actions. On the one hand this emphasizes the necessity of an intensive work of sympathy and publicity for bat conservation and on the other hand the high importance of the monitoring of known roosts. Ideally known roosts ar looked after by local people. The looking after the most important summer and winter roosts in the bat conservation program is maintained by the regular yearly monitoring.
Some of the most important results of the Bavarian bat research program and the main efforts in bat conservation are shown by the following species: Greater mouse-eared bat, Notch-eared bat, Barbastelle, Particoloured bat and Greater and Lesser horseshoe bat. An important part of the bat research program is the monitoring of winter roosts. For many spicies this is the only possibility to examine the population development.

There are two coordination offices for bat conversation in Bavaria: one at the University of Erlangen-Nürnberg (Northern Bavaria), the other at the University of Munich (Southern Bavaria). The location of these coordination offices allows the inclusion of students and scientists in the bat conservation program, for example in dissertations or master`s thesis for basic research. The universities, too, provide special methods like radiotracking for conservation programs for single threatened bat species.

On the national and international level of bat conservation the agreement for the conservation of bats (in Germany since January 1994) and the habitats directive of the EU are important progresses. Annex I of the habitat directives contains many habitat types which are feeding areas of bats too (mainly some types of deciduous forests), and Annex II contains some bat species. Both, habitat and species have to be protected strongly and for their preservation conservation sites must be created. The Bavarian bat research program provides an important part of the implementation of the agreement and of the habitats directive by focusing ist main work on monitoring of summer and winter roosts, the protection of building-roosting bats and on public relation work. One example are the proposals of sites for the "Natura 2000" network.

11 Literature

AGFH (Arbeitsgemeinschaft für Fledermausschutz in Hessen) (1994): Die Fledermäuse Hessens. Geschichte, Vorkommen, Bestand und Schutz. – Remshalden-Buoch.

ANTONI, W. (1980): Verbreitung und Gefährdung der Fledermäuse in Bayern. – Unveröff. Bericht i. A. d. Bayer. Landesamtes für Umweltschutz.

AUDET, W. (1990): Foraging behaviour and habitat use by a gleaning bat, Myotis myotis (Chiroptera: Vespertilionidae). – J. Mammalogy 71: 420-427.

CHRISTOPH, L. (1998): Untersuchung und Dokumentation eines Fledermausvorkommens (Abendsegler) im Bereich der Wasserburger Innhöhe. – Facharbeit am Gymnasium Wasserburg.

GEIGER, H. (1992): Untersuchungen zur Populationsdichte der Wasserfledermaus (Myotis daubentoni KUHL, 1819) im Mittelfränkischen Teichgebiet. – Dipl.-arbeit Univ. Erlangen.

GEIGER, H. (1996): Einsatz der Radiotelemetrie bei Artenschutzbelangen von Fledermäusen am Beispiel der Großen Hufeisennase (Rhinolophus ferrumequinum) in Nordbayern. – Schriftenr. Landschaftspfl. Naturschutz 46: 31-40.

GEIGER, H. & M. HAMMER (1993): Wochenstubenfund der Großen Hufeisennase (Rhinolophus ferrumequinum
SCHREBER) in der Oberpfalz. – Unveröff. Bericht i. A. d. Bayer. Landesamtes für Umweltschutz.

GÜTTINGER, R. (1997): Jagdhabitate des Großen Mausohrs (Myotis myotis) in der modernen Kulturlandschaft. – Schriftenr. Umwelt Nr. 288, hrsg. vom Schweizer Bundesamt für Umwelt, Wald und Landschaft, Bern, 138 S.

HAMMER, M. & F. MATT (1996): Artenschutzkonzept für die Große Hufeisennase (Rhinolophus ferrumequinum, Schreber 1774) in Bayern. – Unveröff. Bericht i. A. d. Bayer. Landesamtes für Umweltschutz.

HAMMER, M., H. GEIGER & F. MATT (1995): Bestandsentwicklung und aktuelle Situation der Großen Hufeisennase (Rhinolophus ferrumequinum) in Bayern. – Tagungsband "Zur Situation der Hufeisennasen in Europa". Nebra.

HELVERSEN, O. v. (1989): Schutzrelevante Aspekte der Ökologie einheimischer Fledermäuse. – Schr.-R. Bayer. Landesamt für Umweltschutz 92 (Beiträge zum Artenschutz 8): 7-17.

HELVERSEN, O. v., M. ESCHE, F. KRETZSCHMAR & M. BOSCHERT (1987): Die Fledermäuse Südbadens. – Mitt. bad. Landesverein Naturkunde und Naturschutz. N.F. 14: 409-475.

HOLZHAIDER, J. (1998): Untersuchungen zur Fledermausfauna in den bayerischen Alpen. – Dipl.-arbeit Univ. München.

ISSEL, B., W. ISSEL & M. MASTALLER (1977): Zur Verbreitung und Lebensweise der Fledermäuse in Bayern. – Myotis XV: 19-97.

KERTH, G. (1998): Sozialverhalten und genetische Populationsstruktur bei der Bechsteinfledermaus Myotis bechsteini. – Berlin.

KRAUS, M. & A. GAUCKLER (1977): Zur Verbreitung und Bestandsentwicklung der Großen Hufeisennase (Rhinolophus ferrumequinum: Chiroptera) in Bayern. – Myotis 15: 3-17.

KRAUS, M. & A. GAUCKLER (1980): Zur Abnahme der Kleinen Hufeisennase (Rhinolophus hipposideros) in den Winterquartieren der Frankenalb (Nordbayern) zwischen 1958 und 1980. – Myotis XVII: 3-12.

KRUG, B. (1988), Pestizidbelastung einheimischer Fledermäuse mit chlorierten Kohlenwasserstoffen. – Dipl.-arbeit Univ. Erlangen-Nürnberg.

KRULL, D. (1988): Untersuchungen zu Quartieransprüchen und Jagdverhalten von Myotis emarginatus (Geoffroy 1806) im Rosenheimer Becken. – Dipl.-arbeit Univ. München, 94 S.

KRULL, D., A. SCHUMM, W. METZNER & G. NEUWEILER (1991): Observation at a maternity colony of the notch-eared bat, Myotis emarginatus, with special references to foraging behaviour. – Behav. Ecol. Sociobiol. 28: 247-253.

LIEGL, A. (1987): Untersuchungen zur Phänologie und Ökologie von Fledermäusen an zwei Karsthöhlen der Fränkischen Schweiz. – Dipl.-arbeit Univ. Freiburg.

MESCHEDE, A., K. G. HELLER & P. BOYE (2000a): Ökologie und Schutz von Fledermäusen in Wäldern. – Schriftenr. Landschaftspfl. und Naturschutz 66, Bonn-Bad Godesberg.

MESCHEDE, A., W. GÜTHLER & P. BOYE (2000b): Fledermäuse im Wald – Informationen und Empfehlungen für den Waldbewirtschafter. – DVL – Schriftenr.

Landschaft und Lebensraum 4, 20S. (Hrsg. Dt. Verband für Landschaftspflege, Ansbach & Bundesamt für Naturschutz, Bonn).

MÜLLER, E. (Hrsg. 1993): Fledermäuse in Baden-Württemberg II. – Beih. Veröff. Naturschutz Landschaftspflege Bad.-Württ. 75, Karlsruhe.

NAGEL, A. & R. NAGEL(1993): Bestandsentwicklung winterschlafender Fledermäuse auf der Schwäbischen Alb. – Beih. Veröff. Naturschutz Landschaftspflege Bad.-Württ. 75: 97-112.

NIEHUIS, M. (1979): Große Hufeisennase (Rhinolophus ferrumequinum) – Nachweise in der Nordpfalz und im Nahetal. – Pfälzer Heimat 30: 42-43.

PREISS, G. (1983): Vierjährige Bestandserhebungen überwinternder Fledermäuse in fränkischen Karsthöhlen und Schutzmaßnahmen. – Myotis 21: 11-34.

RICHARZ, K. (1989a): Report of a successful transplantation of a maternity colony of the Lesser Horseshoe Bat (Rhinolophus hipposideros) and remarks about the actual status of this species in Bavaria. – In: V.Hanak, I. Horacek, J. Gaisler (eds.): European Bat Research 1987, Charles Univ. Press, Praha.

RICHARZ, K. (1989b): Ein neuer Wochenstubennachweis der Mopsfledermaus Barbastella barbastellus (Schreber, 1774) in Bayern mit Bemerkungen zu Wochenstubenfunden in der BRD und DDR sowie zu Wintervorkommen und Schutzmöglichkeiten. – Myotis 27: 71-80.

RICHARZ, K., H. LIMBRUNNER & F. KRONWITTER (1989): Nachweise von Sommerkolonien der Zweifarbfledermaus Vespertilio murinus LINNAEUS, 1758 in Oberbayern mit einer Übersicht aktueller Funde in Südbayern. – Myotis 27: 61-70.

ROER, H. (1984): Zur Bestandsentwicklung von Rhinolophus ferrumequinum Schreber, 1774 und Rhinolophus hipposideros, Bechstein 1800 (Chiroptera) im westlichen Mitteleuropa. – Myotis 21-22: 122-130.

RUDOLPH, B.-U. (1989): Habitatwahl und Siedlungsdichte des Mausohrs Myotis myotis in Nordbayern. – Dipl.-arbeit Univ. Erlangen-Nürnberg.

RUDOLPH, B.-U. (1990): Frühere Bestandsdichte und heutige Bestandssituation der Kleinen Hufeisennase Rhinolophus hipposideros in Nordbayern. – Myotis 28: 101-108.

RUDOLPH, B.-U. (2000): Auswahlkriterien für Habitate von Arten des Anhangs II der Fauna-Flora-Habitat-Richtlinie am Beispiel der Fledermausarten Bayerns. – Natur und Landschaft 75: 328-338.

RUDOLPH, B.-U., M. HAMMER & A. ZAHN (in Druck): Die Mopsfledermaus Barbastella barbastellus in Bayern. – Tagungsband "Artenschutzsymposium Mopsfledermaus", Nebra.

RUDOLPH, B.-U. & A. LIEGL (1990): Sommerverbreitung und Siedlungsdichte des Mausohrs Myotis myotis in Nordbayern. – Myotis 28: 19-38.

SCHLAPP, G. (1981): Untersuchungen zur Verbreitung und Ökologie einheimischer Fledermäuse. – Dipl.-arbeit Univ. Erlangen-Nürnberg.

SCHLAPP, G. (1990): Populationsdichte und Habitatansprüche der Bechsteinfledermaus Myotis bechsteini (Kuhl 1818) im Steigerwald (Forstamt Ebrach). – Myotis 28: 39-58.

SCHLAPP, G. (1996): Bestandserfassung und Schutz von Fledermäusen in Bayern. – Schr.-R. Bayer. Landesamt für Umweltschutz 137: 268-272.

SCHOTT, T. (1998): Beobachtung des Jahresverlaufs eines Abendseglervorkommens. – Facharbeit am Gymnasium Gars.

SSYMANK, A. (1994): Neue Anforderungen im europäischen Naturschutz. Das Schutzgebietssystem "Natura 2000" und die "FFH-Richtlinie" der EU. – Natur und Landschaft 69: 395-406.

SSYMANK, A., U. HAUKE, C. RÜCKRIEM & E. SCHRÖDER (1998): Das europäische Schutzgebietssystem NATURA 2000 – BfN-Handbuch zur Umsetzung der Fauna-Flora-Habitat-Richtlinie (92/43/EWG) und der Vogelschutzrichtlinie (79/409/EWG). – Schriftenr. Landschaftspfl. Naturschutz 53, Bonn-Bad Godesberg.

StMELF (Bayerisches Staatsministerium für Ernährung, Landwirtschaft und Forsten) (1997): Grundsätze für einen naturnahen Waldbau. – Faltblatt, aus "Schule und Beratung", Heft 3/1987, München.

STIEBLER, G. (1997): Fledermaus-Winterzählung. – Der Fränkische Höhlenspiegel (Verbandszeitschrift des Forschungsvereins Höhle und Karst Franken e.V.) 1997: 61-68.

WEBER, C. (1988): Untersuchung über die Beziehung zwischen Testosterongehalt und Swarming-Verhalten von Fledermäusen vor Höhlen der Fränkischen Schweiz. – Dipl.-arbeit Univ. Freiburg.
WEINER, P. (1998a): Untersuchung der Fledermausfauna von Herrenchiemsee (Obb.) unter besonderer Berücksichtigung der Kleinen Hufeisennase (Rhinolophus hipposideros). – Dipl.-arbeit Univ. München.
WEINER, P. (1998b): Untersuchung der Reaktion der Kolonie von Rhinolophus hipposideros auf eine provisorische Überdachung des Lichthofes von Schloß
Herrenchiemsee. – Unveröff. Bericht i. A. d. Regierung von Oberbayern.
WEISHAAR, M. (1995): Große Hufeisennase (Rhinolophus ferrumequinum) in Rheinland-Pfalz. – Tagungsband "Zur Situation der Hufeisennasen in Europa". Nebra.
WOLZ, I. (1992): Zur Ökologie der Bechsteinfledermaus Myotis bechsteini (Kuhl, 1818) (Mammalia: Chiroptera). – Diss. Univ. Erlangen, 147 S.
ZAHN, A. (1995): Populationsbiologische Untersuchungen am Großen Mausohr Myotis myotis. – Diss. Univ. München, 130 S.
ZAHN, A. (1999): Reproductive success, colony size and roost temperature in attic-dwelling bat Myotis myotis. – J. Zool. Lond. 247: 275-280.
ZAHN, A. & B. DIPPEL (1997): Male roosting habits and mating behaviour of Myotis myotis. – J. Zool. 243: 659-674.
ZAHN, A. & G. SCHLAPP (1995): Bestandsentwicklung und aktuelle Situation der Kleinen Hufeisennase (Rhinolophus hipposideros) in Bayern. – Tagungsband "Zur Situation der Hufeisennasen in Europa", Nebra: 177-182.
ZAHN, A., C. CHRISTOPH, L. CHRISTOPH, M. KREDLER, A. REITMEIER, F. REITMEIER, C. SCHACHENMEIER & T. SCHOTT (2000): Die Nutzung von Spaltenquartieren an Gebäuden durch Abendsegler (Nyctalus noctula) in Südostbayern. – Myotis 37: 61-76.

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1.2.2 Research and development project on the distribution, abundance and migrations of seabirds and waterbirds in the German North Sea, and development of a concept for implementation of international nature conservation objectives

Offshore areas are known to be especially important as feeding grounds for divers, ducks, seals and porpoises and as moulting areas for seabirds and water birds. Until now, little has been known about populations of seabirds and waterbirds, and of sea mammals, in near-coastal areas of the German Bight. The R+D project "Inventory of the distribution, abundance and migrations of seabirds and waterbirds in the German North Sea, and development of a concept for implementation of international nature conservation objectives" (the so-called "Boffwatt" project) has now been carried out (MITSCHKE et al. 2001) in order to close this gap and develop a suitable protection concept for implementing international nature conservation objectives in the North Sea. The project was carried out on behalf of the Federal Agency for Nature Conservation (BfN) and funded by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU).

The project focused especially on the seagulls and terns that breed in the Wadden Sea region and possibly hunt for food in neighbouring sea areas. It also sought to provide new insights into the distribution and population sizes of birds that rest or search for food far from the coastline, in waters up to 20 m deep. And a special emphasis was placed on studying population sizes and concentrations of bird species for which the Federal Republic of Germany has a key responsibility, such as the sandwich tern, common tern and little tern *(Sterna sandvicensis, S. hirundo, S. albifrons)*, mew gull *(Larus canus)*, black scoter *(Melanitta nigra)*, red-throated diver and black-throated diver *(Gavia stellata, G. arctica)*. Yet another project topic was the relationship between certain bird species' diets and the birds' distribution in the Wadden Sea and in offshore areas. Finally, the project sought to update knowledge of marine mammals' distributions (cf. Chapter 2.5).

The new findings produced by the project will make it possible to develop a concept for protected areas in the German North Sea, in keeping with the nature conservation objectives of the international agreements Germany has signed.

PROJECT OUTLINE. Existing data on the number of birds at sea, and of their spatial and chronological distributions, from 1990-1996, was analysed. From April 1997 to September 1998, supplementary mappings were then carried out in near-coastal areas of the German Bight, aimed especially at filling in spatial and chronological gaps in the inventories. Special attention was given to offshore areas between the Wadden Sea and the 20 m depth zone / Helgoland Island. Data on birds at sea was analysed with regard to three emphases: distribution, abundance and phenology. The population sizes of birds at sea were calculated for various time frames.

On the islands of Amrum and Juist, during breeding and rearing phases, samples of spitballs and droppings were collected from black-headed gull, mew gull, herring gull and lesser black-backed gull *(Larus ridibundus, L. canus, L. argentatus, L. fuscus)*, in order to analyse these gull species' diets. On the island of Juist, diets of sandwich terns were determined by visual observation. This made it possible to assess the amounts of food that the various breeding birds obtained at sea.

Population and distribution data for sea mammals in Wadden Sea offshore areas were obtained through chance observations, since it was not possible to observe these diving animals systematically.

The data obtained through the project, in combination with Germany's international nature conservation obligations, was used to derive emphases for nature conservation oriented to the needs of birds and mammals.

The findings led to a concept for protecting offshore areas of the German Wadden Sea. Possible negative impacts were taken into account. On the basis of the various bird species' different habitat and food requirements, proposals were derived for protecting and promoting bird and mammal species that breed in the Wadden Sea and search for food in nearby offshore areas. For certain species, resting and wintering areas of international importance were identified, but it has not yet been possible to demarcate these areas.

RESULTS OF THE STUDIES. Findings from data research, and from additional observations, improved our knowledge about the distribution and phenology of many species in offshore areas. The following section presents details for particular species:

During its breeding phases, the **herring gull seldom move**s outside of a 50 km range from the breeding colony. In its rearing phase, its radius of action increases, in keeping with its increased food needs. During this time and the post-breeding period, however, its main range consists of Wadden Sea areas near its breeding site. During the winter, the herring gull can be found throughout the entire North Sea area, and it is highly dependent on human activity (e.g. fishing boats). Overall, herring-gull populations in the North Sea are larger during the winter than during the breeding season.

Unlike the **herring gull**, the lesser black-backed gull appears in offshore areas during its breeding phase. Populations of this species range far into areas with water depth greater than 20 m. Concentrations can be found especially along shipping lanes off the east Friesian coastline and along the 10 m depth line off the north Friesian islands. Once their offspring become full-fledged, lesser black-backed gulls spread quickly over large areas of the German Bight. They use all offshore areas of the Wadden Sea and congregate especially in the Elbe-Weser estuary, in sea areas north-west of Helgoland and off the islands of Amrum and Sylt.

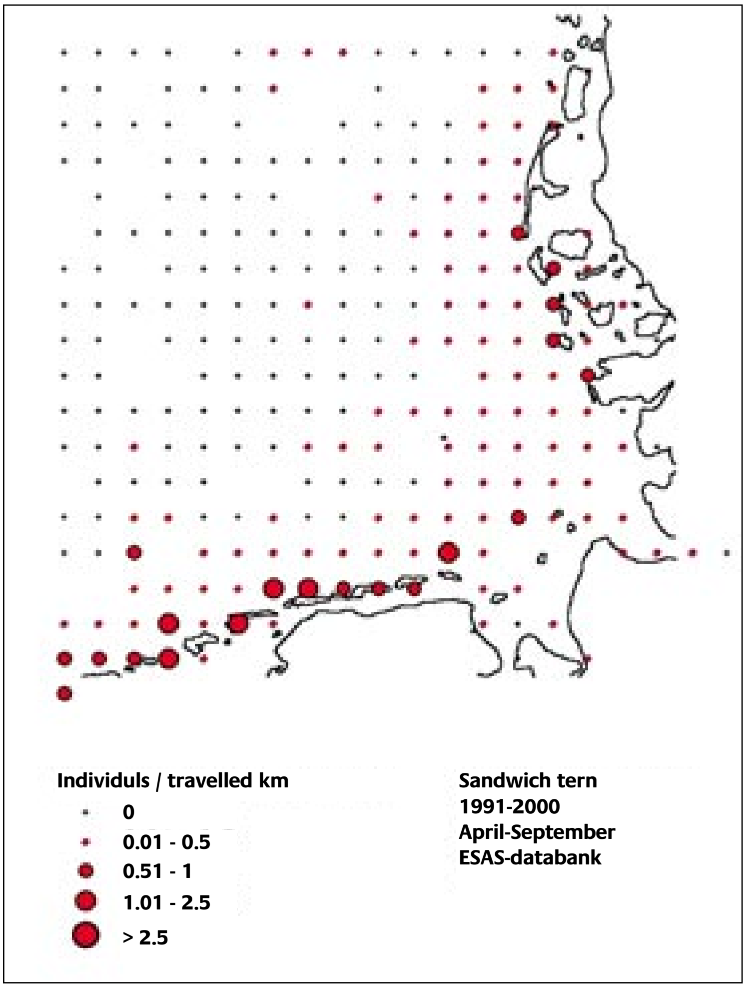
The common tern and arctic tern *(Sterna hirundo, S. paradisaea)* have important feeding habitats in the Wadden Sea surf zone, as well as in shallow waters of the Wadden Sea's rivulet system and shallow waters near the coast. During the breeding season, the only birds found in offshore areas are birds in passage. The common tern stays in the Wadden Sea area from April to September, or considerably longer than the arctic tern, which does not reach its breeding areas until May and leaves them as soon as its young are full-fledged, beginning in July. At the end of its breeding period, the common tern gathers in a few, food-rich zones, and it reaches its maximum concentrations in these areas in August.

The sandwich tern occurs both in the Wadden Sea and in offshore areas, from April to October (Fig.1.2.2-1). During the breeding period, it shows special preference for areas out to the 20 m depth line, near its colonies (Norderoog, Trischen, Scharhörn, Wangerooge, Juist). During its rearing period, when its food requirements grow, it covers longer distances, although it still rarely ranges farther than 25 km away from its nesting site. In contrast to the common tern and arctic tern, it tends not to use very shallow waters for feeding grounds. During the post-breeding period, once their young are full-fledged, many sandwich terns leave their breeding areas, sometimes travelling up to 250-500 km to food-rich concentration points, where they reach their maximum numbers in August. Such population shifts emerge clearly in observation of areas near coasts and far away from coasts.

Important summer moulting populations of the **black scoter** are found in the north Friesian Wadden Sea. Since large populations concentrate only near shallow areas, rich in clams and mussels and with quiet sea areas, only a few areas of the outer Wadden Sea and its neighbouring offshore areas are suited as rest areas for this species. The populations' high mobility hampers estimates of population sizes and characterisation of regularly used resting areas on the east Friesian coast. Because black scoter populations tend to mass in a few areas, in very dense concentrations, they are particularly sensitive to disturbances and damage such as oil spills. Relatively little is known about the populations' behaviour during the winter months. Populations of international importance are seen only off the north Friesian Wadden Sea, and these populations' distribution and constancy are still unclear.

The **red-throated diver** and **black-throated diver** clearly avoid areas near shipping lanes, and they take flight at very large distances to ships at sea. Observations of flying divers have identified a main wintering area between the mouth of the Elbe and Hever-strom in the German Bight. No other areas of concentration have yet been identified. The birds are found in the German Bight only from early October until early May. The largest populations are seen from December to February. Little data is available for areas

Fig. 1.2.2-1: Distribution of the sandwich tern in the North Sea. The figure shows the number of individuals counted per travelled km of observational patrol. (pursuant to GARTHE in lit. 2001).



further offshore. During the winter, most divers stay in offshore areas with water depths less than 30 m, especially areas near estuaries of large rivers. The known resting populations in the German Bight account for more than 20% of the biogeographical population, meaning that German offshore areas have international importance as wintering areas for divers.

During the winter months, the **mew gull** is found in large areas in the German Bight, with concentrations north and east of Helgoland. Only off the east Friesian coast do the birds tend to stay within the 20 m depth line. North and west of Helgoland, they also venture into deeper waters. The German Bight is an important wintering area for the mew gull; internationally significant resting populations are found there. Additional populations can be found in river estuaries, Wadden areas and beyond the 20 m depth line.

Analysis of the birds' diets turned up additional significant aspects with regard to a protection-area concept for offshore areas. In contrast to the popular view that gulls are not selective at all in their choice of food, the project found differences in gulls' prey and feeding-habitat selections, differences that point to ecological distinctions. Lesser **black-backed gulls** feed primarily on the open sea, and they are largely without any competitors in such areas within the German Bight. **Herring gulls** tend to prefer tidal zones of the Wadden Sea. **Black-headed gulls** and **mew gulls**, on the other hand, search for food both in tidal zones and on land. Although each gull species has its own food preferences, different colonies of the same species can have considerably different diets. Such differences are likely to depend on food availability.

Project observations of the sandwich tern's food preferences have confirmed previous observations, to the effect that sandeels (Ammodytes species) and herrings (Clupeidae) of certain sizes make up the great majority of chicks' diet. This dietary specialisation highlights this species' strong dependency on offshore areas of the Wadden Sea.

The harbour seal, a sea mammal that is characteristic of the Wadden Sea, also uses offshore areas year round. It shows a marked preference for water depths of up to about 20 m, throughout the entire year. This is because its diet consists largely of bottom-dwelling fishes. The large fluctuations in numbers of harbour seals that rest on Helgoland Island indicate that regular exchanges take place between the animals' colonies along the North Sea Coast, including offshore areas out to Helgoland.

Fewer than 500 **grey seals** now live in the Wadden Sea. Their colonies are found only in the Netherlands, in basking areas between Vlieland and Terschelling, and in Schleswig-Holstein, between Sylt and Amrum. Since the early 1990s, a small colony of 10-15 animals has lived on Helgoland's dune area. It has not yet been determined whether Wadden Sea grey seals move around between these three colonies (i.e. change their colony membership).

The **harbour porpoise** inhabits all offshore areas of Schleswig-Holstein's Wadden Sea, out to the 20 m depth line. It rarely ventures beyond this line, however. The harbour porpoise's yearly activity cycle on the west coast is not apparent at sea. Like the harbour seal, it subsists largely on bottom-dwelling fishes.

DEVELOPMENT OF A PROTECTION CONCEPT FOR IMPLEMENTATION OF INTERNATIONAL PROTECTION OBJECTIVES. Via the following international agreements that especially concern the North Sea or its bird species, the Federal Republic of Germany has committed itself to protect animals, plants and sea areas.

- Convention on Wetlands of International Importance especially as Waterfowl Habits (Ramsar Convention),
- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention; CMS),
- Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA),
- Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS),
- Agreement on the Conservation of Seals in the Wadden Sea,
- Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention),
- EC Bird Directive,
- Fauna, Flora and Habitats Directive,
- Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) and
- Trilateral Governmental Wadden Sea Conference.

At the eighth "Trilateral Governmental Wadden Sea Conference", objectives for protection within a 3-sea-mile zone were also defined for the Wadden Sea's offshore areas. The objectives include ensuring a good supply of food for birds and protecting populations of the harbour seal *(Phoca vitulina)*, grey seal *(Halichoerus grypus)* and harbour porpoise *(Phocoena phocoena)*.

To meet its obligations resulting from these agreements, Germany requires a concept for protection of seabirds, waterbirds and sea mammals within offshore areas of the German Wadden Sea. Such a protection concept should be aimed at protecting relevant habitats (i.e. sea areas in which significant groups or populations of animals are regularly found) and at ensuring that animals have an adequate supply of food.

These aims are to be achieved by establishing a protection area, at sea, in which birds and sea mammals, and their food supplies, are protected from disturbances and impairments. The EC Bird Directive and the FFH Directive mandate set-asides of such protection areas for certain species, and several international agreements, such as CMS, the Ramsar Convention, AEWA and ASCOBANS, provide for establishment of maritime protection areas. The agreements also propose regulations regarding permitted uses and prohibited activities.

Since it is not possible to change the boundaries of protection areas at short notice, it is important, before such boundaries are defined, to assess whether any shifting in population concentrations and feeding grounds is expected. To take account of changes as a result of natural succession, protection areas should include all relevant areas. Since not enough data relative to meaningful set-aside of such protection areas has yet been gathered, additional multi-year observations are required and will be carried out within the framework of other projects. The present research findings do provide a basis, however, for initial considerations relative to a protection-area concept and further conservation measures.

PROTECTION-AREA CONCEPT. Boundaries of suitable protection areas in the German North Sea should be oriented to populations of selected bird and mammal species, so-called priority species. The criteria for selection of such priority species include species' population and risk situation and concentrations of populations in Europe and German sea areas. In addition, various relevant ecological groups must be protected, such as the Wadden Sea's breeding birds and sea mammals that regularly use offshore areas (herring gull, lesser black-backed gull, sandwich tern, common tern, arctic tern, harbour seal), birds with important resting and wintering populations in offshore areas (black-throated diver, red-throated diver, black scoter, herring gull, mew gull) and sea mammals that live either exclusively or predominantly in offshore areas (grey seal, harbour porpoise).

Because relevant populations are spread over large areas, and because individual species' preferred areas vary with the food supply, set-asides of small protection areas are of little use. Populations of the common tern and arctic tern stay within near-coastal offshore areas during the breeding period. While they are rearing their young, herring gulls can be found in areas considerably outside of the 20 m depth line, while sandwich terns use such areas during breeding. On the other hand, near-coastal shallow-water areas, with water depth to 20 m, are the most important feeding grounds in general. It would thus make far more sense to draw the national park boundaries along the 20 m depth line than it would to draw them at an arbitrary distance from the mainland, as was done for the 3-sea-mile zone.

As to resting birds, the populations of divers and black scoters that congregate densely in small areas are of particular importance. Both tend to rest in waters ranging from 10-20 m in depth, largely outside of existing protection areas. Since these bird species are strongly in need of protection, and since their spatial distribution is not yet clear, it would make sense to define large protection areas or additions for them.

To date, conservation efforts for seals have been limited to keeping disturbances away from their basking and birthing areas. Conservation efforts on behalf of the sandwich tern would also protect the feeding grounds of the three relevant sea-mammal species and for the connections between their Wadden Sea sub-populations.

All in all, if the species covered by the project are to be effectively protected, a large complex of areas will have to be set aside. Initial steps in this direction, within the framework of expansions of protection areas, have already been made. This project's findings have helped prepare the way for seaward expansion of the three German Wadden Sea national parks.

Apart from set-asides of protection areas, an adequate food supply must be ensured for birds and sea mammals in Wadden Sea offshore areas. The fishing industry has a strong impact in this area. To prevent further unnatural increases in populations of sea birds (such as herring gulls), by-catches must gradually be reduced. Efforts must also be made to prevent catching of too many small fish (which are an important food source for terns, for example) and overfishing of clams (for example, trough shell clams are an important food source for black scoter).

ADDITIONAL MEASURES. Oil pollution at sea is a major threat. Such pollution is caused primarily by illegal discharges of oil residues. Measures to reduce this threat, such as free disposal in German ports, need to be improved. In addition, monitoring of ships needs to be intensified and the monitoring programme using seabirds and shore birds as bioindictors needs to be continued.

To reduce the risk of oil spills, a better safety concept, providing for adequate tug-boat capacities, must be put in place for the German Bight. Furthermore, safety requirements and crew training must be improved on an international level. In the interest of effective protection, the Wadden Sea and its nearby offshore areas should be designated a "particularly sensitive sea area (PSSA)" pursuant to the guidelines of the International Maritime Organisation (IMO). Such designation would make it possible to introduce stricter safety requirements (such as compulsory pilots, and an expanded traffic-control and reporting system). These requirements have already been discussed, in the framework of international co-operation, with the governments of the states bordering the Wadden Sea.

Waste pollution is another problem seen for sea birds and sea mammals. Diving sea birds are particularly at risk; for example, they can become fatally enmeshed in nets and ropes.

Development of the North Sea's offshore areas for wind-energy purposes must be sceptically considered. Before installation of any wind turbines is approved, further studies are urgently required of populations in resting and feeding areas and, especially, of migratory patterns at sea.

REQUIREMENTS FOR FURTHER RESEARCH. Plans are in place for preparation of a "German Bight Sea bird atlas" (Seevogelatlas Deutsche Bucht) that would describe, in detail, all seabirds and waterbirds regularly found in the area. This publication would also specify additional, appropriate recommendations for protection. Since the presence of birds in offshore areas can fluctuate strongly, on a seasonal and yearly basis, usually in connection with changes in availability of food, syste-matic observations of birds' distributions and populations at sea play an important role in derivation and recommendation of specific measures for protection. At the same time, causes of spatial and chronological dynamics must be explored and understood, if it is to be possible to predict the future development of bird populations. Relevant studies should be continued, especially studies on dietary ecology of the most important sea birds, on the interactions between fishing and sea birds and on the ways in which the hydrographical and meteorological regime controls dynamics of sea-bird populations near the coast.

OUTLOOK: THE BALTIC SEA. A follow-on project is currently being carried out in the German Baltic Sea. The aim of the R&D project "Seabirds and waterbirds in the German Baltic Sea and their protection within the framework of international agreements" is to document findings about the breeding, resting and wintering populations of all seabirds and waterbirds in the German Baltic Sea and to assess the birds' requirements for protection under international agreements. This includes such actions as inventorying breeding populations on the coasts of Schleswig-Holstein and Mecklenburg-West Pomerania and describing the distribution, abundance and annual cycles of the Baltic Sea's most important seabirds and waterbirds. In addition, the project will analyse previous counts made on land and at sea, and it will carry out counts at sea, in an expansion of the existing "Seabirds at Sea" project.

The project is to be used as a basis for formulating a concept for medium-term and long-term inventories of seabirds and waterbirds in the Baltic. In addition, it will support national implementation of the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA), the EC Bird Directive and the HELCOM Convention. To these ends, a relevant protection concept ("Minimum programme for protection of seabirds and waterbirds of German Baltic Sea waters") is to be formulated.

Ruff

Black-tailed Godwit

1.2.3 Research and monitoring in the framework of efforts to protect wetlands limicolae in Germany – description of R+D projects of the Federal Agency for Nature Conservation (BfN)

Among the species listed in Annex II of the Bonn Convention on the Conservation of Migratory Species of Wild Animals (CMS) and in the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA), and of which breeding populations regularly appear in Federal Republic of Germany, the following limicolae, which breed predominantly in wet grasslands, are referred to as "wetlands limicolae" (Wiesenlimikolen): northern lapwing *(Vanellus vanellus)*, common snipe *(Gallinago gallinago)*, black-tailed godwit *(Limosa limosa)*, western curlew *(Numenius arquata)*, common redshank *(Tringa totanus)* and ruff *(Philomachus pugnax)*; as well as the palaearctic oystercatcher *(Haematopus ostralegus)* and dunlin *(Calidris alpina)*, which tend to depend more strongly on near-coastal habitats. Along with the corn crake *(Crex crex)*, which occurs in similar habitats, and a number of songbird species, these birds make up the breeding-bird community typically found in wet grassland areas and low-lying landscapes (FLADE 1994, ROSENTHAL et al. 1998).

In Germany, protection of these species has high priority in connection with implementation of AEWA, since Germany lies within their core breeding range, and since most of these bird species are endangered, or critically endangered (facing risk of extinction), pursuant to the current Red List of Germany's threatened breeding birds (BAUER et al. pub. pend., HAUPT et al. 2000, cf. Tab. 1.2.3-1).

In central Europe, wetlands limicolae are concentrated throughout a broad band along low-lying areas and marshes of the Netherlands, Germany and Denmark (HAGEMEIJER & BLAIR 1997). In Germany, populations are concentrated in the low-lying north German plain, in the states of North Rhine-Westphalia, Lower Saxony, Bremen, Hamburg, Schleswig-Holstein and, to a lesser extent, Mecklenburg-West Pomerania and Brandenburg (ROSENTHAL et al. 1998, NEHLS et al. 2001, NICOLAI 1993). Other populations, especially of the species northern lapwing, common snipe, western curlew and corn crake, are also found in southern German river valleys and fens (HAGEMEIJER & BLAIR 1997).

While the species' original habitats consisted of coastal salt meadows, bogs, riparian meadows and steppes, they were able to adapt to habitat changes that resulted as human beings began cultivating the land. By occupying cultural landscapes, some species were even able to increase their populations and enlarge their breed-

Tab. 1.2.3-1: Red List status of wetlands limicolae that breed in Germany and are listed in AEWA.
(* Corn crake: Species listed in Annex II of the Bonn Convention on the Conservation of Migratory Species of Wild Animals).

Red List status (BAUER et al., pub. pend.)	
Category 1: Critically endangered (facing risk of extinction):	Dunlin, ruff, common snipe, black-tailed godwit.
Category 2: Endangered:	Northern lapwing, western curlew, common redshank, corn crake*

ing areas (for example, KUSCHERT 1983 for the Eider lowlands, BAUER & BERTHOLD 1996, ROSENTHAL et al. 1998, SEITZ 2001). In the past century, as cultivation, drainage and human-oriented improvement of habitat areas intensified, populations shrank significantly, however, to levels that have persisted to the present day (Tab. 1.2.3-2, BAUER & BERTHOLD 1996, MELTER &WELTZ 2001, NEHLS et al. 2001, SEITZ 2001). This development is alarming especially in that all of the species concerned formerly were common and were characteristic of the north-west German cultural landscape. An overview of the population changes, and of the current situation of breeding populations of meadow birds in north-west German Länder, was most recently published by NEHLS et al. (2001) (Tab. 1.2.3-2).

INVENTORIES AND MONITORING IN THE FRAMEWORK OF MEADOW-BIRD PROTECTION.

Although relatively much is known about the situations of bird populations in individual areas, regions and Länder, it is difficult to obtain a complete overview of population trends and current situation of wetlands limicolae in Germany. Beginning in 1972, nature conservation associations, ornithological associations and specialised nature conservation authorities began organising initial mappings of meadow-bird populations over larger areas. Examples of such efforts include a grid mapping of the northern lapwing in Westphalia, 1972/73, and a mapping of meadow birds in Schleswig-Holstein, 1982-1986 (KUSCHERT 1983, ZIESEMER 1986, BLÜHDORN 2001).

Earlier data consists primarily of data for individual areas or populations, covering short periods of time. This situation did not change until the mid-1980s, when large-area population inventories were made in core areas of meadow-bird populations in Lower Saxony (AK FEUCHTWIESENSCHUTZ WESTNIEDERSACHSEN 1998, MELTER & WELTZ 2001), in the Eider-Treene-Sorge-Niederung region and on the Eiderstedt peninsula in Schleswig-Holstein (NEHLS 2001a), in the Bremen area (SEITZ 2001) and in intensively monitored protected wetlands areas in North Rhine-Westphalia (WEISS et al. 1999). The following section summarises the results of these studies.

Tab. 1.2.3- 2: Development of breeding populations of wetlands limicolae in Germany and in north-west German Länder (NEHLS et al. 2001).

Species	Schleswig-Holstein		Lower Saxony and Bremen		North Rhine-Westphalia	
	about 1970	1985-94	about 1970	1998	about 1970	1999
Northern lapwing	k.A.	16,000	>30,000 (1985)	25,000-30,000	k.A.	12,000-16,000
Ruff	150-300	160	500	10-15	"a few pairs"	0
Common snipe	10,000-15,000	1.400	<6,000 (1985)	2,000-3,000	400-500	77-84
Black-tailed godwit	1,500	1.600	>6,000	4,400-4,600	800	248-258
Western curlew	210	250	3,000	1,600-1,800	>750	596-611
Common redshank	k.A.	4,500	8,500	5,600-6,000	75-100	49-55

A study carried out between 1987 and 1997, covering a total area of 1,263 km^2 in the western part of Lower Saxony, showed that populations of all wetlands limicolae, with the exception of the palaearctic oystercatcher, but including the northern lapwing, common snipe, black-tailed godwit, common redshank and western curlew, showed annual decreases. The rates of decline range from 1.9% for the western curlew to 11.5% for the common snipe. Another indication that the decreases are continuing is the fact that all species – again with the exception of the palaearctic oystercatcher – disappeared from many of the areas studied, during the same period, and that their populations became concentrated in fewer and fewer core areas (MELTER &WELTZ 2001).

In addition, comprehensive surveys carried out in the Bremen area, since the beginning of the 1980s, and covering the northern lapwing, common snipe and black-tailed godwit, showed decreases of over 60% in each case. During the same period, populations of common redshank decreased by 30%. Only the western curlew exhibited a highly positive trend. The decreases found continued even after implementation of comprehensive nature conservation measures beginning in the early 1990s (SEITZ 2001).

Large-area population inventories in the Eider-Treene-Sorge-Niederung area (lowlands area) and on the Eiderstedt peninsula, covering two important core populations of wetlands limicolae in Schleswig-Holstein, also found significant population reductions, through comparison of findings of 1997 with surveys carried out in the 1980s. The reductions were particularly pronounced for black-tailed godwit and common redshank, while the common snipe was found to have stabilised at a lower level. The only species that were able to increase their populations were the palaearctic oystercatcher and western curlew (NEHLS 2001a).

In North Rhine-Westphalia, data is available only for protected wet meadows managed in keeping with habitats requirements of wetlands limicolae; as a result, it is difficult to draw conclusions regarding the overall situation. From 1988 to 1998, the following occurred: populations of black-tailed godwit and western curlew increased until the mid-1990s, following establishment of protected wet meadow areas, but then began shrinking in the second half of the study period. During the same period, the breeding population of common snipe shrank by more than 70% (WEISS et al. 1999).

BLÜHDORN (2001), by preparing a large-area grid mapping of northern lapwing populations in North Rhine-Westphalia, via comparison of data from 1999 with data from 1972/73 and 1988/90, found that total grid areas occupied by northern lapwing had decreased in comparison with 1972/73 (1972/73: 63%, 1999: 40% of all studied grid areas). In the 1990s, the population stabilised at a lower level.

In interpreting these findings, it must be remembered that most of the surveys were carried out in the known core areas for meadow-bird populations. Since comprehensive nature conservation measures had already been carried out in most of these areas, aimed at improving the conditions for meadow birds (for example, in the Bremen area and in protected meadow areas in North Rhine-Westphalia), it must be assumed that these areas are highly attractive for the species in question, and thus have a certain "attractive effect" for new breeding birds (AK FEUCHTWIESENSCHUTZ WESTNIEDERSACHSEN 1998). For example, following diking and reshaping of the Beltringharder Koog (polder, Schleswig-Holstein), black-tailed godwits from grassland areas of the neighbouring Hattstedter Marsch area moved to the polder's very wet grasslands (HÖTKER & KÖLSCH 1993). Since such concentration effects are likely to occur in other areas, to varying degrees, stable or even increasing populations in some areas cannot be considered an indication of positive trends in relevant metapopulations (IKEMEYER & KRÜGER 1999, BOSCHERT 1999a).

PROTECTION MEASURES. Beginning in the 1980s, a number of Länder (German states) established conservation programmes aimed especially at protecting habitats from further degradation. In these efforts, three main strategies were pursued:

- In "contractual nature conservation" (Vertragsnaturschutz), farmers are encouraged to restrict their uses in keeping with criteria for meadow-bird protection and general extensivation of agricultural use: discontinuation of fertiliser use, limitation of numbers of grazing livestock, delay of mowing until after meadow birds reach the end of their breeding season and conversion of cultivated land to grassland. Farmers participate in these programmes on a voluntary basis and are financially compensated for their losses. One of the main problems with this effort is that farmers' acceptance of the programmes varies with the strictness of the usage restrictions and the expected loss of usage. For this reason, the required large-area extensivation programmes can be implemented only with relatively minor restrictions that cannot meet nature-conservation and species-protection criteria.

- In another measure, the public sector purchases core zones of important meadow-bird breeding areas and then optimises these areas by means of suitable measures (damming of water or rewetting, creation of shallow pools and marshes, usage extensivation), in keeping with the habitat requirements of meadow birds. To ensure that extensive use continues, as is required, the areas are often then leased to interested farmers.

- So-called "basic protection" (Grundschutz), as practised in the states of North Rhine-Westphalia and Lower Saxony, is a minimum-level measure aimed at preventing further deterioration of areas, primarily through set-asides of protected areas, bans on further lowering of groundwater levels and bans on tilling. Affected farmers are paid compensation to cover hardship they incur through any loss of use. On the other hand, no grassland-management restrictions are imposed, with the result that further intensification, in the form of increased fertilisation and greater livestock densities per unit area, is possible.

The manner in which such measures are organised, financed and scientifically supported varies from Land (state) to Land, however.

In addition to the conservation efforts of the Länder, projects for protecting meadow birds have also been carried out on the national level, within the framework of "major nature conservation projects" (Naturschutzgroßprojekte), in selected, representative areas. Table 1.2.3-3 provides an overview of these projects (SCHERFOSE et al. 2001).

In light of the fact that most meadow-bird species, as migratory birds, spend the largest part of their life cycles in resting and wintering areas in southern and western Europe and in Africa, conservation efforts are increasingly focusing on relevant species' entire annual habitats. The state of North Rhine-Westphalia, for example, has been co-operating with the Republic of Senegal in developing the Djoudj National Park, an important wintering area of the black-tailed godwit in West Africa (WOIKE 2001).

RESEARCH PROJECTS IN THE FEDERAL REPUBLIC OF GERMANY AIMED AT IDENTIFYING THE REASONS FOR DECLINES IN MEADOW-BIRD POPULATIONS. Clearly, the above-described declines of wetlands limicolae populations have gone hand-in-hand with major changes in grassland use. As a result, most studies of the population decreases have focused primarily on the factors that influence conditions for reproduction in breeding areas. For example, two research and development projects, scientifically supported by the German Federal Agency for Nature Conservation and funded by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), have sought to identify such factors for meadow-breeding bird species and to develop effective protection proposals on the basis of the resulting findings.

The project **"Development of biotope-protection concepts for the Federal Republic of Germany, for selected biotope types: wet grasslands"**, which was carried out from 1991 to 1996 by the University of Bremen's Institute for Ecology and Evolutionary Biology, was aimed primarily at developing supra-regional approaches for a nature conservation concept for wet meadows in the north German low plain, the main distribution area for meadow birds in Germany (ROSENTHAL et al. 1998). This effort began by compiling a comprehensive range of data from the responsible Länder authorities, universities, nature conservation associations and private persons. This data was then analysed, with the help of geographic information and database systems, with regard to the following aims:

- Inventorying wet grassland areas in north German lowlands,
- Classifying the relevant natural areas and biotopes,
- Determining the ecological requirements of the relevant flora and fauna,
- Describing the historical changes and determining the reasons for the current threats,
- Preparing guidelines and protection concepts; assessing natural areas and specific relevant grassland areas,
- Compiling a list of necessary protection and regeneration measures.

The reasons for the declines of wetlands limicolae populations, and the threats to wet grasslands, were analysed, and the resulting findings were translated into specific proposals for protection measures. The following section summarises these findings and describes the various threats' direct and indirect impacts on meadow-breeding bird species. The specific threats identified included:

- Changes in water cycles,
- Fertilisation,
- Intensification of grassland use,
- Follow-on uses,
- Losses and isolation of land areas,
- Disturbances,
- Dangers during migration and wintering.

CHANGES IN WATER CYCLES. To prepare the way for more intensive use of wet grasslands, groundwater levels were lowered via widening of receiving waters and installation of effective drainage systems. In river lowlands, rivers were diked, thereby largely eliminating regular spring flooding regimes in riparian meadows.

Such changes in water cycles profoundly change soil structure, vegetation and food availability (i.e. availability of prey) for wetlands limicolae and their young. When grasslands are drained, and the soil's surface is levelled (to eliminate the shallow basins ponds that hold water for prolonged periods of time), food-organisms for wetlands limicolae descend into deeper soil layers. At the same time, since the soil's surface hardens, ground-pecking species can no longer reach such organisms (for example, DÜTTMANN & EMMERLING 2001, STRUWE-JUHL 1995).

FERTILISATION. Fertilisation of wet grasslands with chemical fertilisers or liquid manure, along with additional enrichment from air-borne nitrogen and nutrient release via mineralisation of organic material (following land drainage), has the primary effect of changing vegetation communities. Increases in available nutrients promote a few fast-growing, tall species of commercially valued grasses, at the expense of the species-rich communities found in nutrient-poor locations. As the numbers of species decrease, the vegetation becomes denser and more homogeneous. Denser vegetation hampers the movements of wetlands limicolae and the birds' search for food. This applies especially to young birds, which are smaller and tend to search primarily visually (GIENAPP 2001, BELTING & BELTING 1999). In addition, as some studies describe, increasing usage intensity shifts the overall food supply in the direction of smaller, less useful food organisms (GIENAPP 2001). Changes in microclimates, as shadowing deepens – i.e. the denser vegetation blocks out more of the sun – can also have a negative impact on young birds, which are especially in need of warmth.

INTENSIFICATION OF GRASSLAND USE. Drainage, along with fertilisation, makes it possible to intensify use of grassland. While earlier uses normally consisted of twice-yearly mowing, beginning in mid-June, or of low-density livestock grazing, the first mowing of the year (or beginning of grazing) may now take place between the beginning and the middle of May. Rolling and fertilising of grasslands takes place as early as mid-March. Under pressure from tight management schedules, the early beginning of mowing and high-density grazing on rotated grasslands, most meadow birds (especially the corn crake, which breeds relatively late - GREEN et al. 1997) are unable to complete their reproduction cycles prior to the beginning of human uses. What is more, intensive usage tends to include harmonisation of site management over large areas, with synchronised mowing or grazing, leaving meadow birds few options to move to neighbouring sites.

FOLLOW-ON USES. The chain consisting of drainage, fertilisation and usage intensification ends with tilling and cultivation of grasslands, which completely destroy habitats. This development is particularly problematic for wetlands limicolae, since farmland does meet the habitat requirements of some birds – such as the northern lapwing – at the beginning of the breeding period. As a result of frequent ploughing etc. and fast growth of vegetation, the birds are unable to reproduce successfully on such land, however. Farmlands thus become an ecological trap – attracting birds for breeding, but then thwarting their reproductive success and leaving them unable to contribute to their populations.

Like follow-on use as farmland, complete discontinuation of usage also leads to habitat losses for typical meadow birds, since most species depend on a minimum level of human use to maintain the open structures of their habitats. On the other hand, land left fallow can, depending on the location, attract other rare and endangered bird species that populate reed and rush vegetation habitats.

LOSSES OF LAND AND ISOLATION. Widespread changes in grassland locations, and the resulting losses of suitable breeding habitats, shrink remaining areas to a size below that required for maintenance of the populations. Remaining populations also suffer from isolation of breeding habitats (MELTER & WELTZ 2001).

ANTHROPOGENIC DISTURBANCES. Along with site changes, structures and infrastructure such as roads (with accompanying rows of trees), high-voltage power lines and – to an increasing degree – wind turbines – negatively affect areas' suitability as breeding habitats for meadow birds. Such structures' primary effect is to reduce the effective land area available to birds, since most species maintain a certain minimum distance to such structures (BLÜHDORN 1998). And construction of networks of paved roads through large, contiguous wetlands areas increases frequency of disturbances in breeding areas, by providing access for recreationers.

RISKS DURING MIGRATION AND WINTERING. The aforementioned factors reduce populations primarily by reducing reproduction rates below levels needed for long-term stabilisation of population sizes. Changes in resting areas and winter quarters, on the other hand, reduce meadow-bird populations by increasing bird mortality. The most significant such changes include destruction and impairment of resting and wintering areas via drainage and land-reclamation measures, along with construction of industrial facilities and environmental pollution, and direct impairments resulting from disturbances and hunting (for example, TUCKER & HEATH 1994, BAUER & BERTHOLD 1996). The species especially affected by such factors include dunlin, ruff and black-tailed godwit, which outside of their breeding periods congregate in just a few areas.

In light of the above-described threats, guidelines were prepared for development of protection concepts, guidelines that describe the desired overall appearance of the landscape, site and management conditions, vegetation, flora and fauna, risks and regeneration objectives. These were then used as a basis for preparing proposals for measures for further development of wet-meadow areas, giving special attention to the abiotic and biotic bases needed to implement wetlands limicolae protection within the meaning of the AEWA:

- Restoration of high water levels and natural water regimes (high water levels in the late winter and early spring, drying of areas at the beginning of the breeding period) via damming or trickling, and creation of a diverse soil profile, with areas of different wetness levels in close proximity to one another.

- Extensivation of agricultural use, via reduction of nitrogen inputs (discontinuation of fertilisation), and reduction of nutrient levels via mowing.

- Extensivation of grazing use, via reduction of livestock populations, changes in grazing practices (stationary grazing, with low livestock density, instead of rotated grazing), delay in annual commencement of grazing and selection of suitable livestock animals for grazing.

- Extensivation of mowing. The first mowing should not take place prior to the middle of June – under certain circumstances, prior to the beginning of July. Mowing techniques and frequencies should be adapted to requirements of meadow-bird protection and to development aims with respect to vegetation and invertebrate fauna.

CONTRIBUTIONS OF PREVIOUS NATURE CONSERVATION PROJECTS TO PROTECTION OF MEADOW BIRDS. Although many measures have been carried out, at major financial expense to the Länder and the Federal Government, to protect and restore wet grassland areas for meadow-breeding bird species, the populations of most wetlands limicolae continue to decline, even in optimally managed protection areas (WEISS et al. 1999, SEITZ 2001, SCHERFOSE et al. 2001). Studies of the success of previous protection measures have been published, for example, for protection areas in the Bremen area (SEITZ 2001), in the Alte Sorge-Schleife area in Schleswig-Holstein (NEHLS 2001b) and for protected wet-meadow areas in North Rhine-Westphalia (WEISS et al. 1999). The results of measures to data vary considerably from case to case. In the main, they show that long-term protection of meadow-bird populations is possible only with widespread, lasting measures. For example, in protected wet-meadow areas of the Weser lowlands near Bremen, after protection measures were implemented (usage restrictions and improvements via hydrological engineering) populations initially increased in some areas – in part, due to population shifts and concentrations – only to decline again as of the mid-1990s. In some cases, populations decreased to levels even lower than those prior to the set-asides. Pursuant to SEITZ (2001), the reasons for this development may include factors outside of the breeding areas (hunting in wintering areas), as well as – especially – extremely high breeding losses due to predation.

A similar result is reached by NEHLS (2001b) on the basis of studies in the Alte Sorge-Schleife nature conservation area. As of 1992, and in accordance with a management and development plan, this area was converted to extensive management and rewetted via damming of drainage ditches. Following implementation of management measures, populations of common redshank and common snipe recovered and returned to their levels at the beginning of the 1980s. A considerable increase in breeding populations of the western curlew was also seen. On the other hand, breeding populations of the northern lapwing remained constant at a low level, and those of the black-tailed godwit even continued to decrease. What is more, the breeding success of both species remained at a very low level even after the area had been converted. In this area too, poor reproductive success of wetlands limicolae, presumably, is closely related to a high predation rate (NEHLS et al. 2001).

IMPACTS OF PREDATION ON REPRODUCTIVE SUCCESS OF MEADOW BIRDS. Research is especially required regarding the current impacts of predation – by crows, birds of prey and predatory mammals – on the breeding success and population development of meadow birds. In addition, the question of whether it is necessary to control populations of predators, along with possible alternatives to such control, must also be studied. In many areas, decreases in populations of meadow-bird species have occurred together with increases in populations of carrion crows *(Corvus corone)* and, to a lesser extent, of magpies (*Pica pica)* and some birds of prey. Because of this coincidence, a causal connection is often suspected. Some studies on the hatching and breeding success of the northern lapwing actually do show that predation has a negative effect on reproductive success (for example, KÖSTER et al. 2001, SEITZ 2001). On the other hand, KÖSTER et al. (2001) and HABERER (2001), in their studies of northern lapwings in Schleswig-Holstein, found no direct correlation between breeding populations of carrion crows and hatching success of northern lapwings. In light of the fact that most nest losses occurred in mainland areas, and not on the islands of Pellworm and Amrum, which are largely free of predatory mammals, it was suspected that predatory mammals were responsible for most nest losses (KÖSTER et al. 2001, HABERER 2001).

The results of yet another research and development project funded by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), and entitled **"Assessment of the contribution of national and international nature conservation projects in Germany to the protection of highly endangered bird species (for example, corn crake) on extensively managed agricultural land – conflicts of aims and potential solutions"**, promises to provide new insights and approaches in this area.

This project was carried out from 1997 to 2000, with scientific support from the German Federal Agency for Nature Conservation, and under the direction of the Bavarian State Bird Conservation Association (Landesbund für Vogelschutz in Bayern e.V. - LBV). The project's aim was to derive requirements, from findings of comprehensive studies of model species – the corn crake and other meadow-breeding bird species (including northern lapwing) – for "meadow-bird-friendly and corn-crake-friendly" management of wet meadows. In a second step, these measures will then be cross-checked against other aims of nature conservation projects (management and development planning) (BOYE 1998).

The studies were carried out in project areas that, as major federal nature conservation projects, have received extensive support. In particular, the following five areas, which differ in their land profiles and locations within natural areas, were selected, to permit comparisons that could support relevant general conclusions:

- Alte Sorge-Schleife (SH)
- Bremer Becken (HB)
- Unteres Odertal National Park (BB)
- Murnauer Moos (BY)
- Schwarzachaue (BY).

In the various project areas, studies were carried out of the breeding populations of all occurring meadow-bird species and of the reproductive success of the wetlands limicolae northern lapwing, western curlew and black-tailed godwit. For the corn crake, a priority species, more detailed studies on biology, breeding success and area use were carried out, by means of captures, telemetry and surveys of habitat structures (both actual and potential habitats). This project's new approaches included surveys of agricultural uses, studies of population dynamics of small mammals (potential prey of predators) and of predatory mammals (especially the fox *Vulpes vulpes*) and supporting studies of the impacts of mowing.

Especially interesting findings with regard to design and management of meadow-bird conservation areas resulted from studies of correlations between the population dynamics of small mammals and predatory mammals and the breeding success of meadow birds. Use of new types of tools yielded indications as to the real culprits behind nest losses. So-called "thermologgers", small thermometers with data-storage units, were hidden in the nests of northern lapwings. By continually recording nest temperatures, these devices provided data on the presence and absence of breeding parent birds and on the times at which nest losses occurred. In one study area in the Unteres Odertal area, it was found that over 60% of all nest losses occurred during the night. From these findings, as well as from additional observations of the activity of possible predators, it was concluded that nocturnally active mammals, primarily foxes, accounted for a significant percentage of nest losses of northern lapwings in the Unteres Odertal area (BELLEBAUM 2000, 2001). This result was also confirmed in parallel studies carried out in the Bremer Becken (SCHOPENHORST & EICKHORST in SEITZ 2001).

It is presumed that foxes and other predatory mammals appear as predators in meadow-bird breeding areas only when they find an adequate and continuing supply of small mammals, their main prey, in such areas. The natural floods occurring in most wet-meadow landscapes covered the areas for prolonged periods during the winter months, destroying the small-mammal populations living in them. As a result, such areas were virtually free of small mammals in the spring – and thus had little attractiveness for foxes as feeding grounds. As a result, meadow-breeding birds were able to raise their young without losses. Since such flooding does not regularly occur in modern cultural landscapes, such landscapes support small-mammal populations year-round, also in meadow-bird habitats, that can be used by foxes. As a result, the nests and young of meadow birds become a welcome dietary supplement for foxes that hunt primarily for mice in the areas.

One important resulting consequence for meadow-bird protection is that in conservation areas it is important to restore the natural, large-area flood regimes, in order to create sufficiently large breeding areas that are (largely) free of predators (BOYE 1998).

Findings to date clearly show that breeding failures are the main reason for declines in meadow-bird populations, which are continuing despite extensive conservation efforts. Another research and development project, initiated by the Bird Conservation Support Association in the Bremer Becken area (Förderverein für Vogelschutz im Bremer Becken e.V.), will build on the above-described research projects and also seek to identify the factors that influence the breeding success of meadow birds. Another, ongoing research project, entitled "Assessment of the environmental factors affecting the breeding success of meadow birds", began by outlining and identify the relevant problem areas by surveying the relevant literature and holding an Internet-based experts' discussion. The resulting field studies are taking place in various, well-studied wet-meadow areas in the Bremen area. Instead of concentrating on highly endangered species whose populations are at risk (black-tailed godwit, ruff and common snipe), they are attempting to answer their questions by studying more common bird species of the same ecological communities. These species will then play a representative role in the effort to identify the factors that influence meadow birds' reproductive success.

It is unclear why predators that have always been a natural part of meadow birds' environment, and whose presence has led to the development of effective defence strategies (camouflaging of nest sites, breeding in colonies and joint warding-off of enemies), are now having such a major impact on the birds' reproductive success. This is the context for the following questions being posed by a planned research and development project:

- What impact does predation have on settlement of meadow birds, and on the birds' hatching and rearing success, and what factors favour or limit the activity density of predators? What predators are behind the losses?

- What conclusions can be drawn about fitness, nesting strategies and behaviour of ground breeders with respect to strategies for avoiding and defending against enemies?

High predation rates are not the only factor observed to be behind breeding failures. A frequent observation in recent years, in some wet-meadow areas, is that pairs either fail to reach the breeding stage or abandon breeding at an early stage of their reproductive cycle. The reasons for such failures to nest are largely unclear:

- Why do birds show tentative or absent nesting behaviour, frequently fail to breed at all, abandon their nests and neglect their young?

Furthermore, it is also unclear how stress factors outside breeding areas influence population development of meadow birds. Such factors include direct pressure in resting and wintering areas (hunting) as well as indirect impacts of stress on non-killed birds:

- Do stressed birds who return to breeding areas show constitutional changes? What disturbance and stress factors occur in resting and wintering areas, and how do such factors affect the birds' reproductive performance?

Another new aspect consists of comparative studies of the status of wetlands limicolae habitats in the birds' original arctic breeding areas with the status of habitats in central European cultural landscapes. Such studies focus on the following questions:

- How do the living conditions of wading birds, in the birds' original breeding areas, compare with conditions in cultural-landscape biotopes, and what conclusions can be drawn with respect to environmental factors and derivation of conservation measures?

In all likelihood, to answer these questions, it will be necessary to consider the interactions between various factors such as physical constitution, settlement/nesting behaviour, breeding density, habitat structure, presence of additional disturbances and dynamics of predator populations.

Tab. 1.2.3-3: Overview of selected meadow-bird breeding areas protected within the framework of major federal nature conservation projects. In each case, the figures include the breeding population in 2000 and population development (qualitative assessment) during the period 1991-2000 (pursuant to data in SCHERFOSE et al. 2001).

			Area (ha)		Black-tailed godwit		Western curlew	
			Core area	Nature conservation project	Population (Bp)2000	Trend 1991-2000	Population (Bp)2000	Trend 1991-2000
Completed projects								
Haseldorfer Marsch*	SH	1979-1983	1.915	2.056	4	Neg.		
Hohe Rhön/Lange Rhön	BY	1981-1995	3.265	3.292				
Alte Sorge-Schleife	SH	1984-1993	500	660	5	Neg.	3	Stab.
Borgfelder Wümmewiesen	HB	1985-1996	677	677	15	Neg.	8	Stab.
Ochsenmoor	NI	1987-1997	1.100	1.029	21	Neg.	29	Stab.
Regentalaue	BY	1989-1998	1.776	194	6	Stab.	18	Stab.
Flumm/Fehntjer Tief	NI	1989-2000	1.316	1.316	104	Stab.	26	Pos.
Ongoing projects								
Meerbruch/Steinhuder Meer	NI	1989-2001	1.050	1.020			8	Neg.
Fischerhuder Wümmewiesen	NI	1992-2001	780	0	6	Neg.	6	Neg.
Drömling	ST	1992-2003	9.623	4.433			23	Stab.
Unteres Odertal	BB	1992-2006	10.878	10.100	1	Neg.	3	Stab.
Murnauer Moos	BY	1992-2003	6.939	2.355				
Hammeniederung**	NI	1995-2006	2.715	545	0	Neg.		

* Data is based on a sub-area of 335 ha, **Data is based on a sub-area of 578 ha with meadow-bird concentrations;
*** Data is based on a total area of 4,400 ha

Continuation Tab. 1.2.3-3 →

Continuation Tab. 1.2.3-3

			Common redshank		Corn crake		Northern lapwing	
			Population (Bp)2000	Trend 1991-2000	Population (Bp)2000	Trend 1991-2000	Population (Bp)2000	Trend 1991-2000
Completed projects								
Haseldorfer Marsch*	SH	1979-1983	29	Stab.	0	Neg.	80	Stab.
Hohe Rhön/Lange Rhön	BY	1981-1995			27	Pos.		
Alte Sorge-Schleife	SH	1984-1993	7	Stab.	6	Pos.	29	Stab.
Borgfelder Wümmewiesen	HB	1985-1996	12	Stab.	16	Pos.	37	Neg.
Ochsenmoor	NI	1987-1997	0	Stab.	8	Pos.	34	Neg.
Regentalaue	BY	1989-1998			11	Pos.	195	Stab.
Flumm/Fehntjer Tief	NI	1989-2000	3	Stab.	1	Stab.	102	Stab.
Ongoing projects								
Meerbruch/Steinhuder Meer	NI	1989-2001			4	Pos.	13	Stab.
Fischerhuder Wümmewiesen	NI	1992-2001	0	Neg.	11	Pos.	31	Neg.
Drömling	ST	1992-2003					67	Stab.
Unteres Odertal	BB	1992-2006	13	Stab.	50	Neg.	103	Pos.
Murnauer Moos	BY	1992-2003			35	Stab.		
Hammeniederung**	NI	1995-2006	0	Neg.	11***	Pos.	0	Neg.

* Data is based on a sub-area of 335 ha, **Data is based on a sub-area of 578 ha with meadow-bird concentrations;
*** Data is based on a total area of 4,400 ha

Description of the R+D project "Assessment of the contribution of national and international nature conservation projects in Germany to the protection of highly endangered bird species on extensively used agricultural land" (MAMMEN et al., in preparation)

AIMS AND EXTENT OF THE STUDY. The research and development project **"Assessment of the contribution of national and international nature conservation projects in Germany to the protection of highly endangered bird species (for example, corn crake) on extensively used agricultural land – conflicts of aims and potential solutions"** was submitted by the Bavarian State Bird Conservation Association (Landesbund für Vogelschutz in Bayern e.V. – LBV). It ran for a period of four years, from 1997 to 2000, and was funded by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) and scientifically supported by the German Federal Agency for Nature Conservation (BfN). Its aim was to help answer autecological questions regarding the corn crake, in several different areas of Germany, and regarding certain targeted nature conservation measures. The selected areas are now being supported under the federal programme "Set-aside and protection of valuable natural and landscape areas of national, representative importance" (major nature conservation projects). The following areas were included in this project:
Alte Sorge-Niederung (SH), Bremer Becken (HB), Unteres Odertal National Park (BB), Murnauer Moos (BY) and Schwarzachaue (BY).

The project's emphases included comparative analysis of corn-crake populations, which can fluctuate widely in size from year to year, study of chronological and spatial dynamics of habitat requirements and review of possible conflicts of aims in protection of the corn crake and other meadow-bird species. Agricultural uses in the project area, and the area's structure, were surveyed, and relevant agro-economic factors and developments were identified. This provided a basis for calculating the cost of meadow-bird protection, especially protection of the corn crake, and, with regard to management and development plans (Pflege- und Entwicklungspläne - PEPL), for preparing recommendations for efficient meadow-bird protection – again, especially for the corn crake.

Important biological and ecological factors affecting meadow birds, especially the corn crake, were identified by mapping breeding bird areas (covering all species), monitoring breeding success (northern lapwing, western curlew, black-tailed godwit), capturing and telemetering corn crakes and surveying the corn crake's habitats, both actual and potential.

To identify threats to relevant species in the project areas, the project surveyed land uses (agriculture), studied small mammals (potential prey of predators) and foxes (density of predators) and monitored the impacts of mowing.

This data provided a basis for conclusions regarding the behaviour of, and threats to, meadow birds, especially the corn crake, and regarding deficits in protection of areas and species and the reasons for such deficits.

Along with these studies, an agricultural-development forecast for the various relevant natural areas was prepared, on the basis of agricultural development to date (and with respect to the various specific project areas) and relevant agro-economic aspects. The next step was to consider the relevant species' habitat requirements and threats in light of expected future agricultural development and to define appropriate target uses. Proposals for achieving these target uses, via appropriate usage of grasslands within the agricultural framework, were then prepared. Finally, cost estimates for relevant implementation were prepared.

Following subsequent review of the management and development plans for the various project areas, deficits in current nature conservation management were identified and relevant recommendations for the future were formulated.

THE SITUATION OF THE CORN CRAKE. The corn crake, a meadow-bird species neglected by nature conservation to date, does not require open, short-grass breeding sites – unlike the northern lapwing and black-tailed godwit, for example. It requires taller vegetation structures that provide adequate cover during the breeding and moulting periods. Pursuant to SCHÄFFER (1999 in MAMMEN et al. in preparation), the corn crake's habitat must have the following structural characteristics: the vegetation must have a minimum height of 20 cm (optimal: 50-70 cm); the vegetation density (expressed as a vertical degree of coverage) must be at least 40%; and the resistance to spatial movement must be low, less than 15 newtons. The corn crake's breeding period begins late in the year. On the average, egg-laying commences between early and mid-May. In some areas, the bird breeds twice or produces a second batch of eggs if the first batch is lost. The breeding period, continuing until the last young have become full-fledged, may thus reach into mid-September. Newly hatched corn crakes leave the immediate nest environment, in the company of their mother, within one to two days after hatching. Young birds' radius of action increases with age. Up to an age of three weeks, the young require several hours to cover a distance of 100-200 m. They become full-fledged at an age of 35 days. The radius of action of corn-crake families, and the mobility of young corn crakes, depend on habitat structure and food abundance; relevant correlations can be established that can be applied to corn-crake populations in general.

RESULTS.

POPULATION-ECOLOGICAL ASPECTS. The project studied the corn crake's preferred habitats, periodical population fluctuations, spatial relationships between calling and breeding sites and the birds' behaviour in connection with mowing of grassland areas. Any measures for protection in connection with mowing regimes must be based on knowledge of the areas the birds require and use and of the corn crake's species-specific behaviour.

The vegetation structures preferred by the birds varied throughout the individual project areas. In both the Unteres Odertal and Alte Sorge-Schleife areas, calling corn crakes were found primarily in sweet grasses. In the Murnauer Moos area, by contrast, calling sites were found primarily in tall-sedge and reed communities / sour grasses. In early May, the vegetation height was over 30 cm in most of the areas. The birds showed a preference for extensively used meadows; they seldom used fallow areas and extensively used pastures. In the Murnauer Moos area, corn crakes bred predominantly in non-fertilised wet meadows.

Radii of action were determined during calling and breeding periods via telemetry of adult birds. The calling sites of males were often located in the immediate vicinity of nests and fertile females. In the Unteres Odertal area, one female's area of movement, during breeding and rearing, and until moulting, was found to be 11.4 ha. The maximum distance between successive bearings (instances of homing) never exceeded 500 m.

Via banding, the birds were shown to have a supra-regionally constant rate of return to their chosen breeding sites.

BIOCOENOTIC AND LANDSCAPE-ECOLOGICAL RELATIONSHIPS.
Mowing beginning in July poses a smaller risk for most other meadow-bird species, such as northern lapwing, western curlew, common redshank and black-tailed godwit, than it does for the corn crake. The reason for this is that such other birds require different habitat structures, and they breed earlier than the corn crake.

Potential destruction of breeding sites was statistically studied in the Unteres Odertal region, for a total of 126 corn-crake areas (callers in mid-May). It was found that mowing as of 15 June would destroy 22% of the birds' territories. Mowing as of 30 June would destroy 47% of such territories, and mowing as of 15 July would destroy 56%. In any given season, the first young corn crakes do not become full-fledged before the middle to end of July, a time when many other meadow birds have already completed their breeding cycles.

Via regular monitoring, and telemetric studies, corn crakes' behaviour upon mowing was observed. A total of 17 adult birds and 31 young birds were observed in the Unteres Odertal area. Of these, 59% of the adult birds, and 42% of the young birds, did not leave the meadow until the last five swaths were being mown (an area no wider than 15 m). Seven young birds (23%) remained in the meadow until the last two swaths were being mown. The percentages of killed adult and young birds were not determined.

A total of 58% of the observed young birds, and 50% of the adult birds, fled directly in front of the mower (at a distance of less than five meters), while an additional 25% and 31%, respectively, fled from the meadow when the mower had closed to within no more than ten meters. The corn crakes' point of flight was not found to depend on the mowing method. Telemetry of individuals revealed that the birds all reacted early to the mowing noises but flew from the meadow at very different times. This flight behaviour is presumed to be linked to the adult birds' breeding instincts and to the strength of their ties to their areas.

The birds' choices of new cover include mown grass, -vegetation along the periphery of neighbouring ditches, reedy or bushy areas and unmown neighbouring meadows or tall-perennial communities. Some of the radio-tagged corn crakes (six of 13) left the study area following the mowing. Other individuals remained in areas immediately adjacent to, or in the vicinity of, their old habitats.

Of the 59 young birds documented in 1999 in the Unteres Odertal area, nine were observed in the vicinity of their nests, 41 made a successful escape during mowing, six were killed during mowing and three were killed by predators following mowing. As a result, the losses that can be directly and indirectly ascribed to mowing were > 15%.

By contrast, agriculture played only a small role in the northern lapwing's losses. In the Alte Sorge-Schleife area, the black-tailed godwit suffered a very high loss rate, 72%. Of these losses, 32% were due to agriculture, 25% were due to predation and 43% were due to nest abandonment.

Of 135 losses of marked nests, of various wetlands limicolae, in the "Borgfelder Wümmewiesen" nature conservation area, only one nest was lost as a result of agriculture (trampling by livestock). The overall loss rate was high, however, and here, as in the Unteres Odertal area, it was due almost completely to predation. In 70% and 87% of cases, respectively, nests were robbed at night and/or at dusk, a fact that points to predatory mammals. And even daytime losses are not necessarily caused by birds (such as carrion crows), since some predatory mammals are active during the day. Foxes top the list of potential predators, which also includes the stone martin, ermine and European polecat. Because the Wümmewiesen area is subject to high water levels and winter flooding, its populations of small mammals are relatively small in the spring and early summer (during the breeding period of meadow birds), with the result that limited numbers of such mammals are available as food for predators.

From 1992 to 2000, according to studies of hatching success in the Wümmewiesen area, and estimates of resulting breeding success, only the western curlew was able to produce enough young to maintain its population. The reproduction rates for the black-tailed godwit, common redshank and northern lapwing were far below these birds' population-maintenance levels.

Water levels in breeding areas are of lesser direct importance for the corn crake. Nonetheless, this species tends to choose areas with high water levels. In the Wümmewiesen area, most meadow birds showed a preference for areas that were flooded in the winter. For limicolae and waterbirds, wetness and moisture play an important role in the search for food. Furthermore, intensity of agriculture use in any given area depends on the area's water cycles.

NEW AGRO-ECONOMIC ASPECTS IN PROTECTION OF MEADOW BIRDS AND CORN CRAKES. First, current trends in agricultural usage were described, to provide a basis for identifying relevant agro-economic aspects. This work revealed that the survival of important meadow-breeder populations is related to regional development of agricultural-usage systems. These systems, in contrast to those in other areas within the conservation areas considered, are still relatively extensive. Development of agricultural-usage systems in these areas will remain a decisive factor in the survival of important meadow-breeder populations.

One form of agricultural usage that is favourable to populations and breeding success of most meadow birds and of the corn crake is keeping of dual-purpose breeds of cattle (milk and meat). Keeping of such livestock produces a mosaic of grasslands that serve both as pastures and as meadows (hay as winter fodder). Traditionally, wet meadows were mowed only late in the year, because only then did the meadows permit satisfactory passage of mowing vehicles. In addition, traditional wet-meadow management normally did not call for mowing until after 1 September – especially in southern Germany.

Modern uses, along with increasing specialisation of agricultural operations, have reduced the need for grasslands – especially wet grasslands. As the economic, agropolitical and legal framework continues to develop, on the global, EU, national and Länder levels, some areas are showing a trend toward extensivation of their natural regional basis and agriculture structures (sizes of farms, production orientation, transfer of farms from one generation to the next).

The aim is now to reshape agricultural usage is a way that protects meadow birds and improves their habitats to an extent that supports viable populations, while still remaining economically acceptable to farmers.

In one approach, the past and expected future agricultural structure and development are determined for the natural areas relevant to each project area, in order to forecast possible development until 2008. Such forecasts provide possible basic scenarios for agricultural uses. Various target uses are then defined that are in keeping with principles of bird conservation and also acceptable for the agriculture sector. The costs resulting from implementation of the measures for protection of meadow birds are then calculated. In each case, the costs are based on the loss incurred by the farmer, as a result of the measure.

Depending on the project area in question, the possible solutions include a grassland bonus, keeping of calving cows / extensive management of cattle and management of traditional wet meadows (in northern Germany). In all areas, it is important to monitor the success of, and compliance with, protection measures. Projects must also be supported by personal representatives, in the various areas, who assist participating farmers and help review compliance with requirements as necessary. Relevant personnel costs can be covered by means of more efficiently targeted protection-area management (for example, restrictions only on areas actually used by meadow birds).

MANAGEMENT AND DEVELOPMENT PLANS (PEPL). The management and development plans (Pflege- und Entwicklungspläne – PEPL) currently in place for the project areas were reviewed as to their aims and implementation status with regard to meadow birds, especially the corn crake. While PEPL are in place for all relevant areas, the plans differ in terms of their objectives and implementation status. Not all of the PEPL list meadow birds as priority species. As a result, it is necessary to consider proposed measures and their execution and to identify any deficits with regard to meadow-bird conservation. In particular, the different habitat requirements of typical wetlands limicolae, such as the northern lapwing and black-tailed godwit, have to be compared with requirements of the corn crake. This makes it possible to identify any resulting nature conservation conflicts are identified, and to propose possible improvements in implementation of suitable measures.

The findings resulting from such efforts, in the various project areas, are being used to produce recommendations for meadow-bird protection as part of nature conservation management in general.

RECOMMENDATIONS FOR NATURE CONSERVATION MANAGEMENT IN MEADOW-BIRD PROTECTION. The following recommendations for nature conservation management within meadow-bird protection can be drawn from the R+D project:

Since many meadow-bird species' natural habitats, such as sedge bogs and natural / dynamic riparian meadows, no longer exist in Germany, the birds must depend on secondary habitats, such as extensively used agricultural land. Nature conservation efforts must now focus on these areas.

At the same time, protection efforts must be oriented to the specific requirements of each priority species. Since different species have different requirements, for effective protection management the relevant species' habitats must be understood as precisely as possible.

This need to understand habitat requirements holds especially for the corn crake, since the breeding period of this late-arriving species can last into September. Important aspects to consider include the time for mowing, the water cycle and suitable control of visitors. Measures to reduce predation, on the other hand, do not seem effective. An especially important aspect is that on-location support must be provided for each protected area. Such support should be provided, on a long-term basis, by the same person(s) who are responsible for inventorying the populations, for monitoring, for definition of relevant areas, for determination of mowing times and for reviewing compliance with protection measures and usage restrictions. Only when a responsible support person is permanently on location can measures be flexibly balanced between the needs of nature conservation and those of farmers – with regard to criteria such as the size of areas concerned, mowing times and grazing periods.

Other options include the following agricultural strategies: instead of imposing usage restrictions, with payment of pertinent compensation, use of flexibly managed contract areas and tendering for nature conservation services can be proposed. Yet another means of involving farmers is to have the nature conservation sector take a stake in resources for agricultural production – for example, by purchasing free-movement stalls and straw supply and then leasing these stalls to farmers so that they do not have to bear the financial risk. This approach would safeguard use of straw for the near future. The meadow bonuses would be correspondingly reduced.

For the corn crake, a key aspect is that mowing be bird-friendly. Fields should not be mown from the outside in; the turning zone should not enclose the entire area; and mowing should not begin too early and take place too quickly. Furthermore, areas of refuge should be provided: ditches, unmown neighbouring fields or leftover strips. Such measures are especially important, when it is not possible to protect known populations in fields from mowing.

1.2.4 Monitoring and research into bird migration

The Mettnau-Reit-Illmitz programme (MRI) as an example of a long-term research programme for monitoring development of populations of common songbird species

To be effective, nature conservation must be based on the best-possible understanding of the current situation of the populations to be protected – and of their long-term trends. Quantitative inventories and monitoring of bird populations have traditionally played a special role in environmental monitoring – because birds function as environmental indicators, play integrative roles within ecosystems, are relatively easy to inventory – and, not least, because they are "popular". A number of standardised methods are available for determining sizes of populations of breeding and resting birds on selected test areas, including territorial mapping, transect counts and point-stop counts (BIBBY et al. 1995, DO-G 1995, FLADE 1994). On the other hand, it is considerably more difficult to obtain meaningful data for large areas and prolonged periods of time. The published semi-quantitative and quantitative grid maps prepared for many regions and German Länder have the drawback of really being only "snapshots" in time. They are ill-suited as instruments for long-term monitoring, because their use in such monitoring would require their being repeated at regular intervals, over large areas – a time-consuming, organisationally complicated procedure.

Most data series that show bird-population trends over long periods of time and large areas thus cover only large birds, which are relatively easy to survey and which occur in low densities, or very rare species confined to scattered, isolated habitat types (BAUER & BERTHOLD 1996).

And yet long-term, standardised surveys of migrating birds can yield meaningful data on large-area population trends for common small bird species that are normally difficult to inventory. One successful method of conducting such surveys is regular migration monitoring, i.e. direct observation of migrating birds at prominent points in the landscape. This procedure has been practised since 1970 at the Randecker Maar area in Baden-Württemberg (GATTER 2000). Another commonly used technique is standardised captures of migrating and resting birds at banding stations. This method is based on the assumption that birds passing through any given location represent a random sample of the breeding population for a larger region. The areas from which the migrating birds originate can be roughly determined through capture of individuals banded in their breeding areas, along with biometry of population-specific differences in captured birds. For such surveys, scientifically conducted bird banding is an indispensable tool for basic conservation research. In addition to revealing population changes, migration routes and winter quarters of migrating birds, it helps illuminate key demographic parameters (reproduction rates, mortality, entry into and departure from relevant areas). These parameters must be known before the causes of population changes can be analysed and proposals for nature conservation measures can be developed (for example, BAIRLEIN 2000, BAIRLEIN et al. 2000).

The MRI programme, which is named after the capture stations that originally participated in the project, **M**ettnau am Bodensee, **R**eit bei Hamburg and **I**llmitz am Neusiedlersee (Austria) (Figure 1.2.4-1), was set up as a "longterm bird-capture programme, of the Radolfzell bird station, covering a broad variety of questions". The programme was oriented to the following problem areas (BERTHOLD et al. 1991):

- **Demography:** Study of the population dynamics of common songbird species, with regard to short-term and medium-term fluctuations, and to long-term population trends. Also: study of age-specific and sex-specific differences in migratory and resting behaviour, habitat selection and diet.
- **Migration research:** Study of the spatial and chronological course of migration; study of migration phenology and migration patterns. Study of passage and resting strategies as a function of age, sex, origin and climatic and local factors. Physiological mechanisms for migration control and fat deposition in connection with moulting and energy management.
- **Biorhythms:** Study of activity patterns of resting birds in correlation with time of day, and study of trends in chronological precision of migration from year to year.
- **Ecosystem research:** Study of resources distribution in resting communities, and of formation of habitat and diet preferences; study of competition. Determination of the capacity of resting sites and their optimal habitats.
- **Methods research:** Study of methods for determining species, age, and sex, for obtaining biometric data and for analysing and drawing conclusions from capture data.

Barred Warbler

The programme was initiated in 1974 by the Radolfzell Bird Station, in co-operation with the Helgoland Bird Station, the Illmitz Biological Station and the Hamburg Bird Conservation Association (Bund für Vogelschutz; now the German Nature Conservation Association - NABU). It initially ran from 1974 to 1983. After a five-year interruption, it was then continued at the Illmitz and Reit stations from 1989 to 1993. The Mettnau station has worked continuously on the programme since the programme's inception. In 1994, the Reit station, near Hamburg, was redesigned and equipped with new capture systems. In the programme, the Illmitz station was then supplanted by a new capture station set up at Galenbeck Lake in Mecklenburg-West Pomerania, also in co-operation with the Rybatchij Biological Station in the Kurische Nehrung area (Russia). From 1994 to 1996, captures were continued in the framework of a scientific network, funded by the European Science Foundation, entitled "Spatio-Temporal Course, Ecology and Energetics of West-Palaearctic-African Songbird Migration" (Direction: Prof. Franz Bairlein). A total of 50 capture stations, from 18 different countries along the entire migration route of West-Palaearctic songbirds, from Europe to West Africa, participated in this project (BAIRLEIN 1997, 1998).

The MRI programme became possible solely through the participation of over 1,000 volunteer staff in the various banding stations. In the course of the project, these volunteers were trained by the stations' technical staff or by other, experienced volunteer personnel. Financial support was provided by the Deutsche Forschungsgemeinschaft, the Max Planck Society and the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU). In a second phase, lasting from 1989 to 1993, the programme led to a research project aimed at providing an overview, via population inventories during breeding periods and a comprehensive survey of previous research, of the status of central European bird populations and the threats they face. It also continued the capture programme at the bird stations. The results of this project were summarised in the overview volume "Die Brutvögel Mitteleuropas – Bestand und Gefährdung" ("The breeding birds of central Europe – populations and threats") (BAUER & BERTHOLD 1996).

METHODS. Each year, from 30 June to 6 November, migrating small birds in the various areas were captured in nylon nets (so-called "Japanese nets"), using carefully standardised methods. The number of nets used, and their arrangement, remained unchanged from year to year. The capture stations chosen for the project were located in protected areas in largely stable phases of succession. This ensured that any changes in capture statistics would not be influenced by factors within the study areas themselves. The nets' walls were checked on an hourly basis throughout the entire daytime period (from before sunrise until shortly after sunset). Captured birds were extricated from the mesh nets, and then identified, as quickly as possible, as to species, age and sex. The birds were also weighed and measured, and their fat reserves and moult status were noted. Each was then banded with a numbered metal band from the relevant bird station and released unharmed.

The resulting data supported conclusions relative to migration phenology, the age structures of the migrating populations and, via comparison of capture statistics from successive years, population trends for the migrating species. In addition, it permitted analysis, for repeatedly captured individuals, of the time the birds spent in specific areas and of changes in the birds' weight and fat reserves (for example, KAISER 1996). This, in turn, made it possible to assess the areas' qualitative suitability as resting habitats.

RESULTS. The results of the MRI programme were summarised and extensively discussed in various publications (overview, for example, in BERTHOLD et al. 1986, 1991, BÖHNING-GAESE 1992). Most recently, in 1999, they were presented in a final report (BERTHOLD et al. 1999). All in all, a total of about 300,000 initial bird captures, representing a total of 37 selected bird species – all songbirds, except for the wryneck – were evaluated. Table 1 shows the development in the capture statistics for the studied species, as a trend in the linear regression of the capture statistics after logarithmic transformation. In general, negative population trends were found for most of the bird species studied. For example, from 1974 to 1993, 20 of the 35 bird species studied showed significant negative population trends at at least one of the participating stations. A total of 11 species were found to have more or less stable populations, and four species showed positive population trends. Remarkably, in spite of the large distances between the stations, the stations contradicted each other regarding the population trends in only four cases. It thus must be assumed that the banding stations' fall capture statistics accurately reflect developments, in central Europe, in populations of the bird species studied. As expected, the total capture statistics for all species, at the various stations, also showed a negative development that paralleled the negative trends for the individual species.

In a detailed analysis of capture data collected by the Mettnau station from 1972 to 1996, BERTHOLD et al. (1998) showed that long-distance migrants, i.e. species that winter predominantly in sub-Saharan Africa, suffered particularly marked population decreases (Tab. 1.2.4-1, see also studies of *Muscicapidae* species, Chapter 3).

The reasons behind the continuing population declines include habitat destruction and change, hunting by humans, increasing stresses and disturbances in areas with high (human) population densities and pollution with biocides and other environmental toxins (for example, BAUER & BERTHOLD 1996, BERTHOLD 2000). The population decreases were particularly pronounced for migratory birds – and especially birds that migrate over long distances – since such species are subject to negative trends in both their breeding areas and their resting and wintering areas.

Recently, discussion has been increasing regarding the ways in which lasting climate change could affect bird species' population trends (for example, BERTHOLD 1998, BERTHOLD et al. 1998, BERTHOLD 2000). It is expected that climate warming would favour stationary and partly migratory birds, since such birds would benefit from lower winter mortality, earlier returns to their breeding areas, earlier commencement of breeding and, possibly, increases in environmental biomass, with accompanying increases in their food supply. Long-distance migrants, which would then, effectively, be later in their return to breeding areas, and whose migration behaviour seems less flexible, would face increasing competition for available resources. Furthermore, migratory birds in general are more strongly affected by negative impacts of climate change in their wintering areas, as the examples of the whitethroat, spotted flycatcher and common redstart clearly show. All three species are long-distance migrants that winter in sub-Saharan Africa. They have suffered considerable population declines as a result of persistent droughts in Sahel zone (for example, BAUER & BERTHOLD 1996).

Tab. 1.2.4-1: Population changes for 35 bird species captured within the framework of the Mettnau-Reit-Illmitz programme, from 1974 to 1993 (pursuant to BERTHOLD et al. 1999; -: negative trend; ---: significant decrease; p <0.05; +: positive trend; +++ significant increase p <0.05; migration-behaviour data pursuant to BERTHOLD 1998, L: long-distance migrants, M: medium-distance migrants, S: non-migrants)

	Species	Migration	Mettnau	Reit	Illmitz	
Acrocephalus palustris	Marsh warbler	L	- - -	- - -	- - -	Negative everywhere
Saxicola rubetra	Whinchat	L	- - -	- - -	- - -	Negative everywhere
Acrocephalus arundinaceus	Great reed warbler	L	- - -	-	- - -	Predominantly negative
Acrocephalus paludicola	Aquatic warbler	L	- - -		- - -	Predominantly negative
Acrocephalus schoenobaenus	Sedge warbler	L	- - -	- - -	-	Predominantly negative
Lanius collurio	Red-backed shrike	L	- - -	-	- - -	Predominantly negative
Luscinia svecica	Bluethroat	L	- - -	+	- - -	Predominantly negative
Muscicapa striata	Spotted flycatcher	L	- - -	- - -	+++	Predominantly negative (counter-trends)
Phoenicurus phoenicurus	Common redstart	L	- - -	- - -	-	Predominantly negative
Phylloscopus trochilus	Willow warbler	L	- - -	- - -	-	Predominantly negative
Sylvia curruca	Lesser whitethroat	L	- - -	- - -	+	Predominantly negative
Turdus philomelos	Song thrush	M	+	- - -	- - -	Predominantly negative
Ficedula hypoleuca	Pied flycatcher	L	-	- - -	+++	Negative (counter-trends)
Jynx torquilla	Northern wryneck	L	- - -	+	-	Negative
Locustella luscinioides	Savi´s warbler	L	- - -	+	+	Negative
Locustella naevia	Grasshopper warbler	L	- - -	+	-	Negative
Parus caeruleus	Blue tit	S	- - -	+	+++	Negative (counter-trends)
Phylloscopus sibilatrix	Wood warbler	L	- - -	+	+++	Negative (counter-trends)
Prunella modularis	Dunnock	M	+	- - -	-	Negativ
Sylvia communis	Whitethroat	L	-	- - -	-	Negativ
Acrocephalus scirpaceus	Red warbler	L	-	+	-	Stable
Emberiza schoeniclus	Red bunting	M	-	+	-	Stable
Erithacus rubecula	European robin	M	+	+	+	Stable
Hippolais icterina	Icterine warbler	L	-	-	+	Stable
Phylloscopus collybita	Chiff-chaff	M	-	+	-	Stable
Pyrrhula pyrrhula	Northern bullfinch	S	-			Stable
Regulus ignicapillus	Firecrest	M	-	+	-	Stable
Regulus regulus	Goldcrest	S	+	+	+	Stable
Sylvia borin	Garden warbler	L	-	-	-	Stable
Troglodytes troglodytes	Wren	S	-	-	-	Stable
Turdus merula	Blackbird	S	-	-	+	Stable
Carduelis carduelis	Eurasian goldfinch	M	-	-	+++	Positive
Lusciania megarhynchos	Nightingale	L	+++	+	-	Positive
Phoenicurus ochruros	Black redstart	M	+	+++	-	Positive
Sylvia atricapilla	Blackcap	M	+++	+	+	Positive
	Total number of capt.		- - -	- - -	-	Predominantly negative

As such relationships show, protection of migratory species, if it is to be effective, must cover species' complete annual habitats – i.e. all of the areas the species use throughout their entire life cycles, for breeding, resting and wintering. Consequently, there is a need for international co-operation in scientific study of threats to species and in implementation of findings in the form of effective nature conservation measures.

INTEGRATED MONITORING OF SONGBIRD POPULATIONS. The development of a bird species' population in a given reference area depends on the species' reproduction and mortality rates, as well as on the numbers of individuals that enter and leave the area (for example, BAIRLEIN 1996). These demographic parameters must be understood before a species' population trends can be assessed and the reasons for its population changes analysed. For example, this information is needed in order to determine whether a bird species' population decrease is occurring because conditions in its breeding areas no longer support adequate reproduction or because too much of the population is being killed in its resting and winter habitats. The three German bird stations' project "Integrated monitoring of songbird populations" is aimed at obtaining data needed for study of the population dynamics of common songbirds. This is to be accomplished via a standardised capture programme – i.e. a programme that permits comparison of data for different years and study areas. An overview of the project's other aims and methods, and of its organisation, is provided by BAIRLEIN et al. (2000).

Fig. 1.2.4-1: Central European locations of banding stations of the Mettnau-Reit-Illmitz programme.

Measurement of the reproduction success of songbirds is hampered by considerable difficulties not encountered, for example, in programmes for monitoring breeding success of coastal birds (EXO et al. 1996) or development of populations of birds of prey and of owls (for example, STUBBE et al. 1996, MAMMEN & STUBBE 2000). For most songbird species, which hide in dense vegetation as they breed, the standard method of locating and regularly monitoring nests is highly time-consuming and can significantly disrupt the breeding process. The relative percentage of young birds captured at the end of the breeding period, as long as capture methods remain the same, may be considered an indirect measure of reproduction success. In addition, banding and monitoring of individuals via capture-recapture can produce data on population sizes, mortality, causes of mortality and migratory movements.

The most important prerequisites for data comparability are that the amount of time invested in captures, in all study areas, remain constant and that captures always be carried out at the same sites. In addition, bird stations' specified methods must be painstakingly applied and all capture activities must be carefully recorded.
Most of the sampling areas established to date consist solely of the habitats "field hedges" and "reed beds". Nonetheless, in the long term, the method can provide significant data relative to basic demographic parameters for a number of bird species, data that can enable important insights into population dynamics and mechanisms of population changes. Ideally, the programme should be continued on a long-term basis, and additional sampling areas, with different habitats, should be included. The programme's ultimate success will depend primarily on the commitment of volunteer bird-banders in the bird stations, however. In 1999, the project's first year following a two-year pilot phase, a total of 26 banders (groups) participated in the field work.

1.2.5 Description of EU-Life projects involving efforts to protect the Eurasian bittern
(Botaurus stellaris)

Eurasian Bittern

Introduction

BIOLOGY OF THE EURASIAN BITTERN. The Eurasian bittern is found in large reedbeds. FLADE (1994) terms it a lead species of reedbeds.

In order to be suitable as nesting areas for bitterns, reedbeds must meet certain criteria. According to BAUER & GLUTZ OF BLOTZHEIM (1969), reedbeds chosen by bitterns are at least 2 ha in area and consist primarily of common reed *(Phragmites australis)* or lesser reed mace *(Typha spec.).*

Bitterns choose reedbeds that are two to several years old, are of even height and contain few bent stems (BLAB 1993). In addition, stems must not be too densely placed to hinder easy movement within the reedbed, either on the bottom or between stems (climbing). Ideally, the reedbeds surround a small reed-free area in which the bittern can hunt for prey while still having adequate cover (SCHLUMPRECHT 1999).

Normally, this very secretive species can be observed only during its migrations. During the breeding season, only the bird's characteristic calls, which are heard primarily at dusk, give an indication of its presence. The bittern's booming calls are also responsible for its common German epithet, "Moorochse" ("bog ox").

THREATS TO THE BITTERN. At the end of the 19th century, bittern populations, which were probably still quite large at the time, began to shrink (BAUER & BERTHOLD 1996). Whereas in the 19th century hunting was seen as the main factor behind the bird's decline, by the beginning of the 20th century habitat loss became its main threat.

The most recent estimate of the size of Germany's bittern population, dating from 1999, placed the population at 360-620 pairs. The Red List of Germany's endangered breeding birds lists the bittern as facing extinction (BAUER et al., pub. pend.).

Extensive development and drainage have destroyed many of the reedbeds occupied by bitterns. Overly intensive mowing of reedbeds has reduced the available area for the birds.

Eutrophication of water bodies damages common reeds and leads to their displacement. Under its influence, common reeds grow more vigorously, initially, but then tend to develop weaker stems. As a result, lesser reed mace begins to take the place of common reeds and ultimately displaces them. Because of the manner in which the bittern moves within reedbeds – by grasping stems – it tends not to settle in reedbeds consisting of lesser reed mace. In addition to losing habitats, bittern populations suffer from anthropogenic dis-

Tab. 1.2.5-1: EU-Life projects that benefit the Eurasian bittern in Germany (From: EUROPEAN COMMISSION 2001b).

Title	Area	Co-ordination / Land (state)	Time frame	Total volume in €	Funding percentage provided by the EU (%)
Conservation and restoration of the Trebeltalmoor (Trebeltal fen) area in Mecklenburg-West Pomerania, including preparatory studies for the Recknitztalmoor area (Recknitztal bog)	Trebeltalmoor – North-east West Pomerania	State Environmental, Nature Conservation and Geological Agency (LUNG), Mecklenburg-West Pomerania	June 94 to June 98	5,271,333	75
Restoration of the Recknitztalmoor area (Recknitztal fen, an EU special protection area for birds)	Recknitztal	State Environmental, Nature Conservation and Geological Agency (LUNG), Mecklenburg-West Pomerania	July 98 to Apr. 01	2,465,084	60
Restoration of the Schaale-Sude river landscape	Elbe Nature Park	Elbe Nature Park, Mecklenburg-West Pomerania	Apr. 99 to July 03	2,159,696,91	50
Wetland habitat management in the Schaalsee Nature Park	Schaalsee Biosphere Reserve	Office for the Schaalsee Biosphere Reserve, Mecklenburg-West Pomerania	Jan. 98 to July 02	663, 065,71	50
Fens and bitterns on the upper Havel River	Obere Havel Nature Park Müritz	Müritz National Park Authority, Mecklenburg-West Pomerania	Sept. 98 to Dec. 02	1,062,317,57	50
Restoration of the "Galenbecker See" natural area for priority species	Nahe Ueckermünde	Ueckermünde State Environmental Office Umweltamt, Mecklenburg-West Pomerania	May 01 to May 05	5,780,907	70
Bittern conservation in the Schorfheide-Chorin EU special protection area for birds	Schorfheide-Chorin	Schorfheide-Chorin Biosphere Reserve, Brandenburg	Oct. 99 to Oct. 03	1,526,743,63	50
Regeneration of the Rambow fen (Rambower Moor) in order to protect the bittern	Brandenburgische Elbtalaue Biosphere Reserve	Brandenburgische Elbtalaue Biosphere Reserve, Brandenburg	Aug. 99 to Aug 03	1,286,512,63	50
Doberschützer Wasser nature conservation project	Doberschützer Wasser/ Saxony	Saxony State Ministry for Environmental and State Development, Saxony	Sept. 94 to Oct. 97	1,220,000	75
Bitterns and pond management – interaction and coexistence	Upper Palatinate	LBV Bayern LV Oberpfalz (Bavarian bird conservation association, Upper Palatinate chapter), Bavaria	Apr. 97 to Sept. 01	536,756,79	50

turbances that cause breeding birds to abandon their nests.

For these reasons, it is necessary – also within the meaning of Article III (2) AEWA – to protect and restore the bird's remaining habitats. Such efforts should also assist the bird in settling in existing potential habitats.

INFORMATION ABOUT LIFE. In 1992, the "EU Life" instrument was created, in connection with the European Bird Directive (79/409/EEC) and the Fauna, Flora and Habitats Directive (92/43/EEC). It supports projects in three major areas of action: Environment (technical environmental protection measures), Third Countries (measures in non-EU countries) and Nature (nature conservation measures).

Life III, the third phase of this programme (Regulation (EC) No 1655/2000), which is scheduled to run for four years, has been in progress since 2000.

Life Nature is used only to promote species / biotope conservation measures that support implementation of the European Bird Directive and the Fauna, Flora and Habitats Directive. As a rule, projects receive funding ranging from 50% of eligible costs to a maximum of 75% in cases involving protection of priority natural habitats (within the meaning of the Life Regulation). In projects in Germany, the remaining funding is normally provided by the relevant state (Land). In some projects, nature conservation associations pay a share of the costs.

Of the bird species found in Germany, the aquatic warbler (*Acrocephalus paludicola*), red-breasted goose (*Branta ruficollis*), corn crake (*Crex crex*), great bustard (*Otis tarda*) and the Eurasian bittern *(Botaurus stellaris*) have been listed by the EU-Life Regulation as priority species (EUROPEAN COMMISSION, 2001a, Ornis Committee from 28/4/93, amended on 26/4/96 and 20/05/97).

The present article provides an overview of the ten EU-Life projects carried out in Germany to protect, create or improve habitats of the Eurasian bittern (*Botaurus stellaris*). Some of the projects also have (or have had) other aims in addition to creation of new reedbed areas for the bittern.

Since the bittern is a priority species within the meaning of the EU-Life Regulation, four of the projects received funding levels of over 50% of eligible costs (to defray the costs borne by the relevant Länder). Table 1.2.5-1 provides an overview of EU-Life projects carried out in Germany.

DESCRIPTION OF THE PROJECTS. The projects described here are being, or were, carried out in the German Länder of Bavaria, Saxony, Brandenburg and Mecklenburg-West Pomerania.

In all of the projects, protection and restoration measures were oriented to area protection. This means that some projects benefited a range of different species. In such projects, the bittern was / is one of several key species.

To counter the above-described threats to the bittern, habitat-conservation measures have been carried out in project areas that are important for the bird's population in Germany.

In the main, these measures included analysis of the reasons for the population declines in the project areas, and of the current condition of the areas' bittern populations. Resulting actions included installation of new reed areas and raising of water levels. These efforts were then followed by establishment of management plans that would permit the biotopes to be properly managed in the future. In addition, agreements were reached with

[1] l´instrument financier européen por l´environnement

the affected users in order to protect the areas in the long term. Later, efforts were made to purchase the relevant areas, to facilitate carrying out planned measures.

PROJECTS IN THE STATE OF MECKLENBURG-WEST POMERANIA. A total of six EU-Life projects with relevance to the bittern have been / are being carried out in Mecklenburg-West Pomerania.

In the EU-Life project **"Conservation and restoration of the Trebeltal fen area in Mecklenburg-West Pomerania, including preparatory studies for the Recknitztal fen area"**, fen-conservation measures were carried out in an effort to restore habitats of priority species (RUNZE 2000).

To regenerate the fen in the river valley, it was necessary to stop the continuing drainage from the Trebeltal fen (Trebeltalmoor) and to restore natural hydrological conditions. This made it possible to promote peat-forming reedbeds, consisting of common reeds and sedges, as habitats for priority species. Development of wet meadows on the valley slopes is to be initiated by raising summer groundwater levels.

The measures included dismantling the three bucket elevators in the area and installing a small supportive dam to control run-off from the valley fen. The old meandering watercourse was restored over a 12 km section.

Overall, 1000 hectares of land within the project area in the Trebeltal were rewetted.

The EU-Life project **"Restoration of the Recknitztal fen area (EU special protection area for birds)"**, which is currently in progress, is building on the previous project in the Trebeltal. This project's primary aim is to stop the drainage from the Recknitz river-valley fen.

The project area is divided into two subareas (MEERGANS 2000). In the south-west part of the area, current use is to be continued even after the project has been completed. The north-eastern part is to be completely rewetted, however, in order to restart fen formation and attract priority species to the area again.

All of the Recknitz within the project area is to be restored to a natural state. To this end, old oxbows are being reconnected to the Recknitz, and the river's artificial course since the 1960s is to be closed off at the transition point(s) on one or both side(s). In the section that is to be rewetted, the height of the existing dam will be increased, in order to keep the water in the valley.

The farmers affected by these measures will be compensated financially or with substitute fields.

The EU-Life project **"Restoration of the Schaale-Sude river landscape"**, being carried out in the Mecklenburgisches Elbetal nature park, is aimed at restructuring a polder through which the Schaale and the Sude flow. This will restore the area's natural flood and overflow regime. Pursuant to LANGE (2000), the restructuring is expected to permit typical riparian grassland complexes and reedbeds to develop in the lowland area.

The measures include reconnection of oxbows, and thus restoration of a freely meandering river above the polder itself. An oxbow located within the polder is to be reconnected to the Schaale. In addition, a summer dike in the polder area is to be removed.

The reedbed is expected to increase its size by 86%, thereby permitting the bittern, which was last seen in the area in 1996, to return to the area.

In area covered by the EU-Life project **"Wetland habitat management in the Schaalsee Nature Park"**, drainage – which has continued from the Middle Ages to the present – is to be at least partially stopped (GEBHARD 2000). Analysis of historical maps revealed that systematic drainage has changed the area profoundly. Restoration of natural hydrological conditions will regenerate the remaining fens and save them from complete destruction. In parts of the project area, the water level is to be raised, via measures such as dismantling of a bucket elevator and closure of ditches. The water level is expected to rise by 30 to 50 cm, thereby affecting 156 hectares of grassland and 35 hectares of forest. This rewetting is expected to improve the conditions for priority species such as the bittern and the corn crake.

When the measures are completed, the project area is to be set aside as a nature conservation area, in the interest of its long-term protection.

The EU-Life project **"Fens and bitterns on the upper Havel River"**, like efforts in the Schaalsee area, is aimed at reversing extensive anthropogenic changes of the past 200 years (SPICHER 2000). Around 1800, in the Zotzen Lake (Zotzensee) lowlands area, the then existing Havelbach (brook) was replaced with the Havel Canal (Müritz-Havel waterway). This reduced the water level in Zotzen Lake and caused drainage of the entire lowlands area.

In 1970, measures to "improve" the lowlands began, launching a process that eliminated some 18% of the fen area over the next 30 years. Zotzen Lake, a mesotrophic lake 15 years ago, is now in a state ranging from eutrophy to hypertrophy.

The EU-Life project will stop the continuing drainage from the area and initiate controlled rewetting, in order to restore the body of the fen until regeneration of peat-forming vegetation can take place. In addition, the old Havelbach watercourse is to be restored to its original condition. The reedbeds are to be expanded by about 13 hectares, in order to provide more habitat area for bitterns.

The EU-Life project **"Remediation of the Galenbecker See natural area, for priority species"**, which began in May, is aimed at ecological restoration of the Galenbecker See (Galenbeck lake) natural area, in order to stop artificially accelerated terrestrialisation of the lake and stabilise the lake's water regime, which is seriously disturbed (SCHIEFELBEIN in lit. 2001). This effort is expected to considerably expand natural habitats in the area and promote populations of priority bird species, such as the bittern.

The main measure is to construct a dam 6.9 km in length to prevent drainage and to separate the project area from the neighbouring cultivated grassland. Within the restoration area, incoming water is to be retained to a target level of 9 m HN (normal high water level), or about one meter above the current level. This will create a large shallow-water area, bordering the lake, that could serve as a site for water reedbeds.

To slow terrestrialisation of the lake, it is imperative to reduce the amount of nutrients flowing into the lake. For this reason, in the main riverbed a filter area, with extensive reedbeds, is to be established for nutrient elimination. At the same time, selective fishing of predatory fish is to be discontinued. This will reduce the numbers of non-predatory/coarse fish, thereby increasing the population of filterers among the plankton, which will improve the water quality. The aim is to form a macrophyte-rich clear-water lake that offers visual hunters such as the northern pike (*Esox lucius*) and the bittern a good food supply and that can function as a water reservoir for the neighbouring fen.

Parts of the land within the project area (about 565 hectares) are to be purchased and transferred to state ownership. Users who need to leave the project early will be compensated.

Public-information efforts play an important role in the success of such restoration measures. For this reason, plans call for regular provision of information to the press, a documentary film on the project, preparation of flyers, an exhibition, excursions and seminars and a popular-scientific brochure. In preparation for the project, two major informational events will be held, and exploratory discussions will be conducted with potentially affected citizens.

EU-LIFE PROJECTS IN THE STATE OF BRANDENBURG. The EU-Life project **"Bittern conservation in the SPA Schorfheide-Chorin**", which covers the largest area of all of the projects, comprises 10 of the water bodies protected by the European Bird Directive (KÖRNER & MÄDEL 1999).

The areas falling within this EU-Life project harbour about 4% of the total bittern population in Germany.

Prior to the beginning of the project, the reasons for the decline of bittern populations in the project area were analysed. Three different factors, which have a cumulative effect, were identified:

1. Since the beginning of the 20th century, some 1,000 hectares of former lake shorelines and fen lakes in the glacially formed landscape have been dried; a total of 300 hectares have been dried since the 1980s alone. In addition, water levels have dropped continually in other habitats.

2. As in the other project areas, eutrophication has seriously weakened and shrunk reedbeds.

3. Disturbance of reedbed-dwelling species, by swimmers, motorboats and fishermen, has caused birds to abandon their breeding areas. Numerous piers, many of them illegal, have fragmented the reedbeds, rendering them unsuitable for bitterns.

The primary aims of the EU-Life project to protect the bittern can be derived from this threat analysis. These aims include protecting and enlarging the reedbeds and reducing the anthropogenic disturbances within the reedbeds.

Buffer zones are to be established around the lakes in order to improve their water and habitat quality. These measures are to be supported by contractual nature conservation in the area. To improve and manage the reeds, and to promote their growth, a small reedbed area will be mown. The cut reed will then be sold in the region.

Removal of 30 illegal piers will end the fragmentation of the reedbeds. This measure is of great importance for the bittern and for other reedbed-dwelling species. To this end, purchase of some 275 hectares of land is planned. In addition, water-damming rights will be obtained, and water-damming levels will be legally established, to safeguard the conservation efforts in the long term.

A mobile exhibition and extensive informational events in the area will help the project gain public acceptance.

The above-described measures will regenerate 100 hectares of former reedbeds and rewet drained fens and fen lakes over an area of 300 hectares.

The bittern population is expected to increase by 10 to 15% within four years.

The EU-Life project "**Regeneration of the Rambow fen in order to protect the bittern"** will aim to implement planned measures with the public's participation (FILODA in lit. 2001).

Before the project began, it was expected that the public would be highly sceptical of the planned measures, and thus an effort was made to generate support, via presentations at numerous village festivals, meetings and community council meetings.

For the project to be possible, it was necessary to involve the affected parties that managed the relevant areas. The project group "Regional Interests" was founded, including the surrounding area's users, citizens and communities as well as representatives of the Life project.

The project area comprises the Rambower See (lake), along with the springs that feed it, as well as part of the Nausdorfer Canal, which empties into the Rudower See (lake), which is heavily used for recreational purposes.

Because the fen is spring-fed, and thus has stable temperatures even in the winter (low probability of freezing), it is an important wintering area for bitterns in Germany.

Restoration of the springs and their natural runoff will return water to the fen, thereby stopping terrestrialisation of the fen. In addition, the surrounding cabbage-thistle meadows will be extensively managed, in order to provide a buffer zone.

A key aim is for water to remain in the fen for longer periods of time, so that the living peat will not dry out during periods of little rainfall. To achieve this aim, continuing drainage of the fen via the Nausdorfer Canal and other drainage ditches must be stopped. In the long term, the peat layer is to be regenerated. The Rambower See, which in the past 50 years has shrunk to a fifth of its former size, will thus contain large reedbed areas that will provide bittern habitats.

To make these measures possible, project funds have to be used for purchasing surrounding areas. The planned measures will also regenerate the reedbeds and enable them to increase in size again, so that significant numbers of bitterns can again breed in the area.

PROJECT IN THE STATE OF BAVARIA. The EU-Life project **"Promoting bittern populations in pond areas of Bavaria"** (LANZ 2000) is focused on a much smaller number of pond/lake areas – only two – than the Schorfheide-Chorin project. The two areas in question, which are close to each other, are the Charlottenhofer Weihergebiet nature conservation area, which is part of the Oberpfälzer Teichgebiete area, and the Hirtlohweiher nature conservation area. The Oberpfälzer Teichgebiet area, near Schwandorf, is one of southern Germany's last remaining pond areas to harbour more than one pair of bitterns.

Purchase of ponds is an important instrument for protecting land in the project area. Alternative approaches include leasing areas or reaching special usage agreements. Because their earnings increased during the project period, the pond users had little incentive to sell the ponds or even to lease them or accept usage restrictions. For this reason, the project period had to be extended by 1,5 years.

Initially, a so-called "consent agreement" (Gestattungsvertrag), with a term of 15 years, was reached with the responsible forest authority. The agreement covers only two ponds, with a total area of 30 hectares. Via a management plan, management of the ponds, and establishment of water conditions favourable to reedbed formation, are being controlled. In addition, development of the existing reed belt is being promoted via planning and seeding. As the project continued, another large pond, with an area of 28 hectares, was added to the EU-Life project via a usage agreement with a pond user. The reedbed area in this pond will be able to grow over the next ten years, via extensivation of usage and supporting measures. The affected pond user is being compensated, from project funds, for a ten-year period.

PROJECT IN THE STATE OF SAXONY. Like the area covered by the Bavarian project for promoting the bittern population, the project area for the EU-Life project **"Doberschützer Wasser nature conservation project"** includes a number of different – although small – water bodies (SCHLUMPRECHT 1999).

Before the project measures were actually commenced, a comprehensive analysis of the bittern's biological requirements was carried out. Information was compiled, via extensive research in the literature and discussions with experts, regarding the bird's habitats (structure), population ecology, diet and feeding habits and sensitivity to disturbances. In addition (also prior to commencement of measures), the biotopes in the project area were mapped, and existing vegetation communities involved in reedbed production were described. Furthermore, notes were made of existing uses of the relevant water bodies, and water bodies in which bitterns had been sighted in the past 15 years were studied.

The analysis found bittern populations in a total of 26 ponds. After much study, in some cases lasting several years, these populations were divided into four different categories, in keeping with the abundance and regularity of occurrence.

70% of the ponds with regularly occurring bittern populations were covered to a degree of at least 50% with common reed *(Phragmites australis)*. The ponds ranged in size from 5.5 hectares to 21 hectares.

In the ponds harbouring breeding bittern populations over several years, common reed was always the dominant plant species. In only about 30% of pond areas were other plants, such as lesser reed mace *(Typha spec.)* or rushes *(Juncus spec.)*, nearly as well-represented as common reed.

About 90% of the regularly occupied ponds were completely, or almost completely, surrounded by a strip of forest at least 20 m wide (usually beech forest). In cases where this surrounding forest strip was narrower, fewer bitterns were found in the relevant ponds. The ponds were either poorly accessible or legally protected. Ponds that were more easily accessible or not legally protected were not regularly occupied.

On the basis of the habitat analysis and their bittern occupancy, a general aim was formulated: to increase the bittern population in the relevant pond area to such an extent that each pond would be occupied by at least one breeding pair.

This, in turn, led to the following development aims: creation of new reedbeds or enlargement of existing ones, reduction of reedbeds consisting of lesser reed mace, rewetting of dried-out ponds and reedbeds, management of reedbeds, establishment of natural water regimes, linking of the wetland areas within a network – for example, by means of strips of wet forest – and adaptation of management to the bittern's requirements.

Efforts to spark reedbed growth began with planting of balls and pallets of common reed. To reduce the lesser reed mace, their beds were mowed twice yearly – once in the winter, over ice, and once in the spring, below the water's surface. Attempts to dig out lesser reed mace rhizomes proved to be very time-consuming. Furthermore, this required the ponds to be drained, an unjustifiable measure given the prevailing, often serious water shortages at the time. In addition, measures were undertaken to restore natural water regimes.

Once shallow-water zones had been restored over an area of three hectares, with initial growth of common reed, the zones were occupied by a number of different amphibian species, some of them rare, and a potential breeding habitat for the bittern was created.

At the project's conclusion, it was shown that the completed measures had created suitable bittern habitats. In 1997, a calling male was found at each of four different ponds. In 1998, a calling male was found at another pond. All in all, from 1998 to 2001, a total of six calling males, at different ponds, were found. In 2001, a total of five breeding females were found in one pond, while only two calling males were found (Grüne Liga Sachsen, pursuant to data of Saxony's Neschwitz bird station, in lit. 2002).

Tab. 1.2.5-2: Overview of measures completed or planned in the projects.

Project	Aim	Measures
Conservation and restoration of the Trebeltal fen in Mecklenburg-West Pomerania, including preparatory studies for efforts in the Recknitztal fen area	Stopping the continuing outflow of water, restoration of a natural water regime, formation of wet meadows, raising of summer groundwater levels	Dismantling of bucket elevator systems, installation of a supportive dam, public-awareness measures
Restoration of the Recknitztal fen (EU special protection area for birds) to a natural condition, Mecklenburg-West Pomerania	Stopping drainage, rewetting part of the area	Restoration of the Recknitz to a natural state, including connecting old oxbows, closure of the man-made canal on one side, damming of water, public-awareness measures
Restoration of the Schaale-Sude river landscape, Mecklenburg-West Pomerania	Establishment of natural flood and overflow regimes	Connection of old oxbows, construction of a summer dike, public-awareness measures

Continuation Tab. 1.2.5-2 →

Continuation Tab. 1.2.5-2: Overview of measures completed or planned in the projects.

Project	Aim	Measures
Wetland habitat management in the Schaalsee Nature Park, Mecklenburg-West Pomerania	Stopping drainage, restoration of natural water regimes	Dismantling of a bucket elevator system, closure of ditches, placement of the area under protection, public-awareness measures
Fens and bitterns on the upper Havel River, Mecklenburg-West Pomerania	Stopping continuing drainage, controlled rewetting	Raising of the high water level at one dam, removal of two polders, dismantling of bucket elevator systems, closure of ditches, removal of dams, reversal of engineering measures along the Havel, public-awareness measures
Remediation of the Galenbecker See natural area, for priority species, Mecklenburg-West Pomerania	Slowing terrestrialisation in the area	Construction of a dam nearly 7 km in length dam, raising of the water level, land purchases, public-awareness measures
Bittern conservation in the SPA Schorfheide-Chorin (EU special protection area for birds), Brandenburg	Protection and enlargement of reedbeds, reduction of anthropo-genic disturbances	Establishment of buffer zones, contractual nature conservation, mowing of reedbeds, over small areas, to encourage growth, removal of illegal piers, public-awareness measures
Regeneration of the Rambower fen in order to protect the bittern, Brandenburg	Stopping of continuing drainage	Public-awareness measures, restoration of springs and their run-off, damming of water at fen run-off points
Doberschützer Wasser nature conservation project, Saxony	Expansion of reed areas, restoration of natural water cycles	Initial planting of reedbeds, mowing and uprooting of lesser reed mace beds, restoration of a section of the Doberschützer Wasser to a natural state, installation of several riverbed glides to raise water levels and reduce the flow speed, filling-in of a ditch, shifting of the location of inflow into a ditch, linking of wetland areas with each other, via strips of wet forest, public-awareness measures
Bitterns and pond management – interaction and coexistence, Bavaria	Enlarging reedbeds	Consent agreement with forest authorities, usage agreements, planting and sowing of common reed, public-awareness measures

1.3 NETWORK OF PROTECTED AREAS

This chapter discusses area protection, drawing on examples of protected areas in the internationally important coastal and Wadden Sea regions, which have long been the focus of particularly intensive conservation measures and efforts.

1.3.1 Tern protection on the coast

The great majority of German tern populations breed on the North Sea and Baltic Sea coasts. As a result, efforts to protect terns in Germany concentrate primarily on coastal areas. The most common species are the sandwich tern, arctic tern and the common tern *(Sterna sandvicensis, S. paradisaea, S. hirundo)*. In 1999, the population of the sandwich tern on the German North Sea coast was 8,858 breeding pairs, while that of the arctic tern was 5,771 and the common tern population amounted to 6,375 breeding pairs. Only 697 breeding pairs of the little tern *(Sterna albifrons)*, and only 29 breeding pairs of the gull-billed tern *(Sterna nilotica)*, have been counted on the North Sea coast (SÜDBECK & HÄLTERLEIN 2001). Another tern species that is found, sporadically, on the Baltic Sea coast is the Caspian tern *(Sterna caspia)*, of which one to three breeding pairs are seen (KÖPPEN 2000, 2001). In 1999, the total numbers of terns breeding regularly on the Baltic Sea coast were as follows: 692 pairs of the sandwich tern, 105 of the arctic tern, 1,148 of the common tern and 212 of the little tern (KNIEF et al. 2001, KÖPPEN 2001). The roseate tern *(Sterna dougallii)* disappeared from

Little Terns

the North Sea coast at the beginning of the 20th century. Individuals sometimes appear there during the breeding season, however (HÄLTERLEIN et al. 2000).

Apart from the main, coastal tern populations, a few, highly scattered tern populations are found in inland areas, including populations of the common tern (1,450-1,650 breeding pairs; BECKER & SUDMANN 1998, ZINTL 1998) and the little tern (about nine breeding pairs; UHLIG et al. 1998). The black tern is found only in inland areas (NIEHUES & SCHWÖPPE 2001).

HISTORY OF SEABIRD CONSERVATION. The beginnings of seabird conservation date from the 19th century. A first ordinance for protection of seabirds on the Island of Borkum was issued in the 1860s. The ordinance was ignored and thus was ineffective, however. In 1875, seabird colonies were placed under protection, for the first time, on the islands of Borkum and Langeoog. It was thought that herring gull excrement would have a fertilising effect and boost plant growth on the dunes and stabilise the land (SCHULZ 1947).

At the turn of the century, bird conservationists, both individually and in associations, began striving to purchase or lease breeding islands and to push for improvements in bird-conservation laws, which at that time did not protect seabirds. In 1907, bird conservationists leased a first group of areas, the Memmert, Itzerodt and Sylt Ellenbogen areas, and installed guards to protect breeding birds from egg thieves and "bird murderers". At the same time, the "Verein Jordsand zur Begründung von Vogelfreistätten an den deutschen Küsten" (Jordsand association for establishment of bird sanctuaries on German coasts) was founded. It then leased Jordsand, one of the Hallig islands east of the island of Sylt.

By World War I, additional sanctuaries had been added, including Trischen (1908), Norderoog and the Werderinseln auf dem Bock (1909), Langenwerder bei Poel and Hiddensee (1910), Mellum (1912) and Norderney (1913). Such efforts of bird conservationists and their groups were backed up by legal protection beginning in 1921, when Prussian hunting laws were amended to extend the off-season for seabirds to the period from March to August (SCHULZ 1947).

Nature conservation in general had its legal origins in the Reich constitution of 1919, which specified that the state was responsible for protecting and managing landscapes and natural monuments. Numerous ordinances and decrees then improved protection for nature and thus for seabirds.

Only the practical efforts of private organisations ensured that the seabird sanctuaries were truly protected, however. The nature conservation and bird conservation associations that began working in the early 20th century to protect certain areas – and that have continued their efforts to the present day – include the "Verein Jordsand", the "Bund für Vogelschutz" (BfV, Bird Conservation Association; now the German Nature Conservation Association (Naturschutzbund Germany NABU)), the "Hamburg Ornithological Association" and the "Mellum Council" (SCHULZ 1947).

After World War I, the list of seabird sanctuaries was expanded as follows: 1926, Wangerooge and Schleimünde, 1927, Grüne Insel, 1928, Hamburger Hallig, 1938, Scharhörn and 1941, Amrum-Nordspitze. On Grüne Insel, protection had to be suspended in 1939, and Trischen had to be abandoned in 1943 due to damage caused by storm flooding. Other islands were then established as bird conservation areas, without arrangements' being made for management by an association or other organisation. At the same time, rich bird life developed on many islands whose owners protected gull colonies in order to harvest their eggs. Species such as the common tern and arctic tern were able to thrive on such islands. This group of seabirdprotection areas included Süderoog, Graswarder near Heiligenhafen, Möwenberg near Schleswig and Lemkenhafen on Fehmarn.

After World War II: in 1964, the (former) GDR's Hiddensee bird station founded a "Central Agency for Seabird Protection, Hiddensee", aimed at co-ordinating protection of bird sanctuaries and organising practical protection measures. Efforts concentrated on protecting the areas against all disturbances, especially those caused by human beings (NEHLS 1969). At the same time, the protected areas were made available for research purposes. In 1964, the former GDR's seven most important seabird sanctuaries (Walfisch, Langenwerder, Barther Oie and Kirr, Fährinsel, Heuwiese, Liebitz and Beuchel) harboured two pairs of Caspian terns, 846 pairs of common terns, 165 pairs of arctic terns, 118 pairs of little terns and 404 pairs of sandwich terns (SCHILDMACHER 1965). The main concern of the "GDR Commission for Coastal Bird Conservation" as of the mid-1970s was to protect coastal-bird habitats over large areas, and not solely in protected areas (KÖPPEN 1998).

As in the past, the real basis for coastal bird protection in Mecklenburg-West Pomerania consists of protected areas managed and supported by volunteers. In 1990, the "Vorpommersche Boddenlandschaft" National Park was established, and in 1994 the "Coastal Bird Conservation Working Group of Mecklenburg-West Pomerania" (AG Küstenvogelschutz Mecklenburg-Vorpommern) was established within the State Office for the Environment and Nature (LAUN). It now provides advising and co-ordination in all aspects of coastal bird protection. Currently, a total of 29 protected areas in Mecklenburg-West Pomerania are being managed by volunteers (KÖPPEN 1998).

Most of the nature conservation areas on Schleswig-Holstein's Baltic Sea coast continue to be managed by nature conservation associations. The State Bird Station in the State Authority for Nature Conservation and Landscape Management in Schleswig-Holstein (LANU) co-ordinates nature-conservation and bird-conservation efforts.

Since the 1980s, most of the bird sanctuaries in the North Sea have been integrated within one of the three German Wadden Sea national parks, and thus fall under the protection regulations defined for the various national parks (cf. Chapter 1.3.2). The "Schleswig-Holsteinisches Wattenmeer" national park was established in 1985 and now comprises an area of 441,500 hectares. While the protected does not include the state's islands and most of the Hallig islands, it does include the area's sand banks and uninhabited Hallig islands. The park is divided into two zones, of which zone I, the core zone, is a usage-free area that covers about one-third of the entire area (LANDESAMT SCHLESWIG-HOLSTEINISCHES WATTENMEER 2001). As was the case prior to the national park's founding, the area is managed primarily by local nature conservation associations (Jordsand Association, Wadden Sea Conservation Station (Schutzstation Wattenmeer), NABU). A national-park service, composed of full-time employees of the national park's administration, has also been in operation since 1996. Joint efforts are being made to protect the conservation-area system effectively (SCHERER 1998).

The "Niedersächsisches Wattenmeer" national park, which was founded a year later, comprises an area of 280,000 hectares. In contrast to the Schleswig-Holsteinisches Wattenmeer park, it also includes all strips of land in front of the area's dikes and the local islands, with the exception of settled areas. The national park has been divided into "quiet" (Ruhe) zones, intermediate zones and recreational zones, and the seabird sanctuaries within the quiet zones are largely protected against disturbances. The most important tern conservation areas continue to be managed by the same nature-conservation and bird-conservation associations that managed the areas before the national park was established: the "Mellumrat", "NABU Niedersachsen" and BUND (Bund für Umwelt und Naturschutz Deutschland - German Association for Environmental and Nature Protection). In addition, a national-park service has been established to manage those areas that are not yet covered by private organisations (ZANDER 1998). Joint efforts are thus being made to provide terns with the most comprehensive and strictest protection possible (MU NIEDERSACHSEN 2001).

The "Hamburgisches Wattenmeer" national park, which was established in 1990, is located between the other two Wadden Sea national parks. Comprising an area of 17,750 hectares, it is located between the estuaries of the Elbe and Weser rivers. It contains the Scharhörn bird sanctuary, which is managed by the Jordsand association. It also includes Nigehörn, a man-made bird-protection island that will take the place of the Scharhörn sanctuary in the long term, when Scharhörn is reclaimed by the sea (JANKE 2000, see below).

MEASURES TO PROTECT TERNS. Establishment of large (more or less) protected areas, covering extensive sections of coastal areas, has created a large, dense network in which terns are to be protected against disturbances. A key element of the protection is that the areas are closed to visitors during the breeding season. Closure is enforced by numerous bird rangers throughout the entire breeding season – and often even throughout the entire year.

Special concepts for routing paths are applied, especially on the larger islands and on the mainland, to prevent human disturbance in areas with near-term potential as breeding areas. In St. Peter-Böhl, Morsum-Odde/Sylt and Kalfamer on Juist, for example, suitable areas are closed for the duration of the breeding season, to permit breeding by little terns (POTEL et al. 1998). Public-awareness measures, aimed at fostering acceptance of the measures, play an especially important role.

Especially on the Hallig islands and the small islands, on which no predatory mammals naturally occur (such as rats, foxes, martins), measures are carried out to reduce or eliminate such predators in protected areas. In addition to such measures as placement of poison bait and hunting of foxes, breeding sites are enclosed with electric fences, for their own protection against predators. At Lensterstrand (Baltic Sea coast of SH), sections of swimming beaches are fenced off, for protection of little terns, and the fences are electrified to ward off predators (especially foxes) (BEHMANN 1998).

Until the 1980s, measures to reduce gull populations, in tern-conservation areas, were carried out in both the North Sea and Baltic Sea. These measures, which included collection, piercing and exchange of eggs, and even killing of brooding birds and young birds, were directed especially against herring gulls and mew gulls (for example, NEHLS 1969, SCHULZ 1947). Protection of large areas also plays an important role in tern conservation. As a group, terns tend to establish their breeding sites in habitats in relatively early phases of succession. Coastline-protection measures have greatly restricted the powerful dynamics to which habitats in the North Sea and Baltic Sea were formerly subject, however. One of the explicit protection aims established for the national parks is that natural and geological processes should take place unchecked in them. In these parks, which cover nearly all of the Wadden Sea, new (protected) habitats (islands, sand bars) that are suitable for terns are constantly being formed. Turminsel island in the Großer Knechtsand area in the Niedersächsisches Wattenmeer national park, for example, was an important breeding area for the common tern and the sandwich tern in the 1960s and (especially) the 1970s. In the 1970s, up to 2,621 (1971) sandwich tern pairs bred there. Beginning in 1975, Turminsel island in the Großer Knecht sand area began to shrink as erosion on its southern and western periphery intensified. Within ten years, the island consisted of only a few remnants; within another four years, Turminsel island had completely disappeared (WIETFELD 1998). The island's terns had to find new breeding sites. Protection in large national parks plays a key role in compensating for such processes: by protecting potential future breeding areas for terns and by closing areas to visitors as necessary.

In the Hamburgischer Nationalpark, an entire island (Nigehörn) was created so that terns on the neighbouring island of Scharhörn would have breeding areas to take the place of those on Scharhörn, which is constantly being eroded by the sea. Since Scharhörn is moving, as a result, toward the Elbe river estuary, its seabirds' breeding sites cannot be protected in the long term. In 1989, therefore, a hydraulic dredge was used to throw up a ring of sand on the southern side of the tongue-shaped Scharhörnplate. The new island was stabilised with sand fences and artificial dunes in its interior, and it now measures some 500 m in diameter. In addition, dune plants were planted and sown, as a another measure to help stabilise the new land. Since then, Nigehörn has developed successfully as a bird protection island (JANKE 2000). Off the coast of Lower Saxony, the island Minsener Oldeoog was artificially enlarged, via hydraulic dredging, and then it was immediately occupied by terns (BECKER & ERDELEN 1987).

Public-awareness measures will play a key role in the long-term success of all of these conservation measures. Especially in areas not easily watched or not always guarded by bird rangers, people – whether tourists or local residents – need to be informed about the species being protected, along with the measures being carried out and the reasons for them. This is important in order to foster acceptance for the measures.

NORDEROOG, A HALLIG ISLAND FOR BIRD PROTECTION. Norderoog, one of the Hallig islands, was purchased in 1909 by the "Jordsand Association", and the association has managed it continually since then. Only about 10 hectares are left of the island, which measured 18 hectares at the beginning of the 20th century (1909). During the 1920s, sedimentation fields were constructed in the western part of the island, in an attempt to combat North Sea erosion. The shrinkage of the island was not stopped until 1977, however, when a barrier of loose stones was piled up and additional annual shoreline-protection measures along the sedimentation fields began to be carried out. The island's size at the time was 7.8 hectares.

Arctic Terns

Since the early 1980s, youth workcamps have been held on Norderoog each summer, following the end of the breeding season. These camps give young people a chance to help save this Hallig island, by working to protect its shoreline, and to experience and learn about the Wadden Sea in the process. This programme has been able to stop the shrinkage of the island, and some land growth has even taken place. The island's current size is 10 hectares (SCHNEIDER 1997).

The Norderoog bird sanctuary has one of the most important sandwich-tern populations on the entire North Sea coast. Beginning in 1913, the terns were protected via efforts to combat the herring gull, which had taken over more and more of the area and which robbed the terns of eggs and young. The anti-gull measures included "sharp" egg collection. Such measures are no longer carried out today.

Today, this bird protection area lies within zone I (quiet zone) of the Schleswig-Holstein National Park.

The following Table (Tab. 1.3.1-1) shows how populations of various tern species have developed over time.

Tab. 1.3.1-1: Development of tern populations on Norderoog, from 1909-2000 (JORDSAND Association in lit. 2001) Legend: BSS = sandwich tern, LSS = gull-billed tern, FSS = common tern, KSS = arctic tern, ZSS = little tern.

Year	BSS	LSS	FSS	KSS	ZSS
1909	2.300	-	450		70
1910	3.100	-	425		70
1911	200	-	570		75
1912	2.000	-	950		112
1913	1.800	-	850		67
1914	4.200	-	1.000		28
1919	820	-	2.504		?
1920	1.450	-	2.000		70
1921	?	-	increased		?
1922	1.800	-	2.750		72
1923	1.100	-	2.400		70
1924	1.650	-	2.500		50
1925	3.000	-	3.000		70
1926	3.767	-	3.461		50
1927	3.764	-	2.807		58
1928	4.600	-	3.000		40
1929	3.458	-	2.218		49
1930	4.251	-	2.618		34
1931	4.000	1	4.000-5.000		45
1932	3.700	1	3.100		14
1933	3.954	1	2.783		25
1934	2.900	1	1.500-1.600		8
1935	3.000	1	2.700		19
1936	3.128	1	2.414		27
1937	3.481	-	2.862		25
1938	2.464	-	2.595		4
1939	3.752	-	3.078		23
1940	3.917	1	2.705		22
1941	3.199	-	2.714		2
1942	2.612	-	2.696		-
1943	4.215	-	2.927		-
1944	3.355	-	2.320		-
1945	3.106	-	2.948		4
1946	1.432	-	37		-
1947	576	-	911		3
1948	2.600	-	1.250		-
1949	3.000	-	1.300		-
1950	2.500	-	1.500		-
1951	2.650	-	2.000		-
1952	2.400	-	700	2.000	-
1953	2.520	-	772	1.990	-
1954	2.380	-	730	2.010	-
1955	670	-	700	2.500	-
1956	1.750	-	730	2.030	-
1957	2.600	-	337	1.244	-
1958	2.400	-	220	800	-
1959	3.000	-	500	1.300	-
1960	2.500	-	500	1.800	-
1961	2.000-2.200	-	600	1.500	-
1962	1.800-2.200	-	600	300-400	-
1963	850	-	240	600	-
1964	1.100	-	300	1.200	-
1965	400-410	-	220-260	640-680	-
1966	310	-	70	900	-
1967	610	-	50	800	-
1968	500-600	-	50-80	1.400-1.470	-
1969	830	-	200	1.000	-
1970	530	-	1.200		-
1971	830	-	170	1.000	-
1972	790	-	180	900	-
1973	800	-	220	1.100	-
1974	710	-	180	1.000	-
1975	1.200	-	110	800	-
1976	1.400	-	180-220	1.000-1.100	-
1977	1.650	-	300	1.000	-
1978	1.050	-	200	1.000	-
1979	1.600	-	400	1.400	-
1980	1.550	-	500	1.400	-
1981	1.550	-	360	1.100	-
1982	1.200	-	260	1.050	-
1983	1.650	-	260	960	-
1984	1.700	-	250	640	-
1985	1.350	-	200	910	-
1986	1.950	-	230	750	-
1987	2.300	-	130	750	-
1988	2.900	-	140	780	4
1989	3.720	-	130	780	-
1990	4.100	-	150	650	-
1991	4.700	1	100	340	-
1992	3.900	-	170	620	-
1993	3.250	-	90	380	-
1994	2.600	-	49	352	-
1995	2.500	-	35	190	-
1996	2.600	-	63	168	-
1997	2.900	-	60	135	-
1998	2.800	-	65	110	-
1999	3.500	-	70	100	-
2000	2.650	-	27	61	-

POPULATION TRENDS.

CASPIAN TERN *(STERNA CASPIA)*. The Caspian tern has not been seen on the German North Sea coast for over 80 years. In 1819, the most important populations of this species, amounting to a total of 250-300 breeding pairs, were found on the island of Sylt (STRIBERNY 2000).

Since the 1950s, one to two breeding pairs of this species have bred sporadically on Mecklenburg-West Pomerania's Baltic Sea coast, in the Heuwiese nature conservation area near Rügen (SIEFKE 1993). In 1999, two pairs of Caspian terns bred in the Heuwiese area and one pair bred in the Beuchel nature conservation area, on Rügen (HÄLTERLEIN et al. 2000, cf. Tab. 1.3.1-2).

GULL-BILLED TERN *(STERNA NILOTICA)*. The breeding population of the gull-billed tern on the North Sea coast fluctuates widely. From the early 1930s to the mid-1950s, the bird could be found on various north-Frisian islands. Since the early 1970s, these populations have shifted to the mainland; between 40 and 65 pairs can be found in the Eiderstedt area, and 49 pairs (1988) have been counted in the Meldorfer Bight area. Since 1953, one to four pairs of gull-billed terns have been seen every year on the lower Elbe river. Individual pairs can also be found from time to time on the coast south-west of Cuxhaven (1985) and in the Leybucht (1990) area (BEHM-BERKELMANN & HECKENROTH 1991). No breeding gull-billed terns have been seen in Lower Saxony's part of the North Sea since the 1990s. Today, most of the bird's breeding population is concentrated on the Elbe estuary (41 BP 1996) (within a colony of common terns), on the coast of Dithmarschen and, in small groups, on Schleswig-Holstein's North Sea coast (RASMUSSEN et al. 2000). In 1999, only 29 pairs were still breeding on the North Sea coast (see Tab. 1.3.1-2). In Baltic Sea areas, the species has not been seen since the 19th century (HÄLTERLEIN et al. 2000).

Fig. 1.3.1-1: Breeding population of gull-billed terns on the German North Sea coast, from 1982-1999 (pursuant to HÄLTERLEIN et al. 2000 and RASMUSSEN et al. 2000).

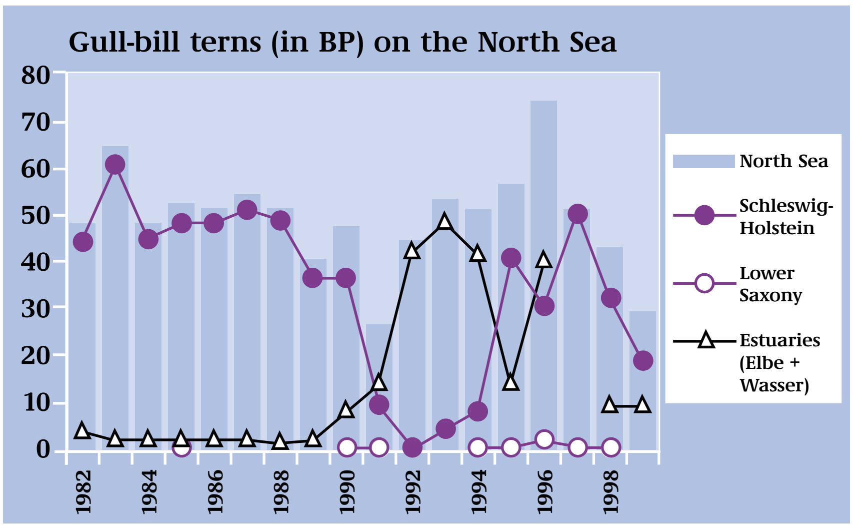


Figure 1.3.1-1 shows trends in gull-billed tern populations in the German North Sea.

SANDWICH TERN *(STERNA SANDVICENSIS).* On Germany's North Sea coast in 1999, a total of 2,598 pairs of sandwich terns bred in Lower Saxony and Hamburg, and 6,260 pairs bred in Schleswig-Holstein (see Fig. 1.3.1-2). In contrast to the case for the common tern and arctic tern, the sandwich tern population is spread among just a few breeding areas, each with large colonies (SÜDBECK & HÄLTERLEIN 2001). Sandwich tern populations fluctuate widely from region to region, but the species' total population remains relatively stable (see Fig. 1.3.1-2).

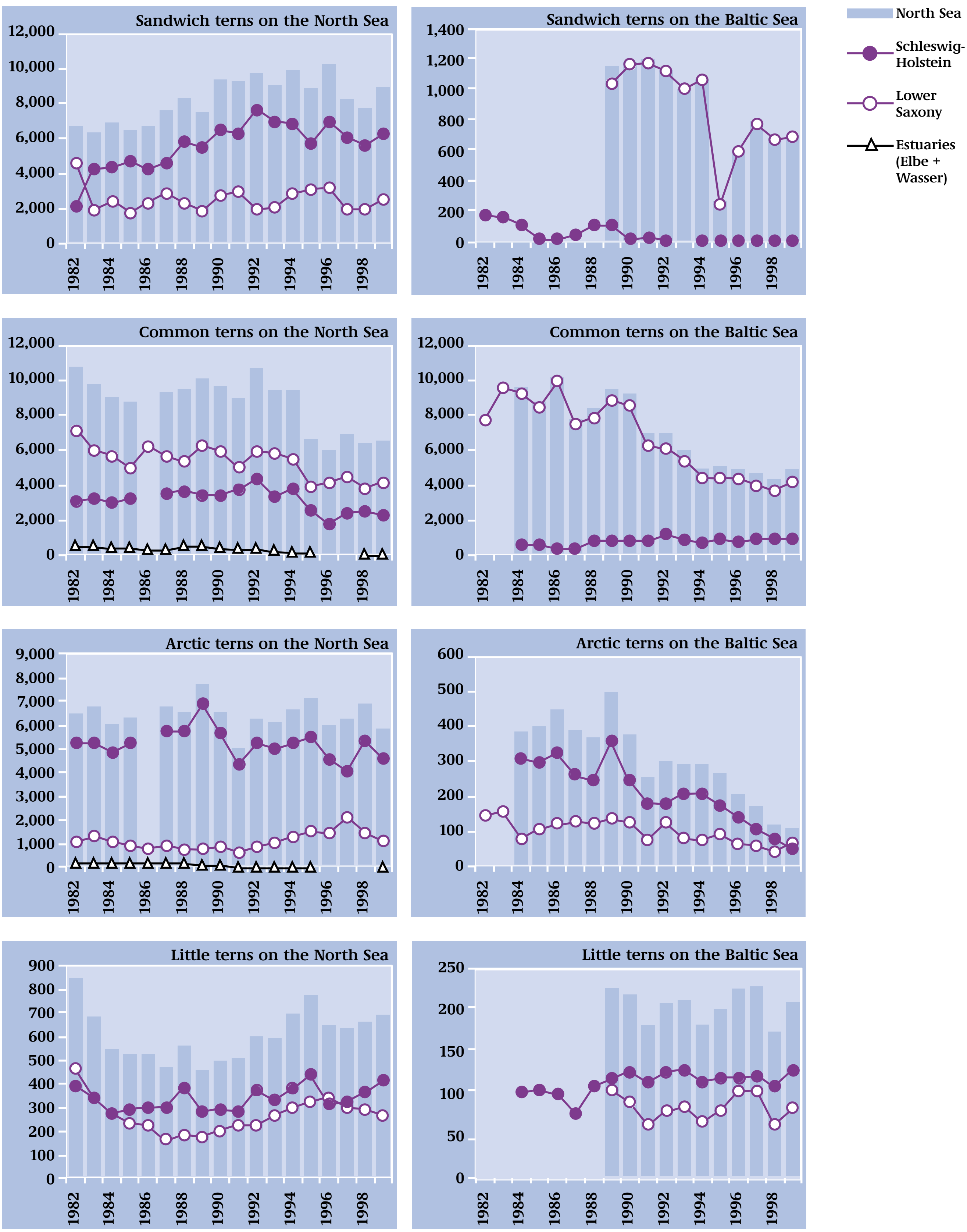
In the 1960s, the breeding population on Lower Saxony's North Sea coast collapsed. The reasons for this development, as for problems encountered by other tern species, have to do with pollution, especially pollution reaching the sea from the Netherlands (BECKER & ERDELEN 1987). The breeding population recovered by the end of the 1960s. In 1978, it reached a new maximum of 5,725 pairs on Lower Saxony's coast. The breeding sites in Lower Saxony shifted from the Ems to the Jade and Weser estuary (Minsener Oog, Scharhörn) (BEHM-BERKELMANN & HECKENROTH 1991). A large colony was present on Memmert in the mid-1990s (RASMUSSEN et al. 2000). Currently, over 2,000 pairs are breeding on Juist (1999; SÜDBECK & HÄLTERLEIN 2001).

The two most important colonies on Schleswig-Holstein's North Sea coast are located on Norderoog and Trischen. The colony on Norderoog has been known since the early 19th century. Early in the 20th century, up to 6,000 pairs of sandwich terns were counted in it. Since then, the population has been decreasing, with wide fluctuations; from the mid-1960s to the mid-1980s, it comprised 3,000 breeding pairs (THIESSEN 1986). Today, Schleswig-Holstein's population ranges between 6,000 and 7,000 breeding pairs, on Trischen and Norderoog (RASMUSSEN et al. 2000, SÜDBECK & HÄLTERLEIN 2001). No other populations are currently known.

The sandwich tern has bred only sporadically on Schleswig-Holstein's Baltic Sea coast. It has bred occasionally in Schleimünde since 1820 and occasionally in Graswarder, as of somewhat later. Beginning in the mid-1960s, and especially since the end of the 1970s, it began returning regularly to some protected areas (KNIEF et al. 1997). In the 1980s, a total of 17-62 pairs (1983/1979) were counted in Schleimünde. Since the 1980s, up to 142 pairs of sandwich terns have also bred on Graswarder (1983; THIESSEN 1986). In the early 1990s, the population on Schleswig-Holsteins east coast collapsed completely. As of 1999, only two breeding pairs were left in the Schwansener See nature conservation area (KNIEF et al. 2001).

Currently, the sandwich tern is regularly found in two areas in Mecklenburg-West Pomerania (Langenwerder, Heuwiese). Since the early 1990s, its population has fluctuated around a constant total level of between 1,050 and 1,200 pairs (SIEFKE 1993). A present, the population is somewhat smaller, at about 670 to 780 pairs (KÖPPEN 2000, 2001).

Fig. 1.3.1-2: Population changes for the most common tern species (in breeding pairs) over the past 20 years on the North Sea (red bars) and Baltic Sea (blue bars). Solid circles = population in Schleswig-Holstein, outline circles = population in Lower Saxony and Mecklenburg-West Pomerania, triangles = population of estuaries (Elbe +Weser) (pursuant to HÄLTERLEIN et al. 2000).


Sandwich terns on the North Sea
Sandwich terns on the Baltic Sea
Common terns on the North Sea
Common terns on the Baltic Sea
Arctic terns on the North Sea
Arctic terns on the Baltic Sea
Little terns on the North Sea
Little terns on the Baltic Sea
North Sea
Schleswig-Holstein
Lower Saxony
Estuaries (Elbe + Wasser)

COMMON TERN *(STERNA HIRUNDO)*. In 1995, 7,557 pairs, or more than 10% of the north-west European common tern population, which is estimated at 74,000 pairs, bred on Germany's coasts. As of 1999, the population had declined to 6,375 pairs (SÜDBECK & HÄLTERLEIN 2001). Some 85-90% of these common terns breed in the Wadden Sea, while the remaining 10-15% breed in the Baltic Sea area. The species' range in Germany is concentrated in the Unterelbe and Außenelbe areas (especially Neufeld, Scharhörn) and in the Außenjade area (Minsener Oog). Some 60% of the total German common tern population breeds in these areas (see Tab. 1.3.1-2). The main concentrations on the Baltic Sea coast are in Mecklenburg-West Pomerania. There, the common tern breeds almost solely on "bird islands", such as Böhmke, Werder, Kirr, Neuer Bessin / Hiddensee (see Tab. 1.3.1-2). Because common terns are difficult to differentiate from arctic terns, precise population-trend data did not become available in about 1950. All in all, the population of "red-footed" terns decreased by about 25% from 1939 to 1995, and the decrease in North Sea areas, at 28%, is higher than that on the Baltic Sea, 20% (SÜDBECK et al. 1998).

In the early 20th century, intensive pressure from egg-gatherers, hunters and feather-collectors drastically reduced common tern populations on Lower Saxony's and Hamburg's North Sea coasts. Once protected areas were established, the populations recovered, reaching a level of 8,000-10,000 pairs by the 1920s. During World War II, food shortages increased the hunting rate, and the population dropped to 3,000-4,000 pairs. By the end of the 1950s, it was back up to 7,000-8,000 pairs, however. In the 1960s, pollution in the Wadden Sea area again reduced the population, to 2,192 pairs (1968). From that point on, it gradually recovered, and around 1980 it registered a sizeable increase, reaching a maximum of 8,500 pairs in 1981. Since then, the population has dropped again – in a process that began gradually and has accelerated in the recent past. At the end of the 1990s, some 3,800-4,400 pairs were counted (SÜDBECK & HÄLTERLEIN 2001, SÜDBECK et al. 1998).

In the first half of the 20th century, Trischen, in Schleswig-Holstein's Wadden Sea area, harboured 8,000 pairs of common terns – far and away Germany's largest colony. In this area, as in Lower Saxony, populations recovered after the turn of the century, especially within the protected areas. The recovery continued until the 1940s, when the populations began declining again. By the 1950s, the population had sunk to about 4,000 pairs; in the 1960s, the Wadden Sea population shrank to fewer than 1,000 pairs. In the 1970s, and especially in the 1980s, the species recovered somewhat, reaching a maximum population of 3,563 pairs in 1988. After 1990, a decline began again in Schleswig-Holstein's Wadden Sea area. In 1999, a total of 2,435 pairs were counted there (SÜDBECK et al. 1998, SÜDBECK & HÄLTERLEIN 2001).

Populations of the bird on Schleswig-Holstein's Baltic Sea coast have fluctuated widely, and major shifts in its breeding areas have occurred. Until the 1980s, it bred only on Oehe-Schleimünde and Graswarder. After the Second World War, common tern populations on Oehe-Schleimünde decreased sharply (from about 300 pairs in the 1930s to about a quarter of this level in the 1950s). The population then disappeared entirely in the mid-1980s. On Graswarder, which never harboured more than 60 breeding pairs, the population is currently fluctuating around a level of about 50 breeding pairs (SÜDBECK et al. 1998). Currently, 105 pairs of common terns are breeding in the Schwansener See area. An additional 84 pairs are spread, in small groups, among several protected areas. The bird no longer comes to Graswarder (KNIEF et al. 2001).

Large common tern populations can be found on Mecklenburg-West Pomerania's Baltic Sea coast. The development there paralleled that on the North Sea: in the late 1960s, the species reached a population minimum there of about 500 breeding pairs. This was followed by a gradual recovery, to a maximum of about 2,100 pairs in 1986. The increases were especially pronounced in the Oder region and on Usedom. The population has been decreasing again since the early 1990s, and it now numbers at least 800-900 pairs (SÜDBECK et al. 1998, KÖPPEN 2001).

ARCTIC TERN *(STERNA PARADISAEA).* In 1995, 7,329 pairs of arctic terns bred on German coasts. Of these, some 75% were found on Schleswig-Holstein's North Sea coast. About 20% of the population bred in Lower Saxony and about 5% was found in Baltic Sea coast areas. From that year until 1999, the population dropped sharply, to about 5,859 pairs (KÖPPEN 2000, KNIEF et al. 2001, SÜDBECK & HÄLTERLEIN 2001, cf. Tab. 1.3.1-2). The arctic tern populations are concentrated on the north Frisian Hallig islands. Somewhat further south, the bird breeds primarily within large colonies of common terns. On the Baltic Sea, the species is found almost solely in an area ranging eastward, from western coastal sections, to the Wismarer Bight. The species' colonies in the area are small and confined almost exclusively to protected areas (SÜDBECK et al. 1998) (cf. Tab. 1.3.1-2).

As was the case for the common tern, the arctic tern's populations on Lower Saxony's North Sea coast recovered during the 1950s, following hunting etc. at the beginning of the last century and during the war years. In the mid-1950s, the breeding population in these areas was about 1,000 pairs. Following slight population growth in the early 1960s, the population dropped to about 400 breeding pairs as a result of discharges of chemical pollutants into the Dutch part of the North Sea coast. From that point on, Lower Saxony's arctic tern population recovered, in a process that continued until the 1980s, and reached a maximum of 1,500 pairs. It then gradually declined again, however. Since the early 1990s, the population has been growing again, and it has returned to its level of the 1980s. A total of 1,118 pairs were counted in 1999 (SÜDBECK et al. 1998, SÜDBECK & HÄLTERLEIN 2001).

In Schleswig-Holstein's Wadden Sea areas, the arctic tern breeds primarily on the Hallig islands, especially Norderoog (cf. Tab. 1.3.1-1). Population trends in Schleswig-Holstein have been similar to those on Lower Saxony's coast, except that the population decreases of the 1960s were not as sharp (SÜDBECK et al. 1998). In 1999, the breeding population on Schleswig-Holstein's North Sea coast comprised 4,652 pairs (SÜDBECK & HÄLTERLEIN 2001).

On Schleswig-Holstein's Baltic Sea coast, the arctic tern population declined until the 1960s, after which it recovered until about 1980. In the 1980s, it fluctuated widely, ranging between 250 and 350 pairs. Since the late 1980s, it has been in a sharp decline that has continued to the present (43 breeding pairs; SÜDBECK et al. 1998, HÄLTERLEIN et al. 2000). Significant growth was registered only on Graswarder: from about 50 pairs in the mid-1950s to over 300 pairs in the early 1970s. The population then decreased to about 100 pairs, in the late 1980s, and it is still dropping. Currently (1999), some 25 pairs are breeding on Graswarder. In Oehe-Schleimünde, the population dropped from about 400 pairs, in the 1930s and 1940s, to fewer than 100 pairs in the mid-1960s. Following a recovery in the 1970s and 1980s, the population collapsed again, in a decline that still continues. In 1999, five pairs were still breeding there (KNIEF et al. 2001).

On Mecklenburg-West Pomerania's Baltic Sea coast, the arctic tern population has decreased slowly, but continually, since the 1980s: from 150 breeding pairs to the current level of 62 pairs, of which 60 on are found on Langenwerder (HÄLTERLEIN et al. 2000, KÖPPEN 2001).

LITTLE TERN *(STERNA ALBIFRONS)*. In the 19th century, the little tern was a common bird species, especially on the islands. It is a pioneer occupant of the temporary beach habitats that form within the sea's dynamic coastal system and then disappear again through natural succession. The little tern populations in Lower Saxony's Wadden Sea area have decreased slightly. The species' maximum breeding population reached 595 breeding pairs in 1952. The population then decreased continually, until 1968, when it reached a level of 241 pairs. Until 1975, it fluctuated around a level of 250 pairs, and then increased again until 1982, to a level of 454 pairs. Of this number, a total of 230 pairs bred on newly formed sand areas on the island Minsener Oldeoog. By 1987, the population had decreased again, to 159, but then doubled by 1995, to 329 pairs (FLORE 1998). In 1996, a total of 333 pairs were counted there

Tab. 1.3.1-2: Current tern populations, broken down by individual breeding populations (North Sea: 1999 (SÜDBECK & HÄLTERLEIN 2001), Baltic Sea Schleswig-Holstein: 1999 (KNIEF et al. 2001), Baltic Sea Mecklenburg-West Pomerania: 1999 (KÖPPEN 2001)). LSS = gull-billed tern; BSS = sandwich tern; FSS = common tern; KSS = arctic tern; RSS = red-footed terns (common tern/ and arctic tern); ZSS = little tern

Area	LSS	BSS	FSS	KSS	RSS	ZSS
North Sea coast Schleswig-Holstein						
Untereider				59		
Meldorfer Speicherköge			2			
Feuchtgebiete Eiderstedt			6			
Rickelsbüller Koog			56	177		
Fahretofter Westerkoog			21	5		1
Hauke-Haien-Koog			11	6		
Ockholmer Westerkoog			9	1		1
Beltringharder Koog			6	24		
Amrum				29	5	40
Föhr			61	161		57
Hallig Langeness			317?	192?	27	24
Hallig Oland					119	
Hallig Gröde			4	297		3
Hallig Habel				90		
Hallig Nordstrandischmoor			?	429		12
Hallig Hooge			179	209		6
Hallig Norderoog		3,500	70	100		
Hallig Süderoog			180	929		
Hallig Südfall			16	318		13
Pellworm				31		
Sylt			1	288		133
Trischen		2,760	330	83		11
Außensände Nordfriesland			25?	75		42
Vorländer Dithmarschen	14		1,011	524		
Vorländer Eiderstedt			36	172	29	90
Vorländer Nordfriesland			4	7	147	
SH - total	**14**	**6,260**	**2,345**	**4,147**	**327**	**433**

Area	LSS	BSS	FSS	KSS	RSS	ZSS
Lower Saxony / Hamburg						
Rysumer Nacken				5		4
Leybucht			27	92		2
Borkum			114	40		73
Lütje Hörn				23		
Memmert			60	16		11
Juist		2,176	32	70	30	13
Norderney			18	19		
Baltrum			179	16		32
Langeoog			7	4		27
Spiekeroog			74	35	7	32
Wangerooge		397	19	19	12	25
Minsener Oog		25	2,264	469		19
Mellum				7		
Jadebusen			273			
Neuwerk			200	180		15
Scharhörn			650	50		8
Nigehörn			150	45		3
Hullen			11	1		
Nordkehdingen			9			
Allwördener Außendeich			11			
Lower Saxony - total		**2,598**	**4,098**	**1,091**	**49**	**264**
Baltic Sea coast Schleswig-Holstein						
Oehe-Schleimünde				5		2
Möwenberg Schleswig			36			
Schwansener See		2	105	7		46
Aschau						4
Bottsand				4		7
Strandseelandschaft / Schmoel						2
Sehlendorfer Binnensee			4			6
Graswarder				25		2
Krummsteert			1	2		1
Wallnau			18			4
Grüner Brink			20			
Laboe Kiesbank						2
Lipper Strand						1
Fastensee/Fehmarn						10
Lensterstrand						41
Schleswig Holstein - total		**2**	**184**	**43**		**128**
Mecklenburg-West Pomerania						
NSG Langenwerder				60		10
NSG H.I. Wustrow				1		1
Insel Kirr			330			
Barther Oie		500	160	1?		
Neuer Bessin		3	21			73
Heuwiese		2	150			
Liebitz			6			
Beuchel		185	4			
Insel Tollow			3			
Gustower Werder			151			
Werderinseln Riems			9			
Böhmke u. Werder			130			
Mecklenburg-West Pomerania - total		**690**	**964**	**62**		**84**

Red Knots

(RASMUSSEN et al. 2000). The population in 1999, at 264 pairs, was slightly smaller (SÜDBECK & HÄLTERLEIN 2001). A large majority of little terns, 87%, breeds on the islands, primarily in naturally formed habitats. Only about 3% breed on the mainland, and some 10% breed on the Elbe and in Hamburg, especially on naturally flooded fields (FLORE 1998, see Tab. 1.3.1-2).

National Park Observer

The size of the little tern population on Schleswig-Holstein's North Sea coast is estimated to have been about 500-1,000 pairs in the 20th century prior to the World War II (THIESSEN 1986). Of this population, a colony of 300 (1917) to 600 (1914) pairs – far and away the largest – bred on Trischen. In the 1950s, the population on Trischen declined rapidly; by the end of that decade it numbered only 10-20 pairs. On the whole, the little tern population on Schleswig-Holstein's west coast decreased as of the late 1950s and in the 1960s. In 1976, the population numbered 226-240 pairs. By the mid-1980s, the population was back up, comprising 310-340 breeding pairs (THIESSEN 1986). Recovery continued until the mid-1990s, reaching 436 pairs (1995). The current level is 363-433 pairs (RASMUSSEN et al. 2000, SÜDBECK & HÄLTERLEIN 2001) (cf. Fig. 1.3.1-2).

In Oehe-Schleimünde, on Schleswig-Holstein's Baltic Sea coast, this species was documented as a breeding bird as early as 1820. The total population in the 1950s is estimated to have numbered some 100 breeding pairs. In the 1960s and early 1970s, the population recovered slightly. By about 1975, it had decreased again, to 100 pairs. The population then grew again, until the mid-1980s, to a level of about 120 pairs, and has fluctuated since then around this level (THIESSEN 1986). Currently, some 128 pairs (1999) are breeding in this area, almost solely in protected areas. Except for a few scattered pairs, the Schwansener See nature conservation area and the Lensterstrand area harbour the entire breeding population of the little tern in this region (KNIEF et al. 2001).

On Mecklenburg-West Pomerania's Baltic Sea coast, the little tern's breeding population, comprising about 60-80 pairs, is found almost exclusively in two protected areas (Langenwerder, Neuer Bessin). Apart from this group, only isolated breeding pairs are seen (SIEFKE 1993). Currently, some 84 pairs are breeding in this area (KÖPPEN 2001).

Any long-term protection for the little tern will have to include protection of suitable nesting sites for the bird, since the little tern is highly sensitive to disturbances at its breeding sites. In addition, it tends to prefer habitats that are no older than five to ten years old – habitats which thus must constantly be reformed (FLORE 1998). This requirement is also based on the species' classification, in the AEWA action planning, as a species of column 1, 3b.

1.3.2 The Wadden Sea national parks on the German North Sea coast

The Dutch-German-Danish Wadden Sea, including its barrier islands and bordering estuaries, extends along the North Sea coast, from Den Helder in the Netherlands to Esbjerg in Denmark.

The Wadden Sea is an extremely dynamic habitat, shaped by tidal rhythms. It comprises sandy, muddy and mixed-soil wadden areas that are regularly flooded and drained by tides; extensive networks of tidal channels; and bordering sand bars, beaches and seagrass meadows, all with their typical communities. On its seaward side, the Wadden Sea gradually gives way to offshore areas of the North Sea.

Because it receives a rich inflow of nutrients from rivers that empty into it, the Wadden Sea is a very productive habitat, with a relatively short food chain between food producers and the consumers that depend on them. An abundance of nutrients, a vast expanse and close interrelationships between different, merging habitats make the Wadden Sea an extremely important habitat for a great many different organisms. For example, the Wadden Sea provides food for many bird species that breed in its bordering seagrass meadows, dunes and sand bars. Of the 31 bird species that breed in the Wadden Sea, a total of six species – the white spoonbill *(Platalea leucorodia)*, pied avocet *(Recurvirostra avosetta)*, kentish plover *(Charadrius alexandrinus)*, gull-billed tern (*Sterna nilotica*), sandwich tern *(Sterna sandvicensis)* and little tern *(Sterna albifrons)* – are each represented in the Wadden Sea with over one-fourth of their total north-west European populations (RASMUSSEN et al. 2000, Tab. 1.3.2-1). Seven other species – the common shelduck *(Tadorna tadorna)*, palaearctic oystercatcher *(Haematopus ostralegus)*, common redshank *(Tringa totanus)*, black-headed gull *(Larus ridibundus)*, lesser black-backed gull *(Larus fuscus)*, herring gull *(Larus argentatus)* and common tern *(Sterna hirundo)* – each have 5 to 25% of their north-west European populations in the Wadden Sea, meaning that Wadden Sea is a significant area for them (RASMUSSEN et al. 2000, Tab. 1.3.2-1).

In addition, the Wadden Sea is a resting and moulting area for a number of Arctic limicolae and geese that come to it to build up body reserves for migrations between winter quarters on the coasts of west and south Africa and their Arctic breeding areas along the coasts of north-east Canada, Greenland and Siberia (GÜNTHER & RÖSNER 2000, Tab. 1.3.2-2).

PROTECTION FOR THE WADDEN SEA.

INTERNATIONAL CO-OPERATION IN RESEARCH AND EFFORTS TO PROTECT THE WADDEN SEA. Because the Wadden Sea crosses boundaries, because its animal species undertake extensive migrations and because the North Sea's international waters are closely linked with the water systems of the hinterlands in the area, international co-operation is a necessary part of all efforts to protect and study the Wadden Sea. The three countries bordering the Wadden Sea, the Netherlands, Germany and Denmark, have reached agreement on a joint trilateral policy to protect the Wadden Sea. This policy was initiated in 1982 via the "Joint Declaration on the Protection of the Wadden Sea" and then expanded and specified at three government conferences: 1991 (Esbjerg, Denmark), 1994 (Leeuwarden, Netherlands) and 1997 (Stade, Germany). These trilateral efforts to protect the Wadden Sea are based on the following core aspects:

	Date established	Area (hectares)
Schleswig-Holstein Wadden Sea National Park	1 October 1985	441,500
Lower Saxony Wadden Sea National Park	1 January 1986	280,000
Hamburg Wadden Sea National Park	9 April 1990	17,750

Tab.1.3.2-1: Populations of typical breeding bird species in the area subject to the 1996 Trilateral Wadden Sea agreement, in comparison with population estimates for Germany and north-west Europe, and with classification of species' international importance (pursuant to RASMUSSEN et al. 2000; figures are numbers of breeding pairs).
North-west Europe: Belgium, Denmark, Estonia, Finland, France, Germany, Iceland, Ireland, Latvia, Lithuania, Luxembourg, Netherlands, Norway, Poland, Russia (Region of the Bothnian Gulf and Königsberg), Sweden, Switzerland, UK.

International importance:
+++ = over 25% of the north-west European population breeds in the Wadden Sea.
++ = 5-25% of the north-west European population breeds in the Wadden Sea.
+ = 1-5% of the north-west European population breeds in the Wadden Sea.
- = less than 1% of the north-west European population breeds in the Wadden Sea.

Species	Scientific name	Germany	NW Europe	Wadden Sea	Importance	%
Great cormorant	Phalacrocorax carbo	14,473	85.000	838	+	1
White spoonbill	Platalea leucorodia	11	845	592	+++	70
Common shelduck	Tadorna tadorna	3,840-4,270	100,000	4,982	++	5
Common eider	Somateria mollissima	1,305	1,000,000	11,534	+	1
Red-breasted merganser	Mergus serrator	590	330,000	41	-	0
Hen harrier	Circus cyaneus	63	8,900	142	+	2
Palaearctic oystercatcher	Haematopus ostralegus	40,000	235,000	46,360	++	20
Pied avocet	Recurvirostra avosetta	6,000	18,900	10,617	+++	56
Ringed plover	Charadrius hiaticula	1,200	93,000	1,367	+	1
Kentish plover	Charadrius alexandrinus	400	2,000	521	+++	26
Northern lapwing	Vanellus vanellus	80,000-100,000	830,000	11,336	+	1
Dunlin	Calidris alpina schinzii	30	1,000	39	+	4
Ruff	Philomachus pugnax	120-150	79,000	82	-	0
Common snipe	Gallinago gallinago	?	72,000	645	-	1
Black-tailed godwit	Limosa limosa	7,000-8,000	123,000	2,956	+	2
Western curlew	Numenius arquata	4,000-5,000	133,000	632	-	0
Common redshank	Tringa totanus totanus	10,000-12,000	59,000	12,835	++	22
Ruddy turnstone	Arenaria interpres	3	18,000	2	-	0
Mediterranean gull	Larus melanocephalus	20	327	5	+	2
Little gull	Larus minutus	0-2	12,000	2	-	0
Black-headed gull	Larus ridibundus	200,000-250,000	1,700,000	133,182	++	8
Mew gull	Larus canus	15,000	475,000	10,442	+	2
Lesser black-backed gull	Larus fuscus	16,000	215,000	37,294	++	17
Herring gull	Larus argentatus	45,000	685,000	77,250	++	11
Greater black-backed gull	Larus marinus	11	107,000	15	-	0
Gull-billed tern	Sterna nilotica	70	86	86	+++	100
Sandwich tern	Sterna sandvicensis	11,000	63,000	17,285	+++	27
Common tern	Sterna hirundo hirundo	12,000	113,000	13,476	++	12
Arctic tern	Sterna paradisaea	6,300	449,000	8,955	+	2
Little tern	Sterna albifrons	800	3,400	983	+++	29
Short-eared owl	Asio flammeus	200-500	?	114	-	

- Common Principles
- Common Targets
- Trilateral Co-operation Area
- Trilateral Wadden Sea Plan
- Trilateral Monitoring and Assessment Program

The **"Trilateral Monitoring and Assessment Program (TMAP)"** is an important instrument for monitoring the condition of the Wadden Sea ecosystem. Established in 1994, on the basis of existing national monitoring programmes, it provides for co-ordinated monitoring and recording of environmental parameters used to describe the status of the Wadden Sea. The first internationally co-ordinated monitoring projects focussed on populations of breeding and resting birds and populations of harbour seals *(Phoca vitulina)*. During a test phase, a joint methods guide was developed, to ensure the comparability of data collected throughout the Wadden Sea (MARENCIC et al. 1996).

The TMAP Manual, containing detailed descriptions of relevant methods and of requirements for data management (CWSS 2001), is now in place. Monitoring projects are now underway in many different areas. In addition to watching bird and seal populations, monitoring projects are keeping track of breeding rates for coastal birds (THYEN et al. 1998), pollutants in bird eggs and (BECKER et al. 1998) and pollutants in the water and in sediments.

TMAP results are published annually in a special series, "Wadden Sea Ecosystem".

PROTECTION STATUS IN GERMANY. Each of the three German Länder (states) bordering the Wadden Sea, Lower Saxony, Hamburg and Schleswig-Holstein, has established a Wadden Sea national park.

Schleswig-Holstein's national park, Schleswig-Holstein Wadden Sea National Park (Schleswig-Holsteinisches Wattenmeer), was set aside on 1 October 1985. Lower Saxony established its own park, Lower Saxony Wadden Sea National Park (Niedersächsisches Wattenmeer), a short time la-

Tab. 1.3.2-2: Overview of development and size of resting populations of 48 wadden and water fowl in the Schleswig-Holstein Wadden Sea National Park, from 1988 to 1999 and in comparison to the size of the relevant entire populations (pursuant to GÜNTHER & RÖSNER 2000).

Continuation →

Species	Scientific name	Change, 1988-91 to 1996-99	Maximum number, 1988-1999	Populations size	Importance	%
Great crested grebe	Podiceps cristatus	31	570	150,000	-	0,4
Great cormorant	Phalacrocorax carbo	70	3,700	120,000	+	3,1
Grey heron	Ardea cinerea	2	510	450,000	-	0,1
Mute swan	Cygnus olor	38	690	210,000	-	0,3
Greylag goose	Anser anser	64	7,200	120,000	++	6,0
Barnacle goose	Branta leucopsis	24	102,000	267,000	+++	38,2
Brent goose	Branta bernicla	-27	133,000	250,000	+++	53,2
Common shelduck	Tadorna tadorna	-31	211,000	300,000	+++	70,3

Change, 1988-91 to 1996-99: Change in the middle index value between the first and the last third of the study period (value > 15 defined as increase; < 15 defined as decrease). Figures for size of total population pursuant to ROSE & SCOTT (1997) (in some cases, values consist of summed figures for several populations in passage).

International importance:

+++ = over 25% of the total population rests in the Wadden Sea.

++ = 5-25% of the total population rests in the Wadden Sea.

+ = 1-5% of the total population rests in the Wadden Sea.

- = less than 1% of the total population rests in the Wadden Sea.

Species	Scientific name	Change, 1988-91 to 1996-99	Maximum number, 1988-1999	Population size	Importance	%
European wigeon	Anas penelope	-20	160,000	1,250,000	++	12,8
Gadwall	Anas strepera	48	940	25,000	+	3,8
Green-winged teal	Anas crecca	-22	19,400	400,000	+	4,9
Mallard	Anas platyrhynchos	-42	33,300	5,000,000	-	0,7
Northern pintail	Anas acuta	-23	10,400	60,000	++	17,3
Garganey	Anas querquedula	61	170	2,000,000	-	0,0
Northern shoveller	Anas clypeata	0	3,600	40,000	++	9,0
Common pochard	Aythya ferina	39	2,500	350,000	-	0,7
Tufted duck	Aythya fuligula	39	1,700	750,000	-	0,2
Common eider	Somateria mollissima	-22	215,000	1,500,000	++	14,3
Common goldeney	Bucephala clangula	32	1,800	300,000	-	0,6
Red-breasted merganser	Mergus serrator	45	450	100,000	-	0,5
Black coot	Fulica atra	12	4,300	1,500,000	-	0,3
Palaearctic oystercatcher	Haematopus ostralegus	-25	163,000	874,000	++	18,6
Pied avocet	Recurvirostra avosetta	-18	8,500	67,000	++	12,7
Ringed plover	Charadrius hiaticula	24	14,900	242,500	++	6,1
Kentish plover	Charadrius alexandrinus	26	1,040	67,000	+	1,6
European golden plover	Pluvialis apricaria	-15	46,800	1,800,000	+	2,6
Grey plover	Pluvialis squatarola	-11	49,200	168,000	+++	29,3
Northern lapwing	Vanellus vanellus	13	16,900	7,000,000	-	0,2
Red knot	Calidris canutus	-35	296,000	861,000	+++	34,4
Sanderling	Calidris alba	5	27,500	123,000	++	22,4
Curlew sandpiper	Calidris ferruginea	5	19,400	436,000	+	4,4
Dunlin	Calidris alpina	-13	502,000	1,394,000	+++	36,0
Ruff	Philomachus pugnax	-3	12,800	1,000,000	+	1,3
Common snipe	Gallinago gallinago	-34	2,142	20,000,000	-	0,0
Black-tailed godwit	Limosa limosa	21	1,466	350,000	-	0,4
Bar-tailed godwit	Limosa lapponica	-20	158,000	815,000	++	19,4
Western curlew	Numenius arquata	-1	61,200	348,000	++	17,6
Spotted redshank	Tringa erythropus	29	12,400	50,000	++	24,8
Common redshank	Tringa totanus	-7	12,500	286,000	+	4,4
Common greenshank	Tringa nebularia	16	4,596	50,000	++	9,2
Common sandpiper	Tringa hypoleuca	40	460	1,000,000	-	0,0
Ruddy turnstone	Arenaria interpres	-1	3,400	99,000	+	3,4
Little gull	Larus minutus	64	840	75,000	+	1,1
Black-headed gull	Larus ridibundus	5	79,600	5,000,000	+	1,6
Mew gull	Larus canus	6	41,600	1,600,000	+	2,6
Lesser black-backed gull	Larus fuscus	68	3,700	700,000	-	0,5
Herring gull	Larus argentatus	6	56,700	1,400,000	+	4,1
Greater black-backed gull	Larus marinus	-4	3,100	480,000	-	0,6

ter, on 1 January 1986. Finally, Hamburg dedicated its national park, Hamburg Wadden Sea National Park (Hamburgisches Wattenmeer), on 9 April 1990.

The primary protection aim in the national parks is to permit natural processes in the Wadden Sea to take place largely undisturbed by human beings. In addition to protecting such processes, the national parks also seek to enable visitors to experience, understand and share nature in the Wadden Sea (see Chapter 2.3.3.2 regarding the protection aims of national parks).

ECOSYSTEM RESEARCH AS A SCIENTIFIC BASIS FOR THE PROTECTION CONCEPTS OF THE WADDEN SEA NATIONAL PARKS. In 1989, shortly after the founding of the Schleswig-Holstein and Lower Saxony Wadden Sea national parks, interdisciplinary research projects entitled "Wadden Sea ecosystem research" began in both Länder, with joint federal/Länder financing. While these projects were aimed at providing a scientific basis for protection of the Wadden Sea, both had a practical approach, including analysis of human impacts on the ecosystem and preparation of specific proposals for protection of the Wadden Sea.

The projects, part of a networked effort initiated by the Regional Office for the Schleswig-Holstein Wadden Sea National Park, explicitly considered human beings as key factors influencing the area. By gathering socio-economic data and analysing the region's population and economic structures, the projects were able to identify usage conflicts and prepare suitable proposals for solutions. The results entered into a project report (STOCK et al. 1996) that broke new ground in combining scientific findings with proposals for nature conservation and regional development. The report sparked discussion – sometimes very emotional discussion – about the national park's future. In numerous open and closed meetings, the responsible bodies discussed their positions and worked to find solutions.

Barnacle Goose

UNESCO then recognised the research project, on the strength of its approach, as a pioneering pilot project in the framework of the "Man and Biosphere (MAB)" programme.

The research projects currently underway in Schleswig-Holstein's Wadden Sea park include studies of breeding and resting birds, sea ducks, seals, fish, North Sea shrimp, sea grass and macroalgae, mussels, tidal zones, foreland areas and socio-economics. Findings from research and monitoring projects also enter into the TMAP. Similar research projects are also being carried out in Lower Saxony and Hamburg.

PROTECTION ZONES. A key feature of the national parks is a differentiated protection concept that provides for zones with different protection emphases. Areas designated as zone I have top protection priority, while uses by humans are permitted, subject to restrictions, in zones II and III.

The zonation system take into account both the abundance and sensitivity of the natural resources in question as well as the economic and social requirements of residents in the area. The Schleswig-Holstein Wadden Sea National Park is divided into two zones: zone I, the core zone in which uses are prohibited, takes up about one-third of the area (LANDESAMT SCHLESWIG-HOLSTEINISCHES WATTENMEER 2001).

The Lower Saxony Wadden Sea National Park is divided into quiet (I), intermediate (II) and recreation zones (III) (MU NIEDERSACHSEN 2001).

Like the Schleswig-Holstein Wadden Sea National Park, the Hamburg Wadden Sea National Park is divided into two zones, known as "quiet" (I) and "recreation" (II) zones.

PUBLIC-AWARENESS MEASURES. Efforts to enhance public awareness play a central role in the national parks' protection concepts. Such efforts include providing information to the many visitors and tourists who come to the Wadden Sea each year and, especially, making the local population aware of the need for conservation – in order to foster their understanding for the national parks' purposes and for the need to restrict uses. Efforts are made to defuse usage conflicts before the fact, by promoting objective discussion, in order to enhance acceptance for the national parks.

Public-awareness efforts in the Schleswig-Holstein Wadden Sea National Park revolve around the national park centres operated by the national park authority's staff and the "Multimar Wattforum", in Tönning, which opened in 1999 within the "EXPO 2000" framework. With a wide range of exhibits and informational events, held throughout the year, the Multimar Wattforum seeks to communicate, to visitors as well as the local population, the aims and purposes of the national park concept and findings from scientific research on the Wadden Sea ecosystem. The national park centres also serve as stations for the national park service, which was established in 1996. The primary duty of the national park service's full-time staff is to inform the local residents and visitors to the area; they provide a personal link between the national park's administration and the public. Non-government / non-official associations and groups devoted to nature conservation and environmental education in the Wadden Sea area have traditionally carried out many of the public-awareness measures in the national park (cf. Chap. 1.3.1). These organisations' staff and civilian-service personnel (service carried out by young men as alternative to military service) manage numerous exhibits and information centres, offer a broad range of nature walks, lectures and workshops – and thus play an important role in efforts to enhance public awareness about the Schleswig-Holstein Wadden Sea National Park.

Similarly, public-awareness measures in the Lower Saxony Wadden Sea National Park revolve around a total of twelve "national park houses" and three national park centres. Most of these facilities are co-operated by non-official nature conservation and environmental protection groups. The groups' main tasks include holding exhibits and carrying out nature-oriented information events and tours. A special emphasis is placed on involving schools and other educational institutions in public-awareness measures for the national park.

Public-awareness measures for the Hamburg Wadden Sea National Park, the smallest of Germany's three Wadden Sea national parks, are carried out in an information centre on the island of Neuwerk that is operated in co-operation with the Jordsand association.

In all three of the national parks, public-awareness measures include publication of pamphlets and brochures, installation of informative signs and markers, laying out of nature trails in heavily frequented areas and marking of sensitive breeding and resting areas that are closed to visitors (as well as providing relevant information).

Although the Wadden Sea national parks and the ten other German national parks are federally organised, EUROPARC Germany, their parent organisation, works to standardise the appearance of markers, informative signs, logos, etc. in Germany's national parks. The idea behind this effort is that an easily recognised and familiar "corporate identity" can help enhance awareness and acceptance of the national park concept.

1.3.3 Basis for scientific assessment of Germany's SPAs under the EC Bird Directive

The EC Bird Directive obligates the Federal Republic of Germany to take special measures to protect habitats of the Directive's Annex I species that are found in Germany (78 species) as well as habitats of migratory bird species that are not listed in Annex I and that regularly occur in Germany (186 species). Furthermore, protection for migratory birds must emphasise protection of wetlands, especially internationally important wetlands.

The R+D project "Analysis of populations, occurring in Germany, of species listed in Annex I EC Bird Directive and of populations of migratory bird species regularly occurring in Germany; assessment of areas set aside for protection of such species" has been underway since 2000. The aim of this R+D project is to enhance knowledge about populations, distribution and conservation status of Annex I species and of migratory bird species regularly occurring in Germany. The resulting findings will improve our picture of implementation of the EC Bird Directive in Germany.

In a first step, the current situation of all relevant bird species in Germany was determined with regard to population, distribution, conservation status and any range changes. This review took account of the fact that many species – 202 in all – appear both as breeding birds and as passage migrants or wintering birds.

The study is also sifting through past research, in an effort that includes a comprehensive, nation-wide review of the relevant literature. All data items regarding populations of species are referenced and thus remain easily identifiable as to origin.

BREEDING BIRDS. The most current published overview of bird distribution and abundance is the Atlas der Brutvögel Deutschlands (Atlas of German Breeding Birds; RHEINWALD 1993). This atlas covers the 1980s, with an emphasis on 1985. More recent distribution atlases have also been published with regional coverage (usually on a Länder level). All of the distribution figures consist of grid representations of varying degrees of fineness.

The R+D project is drawing on the available literature in an attempt to produce a national overview map for each population, using grids with quadrants finer than 25 x 25 km. For species with more pronounced changes in abundance or distribution, recent reference material will be used to provide the best-possible representation of recent developments.

PASSAGE MIGRANTS AND WINTER GUESTS. Only two of the available atlases cover passage migrants and winter guests: a work from the Rhineland (WINK 1990) and one from Baden-Württemberg (BAUER et al. 1995). For the greater part of Germany, therefore, the relevant literature is being reviewed.

CURRENT POPULATION CONCENTRATIONS IN GERMANY'S NINE MAJOR LANDSCAPE AREAS. Germany can be divided into nine different major landscape areas, each with specific basic ecological conditions, and each with different avifauna. These areas include the North Sea coast, Baltic Sea coast, north-west German lowlands, north-east German lowlands, west-German uplands, east-German uplands, south-west-German uplands and cuesta landscape, Alpine foreland and the Alps (cf. SSYMANK et al. 1998).

The locations in which guest-bird populations are concentrated are being determined for Germany's nine major landscape areas and then represented as grid areas or regions. This is being carried out in accordance with defined criteria, and in terms of percentages of total numbers of passing migrants and resting individuals. The available data on breeding birds does not permit any correlations with major landscape areas. For such birds, therefore, the political boundaries of the Länder are used as a reference base.

DETERMINATION OF THE CONSERVATION STATUS OF RELEVANT BREEDING BIRDS. The conservation status of relevant breeding birds is determined primarily on the basis of the relevant Red Lists; in addition, regional avifauna data is used to analyse the status of relevant population concentrations.

ASSESSMENT OF NATIONAL POPULATIONS. Populations in German breeding areas, as well as populations of birds that pass through or winter in Germany, are assessed in comparison with the relevant European populations and total populations. Such review takes account of species' geographic restrictions, rareness, sensitivity to certain risk factors and dependence on specific habitat characteristics (TUCKER & HEATH 1994).

COMPARISON OF POPULATIONS WITH DESIGNATED PROTECTION AREAS. The designated protection areas are overlaid over the same grid used for the bird data. For each bird species, this technique quickly reveals potential correlations, by showing when populations and protection areas lie within the same grid sectors. On the other hand, it is unfortunately not possible to determine whether the bird populations documented in the literature actually occur within the relevant protection areas. Nonetheless, this method also immediately reveals discrepancies between grid locations of population-concentration areas and protection areas.

In a further step, the potential correlations are reviewed in the light of actual circumstances. To this end, the survey-form data on populations, abundance and conservation status of the relevant bird species is assessed. Any relevant information about area boundaries and biotope types is also taken into account.

ASSESSMENT OF DESIGNATED PROTECTION AREAS. Designation of special protection areas within the framework of the EC Bird Directive, like assessment of such designation in Germany, is the responsibility of the Länder. To determine the "most suitable territories in number and size" pursuant to Art. 4 (1) of the EC Bird Directive, criteria should be used that reflect the following:

- Size and distribution of populations and the relevant trends,
- Biological characteristics of species and populations,
- Distribution of protection areas with respect to locations of populations,
- Size, biotopes and conservation status of habitats in the protection areas.

It must also be remembered that the Länder have often had to orient their practice to areas' existing protection status or to relevant ownership relationships. Furthermore, it would be useful to compare area sizes and relevant applied criteria with those of other EU countries, to obtain an international perspective on designated national protection areas. The R+D project's findings are expected to provide a basis on which the Länder can assess their bird populations and designated protection areas within a European framework.

1.4 CONTRIBUTIONS BY NON-GOVERNMENTAL ORGANISATIONS (NGOS)

Along with the Federal Government and the Länder, many non-governmental organisations support and contribute to implementation of the CMS. The following section presents a selection of efforts to protect migratory animal species, including activities by the European Natural Heritage Fund (EURONATUR), the German Nature Conservation Association (NABU), the Whale and Dolphin Conservation Society (WDCS), the German Hunting Association (Deutscher Jagdschutz-Verband – DJV) and the Umbrella Association of German Avifaunists (Dachverband Deutscher Avifaunisten – DDA). The relevant sections were prepared for this publication by the associations themselves, and they are presented in their original versions as submitted.

Lake Prespa: Lake Prespa – an important habitat for waterbirds, and a successful international conservation project

1.4.1 EURONATUR

INTRODUCTION. Over the past 30 years, the Bonn Convention on the Conservation of Migratory Species of Wild Animals (CMS), along with its subordinate agreements, has contributed substantially to the protection of migratory species of wild animals and their habitats, both in Europe and worldwide. The European Natural Heritage Fund (EURONATUR) publicises and supports this central concern and has committed itself to supporting implementation of this convention. With this in mind, in 1996 EURONATUR awarded its environmental prize to Arnulf Müller-Helmbrecht, CMS Secretary General, for his outstanding efforts on behalf of the convention.

EURONATUR'S CONTRIBUTIONS TO CMS IMPLEMENTATION. EURONATUR was set up in 1987. Under the motto "nature knows no borders", it works on behalf of international nature conservation and trans-boundary co-operation with partner organisations in project areas, efforts that benefit many CMS Annex I species. One example of successful international co-operation was the creation of the Prespa national park in Albania in May 2000, an Albanian-German nature conservation project in which the CMS Secretariat played a decisive role. The project protects migratory animal species, such as waterbirds and bats, in many different ways.

EURONATUR

On the west Saharan Atlantic coast, near Cap Blanc, EURONATUR is working to protect the world's largest colony of the Mediterranean monk seal *(Monachus monachus)*, which is in danger of extinction. Its food supply is threatened by the exploitative fishing methods of international fishing fleets – methods that are allowed to continue, since the coastal section in question is still "no-man's land", politically speaking. EURONATUR has appealed to international monitoring bodies and supported the necessary preparations for an international protection area. Thanks to the commitment of our Spanish partners, the nature conservation organisations Isifer and Fundación CBD-Hábitat, an action plan was developed, within the CMS framework, for protecting the monk seals at Cap Blanc. Morocco has agreed to protect the sea region off the coast and to act against illegal activities of large fishing fleets, while Mauritania is monitoring the land areas of the coast. Local representatives of our Spanish and North-African partners in nature conservation are continually monitoring and protecting the colony, which currently comprises 100 animals (and is slowly growing). As a result of strong population growth in the area, local fishing families have greatly intensified their fishing in recent years – also in waters near the seals' caves. These families are being integrated within the protection concept. In training courses – for example, covering more efficient fishing methods – the fishermen are agreeing to refrain from fishing near the seals' caves. The monk seals profit as conditions for the local residents improve – for example, on the island of Alonnisos, in the Northern Sporades, the Greek national marine park. Fishermen there have agreed to protect the monk seals, and have received exclusive fishing rights in the waters of the Sporades islands in return.

Migratory birds face a wide variety of threats. EURONATUR thus works to protect important resting places of migratory birds, along the various flyways. In co-operation with the German Nature Conservation Association (NABU), it is carrying out an international campaign to promote bird-safe power lines. Each year, thousands of birds are electrocuted by power transmission installations.

The Dalmatian pelican *(Pelecanus crispus)* and the eastern white pelican *(Pelecanus onocrotalus)* are both profiting from trans-boundary expansion of existing protection areas at Lake Mikri Prespa and Lake Megali Prespa, in Albania, Macedonia and Greece. EURONATUR has helped bring about this expansion, in co-operation with the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) and local partners. The world's last remaining breeding colonies of the hermit ibis *(Geronticus eremita)*, located on Morocco's Atlantic coast, are in danger of extinction. For five years, EURONATUR has been supporting efforts to guard and monitor these colonies.

Ferruginous Duck: The ferruginous duck – its survival depends on national and international conservation efforts

To help protect the ferruginous duck *(Aythya nyroca)* in its main areas of concentration in central Europe, Hungary and Croatia, EURONATUR is working to protect extensively managed carp ponds that now serve as breeding sites for some 90% of the remaining ferruginous duck population. Land purchases and land-restoration measures, in a variety of European regions in Hungary, Ukraine, Bulgaria and Spain, are helping to protect habitats of the great bustard *(Otis tarda)*.

EURONATUR'S CONTRIBUTIONS TO THE REGIONAL AGREEMENTS: AGREEMENT ON THE CONSERVATION OF BATS IN EUROPE (EUROBATS). To help protect bats, EURONATUR is co-operating with German, Polish and Czech partners in a trans-boundary project. The participants include the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), the Polish nature conservation organisation "pro Natura", located in Breslau, the regional museum for cultural history in Ceska Lipa (Czech Republic), the Zippelsförde nature conservation station in Brandenburg, the Brandenburg chapter of the German Nature Conservation Association and the bat-banding centre in Dresden.

The objects under protection consist of old bunker systems that are part of the so-called "east wall". These bunkers, which harbour up to 30,000 bats, of 12 different species, are the largest winter roost for bats in northern Europe. They are located under and around the Polish community

Drau:
Drau, the lifeline – with its riparian meadows, it is an indispensable resting area for migratory waterbirds

Photos: EURONATUR/ Schneider-Jacoby

of Nietoporek (English: "bat village"). In addition, on both sides of the German-Polish border (in Brandenburg, Saxony and Mecklenburg, and from Stettin into the Czech Republic), a total of 230 suitable objects have been identified. Banding programmes have revealed that many of the bats come from communities up to 260 km away, in Mecklenburg and Saxony, and from areas even further east, to winter in these objects.

Following inspection and inventory of the objects, eleven of the objects have been structurally stabilised, with funding from the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU). Plans have been prepared for necessary modifications and renovation of an additional 80 or so key objects. Supporting scientific studies, involving bat captures and marking, winter counts, automatic registration of bats' annual and daily activities and study of microclimatic parameters in subterranean objects, have provided important findings about bats' migratory behaviour.

AGREEMENT ON THE CONSERVATION OF AFRICAN-EURASIAN MIGRATORY WATERBIRDS (AEWA). Conservation of large intact wetlands plays an especially important role in protection of waterbird populations in Africa and Eurasia. EURONATUR is helping to protect large suitable wetlands in areas such as the Volga Delta, the Ohrid and Prespa lakes between Greece, Macedonia and Albania and the extensive Narev lowlands in north-east Poland. The two best-conserved riparian areas in the Danube region are of central importance: along the Save river, a total of 112,000 hectares of lands subject to natural flooding regimes have been mapped out as retention areas, in the context of an environmental report prepared for the World Bank by EURONATUR, in co-operation with Croatia's water resources management sector. The areas in question provide natural flood protection to the region. They consist of an extensive mosaic of riparian forests, extensively grazed pastures and ponds, and are home to 80,000 migrating waterbirds, up to 5,000 ferruginous ducks and 50 white-tailed sea eagles *(Haliaeetus albicilla).*

A total of five countries are participating in the project, the largest EURONATUR-supported project for protecting wetlands in central Europe along the Mur, Drau and Danube rivers. In the border regions connecting Austria, Slovenia, Croatia, Hungary and Yugoslavia, EURONATUR has prepared a concept for 200,000-hectare biosphere reserve known as "European Life Line Drava-Mura". Some 80% of the lands required for this reserve are already under protection or are slated for protective set-aside. This riparian area is also of outstanding importance for migratory waterbirds. On the basis of counts in Slovenia, Croatia and Hungary, it is estimated that 250,000 to 500,000 waterbirds use the area, especially for resting along rivers during cold winters.

To help support fulfilment of Germany's obligations under the AEWA action plan, EURONATUR has prepared a protection concept for the red-crested pochard *(Netta rufina)* and the ferruginous duck, and it has collaborated in preparation of the European species action plans for the red-crested pochard, the ferruginous duck and the white-tailed sea eagle. With its experience gained in Germany and in international project areas, EURONATUR has been able to contribute effectively to implementation of the most important AEWA aims.

Further information about EURONATUR's work and about the project areas is available from the following address:

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1.4.2 NABU (German Nature Conservation Association)

The German Nature Conservation Association (Naturschutzbund Deutschland - NABU), founded in 1899 as the "Association for Bird Conservation", is one of Germany's oldest and largest conservation organisations. In co-operation with its Bavarian partner, the State Bird Conservation Association (Landesbund für Vogelschutz - LBV), it represents over 350,000 members. Its central concern is comprehensive environmental protection and conservation, with special emphasis on nature conservation and species protection, public awareness and environmental education. NABU functions on a scientific basis. To support such activities, it has established specialised national committees and working groups, consisting of many co-operating experts who work on a volunteer basis.

As the German partner of BirdLife International, NABU also works internationally. One of the main emphases of its work is protection of migratory animal species. NABU's efforts in this area include establishment of migratory-bird camps, on Malta and Calabria, to combat illegal bird hunting, in close co-operation with local authorities. In central Asia (for example, on Lake Tengiz, Kazakhstan) and Azerbaijan, it supports development of membership-based NGO's and prepares guidelines for set-aside of biosphere reserves. Central Asia is an extremely important hub for bird migration from Siberia to southern areas and for movements of migratory mammals such as the highly endangered Saiga antelope *(Saiga tatarica)*. In keeping with the Bonn Convention on the Conservation of Migratory Species of Wild Animals (CMS), NABU works to protect resting and wintering areas for migratory animal species. In close co-operation with BirdLife International, NABU uses and supports CMS instruments in efforts that include preparing action plans for globally endangered bird species such as the aquatic warbler *(Acrocephalus paludicola)*. State chapters of NABU also maintain many bilateral partner-ships with nature conservation and environmental protection organisations in other countries.

For many years, NABU has worked to protect the white stork *(Ciconia ciconia)*, the animal represented in the association's coat of arms. These efforts recently led to a "Programme for the future of the white stork" (Zukunftsprogramm Weißstorch). This programme represents the first detailed, complete-coverage action plan ever established to protect a bird species in Germany.

Since 2001, NABU has been carrying out two projects in preparation for the 7th Conference of the Parties to the Bonn Convention on the Conservation of Migratory Species of Wild Animals (CMS). These projects are described below.

THE PROJECT "STUDIES OF ELECTROCUTION OF LARGE BIRDS IN CENTRAL AND EASTERN EUROPE, AND DEVELOPMENT OF POTENTIAL SOLUTIONS". Over the past ten years, above-ground networks of outdoor power lines have grown increasingly dense. This trend has been particularly pronounced in central and eastern European countries, and the numbers of inadequately insulated and non-insulated power-line masts have increased considerably. Such masts are a major threat for large birds such as storks and raptors and even for species as small as starlings *(Sturnus Vulgaris)*. Although birds die through direct collisions with electrical power lines, birds with large wingspans are often electrocuted as they land on, or take off from, power masts with lacking or inadequate insulation. What is more, perching birds, simply by stretching their wings, can cause deadly short circuits or – where conducting masts are involved – lethal ground circuits.

World-wide, electrocution is now one of the most frequent causes of death for migratory birds. It threatens ecosystem "flagship species" such as the white stork and black stork *(Ciconia ciconia, C. nigra)*, lesser spotted eagle *(Aquila pomarina)*, greater spotted eagle *(Aquila clanga)*, osprey (*Pandion haliaetus)* and steppe eagle *(Aquila nipalensis)*. What is more, burning birds that fall to the ground sometimes even cause forest fires. This fact adds an economic aspect to the problem's ecological aspects.

NABU's national working group on avian electrocution has been studying this problem intensively since the early 1970s. In many Länder, the situation has been considerably improved through co-operation with power utilities, but problems still remain in Germany, even though the threat can often be eliminated by means of simple, low-cost measures. One result of NABU's efforts has been that the amended version of the Federal Nature Conservation Act (Bundesnaturschutzgesetz) now contains new (and unprecedented) requirements for protection of birds from interaction with outdoor power lines.

Most central and eastern European countries still lack regulations requiring new masts to be bird-safe and existing, potentially dangerous masts and lines to be suitably retrofitted (Germany has had a relevant DIN/VDE regulation since 1985; the CMS Secretariat has long urged its member countries to build only bird-safe power masts and to add protection to dangerous masts). And yet many species have their main ranges or important populations in central and eastern European countries. Most significantly, many migration routes of Eurasian migratory birds are concentrated in central and eastern European regions. These countries thus have special responsibility with regard to pan-European species-protection efforts.

NABU's project, which has been funded by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), has now presented findings from years of research in 21 different countries. The project's extensive data documents a situation that is especially alarming in eastern Europe. High-voltage and medium-voltage power masts of bird-endangering designs are especially widespread in Poland, Estonia, the Czech Republic, Hungary and Slovakia. At the same time, positive examples exist to show that installation of bird-safe systems is already feasible today.

Within the NABU project framework, and under the scientific direction of Dr. Dieter Haas, specific guidelines were developed for effectively reducing the enormous risks with the help of perch-guards and design modifications. The guidelines are oriented both to EU countries and central and eastern European countries, and they have led to specific proposals for resolutions to be taken at the 7th Conference of the Parties on the Bonn Convention on the Conservation of Migratory Species of Wild Animals (CMS). In the coming years, efforts will have to concentrate on implementing these guidelines in as many countries as possible. The aims include: 1. Establishing binding design regulations, for new systems, that minimise the risks for birds, and 2. Moving forward with efforts to disarm "killer masts".

THE "STORK MIGRATION" CO-OPERATION PROJECT. The white stork is considered a key species that can provide indications about the current environmental situation and quality of natural habitats. In addition, it has a popularity unlike that of any other bird; it is widely seen as a symbol of good fortune and mobiliser of goodwill. Consequently, efforts to protect the stork have wide-ranging positive effects – not solely from a scientific perspective – and they generally meet with a receptive, co-operative public.

By migrating over long distances between Germany and their winter habitats in eastern and southern Africa, storks are exposed to a wealth of civilisation-related dangers (dangerous electrical power lines and masts, hunting, poisoning, loss of resting areas, etc.). Efforts to defuse such dangers and to support populations in their breeding, resting and wintering areas can often accomplish much with little – much not only for the stork, but also for many other migratory species.

In 2001, the multimedia project "Stork Migration" was launched to promote trans-boundary measures to protect migratory birds. The project, with which NABU wishes to highlight Germany's global responsibility for protection of migratory animal species, is part of the biodiversity campaign "Life needs diversity" ("Leben braucht Vielfalt"). The partners in the effort include the German Federal Agency for Nature Conservation and meteomedia AG (Jörg Kachelmann).

In summer 2001, six adult storks from the Elbe region were fitted with satellite transmitters and then telemetrically tracked on their east-African migratory route. Their progress, and their positions at all times, were shown continuously in the Internet (www.storchenzug.de). Another highlight was scheduled for their return flight from their winter quarters: for a period of several weeks, the storks' migration was presented live to the German TV audience in the "Wetter im Ersten" (ARD broadcasting network) weather programme. NABU uses such efforts, which mainly have a publicity effect, to call national attention to the global importance of sustainably managing environmental and natural resources. Nonetheless, "Stork Migration" yielded specific new findings about the storks' migratory routes, findings that provide a basis for trans-boundary conservation measures along the flyways between Germany and the birds' African winter homes.

White Stork

The "Stork Migration" project, in which NABU is functioning and co-operating as a national partner of BirdLife International, complements NABU's continuing efforts to protect species in its own country. To date, NABU, its state associations and local groups have purchased, leased or contractually secured over 5,000 protection areas. The NABU foundation "National Natural Heritage" ("Nationales Naturerbe"), established in 1999, works to acquire land on which management and uses can be discontinued, to permit nature to develop in accordance with its own laws.

November 2001
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1.4.3 WDCS (Whale and Dolphin Conservation Society)

"The global voice for protection of whales, dolphins and their habitats"

The Whale and Dolphin Conservation Society (WDCS) is an internationally active, non-profit organisation devoted solely to the protection of whales and dolphins and their habitats. Founded in 1987 in Bath, England, the WDCS opened an office in Germany in March 1999 (it also has offices in Australia and the U.S.). Since the early 1990s, the WDCS has initiated and supported some 100 projects, world-wide, aimed at protecting these fascinating sea mammals and their habitats.

The WDCS has years of experience within the framework of the Bonn Convention on the Conservation of Migratory Species of Wild Animals (CMS) and its regional agreements on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS) and on Conservation of Small Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAnS). This experience plays a useful role in the WDCS' representative roles – for example, in the ASCOBANS advisory committee – and in its efforts to provide and prepare essential information about the global and regional dangers to which whales and dolphins are exposed, including fishing, noise pollution and chemical sea pollution, hunting and other direct killing, habitat destruction and global warming.

Annex II of the CMS includes the North Sea and Baltic Sea populations of the bottlenose dolphin *(Tursiops truncatus)*. In one of its many projects, the WDCS is working to protect the last resident population of bottlenose dolphins in the North Sea – a group of about 130 animals that live predominantly in Moray Firth, a sea arm in north-eastern Scotland, while also roaming over large distances. The project, a long-term research project carried out in co-operation with the University of Aberdeen, is gathering important data for the establishment of a dolphin-conservation area (Special Area of Conservation).

Another cetacean species, the harbour porpoise *(Phocoena phocoena)*, suffers especially greatly under the impacts of fishing. This species is also listed in Annex II of the CMS, and it is also at home in German waters. WDCS is working to eliminate porpoise by-catches (porpoises that die in fishing nets) completely.

Habitat pollution is a threat that does not stop at national boundaries; it threatens migratory whale and dolphin species world-wide. Killer whales *(Orcinus orca)* off the west coasts of Canada and the U.S. are among the most extensively studied whales. Since they are at the upper end of the food chain, their bodies accumulate particularly high concentrations of pollutants that greatly impair their health. By supporting local research projects relative to protection of this population, the WDCS is helping to collect information needed for specific management plans in this region. Similar initiatives are taking place in many other parts of the earth, including efforts to protect freshwater dolphin species in Asia. For example, the habitat of the Ganges river dolphin *(Platanista gangetica)*, also known as the "susu", is gravely threatened by numerous human activities, including chemical pollution, fishing and – above all – construction of dams and power stations.

In addition to supporting scientific research at relevant locations, and lobbying for improved laws to protect cetaceans, the WDCS also is active in the area of environmental education. Co-operation with local residents in project areas always plays a key role – local populations must help formulate and support efforts to protect whales and dolphins, if projects are to be successful and an effective global network for protection of these wonderful animals is to be built.

In one example of WDCS' education projects, in early summer 2001, life-size, inflatable whale and dolphin models, the "whales and dolphins on tour", were taken on a six-week tour of northern Germany. In addition to presenting specific details, such as how beached small whales are rescued, the mobile exhibition gave children, adolescents and many adults a look at the world of whales and dolphins – a world full of fascinating surprises and wonders and, unfortunately, full of dangers.

The many threats to cetaceans are a key reason why the Bonn Convention on the Conservation of Migratory Species of Wild Animals (CMS) is so indispensable. The WDCS will thus continue to work within the CMS framework and to strive for establishment of additional regional agreements to protect migratory whale and dolphin species.

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1.4.4 DJV (German Hunting Association)

Position of the DJV regarding use of migratory bird game species

PRELIMINARY REMARK. The great majority of small game species subject to German hunting law, i.e. all waterbirds and the Eurasian woodcock, are migratory birds. For climatic reasons, the breeding and wintering areas of these birds are often widely separated. For this reason, such species carry out more or less extensive migrations, every spring and fall. Stationary birds, on the other hand, spend the entire year within relatively small areas. This is the only respect in which the two categories of game birds differ.

RESEARCH FINDINGS. Over the past two decades, research into population dynamics and ecological aspects of hunting has made significant progress, especially with regard to migratory birds. Research, now world-wide, of the International Waterbird Research Bureau (IWRB), known since 1996 as Wetlands International (WI), and special internationally co-ordinated research projects have increased our knowledge about the impacts of hunting (summary in KALCHREUTER 2000).

- In general, any vital animal population can be used for hunting, to a certain degree, without any risk of impairing or endangering the population. In this regard, there is no difference between non-migratory deer and the migratory green-winged teal.

- The extensive habitats of migratory birds call for large-scale surveys, such as those carried out for decades by the IWRB/WI. Studies that are solely national or even local can lead to grotesque misassessments of populations' situations. The main breeding areas of nearly all of our waterbirds and woodcocks, for climatic and other ecological reasons, lie in eastern Europe and west Siberia.

During breeding periods, wading birds and waterbirds are distributed over extensive, usually inaccessible areas, and thus they are virtually impossible to count. The WI counts thus take place in mid-winter, when birds gather at west and south European and African water bodies for the winter. Consequently, it would be infeasible to make fall bag limits dependent on results of inventories during breeding seasons, as is occasionally proposed. Even the highly sophisticated waterfowl management methods used in North America no longer include such counts, which formerly were carried out at great expense. Such counts were discontinued when it was realised that populations are limited by factors other than current forms of hunting.

Depending on their breeding success (which usually depends on climate), populations of migratory birds that pass through our country can fluctuate significantly from year to year. Long-term trends thus can be recognised only through study of periods of at least ten years.

The international waterbird counts analysed since 1967 present the following picture (the most recent population figures and relevant trend graphs in DELANY et al. 1999 and KALCHREUTER 2000):

- Populations of most of the 17 duck species that regularly occur in our country, and of the six goose species found here (which breed primarily in the Arctic), have increased – significantly, in some cases. The total number of waterbirds in the west Palaearctic migratory region, which is relevant for Germany, has about doubled since the mid-1970s.

- Similar conclusions can be drawn with regard to German breeding populations. The garganey and the ferruginous duck have decreased in numbers, while populations of the gadwall, red-crested pochard and tufted duck have grown significantly. Over the past century, the tufted duck, common pochard and common goldeneye have continuously expanded their breeding areas into western Europe.

- The primary factor driving this development of resting and breeding populations of ducks was a greater supply of food in moderately eutrophicated water bodies, i.e. water bodies containing organic pollutants.

- Wild geese have also been finding increasingly better grazing conditions as a result of fertilisation of agricultural land they use in winter. The positive population development also resulted from high breeding success during a number of climatically favourable springs in the Arctic – success that, probably, was also due to global warming in general.

Hunting in Germany has never had a noticeable effect on populations of waterbirds, and this is not surprising, given the relatively low intensity of hunting in this country. Waterbirds have thrived regardless of what hunting provisions have been in place.

- The most marked increases in duck populations, especially in populations of "rare species" such as the northern shoveller and the gadwall, occurred at a time when nearly all of the species were still hunted in Germany (prior to 1977).
- Increases in populations of the white-fronted goose and bean goose, which are hunted throughout their entire west Palaearctic range, were similar in extent to those of the brent goose and barnacle goose, which are protected. The same phenomenon also occurred with nearctic goose species, even though hunting intensity in North America is considerably higher than in Germany. The question of whether, and to what extent, increases in white-fronted goose populations in western Europe are due to migratory shifts from east to west is irrelevant in this context. The North American white-fronted goose population has increased its numbers, in spite of intensive hunting and without additional migratory influx, to an extent comparable to the growth in the west Palaearctic white-fronted goose population.
- Conversely, the 1977 ban on hunting during the mating season did not increase numbers of the Eurasian woodcock to the extent expected by bird conservationists. Because it is highly secretive, this species is unknown to most nature lovers. It is thus considered rare or even endangered. In reality, its fall population within its west Palaearctic migratory range, pursuant to the most recent figures presented by ROSE & SCOTT (1997), is on the order of over 15 million woodcocks. Of this number, some 25% are bagged in Europe, while fewer than 0.01% are bagged in Germany. As a result, the woodcock occupies all suitable habitats in Germany, which is located at the edge of its east-European / west-Siberian breeding range. Fluctuations in numbers of bagged birds result primarily from fluctuations in the bird's breeding success in the eastern part of its range.


Barnacle Goose

SUSTAINABLE USE. Hunting of migratory bird species produces prized game. The total value of birds bagged each year is estimated at over four million DM (DJV 2001). According to the latest results of hunting-oriented ecological research, bag rates are within a tolerable range, as is confirmed by population developments for the various relevant species. Hunting of migratory birds must thus be considered a sustainable use of renewable resources. It conforms to the EC Bird Directive, the Ramsar Convention, the Bern Convention, the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA) (under the CMS) and the IUCN resolution on sustainable use of natural assets (IUCN 2000).

Bonn, February 2001

DJV Board

1.4.5. DDA (Umbrella Organisation of German Avifaunists)

MONITORING AND RESEARCH FOR BIRD CONSERVATION. The Dachverband Deutscher Avifaunisten e. V. (DDA) / Umbrella Organisation of German Avifaunists was founded over 30 years ago – on 11 January 1970 – in order to consolidate and represent the interests of Germany's field ornithologists and birdwatchers, including their formal and informal working groups and associations. The need for a national umbrella organisation became especially pressing in the post-war period, as more and more non-governmental organisations (NGOs) for ornithology were established at the Länder level (mirroring the fact that Germany's Länder are responsible for nature conservation enforcement and practice, in keeping with Germany's federal structure). These organisations, which still collect the majority of all ornithological data, in co-operation with state bird stations (Satellite Vogelschutzwarten) and other specialised Länder authorities, required an umbrella association that could organise and strengthen ornithological and bird-conservation efforts at the national level.

A decisive "quantum leap" was made upon German reunification in 1990. Ornithological organisations in the former German Democratic Republic sought a new contact in western Germany, and the DDA responded by offering to extend its own regional-level structures to the new Länder. Beginning in 1990, relevant Länder organisations were founded throughout the new German Länder, and these organisations found a national home in the DDA. This made it possible to expand the DDA's long-term projects seamlessly to the east (also because these projects fit well with a number of programmes already in place there). Currently, the DDA represents **44 organisations**, with a combined total membership of **about 9,000 people**.

As the DDA's own tasks became more and more complex, it became even clearer that responsible, forward-looking nature conservation and bird protection requires a solid scientific basis that covers the overall habitats of the individual species concerned. Where migratory species are concerned, such a basis must have a national or even international perspective. In the late 1970s, the DDA and its member associations thus took the logical step of engaging in international co-operation, especially by providing scientific support within the framework of international conventions and directives (Ramsar Convention, CMS, Bern Convention and EC Bird Directive).

THE DDA'S ACTIVITIES AND PROGRAMMES FOR PROTECTION OF MIGRATORY BIRD SPECIES. Soon after it was founded, the DDA joined the "German Section of the International Council for Bird Protection ("Deutsche Sektion des Internationalen Rates für Vogelschutz" - DS/IRV), which was then renamed the "German Council for Bird Protection" ("Deutscher Rat für Vogelschutz" - DRV) when the ICBP was reorganised as BirdLife International. For the DS/IRV, the DDA prepared the scientific basis for the first

Red List of Endangered German Breeding Birds (Rote Liste der in Deutschland gefährdeten Brutvogelarten - DS/IRV 1971). It is still a member of the national Red List body, and it has directorial responsibility – in close co-operation with the state bird stations of the German Länder – for collection of data on population sizes and trends for all breeding bird species. The Red List body has also initiated discussion about preparation of a **Red List of endangered migratory bird species**; these efforts are still in an early phase.

The DDA's scientific support within the Red List framework draws on two national monitoring programmes that the DDA carries out under its own responsibility: **the DDA monitoring programmes for common** (SCHWARZ & FLADE 2000) **and rare breeding bird species** (MÄDLOW & MODEL 2000). Monitoring of rare breeding bird species, in particular, provides regionalised population data, at the Länder level, for nearly all endangered waterbird species that fall under the protection of the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA). In past years, programmes have also been carried out to monitor selected bird species (varying from year to year) – such as the red kit *(Milvus milvus)* in 2000 and the great crested grebe *(Podiceps cristatus)* in 2001, both of which were named "bird of the year" by the German Nature Conservation Association (NABU) and the Bavarian State Bird Conservation Association (Landesbund für Vogelschutz Bayern - LBV).

In addition, the DDA and its member associations have provided key scientific avifaunal data, to German BirdLife partners (NABU and LBV), for preparation of the German list of **Important Bird Areas**. At least one-third of German IBA are nationally or internationally important resting sites for waterbirds and meet the criteria of the Ramsar Convention (BIRDLIFE INTERNATIONAL 2001) or of the AEWA.

The DDA has also successfully pursued its statutory objectives at the European and international levels. For example, it played a decisive role in the founding of the **"European Bird Census Council"** (EBCC), which is a European mirror image of the DDA in terms of its tasks and aims: the EBCC co-ordinates monitoring projects in Europe, in order to enhance understanding of national findings and to improve the interrelationships between projects. Since the EBCC's founding, the DDA has been its German representative and member. One milestone in relevant work at the European level has been the European Atlas of Breeding Birds (HAGEMEIJER & BLAIR 1997).

The national German counterpart to this work, the **Atlas der Verbreitung und Häufigkeit der Brutvögel Deutschlands** (Atlas of the Distribution and Abundance of German Breeding Birds - RHEINWALD 1993), was published in 1993 – i.e. just a few years after German reunification. A new atlas project is now in the design and development phase: a current picture of the distribution of breeding bird species, on the basis of quantitative data, designed to overlay with databases for other ecological parameters, to enhance study of nature-conservation and bird-protection issues. This atlas could appear at the end of the 1st decade of the 21st century – if the necessary financing is obtained. Ornithological associations active at the national level have submitted a joint application, to the German Federal Agency for Nature Conservation, for funding for a preliminary scientific study (selection of sampling areas, determination of representative nature) that would begin the project.

The "**Centre for Waterbird Research and Wetlands Protection in Germany"** (Zentrale für Wasservogelforschung und Feuchtgebietsschutz in Deutschland" - ZWFD), which is housed within the DDA, provides the official **NGO delegate to Wetlands International**, a globally active organisation that scientifically advises many international bodies in fulfilment of their wetlands-protection tasks, including protection of their flora and fauna. Wetlands International's core tasks include co-ordinating the **"International Waterbird Census"**, the national execution of which is the ZWFD's responsibility. The ZWFD resulted from a merger of the "Rieselfelder Münster" biological stations, the "Biological Station in the Wesel District" (Biologische Station im Kreis Wesel) and the eastern German "Support association for waterbird ecology and wetlands protection" ("Förderverein für Wasservogelökologie und Feuchtgebietsschutz") in Buckow/ Brandenburg. Together, the three institutions co-ordinate national counts of waterbirds and geese. The results of such counts are used to fulfil German reporting requirements in connection with the Ramsar Convention, CMS (including AEWA) and the EC Bird Directive (SUDFELDT et al. 2000).

PROBLEMS AND PERSPECTIVES AT THE NATIONAL LEVEL. The DDA's achilles heel is the low level of funding it has as a central organisation. Its members' dues do not cover the cost of separate projects or monitoring programmes. For this reason, the DDA must rely on external support – for example, public-sector funding for specific projects. Since the DDA and its member associations collect data (largely through volunteer work) that the German government is required to report, in the framework of the directives, agreements and conventions it has signed, efforts are currently being made to obtain permanent financial support for at least the organisation's co-ordinative work. The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) has commissioned the ZWFD to carry out a research and development project that is scheduled to begin in mid-2002 and is aimed at making the waterbird counts a permanent institution in the medium term. This project could be an important step in toward permanent monitoring of the natural environment and its valuable assets (areas, endangered bird species), as required by CMS, AEWA, the EC Bird Directive and German specialised authorities. Over the past three years, smaller assessments and compilations by the organisation have received federal funding from the German Federal Agency for Nature Conservation, especially for regular reporting to Wetlands International, in the framework of the International Waterbird Census.

ACTIVITIES OF DDA MEMBER ASSOCIATIONS TO PROTECT MIGRATORY BIRD SPECIES. Finally, we also wish to mention the DDA member associations' many activities to protect migratory bird species. Most of these activities involve bilateral or multilateral co-operation to protect internationally important bird protection areas, or to protect individual, highly endangered waterbird species. Table 1.4.5-1 provides an exemplary – since it is surely incomplete – overview:

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Tab. 1.4.5-1: Activities of DDA member associations

DDA member association	Co-operation partner(s)	Project
Arbeitsgemeinschaft Berlin-Brandenburgischer Ornithologen (ornithologists' working group in Berlin-Brandenburg) and NABU BB	About 12 German and international project partners	Wader Wetlands Inland (project partners in Poland, Belarus and Ukraine)
"Rieselfelder Münster" Biological Station	North Rhine-Westphalian Ministry for Environment and Nature Conservation, Agriculture and Consumer Protection; Friedrich Ebert Foundation; NP Djoudj	Support and management measures in the Djoudj National Park / Senegal
"Rieselfelder Münster" Biological Station	Zoologische Gesellschaft Frankfurt	Kamanos Reservation/Lithuania
"Rieselfelder Münster" Biological Station	Societatea Ornitologica Romana; Danube-Delta Research and Design Institute	Systematic studies on waterbird and wading bird migration in the Razim-Sinoie lagoon area in the Danube Delta World Natural Heritage area
Biological Station in the Wesel District (Kreis Wesel)	Christian and Paola Moullec (France), Dr. Lambart von Essen (Sweden), Dr. Wolfgang Scholze (environmental representative of the Deutsche Aero Club)	Project to protect the lesser white-fronted goose
Biological Station in the Wesel District	Institute for ecology and evolution of the Russian Academy of Sciences, Russian banding centre	English-language overview of Russian literature on waterbirds
Biological Station in the Wesel District	French nature conservation ministry; "Le Balkan", a French-Bulgarian foundation	Visitor and research centre in the "Dourankoulak Lake" Ramsar area
Ornithologische Arbeitsgemeinschaft für Schleswig-Holstein und Hamburg (ornithological working for Schleswig-Holstein and Hamburg)	FTZ Büsum, University of Kiel, University of HH, BfN, UBA, EU	Seabirds at sea

2 Conservation status and protecting measures of CMS-protected species native to Germany

Sea Eagle

2.1 Conservation status of CMS-protected species native to Germany, and related measures

This section describes the conservation status of all animal species that are protected by the Bonn Convention on the Conservation of Migratory Species of Wild Animals (CMS) and that are native to Germany. It also describes the relevant legal provisions for their protection and relevant practical protection measures.

The description begins with the following bird species that are listed in Annex I CMS and that are to be strictly protected: white-tailed sea eagle, great bustard, ferruginous duck, aquatic warbler.

A description is then provided of the situation of migratory animal species listed in Annex II and for which, pursuant to Article IV of the CMS, regional agreements are to be concluded. The species covered by existing regional agreements (Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA), Agreement on the Conservation of Bats in Europe (EUROBATS), Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS), Agreement on the Conservation of Seals in the Wadden Sea) are summarised. Section 3 then describes the conservation status of Annex II species for which no regional agreement is yet in force.

The descriptions are structured in keeping with the format prescribed, by the CMS or the regional agreements, for the various relevant reports.

2.1.1 White-tailed sea eagle *(Haliaeetus albicilla)*

The conservation situation of the white-tailed sea eagle is described comprehensively in Chapter 1.1; the reader's attention is called to that section. For the sake of completeness, this section outlines, in keeping with the CMS reporting format, the measures taken to protect the white-tailed sea eagle.

DISTRIBUTION IN GERMANY.

SUMMARISE INFORMATION ON POPULATION SIZE, TRENDS AND DISTRIBUTION (IF KNOWN). IF POSSIBLE, PROVIDE RELEVANT DATA SHOWING EARLIER AND CURRENT SIZE. The white-tailed sea eagle breeds in the German Länder Schleswig-Holstein, Mecklenburg-West Pomerania, Hamburg, Lower Saxony, Saxony-Anhalt, Brandenburg, Saxony, Thuringia and Bavaria.

Following a decline in the population of the white-tailed sea eagle in the mid-19th century, as a result of hunting and, later, of pesticide use (DDT), the population increased again toward the end of the 20th century (see Chapter 1.1).

The German Länder with the densest populations of white-tailed sea eagle are Mecklenburg-West Pomerania and Brandenburg. A total of 321 pairs bred in Germany in 2000.

Tab. 2.1.1-1: Options for protecting nest locations in the Länder, as set forth by the relevant Länder nature conservation acts

Land	Relevant provisions for nest protection in the various state nature conservation acts
Schleswig-Holstein	Art. 25 Special protection provisions: empowerment of the supreme nature conservation authority to carry out special protection and management measures and to prohibit certain actions.
Mecklenburg-West Pomerania	Art. 36 Special species protection, nest protection zones: establishment of nest protection zones by the supreme nature conservation authority: In Zone I (within a radius of 100 m around the nest), forest management work or any changes to the area are prohibited. In Zone II (within a radius of 100 to 300 m), agricultural, silvicultural and fishing-related measures are prohibited from 1 March to 31 August. Hunting is prohibited in both protection zones from March to August.
Lower Saxony	Art. 41 Protection directive: in certain areas, the supreme nature conservation authority may take provisions to protect endangered species, for limited periods of time. It can also prohibit actions planned by the owners of such areas.
Brandenburg	Art. 33 Nest locations: prohibition of changes within a radius of 100 m and prohibition of mechanised agriculture and silviculture from 1 March to 31 August, within a radius of 100 to 300 m. In addition, no hunting facilities may be built or used within a radius of 500 m. An option for expansion of zones applies.
Saxony-Anhalt	Art. 31 Special protection directives: the nature conservation authority may prohibit actions in certain areas and for certain periods of time (also can apply to affected owners).
Thuringia	Art. 28 Protection of wild plants and animals (4): the lower nature conservation authority may, in individual cases and for limited periods of time, issue directives requiring protection of breeding sites and habitats from disturbances.
Saxony	Art. 25 Protection and care of wild plant and animal species: nature conservation authorities are empowered to take special measures to protect breeding sites, for limited periods of time.
Bavaria	Art. 18 Empowerment of the supreme nature conservation authority: the supreme nature conservation authority can take measures to protect especially protected species.

Sea Eagle

MEASURES TAKEN IN KEEPING WITH ART. III (4), INCLUDING: CONSERVATION AND RESTORATION OF HABITATS, ELIMINATION OF OBSTACLES THAT PREVENT MIGRATION AND ELIMINATION OF FACTORS THAT ARE ENDANGERING THE SPECIES.

No special action plan to protect the white-tailed sea eagle has been prepared. However, this species is the focus of extensive conservation efforts in the Länder (see also Chap. 1.1). Special measures taken to protect the white-tailed sea eagle include protection of sensitive nesting areas. These efforts are backed by legal provisions (Tab. 2.1.1-1).

In Schleswig-Holstein, a total of some 200 volunteers work each year to protect the white-tailed sea eagle. The nests are monitored by a network of regional nest monitors. Throughout all of Germany, some 400 persons are active in protection of the white-tailed sea eagle (STRUWE-JUHL in lit. 2001).

MEASURES TAKEN IN KEEPING WITH ART. III (5), INCLUDING: PROHIBITION OF TAKING (LEGAL MEASURES) AND EXCEPTIONS (REASONS FOR EXCEPTIONS, DURATION OF EXCEPTIONS, LEGAL BASES, STATISTICS).

The white-tailed sea eagle is an animal species that is strictly protected under nature conservation law. It is also subject to German hunting law. Since no hunting season has been defined, this species may not be hunted at any time during the year. In addition to these prohibitions of taking and killing, the bird is also protected by prohibitions of disturbances, possession and sale, pursuant to nature conservation and hunting law. Violations of these provisions are either crimes or administrative offences. This species is thus subject to more extensive provision in Germany than the protection provided by provisions of Art. III No. 5 of CMS.

Exceptions are allowed for removal of dead birds for scientific purposes.

It is not known to what extent any licensed hunters have removed and made use of white-tailed sea eagles they have found dead.

2.1.2 Great bustard *(Otis tarda)*

DISTRIBUTION IN GERMANY.
In Germany, remaining populations of the great bustard are found only in the German Länder of Brandenburg and Saxony-Anhalt (LITZBARSKI & LITZBARSKI 1996). In Saxony-Anhalt, the remaining populations are found in the "Zerbster Land" EU special protection areas for birds, in the Anhalt-Zerbst rural district, and in the Fiener Bruch area, which is located south of Genthin and extends toward Brandenburg. Individuals are found occasionally in the Magdeburger Börde area and in the Trüben area (east of Stendal) (DORNBUSCH 1996).

The state of Brandenburg harbours two important great bustard populations – in the Havelländisches Luch and Belziger Landschaftswiesen areas. Apart from these important areas, individuals turn up occasionally in a few other areas.

The Havelländisches Luch nature area has the largest, and most densely populated (i.e. by the bird) great bustard area in Germany. In 1999, a total of 29 great bustards (nine males and 20 females) were counted there (RYSLAVY 2001).

Another important area for the great bustard is located about 45 km south of the Havelländisches Luch area, bordering the Hoher Fläming area, in south-west Brandenburg and in the lowland of the Baruther Urstromtal. In this area, which is know as the "Belziger Landschaftswiesen", a total of 26 great bustards (seven males and 19 females) were counted in 1999 (RYSLAVY 2001).

The above-mentioned Fiener Bruch area, in which five hens were counted in 1999, is located about 30 km west of the Belziger Landschaftswiesen. To mate, the Fiener Bruch hens enter the Belziger Landschaftswiesen area. They then return to the Fiener Bruch to raise their young (RYSLAVY 2001).

Apart from these areas in which the great bustard is a permanent resident, Brandenburg has five other areas in which the great bustard is occasionally found, in groups of fewer than five birds.

SUMMARISE INFORMATION ON POPULATION SIZE, TRENDS AND DISTRIBUTION. IF POSSIBLE, PROVIDE RELEVANT DATA SHOWING EARLIER AND CURRENT SIZE. As a result of clearing of forests and expansion of agriculture in the Middle Ages, the great bustard became a resident of cultural landscapes (BERTHOLD 1990). In the 18th century, it was found throughout farmlands, and it was so common that it caused crop damage (KLAFS 1965).
The population of the great bustard began to decline in 1850. By the late 1930s and early 1940s, the population in the north-east German low plain had fallen to about 4,000 great bustards (LITZBARSKI & LITZBARSKI 1996). Tab. 2.1.2.-1 lists the reliable counts of great bustard that have been conducted in Germany since 1960.

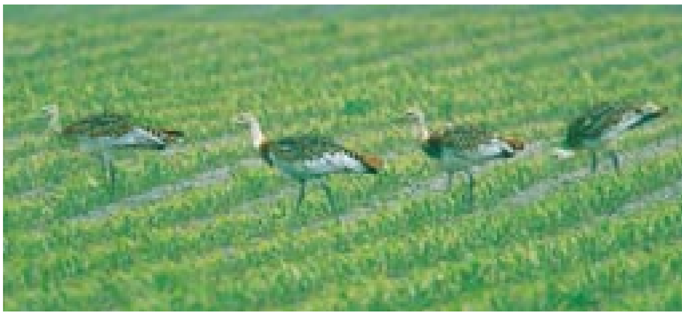
Great Bustards

Tab. 2.1.2-1: Population of the great bustard in Germany (from DORNBUSCH 1983, NICOLAI 1993 and supplemented by LITZBARSKI & LITZBARSKI 1996, Environment Authority (Landesumweltamt) of the State of Brandenburg – State Bird Station in lit. 2001 and Ministry for Physical Planning, Agriculture and the Environment of the State of Saxony-Anhalt in lit. 2001).

Year	Population (Individuals)
1960	1200
1970	950
1975	850
1980	560
1985	350
1990	220
1995	90-100
2000	82

Figure 2.1.2-1 shows how the great bustard population continued to shrink in Brandenburg into the 1990s. The population did not begin to recover – slowly – until 1998.

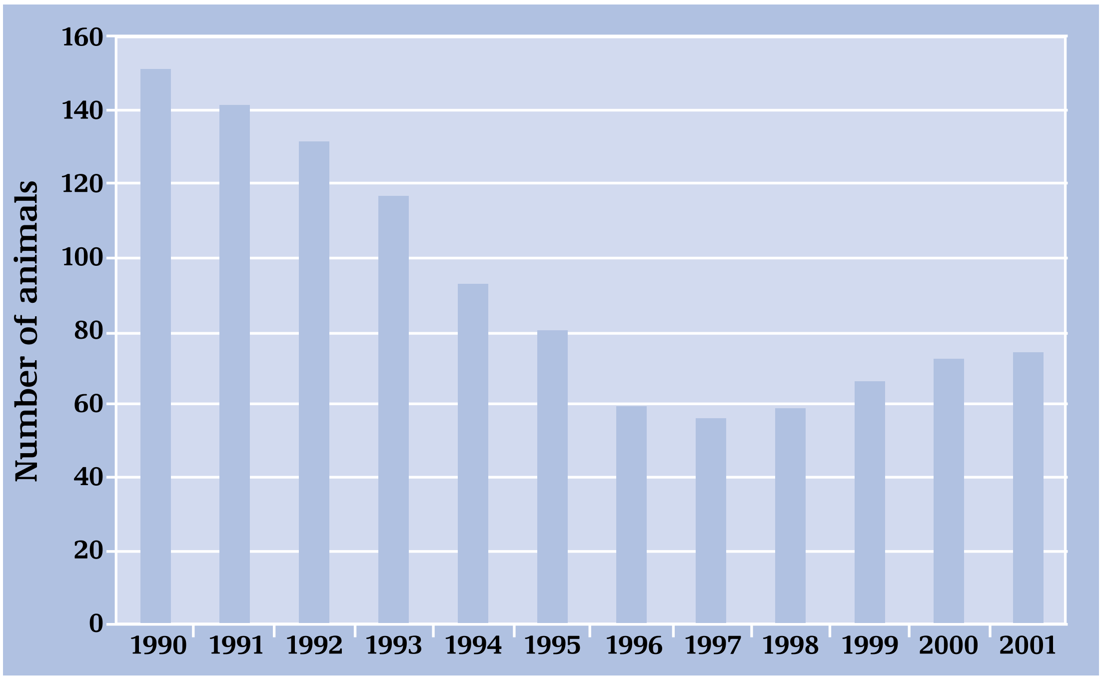
REASONS FOR THE SPECIES' DECLINE. In Germany, the great bustard requires habitats with cultivated land (LITZBARSKI & LITZBARSKI 1996). In the mid-19th century, traditional "three-field" rotation farming systems were abandoned as artificial fertiliser was introduced (GEORGE 1996). As a result, fallow fields, valuable breeding areas for the great bustard, were no longer available to the bird. In addition, potential breeding habitats on poorer soils were lost through planting of pine and spruce forests.



Great Bustards

Increasing agricultural mechanisation inflicted high rates of brood loss on the great bustard. After World War II, diversity of field flora and fauna decreased as a result of widespread pesticide use, and thus great bustards lacked the protein-rich food (arthropods) they needed to raise their young (LITZBARSKI & LITZBARSKI 1996).

Fig. 2.1.2-1: Development of populations of the great bustard in Brandenburg (pursuant to Environment Authority (Landesumweltamt) of the State of Brandenburg – State Bird Station in lit. 2001).



The most significant threat to remaining populations is predation by predatory mammals (such as foxes).

MEASURES TAKEN IN KEEPING WITH ART. III (4), INCLUDING: CONSERVATION AND RESTORATION OF HABITATS, ELIMINATION OF OBSTACLES THAT PREVENT MIGRATION AND ELIMINATION OF FACTORS THAT ARE ENDANGERING THE SPECIES. In Brandenburg, measures taken to protect the great bustard are concentrated on the two areas with the densest bustard populations.

In both the Havelländisches Luch and Belziger Landschaftswiesen areas, conservation measures are co-ordinated by Brandenburg's state bird station (Staatliche Vogelschutzwarte) and its extension.

Via a programme for breeding bustards in captivity, an attempt is being made to maintain and enlarge the great bustard population. The eggs for the programme are obtained from nests of wild hens and then hatched in incubators. The hens respond to their loss by producing second broods, which they then raise in the wild. Eggs have been artificially incubated in the Buckow bird station since 1979. As of 1995, that station had released a total of 270 great bustards into the wild (LITZBARSKI & LITZBARSKI 1996).

In addition to this breeding and release programme, an attempt is being made to improve the great bustard's habitat to such an extent that the birds can raise their young in the wild. This involves farming the fields in such a way that the birds have enough protein-rich food for their young (avoidance of pesticides). Another important aspect of great-bustard protection is to conserve open, large agricultural landscapes.

Releases of bustards raised in captivity have been complemented by construction of enclosures that protect the bustards from predatory mammals. These enclosures are now also being used successfully by naturally breeding bustards.

In Saxony-Anhalt, areas occupied by bustards are directly managed and protected by a conservation official. As in Brandenburg, the birds' breeding areas are kept largely free of disturbances by means of enclosures. In addition to the erection of a fox-proof fence around a 10 hectare section of the Fiener Bruch area, farming-related work in the vicinity has been reduced to the necessary minimum. Cultivation of lucernes, which benefits great bustards, has been introduced in some areas.

MEASURES TO PREVENT IMPAIRMENTS OF GREAT BUSTARD POPULATIONS RESULTING FROM CONSTRUCTION AND USE OF THE HIGH-SPEED RAILWAY LINE THROUGH THE HAVELLÄNDISCHES LUCH AREA. Prior to German reunification, the two former German states concluded an agreement calling for the single-track railway line through the Havelländisches Luch area, a section of the

Tab. 2.1.2-2: Population of the great bustard in Saxony-Anhalt (pursuant to Ministry for Physical Planning, Agriculture and the Environment of the State of Saxony-Anhalt in lit. 2001).

Year	1997	1998	1999	2000	2001
Individuals	15	10	10	10	10

Hanover – Berlin line, to be expanded into an electrified, high-speed line with two tracks (SCHÖPS 2000). This agreement was then set forth in detail in the "German unification traffic plan" ("Verkehrsplan deutsche Einheit").

There was concern that great bustards would be particularly prone to lethal interactions with the power lines for the railway and would suffer other impairments through the railway's construction and operation. The German Nature Conservation Association (NABU) prepared a 19-point catalogue that became an important aspect of negotiations between German Railways (Deutsche Bahn), Brandenburg's Ministry for the Environment and various nature conservation organisations. The catalogue then accepted by German Railways provided for the following:

1. Appointment of a conservation expert to provide consultation in connection with the construction (this expert also would provide input during the planning phase);

2. No construction would take place during the night,

3. All construction would stop during the great bustard's mating period, from 1 March and 31 August,

4. Construction of five-meter embankments, covered with vegetation (bustard-protection embankments), on both sides of the railway line,

5. Planting of trees at least seven meters tall, along with small bushes, as over flight aids at three ditch sections at which the embankment had to be interrupted.

The threats to the birds resulting from construction of the ICE line were successfully reduced, as called for in the great-bustard action plan.

MEASURES TAKEN IN KEEPING WITH ART. III (5), TAKING OF ANIMALS, INCLUDING: PROHIBITION OF TAKING (LEGAL MEASURES) AND EXCEPTIONS (REASONS FOR EXCEPTIONS, DURATION OF EXCEPTIONS, LEGAL BASES, STATISTICS). The great bustard is an animal species that is strictly protected under nature conservation law. It is also subject to German hunting law. Since no hunting season has been defined, this species may not be hunted at any time during the year. In addition to these prohibitions of taking and killing, the bird is also protected by prohibitions of disturbances, possession and sale, pursuant to nature conservation and hunting law. Violations of these provisions are either crimes or administrative offences. This species is thus subject to more extensive provision in Germany than the protection provided by provisions of Art. III No. 5 of CMS.

No exceptions pursuant to Article III (5) were permitted within the reference period 1999 to 2001.

2.1.3 Ferruginous duck *(Aythya nyroca)*

DISTRIBUTION IN GERMANY.

SUMMARISE INFORMATION ON POPULATION SIZE, TRENDS AND DISTRIBUTION. IF POSSIBLE, PROVIDE RELEVANT DATA SHOWING EARLIER AND CURRENT SIZE.

In the mid-19th century, the ferruginous duck was found to have expanded its range beyond its main range areas in eastern and south-eastern Europe (BAUER & GLUTZ VON BLOTZHEIM 1969). For decades after this expansion, the ferruginous duck remained widespread throughout Germany (BAUER & BERTHOLD 1996). Its most important range areas were in eastern Germany. The ferruginous duck was a common breeding bird in the Niederlausitz and Oberlausitz areas and in the Oder estuary (BAUER & GLUTZ VON BLOTZHEIM 1969).

Another population was located in the south-east, in the middle Franconian lake district. The ferruginous duck was still a common breeding bird there in the early part of the 20th century. By 1953, the population in this area had dwindled to five breeding pairs, however. Ten years later, in 1963, the ferruginous duck had disappeared from the area (WÜST 1990).

Another breeding population was found in the Riddagshäuser Teiche area, near Braunschweig (BAUER & GLUTZ VON BLOTZHEIM 1969). According to SCHERNER (1981), this population died out prior to 1925.

In addition, the ferruginous duck was seldom seen as a breeding bird in western Germany (BAUER & GLUTZ VON BLOTZHEIM 1969).

Also in the Lausitz area, where the ferruginous duck was one of the most common duck species in the early 20th century (TOBIAS, cit. in RUTSCHKE 1983), the bird's population decreased until the 1970s (KRÜGER 1987). The breeding population between 1960 and 1973 was about 10-15 breeding pairs. This population disappeared as of 1976. In the Hoyerswerda area, the ferruginous duck died out 10 years later, in 1986 (KRÜGER 1987).

According to RUTSCHKE (1983), no ferruginous duck broods were observed after 1970 in northern Brandenburg. The bird had also disappeared from Mecklenburg-West Pomerania by the 1980s (KLAFS & STÜBS 1987).

One of the last reported sightings of breeding ferruginous ducks in the Lake Constance area dates from 1979 (SCHUSTER et al. 1983).

On the other hand, new sightings have been reported time and again. In 1995, a ferruginous duck brood was sighted at Lake Constance (Mettnau) (SCHNEIDER-JACOBY 1999) – the first such sighting since 1979.

The ferruginous duck was sighted as a breeding bird in 1999 and 2000 in Brandenburg and Saxony, in the Niederlausitz area (REUSSE et al. 2001). Whereas in 1999 only one brood was observed in Brandenburg, in the following year two additional broods were sighted on Saxony's side of the border. In Saxony-Anhalt, territorial pairs were sighted in 1997 and 1999, in the area of the Flusslandschaft Elbe biosphere reserve (in lit. 2001).

The ferruginous duck occurs only sporadically in Germany as a migratory bird. Migratory ferruginous ducks can be seen only in the Lake Constance area, in August and September. According to SCHNEIDER-JACOBY (1999), since 1993, up to 20 individuals have come to Mindelsee lake each year to moult their wing feathers.

REASONS FOR THE POPULATION'S DECLINE. In Germany (especially in the Lausitz area and in the middle Franconian lake district), the ferruginous duck bred primarily in areas with vegetation-rich fish ponds. In the 1970s, when many ponds were already intensively managed, even more intensive methods of pond management were introduced, so HABERMEIER (1997). This development was compounded by the EC's pond-construction programme (Entlandungs- und Teichbauprogramm), which also further intensified pond management (JODL 1991). As part of such management, smaller, overgrown ponds were enlarged and scraped, and fish populations were enlarged. What is more, ponds and other water bodies began to undergo eutrophication from influx of airborne nutrients. This reduced the diversity of water vegetation, eliminating even more breeding areas for the ferruginous duck (HECKER 1994). At a conference for implementation of AEWA, SCHNEIDER-JACOBY (2000) presented a detailed analysis of the situation of the ferruginous duck.

MEASURES TAKEN IN KEEPING WITH ART. III (4), INCLUDING: CONSERVATION AND RESTORATION OF HABITATS, ELIMINATION OF OBSTACLES THAT PREVENT MIGRATION AND ELIMINATION OF FACTORS THAT ARE ENDANGERING THE SPECIES. The various populations in Saxony are being supported and their breeding sites are being protected. Several German Länder have set aside special protection areas, pursuant to the European Bird Directive (79/409/EEC), for the ferruginous duck.

MEASURES TAKEN IN KEEPING WITH ART. III (5), TAKING OF ANIMALS, INCLUDING: PROHIBITION OF TAKING (LEGAL MEASURES) AND EXCEPTIONS (REASONS FOR EXCEPTIONS, DURATION OF EXCEPTIONS, LEGAL BASES, STATISTICS). The ferruginous duck is an animal species that is strictly protected under nature conservation law. It is also subject to German hunting law. Since no hunting season has been defined, this species may not be hunted at any time during the year. In addition to these prohibitions of taking and killing, the bird is also protected by prohibitions of disturbances, possession and sale, pursuant to nature conservation and hunting law. Violations of these provisions are either crimes or administrative offences. This species is thus subject to more extensive provision in Germany than the protection provided by provisions of Art. III No. 5 of CMS.

No exceptions pursuant to Article III (5) were permitted within the reference period 1999 to 2001.

2.1.4 Aquatic warbler

(Acrocephalus paludicola)

Aquatic Warbler

DISTRIBUTION IN GERMANY.
In Germany, the aquatic warbler now breeds only in the Unteres Odertal area, in the state of Brandenburg (RYSLAVY 2001). These birds are part of a population that includes about 300 singing males and that breeds near Szczecin/Poland (FLADE, orally reported). The nearest other area populated by the bird is the Biebrza lowlands area in east Poland.

Outside of the Unteres Odertal area, a few appearances of the bird have been documented during migration periods – usually through capture of banded individuals – in lowland areas of the Havel (Rietzer See), Spree (Alte Spreemündung) and Ucker (Uckersee) rivers (MINISTERIUM FÜR LANDWIRTSCHAFT, UMWELTSCHUTZ UND RAUMORDNUNG BRANDENBURG in lit. 2002).

SUMMARISE INFORMATION ON POPULATION SIZE, TRENDS AND DISTRIBUTION. IF POSSIBLE, PROVIDE RELEVANT DATA SHOWING EARLIER AND CURRENT SIZE.
The aquatic warbler was also found throughout western Europe until the 1930s (SCHÄFFER & SCHÄFFER 1999). Even during the time of the bird's largest distribution, its occupied range was considerably fragmented, however.

WAWRZYNIAK & SOHNS (1977) provide an overview of the bird's former distribution in Germany.

In 1936, apart from existing, regular populations in Mecklenburg-West Pomerania and Brandenburg, the Länder Bavaria, Württemberg, Baden, Rhineland, Thuringia, Saxony, Anhalt, Lower Saxony and Schleswig-Holstein had scattered populations and broods of the aquatic warbler (NIETHAMMER, cit. in WAWRZYNIAK & SOHNS 1977). By 1975, most of these populations had disappeared (WAWRZYNIAK & SOHNS1977).

PETERSEN (1956) studied populations of the aquatic warbler at five known breeding sites. Populations on the lower Rhine, between Emmerich and Rees, disappeared in 1951, and those in the Truper Blänken area, near Bremen, and on the lower Elbe River, near Bleckede, disappeared in the mid-1950s. Even in the Dümmer area, which harboured a rich population at 16 different sites, no more aquatic warblers were sighted after 1957.

The last population in west Germany, which may have persisted into the 1970s, was located in north Friesland, near Husum (WITT 1969).

In eastern Germany as well, populations of the bird were already in decline by the 1970s. They were confined to the northeast and central areas of that region. The former eastern German populations in the Lewitz area and along the east banks of the Müritz river died out no later than the end of the 1950s (WAWRZYNIAK & SOHNS 1977). Other populations, some quite large in number, near Ueckermünde, in the Peenetal area, near Brandenburg and along Gülper See (lake), disappeared no later than the 1970s.

The areas in which the aquatic warbler persisted after this time include the Freesendorfer Wiesen, in the immediate vicinity of the Greifswalder Bodden area, in Mecklenburg-West Pomerania, and the Odertal area, below the Unteres Odertal national park, near Schwedt in Brandenburg. In 1979, the bird occupied the Freesendorfer Wiesen area (Freesendorfer Wiesen and Struck nature conservation area), following measures to conserve habitats of rare meadow-breeding species, and by the end of the 1980s aquatic warbler populations reached their maximum size in these areas. However, the population then collapsed again in the 1990s as a result of usage changes (MLUR BB in lit.

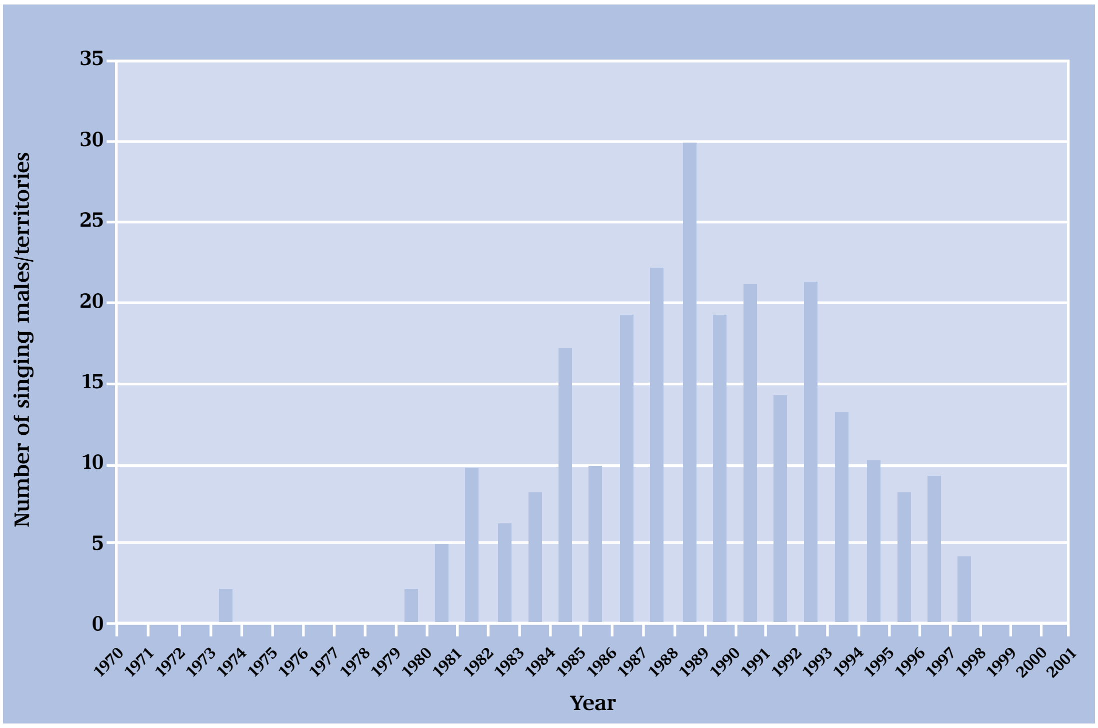
2002). Since 1998, the bird has not been sighted in the Freesendorfer Wiesen area (FLADE, orally reported), and thus the Unteres Odertal area is the last area in Germany in which the aquatic warbler can still be found. Fig. 2.1.4-1 shows the population's development in the Struck-Freesendorfer Wiesen nature conservation area. Fig. 2.1.4-2 shows how the aquatic warbler population in the Unteres Odertal area has fluctuated widely from the mid-1960s until the present. Presumably, the slight recovery in the 1990s was due to improved protection for meadow-breeding birds, including precise territory inventories and late mowing of areas occupied by the bird; habitat degeneration then brought about a rapid decline, however (MLUR BB in lit. 2002). The figure also shows that the population of the aquatic warbler has declined significantly throughout the overall period.

Unfortunately, little data is available on the number of broods actually raised. HELMECKE & BELLEBAUM (in lit. 2001) list only two instances of breeding for 2001 (nest find + feeding female). In 1999, only one instance of breeding was documented.

REASONS FOR THE BIRD'S DECLINE. The aquatic warbler has very specific needs with regard to its breeding areas. Ideally, it breeds in extensive wet meadows, with vegetation consisting largely of Carices (sedges). It also breeds in twig rushes *(Cladietum marisci)*. Water levels in the wet meadows and marshes it selects are normally not higher than 10 cm.

The world-wide decline of aquatic warbler populations is due to rapid, continuing habitat losses.

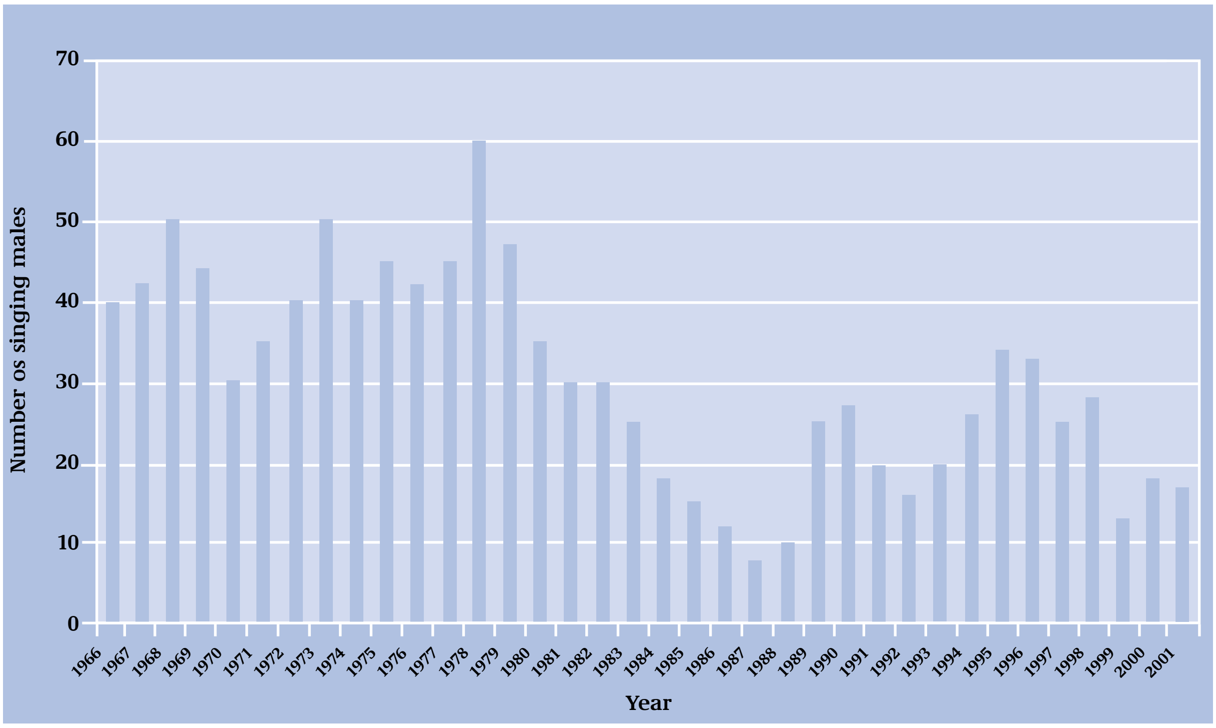
Fig. 2.1.4-1: Population of the aquatic warbler in the Struck-Freesendorfer Wiesen nature conservation area (pursuant to SELLIN in lit. 2001)].



Systematic drainage of wet meadows and marshes, to expand agricultural lands, has eliminated many of the bird's habitats (AQUATIC WARBLER CONSERVATION TEAM 1999).
As agriculture has become more and more intensive in this century, many of the important fens for aquatic warblers have been dried out through drainage and nearly destroyed. This has occurred, for example, in the Dümmer area, near Osnabrück, which used to harbour a significant population of the bird (WAWRCYNIAK & SOHNS 1977).

Apart from drainage, intensive grazing is also a major threat. The aquatic warbler population that disappeared in 1998 from the Freesendorfer Wiesen (nature conservation area and EU special protection area for birds) in Mecklenburg-West Pomerania was probably forced out of the area by overly intensive grazing (SELLIN, orally reported).
In addition, remaining potential habitats for the bird in the Unteres Odertal area have been impaired or lost through permitted uses – in part, as a the consequence of prohibitions of uses in the fully protected reserve. Another large threat is looming in planning of a new border-crossing road that will run through the heart of the special protection area and that would split sub-populations of the aquatic warbler within the Unteres Odertal area (fragmentation effect, potential dangers from traffic, noise impacts) (MLUR BB in lit. 2002).

Fig. 2.1.4-2: Development of the aquatic warbler population in the Unteres Odertal area (pursuant to FLADE, orally reported).



Little is known about threats the bird faces during its migrations and in its winter quarters, although it is likely that the bird's Atlantic coast flyway exposes individual birds to the risk of capture and shooting (especially France, north-west and west Africa) (MLUR BB in lit. 2002).

MEASURES TAKEN IN KEEPING WITH ART. III (4), INCLUDING: CONSERVATION AND RESTORATION OF HABITATS, ELIMINATION OF OBSTACLES THAT PREVENT MIGRATION AND ELIMINATION OF FACTORS THAT ARE ENDANGERING THE SPECIES. Because the aquatic warbler is a species listed in Annex I of the EC Bird Directive (79/409/EEC), protection areas must be set aside for it within the framework of establishment of the Natura 2000 European network of protection areas. Such set-aside has already taken place in the Unteres Odertal area (DITTBERNER & KÖHLER 1998). Consequently, 100% of Germany's aquatic warbler population is located within special protection areas, and thus adequate protection for the population has been provided (MLUR BB in lit. 2002).

Apart from the direct protection provided by Germany's ordinance on species protection (Bundesartenschutzverordnung), habitats of the aquatic warbler are protected by Art. 20c Federal Nature Conservation Act (BNatSchG), which lists protected biotopes, such as reeds, that may not be destroyed.

The state of Brandenburg is currently preparing a national action plan (a plan separate from BirdLife International's international action plan) and species protection programme for the aquatic warbler (MLUR BB in lit. 2002).

The responsible Land ministry, the Ministry for Agriculture, Environmental Protection and Physical Planning, acting in cooperation with Brandenburg's state bird station (Staatliche Vogelschutzwarte), has identified principles for relevant conservation and development measures (MLUR BB in lit. 2002):

- **HABITAT PROTECTION**

As a rule, remaining and rewetted fens, wet meadows and riparian meadows must be conserved and protected, and wet grassland areas must be restored to a natural state (drainage ditches filled in or dammed) and then permitted to become more oligotrophic (extensive usage without fertilisation). A key requirement is to ensure that breeding areas have adequate water levels upon the aquatic warbler's arrival.

- **MEASURES FOR MANAGING POTENTIAL HABITATS**

As a result of habitat loss in the Unteres Odertal area (50% of the national park is set aside as a fully protected reserve), new aquatic warbler habitats must be created. The Polder 5/6 and Gartzer Bruch areas are suitable locations for such efforts.
In Brandenburg, the aquatic warbler's habitat requirements are to be met, in the medium-to-long term, in at least four other areas in which the species bred until the 1970s. Each of these areas must be extensive (at least 500-1,000 hectares in each case). The areas in question include the Oberes Rhinluch, Untere Havelniederung (Gülper See / Große Grabenniederung area), Mittlere Havelniederung (Bereich Rietzer See), Uckerniederung near Prenzlau, Oderwiesen near Frankfurt/O. (or Neuzeller Aue) and the aforementioned Gartzer Bruch (Unteres Odertal) area.

The measures to be carried out include: gradual raising of the water levels in these areas, and development of plant communities in the direction of wet sedge colonies; ensuring that water levels remain adequate; annual, extensive mowing on these areas, following the beginning of measures, in connection with avoidance or reduction of fertilisation (biomass removal, oligotrophic development). These measures will necessitate contractual conservation arrangements or land purchases with leasing under the restrictions described above.

GRASSLAND USE

If the species is to reproduce adequately, the grassland areas it occupies must be extensively managed. Necessary grassland-management measures include (normally, these are possible only in connection with compensation payments or leasing of purchased land under arrangements with restrictions):

- Mowing / grazing may take place on occupied areas only as of 15 August, to permit second broods.
- Where earlier mowing is permitted, in exceptional cases, in territories or documented nesting sites of aquatic warblers, suitable areas must be left unmown until 31 August.
- Excessive "fraying" of sedge areas in the Unteres Odertal, a process which is naturally countered by seasonal, lengthy flooding and ice formation, must be managed by mowing, at least at irregular intervals.
- Mowing is to be given priority over grazing (higher biomass removal, damage from trampling, poor food quality for birds in August).
- Since birds do not breed on the same areas every year, all management measures, and any late mowing, must be handled flexibly (SCHMIDT, orally reported).
- Reduced fertilisation or no fertilisation (oligotrophic development).
- Conservation or creation of taller vegetation structures – for example, on edges of ditches or in sinks (as potential singing posts when the birds arrive).

PROTECTION OF BREEDING AREAS

Impairment of breeding areas through new infrastructure construction (especially roads), commercial parks, etc. must be prevented. The planned new border crossing in the Unteres Odertal areas must be unconditionally rejected, due to the EU-wide importance of this last breeding population of aquatic warblers. From the perspective of conservation, any reduction in groundwater levels and any surface drainage and any pumping of water, before mid-May, from Unteres Odertal polder areas occupied by birds must be avoided. The same applies to expansion of intensively farmed areas and new uses on land harbouring aquatic warblers.

MIGRATORY PASSAGE / WINTERING

All hunting in the bird's migratory passage and wintering areas (netting, trapping, shooting) must be prohibited.

MONITORING

The bird's occupied territories must be mapped on an annual basis (singing males). Inventories of feeding parent birds in the Unteres Odertal area are urgently required, to permit flexible handling of management measures. In addition, inventories must be taken of all relevant water levels, vegetation structures, succession, usage and any disturbances.

If the aquatic warbler is to be enabled to return to the Freesendorfer Wiesen area, all management of the area must be strictly oriented to the bird's requirements. This would permit the completely destroyed vegetation – brackish water reeds – to regrow. Such expectations seem unrealistic, however, since construction of a new power station is planned on neighbouring land.

MEASURES TAKEN IN KEEPING WITH ART. III (5), TAKING OF ANIMALS, INCLUDING: PROHIBITION OF TAKING (LEGAL MEASURES) AND EXCEPTIONS (REASONS FOR EXCEPTIONS, DURATION OF EXCEPTIONS, LEGAL BASES, STATISTICS). The aquatic warbler is a specially and strictly protected species pursuant to Art. 10 (2) Nos. 10 and 11 Federal Nature Conservation Act (BNatSchG). Pursuant to Art. 42 (1) BNatSchG, therefore, the bird may not be trapped, captured, injured or killed, nor may it, at any stage of its development, or its nesting, breeding, living or refuge structures, be removed from their natural locations, or be damaged or destroyed. Furthermore, the birds may not be disturbed in their nesting, breeding or refuge sites – for purposes of birdwatching, photography, filming or similar activities. Extensive prohibitions of possession and sale also apply to the aquatic warbler.

No exceptions pursuant to Article III (5) were permitted within the reference period 1999 to 2001.

2.2 Administrative agreement for protection and management of the central European population of the great bustard *(Otis tarda)*

Under the aegis of the Convention on the Conservation of Migratory Species of Wild Animals (CMS), a "Memorandum of Understanding" (MoU; similar to an administrative agreement) was prepared especially for protection of the central European population of the great bustard. This MoU came into force 1 June 2001, after it had been signed by five range states.

Pursuant to Germany's Federal Nature Conservation Act (Bundesnaturschutzgesetz), the great bustard is a specially and strictly protected species. As a result, it may not be captured, trapped or hunted, and its breeding and refuge areas may not be disturbed or destroyed (see Chap. 2.1.2).

Sites in Germany that are occupied by the great bustard are protected as EC special protection areas for birds or as nature reserves (see Chap. 2.1.2).

In the mid-1990s, two EU-Life projects were carried out with the aim of introducing extensive cultivation on great bustard habitat sites that were being intensively farmed (see Chap. 2.1.2). To reinforce support for extensive use, and to help keep the relevant areas open, land was purchased and, in part, leased for restricted use (EUROPEAN COMISSION 2001b).

Nature conservation stations have now been established near the important habitat sites, and a conservation ranger has been appointed for the Fiener Bruch area (MINISTRY FOR REGIONAL PLANNING, AGRICULTURE AND ENVIRONMENT OF THE STATE OF SAXONY-ANHALT in lit. 2001). As a result, direct monitoring of great bustard populations is now possible. This, in turn, makes it possible to respond immediately to any acute threats.
No measures to protect potential great bustard habitats have been carried out to date. Measures to protect occupied habitats are focused on sites that play an important role in rearing of young.

The German Federal Government supports the MoU for protection of the great bustard. However, the MoU is designed to require ratification by a special act, with the approval of parliamentary bodies. While the great bustard urgently requires protection, this ratification process is disproportionately lengthy and involved.
The two German Länder involved,

Brandenburg and Saxony-Anhalt, have already undertaken significant efforts to protect the great bustard. In addition, at the international level, a suitable action plan has been approved, under the aegis of the Convention of 19 September 1979 on the Conservation of European Wildlife and Natural Habitats (Bern Convention), and of the EC Bird Directive; this plan is a key element of the MoU. The measures being undertaken in Germany are in harmony with the plan (see Chap. 2.1.2). The Federal Republic of Germany is thus willing to participate in international co-operation, within the MoU framework, to protect and manage the central European population of the great bustard, but it is not currently planning to participate formally in the MoU process.

2.3 Native species listed in the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA)

AEWA comprehensively covers the broad area of waterbird protection. Its provisions relative to conservation status and protection measures address issues ranging from basic strategy to specific training of the persons ultimately responsible for enforcing protection in the habitats in question. The present report is provided to inform the AEWA Secretariat and the other parties to the agreement about the relevant situation in Germany, to inform the German public and to help competent authorities in Germany develop a basis for further enhancement of protection.

The requirements set forth by AEWA address all aspects of modern waterbird protection. Unfortunately, the agreement and its various annexes and tables have an unusually complex structure. In September 1998, to enable Germany to meet the agreement's requirements, the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), in co-operation with the Federal Agency for Nature Conservation (BfN), held a conference to prepare implementation of AEWA (HAUPT et al. 2000). This conference provided a forum for discussion of various scientific aspects relative to AEWA implementation in Germany and – via publication of relevant results (HAUPT et al. 2000) – for presentation of this waterbird-protection instrument to the scientific community at large, beyond the bounds of the conference itself.

The following description of the conservation status of AEWA waterbird species, and of measures taken to protect these species, conforms to the reporting format approved at the first meeting of the parties to the agreement in November 1999. The chapters are structured in accordance with the table of contents and its useful subject selection. In the reporting format, the questions to be answered are numbered consecutively within the main chapters, without any reference to the relevant fine outline structure. To facilitate orientation, therefore, the following report includes the relevant reporting-format number for each question.

2.3.1. WATERBIRD CONSERVATION

2.3.1.1 Progress in waterbird conservation – the health of native waterbird populations

SUMMARY OF PROGRESS TO DATE. Germany has a long tradition of waterbird conservation, and it builds on this tradition by continually refining its conservation efforts in keeping with the latest scientific findings. Waterbird conservation in Germany is fully integrated within the country's general nature conservation, with all of its strategies and regulations. Increasingly, the situation in Germany is also being affected by international standards. For waterbirds of special importance, such standards include AEWA as well as the EC Bird Directive, which provides comprehensive protection for relevant species and their habitats. It also provides a framework within which many AEWA provisions are already being implemented in Germany. In some areas, AEWA's provisions are more extensive than those of the Bird Directive. For example, the agreement requires the parties to collect population-differentiated statistics and to monitor populations. In this area, no implementation-oriented progress has yet been made in recent years. New concepts – for example, in the area of monitoring – are required and remain to be developed.

A key prerequisite and tool for any effective protection is a precise understanding of the assets to be protected – in this case, waterbird populations. The following section describes the AEWA populations occurring in Germany, and, where possible, also describes the relevant population trends. Differentiation of different populations of the same species is not yet a standard feature of field ornithology in Germany – and often, it is not feasible; as a result, it is not always possible to identify different relevant populations with certainty. The following presentation must thus be considered a basis for further development.

AEWA WATERBIRD POPULATIONS IN GERMANY.

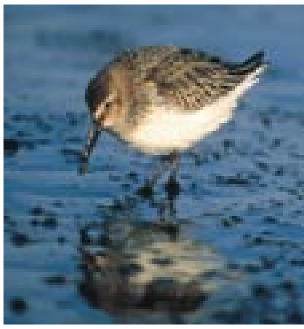
SOURCES. The descriptions of population trends and distributions, and differentiation of flyway populations, are in keeping with the "Report on the Conservation Status of Migratory Waterbirds in the Agreement Area" (WETLANDS INTERNATIONAL 1999). Other data was taken from SCOTT & ROSE (1996) and (HAGEMEIJER & BLAIR 1997). For geese, the current overview of Western Palearctic goose populations was used (MADSEN et al. 1999). The trend figures for mid-winter populations of ducks are based on international waterbird counts organised under the leadership of Wetlands International (formerly: International Waterfowl and Wetlands Research Bureau) (International Waterbird Census IWC, DELANY et al. 1999).

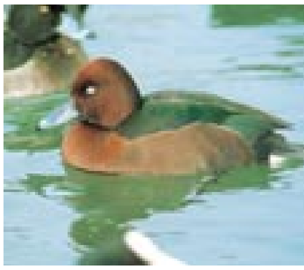
In interpretation of trends for mid-winter populations at the German level, it must be noted that the boundary between the census regions of north-west Europe and central Europe, a boundary drawn on the basis of biogeographical criteria, passes through Germany. The Länder Bavaria, Baden-Württemberg, Thuringia and Saxony are assigned to the central Europe / Mediterranean region, while Germany's northern Länder are part of the north-west European region.

The calculations of population trends are based on mid-winter populations (January counts) in selected sites (reduced site list) in which a large percentage of the waterbird populations for the relevant Land (state) spend the winter. Wherever possible, the inventories were conducted on an annual basis, to prevent data gaps (that


Coot


Wood Sandpiper


Dunlin


Ferruginous Duck

would result if censuses were not carried out in certain years). Trends were analysed with the TRIM programme, which uses a population index to show the relevant annual population relative to the population of the reference year (normally, 1989) (DELANY et al. 1999, SUDFELDT et al. 2002).

A fundamental problem in assessment of the importance of individual areas or larger geographic units for specific waterbird populations is that counts can never be more than snapshots of what are actually complex migratory processes. Thus a given area, even if it harbours a relatively small number of simultaneously present individuals, may be vitally important with regard to passage of the entire relevant population if many individuals use the area successively as a resting site (turnover).

EXPLANATION OF THE FORMAT USED FOR THE SECTIONS ON INDIVIDUAL SPECIES. The sections on individual species contain information about populations listed in Table 1 of the AEWA Action Plan. Populations are subdivided in the manner used by AEWA:

- For populations whose breeding and wintering areas are well known and widely separated, the relevant breeding and wintering areas are separated by a slash (breeding area / wintering area).

- For populations whose breeding or wintering areas are either poorly known or clearly overlap, populations are classified only in terms of their breeding or winter distributions. In such cases, the relevant reference season is given in parentheses (breeding: bre, wintering: win).

- For populations whose breeding and wintering areas are either poorly known or significantly overlap, the entire range is listed as the reference area.

Columns A-C provide status information in keeping with the format used in Table 1 of the AEWA Action Plan. This information is followed by size data for flyway populations (in individuals) (WETLANDS INTERNATIONAL 1999). Where no figures are listed, the following letters are used, with meanings as indicated:

A:	< 10,000
B:	10,000 – 25,000
C:	25,000 – 100,000
D:	100,000 – 1,000,000
E:	> 1,000,000

The figures for the population trends also come from WETLANDS INTERNATIONAL (1999). In the main, they are in keeping with the updated figures of ROSE & SCOTT (1997). Their meanings are as follows:

0:	Stable
+:	Increasing
–:	Decreasing
?:	Population situation unclear / no information available.
():	In cases in which WETLANDS INTERNATIONAL (1999) provides conditional populationtrend data (probably / possibly), the data is provided in parentheses.

The following section presents all AEWA species of which populations regularly occur in Germany. Those populations for which Germany is a range state, as a consequence, are marked in the tables by means of a light background.

RED-THROATED DIVER Gavia stellata	**A**	**B**	**C**	**Population**	**Trend**
NW-Europe (win)		2c		D	–
Caspian, Black Sea & E Mediterranean (win)		(1)		?	?

Annex I lists other species and populations that occur in Germany only occasionally and/or in very small numbers, and for which Germany is not considered a range state.

Annex II summarises the results, in a table, of a current (fall 2001) survey on breeding and resting populations of waterbirds in various Länder.

RED-THROATED DIVER *(GAVIA STELLATA).* The circumpolar range of the red-throated divers comprises the Arctic zone, and parts of the boreal zone, of Eurasia and the North American continent. In Europe, its breeding range extends from Iceland and Spitzbergen across Scotland, the Scandinavian peninsula and the northern part of Russia. The red-throated diver's wintering areas in the Western Palearctic are located in coastal waters of the North Sea and Baltic Sea; along the Atlantic coast of Norway, the British Isles and France and southward into the Bay of Biscay; and in the eastern Mediterranean and around the Black Sea and Caspian Sea (BEZZEL 1985, HAGEMEIJER & BLAIR 1997, WETLANDS INTERNATIONAL 1999).

No discrete populations can be identified within the AEWA area. On the basis of the wintering regions, the north-west European winter population is differentiated from the winter population of the Caspian Sea and Black Sea and of the eastern Mediterranean region (ROSE & SCOTT 1997, WETLANDS INTERNATIONAL 1999).

In Germany, large concentrations of the north-west European winter population of the red-throated diver regularly occur in the German Bight. The bird shows a pronounced preference for estuaries and for areas just beyond the Wadden Sea with water depths less than 30 m (SKOV et al. 1995, MITSCHKE et al. 2001). Since current methods do not permit separate counting of red-throated divers and black-throated divers *(Gavia arctica)* in broad surveys in offshore areas, population data is available only for both species together. The red-throated diver accounts for far and away the largest share, about 90%, of the winter population of the two species in the German Bight (cf. black-throated diver). Both divers reach the offshore area of the German Wadden Sea beginning in September, and their populations continue to increase there until mid-winter. Red-throated divers undergo moulting of flight feathers in October/November. They begin returning at the end of February, and all birds leave by May (SKOV et. al. 1995, MITSCHKE et al. 2001). The most important winter populations (December through March) of red-throated divers and black-throated divers in German waters, comprising an average of 10,100 individuals, are located in the eastern German Bight, north of the Elbe estuary and up to Heverstrom; off Süderoog (7,650 individuals) and the east Friesian islands (2,100 individuals); and in the Amrum Bank area (1,900 individuals). During the return journey, in April/May, the largest known concentration of red-throated and black-throated divers, comprising about 24,000 individuals, is found in the eastern German Bight (data from SKOV et al. 1995). Another important resting population, comprising an average of 1,875 individuals, is found in the Baltic Sea, in the Pomeranian Bight region (SKOV et al. 2000).

BLACK-THROATED DIVER *(GAVIA ARCTICA).* The black-throated diver is a

BLACK-THROATED DIVER Gavia arctica arctica	A	B	C	Population	Trend
W Siberia/Europe		2c		120,000	0 (–)
Gavia arctica suschkini					
Central Siberia/Caspian Sea			(1)	?	?

breeding bird in the boreal to Arctic zones of Eurasia and North America. The range of the Western Palearctic nominate form extends from northern Scotland to northern Siberia, across Scandinavia and northern Russia. The bird winters in the coastal waters of the North Sea and Baltic Sea; along the Atlantic coast and southward into the Bay of Biscay; and in the northern Mediterranean, including the Black Sea. The central Asian sub-species G. a. suschkini winters at the Caspian Sea (HAGEMEIJER & BLAIR 1997, WETLANDS INTERNATIONAL 1999). Of the two populations occurring within the AEWA area, the west Siberian / European population of the nominate form regularly winters in Germany.

The black-throated diver regularly winters in the coastal waters of the North Sea and Baltic Sea. Since the red-throated diver and black-throated diver are counted together, because they are particularly difficult to distinguish during the winter, when they are at sea, no species-specific data for the black-throated diver is available (cf. red-throated diver). Pursuant to random sampling data, the black-throated diver accounts for about 5 to 11% of the total population of both species in midwinter (SKOV et al. 1995, MITSCHKE et al. 2001). During spring migration, the black-throated diver can account for up to about 25 to 50% of the total population, when additional birds arrive in the eastern North Sea and in the Kattegatt (SKOV et al. 1995). Regarding the population figures for both species, see the data for the red-throated diver.

RED-NECKED GREBE *(PODICEPS GRISEGENA)*. The red-necked grebe breeds throughout the boreal and northern temperate zones of the entire Holarctic. Of the three described sub-species, the nominate form is found in the Western Palearctic, the sub-species *P. g. holboellii* is found in east Asia and on the North American continent, and *P. g. balchashensis* occurs in the central Asian region of Lake Baikal. The wintering areas of European breeding birds are found primarily in the coastal waters of the North Sea and Baltic Sea, as well as along the Atlantic coast – Norway, the British Isles and southward into the Bay of Biscay. Breeding birds of eastern and south-eastern Europe winter at the Black Sea and in the eastern Mediterranean. The winter population of the Caspian Sea presumably consists of breeding birds from west Siberia and the Volga region (HAGEMEIJER & BLAIR 1997, WETLANDS INTERNATIONAL 1999). Three wintering groups are differentiated within the AEWA area; birds belonging to one of these, the north-west European winter population, regularly occur in Germany. Some of the central European breeding birds belong to the winter population from the Black Sea and the Mediterranean (BEZZEL 1985, BAUER & BERTHOLD 1996).

The wintering populations of the red-necked grebe in Germany are concentrated on the offshore areas of the eastern German Bight (average of about 1,850 individuals, SKOV et al. 1995) and on the Baltic Sea, in the area of the Pomeranian Bight (average of about 1,275 individuals, SKOV et al. 2000).

Germany lies at the western edge of the red-necked grebe's contiguous breeding range in Europe. Regularly occurring breeding populations are found only in the northern and north-eastern Länder

RED-NECKED GREBE Podiceps grisegena grisegena	**A**	**B**	**C**	**Population**	**Trend**
NW-Europe (win)		1		C	0
Black Sea & Mediterranean (win)		(1)		C	?
Caspian Sea (win)	2			15,000	?

(HAGEMEIJER & BLAIR 1997). In the mid-1990s, WITT et al. (1996) estimated the breeding population of the red-necked grebe in Germany to number 1,160 to 1,340 breeding pairs. In 1999, BAUER et al. (pub. pend.) estimated that the population had reached 1,500 to 2,600 pairs. More recent regional data is available, for example, for Schleswig-Holstein, where in 1998 a total of 699 pairs bred (VLUGG 2000). For Brandenburg, DÜRR et al. (1997) placed the breeding population at 200 to 250 pairs. Population trends for this species in Germany were positive, especially in the 1980s. For example, the breeding population in Schleswig-Holstein increased from 331-365 pairs, in the 1970s, to 524-699 pairs in the period 1991-1998. In a parallel report, SÜDBECK & OLDEKOP (1999) note that the western peripheral population in Lower Saxony increased from about five breeding pairs in the 1970s to about 20 pairs in 1997/98. VLUGG (2000) presumes that this positive population trend is due primarily to increases in central range areas that had a positive impact on peripheral populations. In addition, the red-necked grebe may have profited from an increasing food supply as a result of water-body eutrophication.

SLAVONIAN GREBE *(PODICEPS AURITUS)*. The range of the Slavonian grebe is circumpolar, extending across the boreal zone from Scandinavia to Siberia, including Kamchatka, and from Alaska to Newfoundland (HAGEMEIJER & BLAIR 1997). Of the three described sub-species, the nominate form breeds in western Eurasia. Two forms are differentiated on the basis of bill size. Large-billed breeding birds found in Norway, Iceland, Scotland and the Faeroe Islands winter along the Norwegian coast and around the British Isles; the small-billed form occurring in Finland, Sweden, the Baltic and breeding areas further east winters on the North Sea and Baltic Sea and along the European Atlantic coast, in an area extending southward to north-west France. A small population winters in the Caspian Sea region. Parts of the north-east European breeding population (small-billed) regularly winter in Germany.

The Slavonian grebe's important resting and wintering areas in Germany include the shallow coastal waters of the Baltic Sea in the area of the Pomeranian and Wismar bights, along the coast of Mecklenburg-West Pomerania, where averages of 1,125 and 100 individuals, respectively, winter (SKOV et al. 2000). Germany lies at the southern edge of the Slavonian grebe's contiguous breeding range in the Western Palearctic. The only German breeding population, in Schleswig-Holstein, apparently appeared regularly from 1983 through 1997 (BUNDESDEUTSCHER SELTENHEITEN-AUSSCHUSS and DEUTSCHE SELTENHEITENKOMISSION 1992, 1994, 1995, 1996, 1997, 1998, 2000, BRUNS & BERNDT 1999, MÄDLOW & MODEL 2000). In 1999, a total

SLAVONIAN GREBE Podiceps auritus auritus	A	B	C	Population	Trend
NW Europe (large-billed form, breeding)	1c			5,000	0/+
NE Europe (small-billed form, breeding)		1		C	? (−)
Caspian Sea (win)	2			B	?

PURPLE HERON Ardea purpurea purpurea	A	B	C	Population	Trend
W Mediterranean (breeding)	2			B	–
E Europe/SW Asia (breeding)		(2c)		D	? (−)

of two breeding pairs of the Slavonian grebe were sighted in Germany (BAUER et al. pub. pend.).

PURPLE HERON *(ARDEA PURPUREA).* The purple heron breeds throughout extensive parts of southern Europe, Asia Minor, Africa and south-east Asia. Of the four described sub-species, the nominate form breeds within Europe – primarily in the Mediterranean region and in the countries bordering the Black Sea and Caspian Sea. The northernmost breeding population is found in the Netherlands and Poland (HAGEMEIJER & BLAIR 1997).

Breeding birds from western Europe winter in tropical West Africa (flood plain of the Niger and in Senegal), while south-east European and south-west Asian breeders winter in north-east and east Africa, along the upper Nile, in Sudan and in Ethiopia (BEZZEL 1985, HAGEMEIJER & BLAIR 1997, WETLANDS INTERNATIONAL 1999). Two populations in addition to the non-migratory African breeding birds are differentiated within the AEWA area. The purple herons that breed in Germany are grouped with the breeding population of the western Mediterranean.

The total European population (not including Russia) is estimated at about 8,090 breeding pairs (HAGEMEIJER & BLAIR 1997). In most European countries, breeding populations have been in decline. Breeding populations are stable, or fluctuating at a low level, in only four countries (TUCKER & HEATH 1994, HAGEMEIJER & BLAIR 1997). In Germany, small numbers of the purple heron breed in the southern Länder Rhineland-Palatinate (9-13 pairs), Baden-Württemberg (4-6 pairs) and Bavaria (5 pairs). In 1995, a breeding pair in addition to these known groups was sighted in Saxony-Anhalt (TODTE & BOUDA 1996). In the mid-1990s, the entire German breeding population comprised 15 to 20 breeding pairs, while in 1999 it was thought to include 21 to 34 pairs (BAUER et al. pub. pend., WITT et al. 1996, MÄDLOW & MODEL 2000). The purple heron's breeding population fluctuates widely, for reasons due to local factors, such as water-level fluctuations, disturbances and habitat changes in breeding areas, as well as to changes in African wintering areas, where droughts have reduced resting and wintering wetlands habitats (TUCKER & HEATH 1994, BAUER & BERTHOLD 1996).

LITTLE BITTERN *(IXOBRYCHUS MINUTUS).* The range of the five subspecies of the little bittern comprises three more or less separate breeding ranges, in the European and west Siberian Western Palearctic, in the Australasian region and in sub-Saharan Africa. The nominate form's European breeding range extends from Portugal and Spain to Russia, across France and central Europe. The northern limit of the breeding range is found in Latvia and European Russia, at about 60° northern latitude. The European population is concentrated in the eastern European countries Romania, Ukraine, Hungary and Moldavia, as well as on the Iberian peninsula (HAGEMEIJER & BLAIR 1997). The Western Palearctic breeding birds winter in sub-Saharan Africa – primarily in east African wetlands (Sudan, Ethiopia) – where their range overlaps with the ranges of west and south-west Asian breeding populations, which are also migratory (WETLANDS INTERNATIONAL 1999).

LITTLE BITTERN Ixobrychus minutus minutus	A	B	C	Population	Trend
Europe & N Africa (breeding)		2c		D	–
W & SW Asia (breeding)		(1)		C	?

In the mid-1990s in Germany, the little bittern bred regularly only in the eastern Länder Berlin and Brandenburg (about 9-12 pairs) and Saxony-Anhalt (about 10 pairs), as well as in Baden-Württemberg (20-30 pairs). Mecklenburg-West Pomerania, Saxony, Hesse and Rhineland-Palatinate harbour residual populations comprising fewer than five pairs each (MÄDLOW & MODEL 2000). WITT et al. (1996) placed the little bittern's total population in Germany at 105 to 145 pairs in the mid-1990s. In 1999, the total population had decreased slightly to about 90 to 120 pairs (BAUER et al. pub. pend.). Like the purple heron, the little bittern is subject to increased mortality in the Sahel zone, as a result of drying of suitable resting areas. In addition, destruction of suitable wetlands in its breeding range has also contributed to declines, some considerable, in the entire European breeding population (TUCKER & HEATH 1994, HAGEMEIJER & BLAIR 1997).

EURASIAN BITTERN *(BOTAURUS STELLARIS).* The Eurasian bittern / great bittern breeds in the temperate zone of the entire Palearctic. Its range extends from the east coast of England to Japan, across Europe, Russia and Asia (HAGEMEIJER & BLAIR 1997). In addition to the Western Palearctic nominate form, the AEWA area harbours an isolated population of the sub-species B. s. capensis in South Africa. As is the case for the little bittern, the European breeding population is concentrated in the eastern European countries Poland, Belarus, Romania and Ukraine; a total of about 70% of the European population, estimated at about 10,000 to 12,000 pairs (outside of Russia) breeds in these countries (HAGEMEIJER & BLAIR 1997). Especially in the western and southern parts of its range, the Eurasian bittern either is sedentary or is a short-distance migrant. Breeding birds of northern and eastern Europe, on the other hand, migrate to western and southern Europe in especially cold winters. Two populations of the nominate form are differentiated. Germany is part of the European breeding population's range.

Germany lies at the western edge of the Eurasian bittern's breeding range in Europe, which is more or less contiguous. Further to the west, significant populations are found only in the Netherlands and France; they amount to about 150-275 and 300-350 territorial pairs, respectively (HAGEMEIJER & BLAIR 1997). In keeping with this range pattern, in the mid-1990s the largest German breeding population of the Eurasian bittern was located in the eastern German Länder Mecklenburg-West Pomerania (120-150 pairs), Brandenburg (38-93 pairs) and Schleswig-Holstein, which is rich in water (90 -160 pairs). The Länder Lower Saxony, Saxony, Saxony-Anhalt, Thuringia and Bavaria each harboured about 20 pairs (MÄDLOW & MODEL 2000). WITT et al. (1996) estimated the German breeding population in 1994 to be about 430 to 510 pairs. BAUER et al. (pub. pend.) placed the population in 1999 at about 360 to 620 pairs. In large areas of central Europe, the breeding population of the Eurasian bittern has decreased since the 1950s, and the bird has disappeared completely from many of its breeding areas. The primary reasons for the population shrinkage include major losses of extensive reed areas, though drainage of wetlands and through reedbed die-off following overfertilisation, mowing of reeds and disturbances caused by increasing development for tourism (BAUER & BERTHOLD 1996). In cold winters, extended ice periods can lead to major population

EURASIAN BITTERN Botaurus stellaris stellaris	**A**	**B**	**C**	**Population**	**Trend**
Europe (breeding)	3c			C	–
SW Asia (win)	2			A or B	?

losses, resulting in considerable population fluctuations at the northern periphery of the bird's breeding range (BAUER & BERTHOLD 1996).

BLACK STORK *(CICONIA NIGRA)*. The black stork lives in forest regions of the temperate and southern boreal zone of the entire Palearctic, from central Europe to north-east China and Korea. In Europe, its contiguous range extends eastward from Germany and the Czech Republic to Russia, across Austria, Hungary, Poland, Belarus and the Baltic countries. Birds of south-east Europe (especially Croatia, Bulgaria and Greece) are part of this central and east European population. Birds that breed in Spain and Portugal are largely isolated from this population, and they are classified as a separate south-west European population (WETLANDS INTERNATIONAL 1999). Outside of Europe, a small, isolated population is found in South Africa, presumably originating via settlement of winter guests from the European population (HAGEMEIJER & BLAIR 1997). At least half of the entire European population breeds in the eastern European countries Belarus, Latvia, Lithuania and Poland (HAGEMEIJER & BLAIR 1997). DORNBUSCH (2000) presumes that the world population of black stork amounts to no more than 12,000 breeding pairs, of which about 6,500 make up the European population and 4,500 pairs form the Asian population. The Iberian population, comprising about 400 pairs, and an isolated breeding population in southern Africa, numbering about 600 pairs, represent only a small part of the total population. The winter quarters of the black stork's central and eastern European populations are found in north-east and east Africa (Ethiopia, Uganda, Tanzania). Birds from breeding areas located west of the Oder River winter primarily in west Africa (Mauritania, Senegal), south of the Sahara (HAGEMEIJER & BLAIR 1997, WETLANDS INTERNATIONAL 1999, DORNBUSCH 2000). Germany lies within the breeding range of the central and eastern European population.

The population of the black stork in Germany has increased continuously over the past few decades, following a nadir in the 1950s. In most German Länder, this population growth continued into the 1990s, and by the mid-1990s about 300 black stork pairs were breeding in Germany. The largest groups, each comprising more than 30 pairs, are scattered throughout the Länder Lower Saxony, Brandenburg, Saxony and Bavaria. Other significant populations are found in North Rhine-Westphalia, Hesse, Bavaria and Thuringia (DORNBUSCH 2000, MÄDLOW & MODEL 2000). In 1999, the population had reached a level of 330 to 390 pairs (BAUER et al. pub. pend.). Increases in the black stork's population have manifested themselves both as growth in the breeding population and as an increase in the numbers of migrating black storks observed at permanent stations such as those at the Randecker Maar and in the Pyrenees. They have occurred through westward expansion of the eastern European population. In general, the population's recovery is due to the success of efforts to protect breeding black storks against human disturbances, hunting and forestry, via establishment of nest-protection zones, as well as to favourable changes in African winter quarters (BAUER & BERTHOLD 1996, GATTER 2000).

BLACK STORK Ciconia nigra	A	B	C	Population	Trend
SW Europe/W Africa	1c			1,000	0/+
Central & E Europe (breeding)	2			20,000 - 30,000	+

WHITE STORK *(CICONIA CICONIA)*. The white stork's breeding area comprises the Mediterranean and temperate zones of Europe and northern Africa, as well as parts of western and central Asia. A small, isolated breeding population has existed in South Africa since the 1940s (BEZZEL 1985, TUCKER & HEATH 1994, HAGEMEIJER & BLAIR 1997). Breeding birds of the Iberian peninsula and north-west Africa winter in west Africa and, to an increasing extent, in the southern part of the Iberian peninsula. Birds that breed in central and eastern Europe tend to migrate in a south-easterly direction, to wintering areas in eastern and southern Africa. A small part of the population, located west of a migratory divide that passes through Germany (and has a broad transition zone), migrates in a south-westerly direction, to west Africa (Senegal to Chad). All in all, four populations are differentiated, and parts of the central and eastern European breeding population breed in Germany (WETLANDS INTERNATIONAL 1999).

The world population of the white stork was most recently estimated, via a 1994/95 international survey that covered all of the bird's important range states, to number about 166,000 nesting pairs. About 90% of the world population breeds in Europe (SCHULZ 1999). During the years covered by the survey, a total of 4,155 and 4,063 nesting pairs, respectively, or about 2.5% of the total population, bred in Germany. The German breeding population was concentrated on the eastern German Länder Brandenburg (1,270 nesting pairs), Mecklenburg-West Pomerania (1,237 nesting pairs), Saxony-Anhalt (519 nesting pairs) and Saxony (401 nesting pairs); these Länder accounted for over three-fourths of the entire German population. Other breeding populations, comprising over 100 nesting pairs in each case, are found in Lower Saxony, Schleswig-Holstein, Baden-Württemberg and Bavaria. Germany's other Länder harbour relatively few breeding pairs (KAATZ 1999).

Overall, the German breeding population had increased by about 21% in the mid-1990s, since the last international survey, which dated from 1984 (3,371 nesting pairs). Clearly, this trend continued in the second half of the decade, and in 1999 the population was estimated to have reached 4,325 to 4,400 pairs (BAUER et al. pub. pend.).

Similar increases were also registered in most other European countries, and the real growth of the world population is placed at about 23 % (from about 135,000 nesting pairs in 1984 to 166,000 nesting pairs in 1994/95) (SCHULZ 1999).

According to SCHULZ (1999), the most important reason for the population growth in Germany is influx of breeding birds from the south-western and eastern European core populations. The reasons for the population growth in these two regions differ. The south-west European population's recovery has been due primarily to a relatively favourable rainfall situation, resulting in an improved food supply in the bird's west African winter quarters, and to the bird's use of landfills as new food sources. The increase in the eastern European breeding population is due pri-

WHITE STORK Ciconia ciconia ciconia	A	B	C	Population	Trend
S Africa	1c			30	+
Iberian peninsula & NW Africa (breeding)	3b			100,000	– (0/+)
Central & E Europe (breeding)		2c		400,000	–
SW Asia (breeding)	3b			C	?

marily to factors within breeding areas themselves. Presumably, discontinuation of farming on certain lands, for economic reasons, has improved the bird's food situation and thus led to more favourable conditions for reproduction (SCHULZ 1999). Even though the population trend is currently positive, lasting improvement in the white stork's situation in Germany cannot yet be expected. As a result of widespread destruction of wetlands and river lowlands that serve as feeding areas for the bird, the white stork's reproduction rate is still too low to maintain the population without influx from other areas (SCHULZ 1999).

WHITE SPOONBILL *(PLATALEA LEUCORODIA).* The white spoonbill / Eurasian spoonbill, which has four sub-species, is scattered throughout parts of Europe, Africa and Asia (sub-species *P. l. major*) (HAGEMEIJER & BLAIR 1997, WETLANDS INTERNATIONAL 1999). The sub-species P. l. archeri lives in countries bordering the Red Sea. The sedentary sub-species P. l. balsaci is confined to just a few breeding areas in Mauritania and Senegal (WETLANDS INTERNATIONAL 1999). In Europe, isolated breeding populations of the nominate form are found in south-east Europe (Hungary, Ukraine, Greece, Croatia) and Russia, as well as in southern Spain, France and the Netherlands (HAGEMEIJER & BLAIR 1997). Eastern European breeding birds winter in the eastern Mediterranean, as well as in north-east and west Africa. Birds that breed on the Iberian peninsula, in France and in the Netherlands migrate to the west African Atlantic coast (Mauritania and Senegal) for the winter (HAGEMEIJER & BLAIR 1997, WETLANDS INTERNATIONAL 1999). Birds of one of the two nominate-form populations within the AEWA area – the east-Atlantic population – have been breeding in Germany since 1995. The white spoonbill first settled in Germany in 1995. In 1996, after five unsuccessfully breeding pairs had been observed on the island of Memmert, in Lower Saxony's part of the Wadden Sea, a total of eight breeding pairs were sighted in the same area, and three more successful pairs were seen on Mellum (CLEMENS 1996, WILKENS 1997, MÄDLOW & MODEL 2000). The breeding population in Lower Saxony's part of the Wadden Sea has increased continuously since then, and by 2000 it had reached 49 breeding pairs. In 2000, a first two breeding pairs came to Schleswig-Holstein's part of the Wadden Sea (HÄLTERLEIN et al. 2000, RASMUSSEN et al. 2001). 1996 also saw the first instance of breeding in Denmark (concurrent with Germany's first instance). Readings of colour-coded bands on banded white spoonbills showed that the new arrivals in Wadden Sea were birds from the Dutch population (RASMUSSEN et al. 2000). The new influx in the German coast was preceded by a sharp increase in the Dutch breeding populations (FLEET et al. 1994), an increase that continued in the second half of the 1990s, as the total Dutch population grew from 661 pairs in 1994 to 1,270 pairs in 1998 (RASMUSSEN et al. 2000). In light of the rapid growth of the breeding population in the German Wadden Sea, and the Dutch population's continuing growth as of 1999, further growth of the German population cannot be ruled out. The reasons for the growth of the western

WHITE SPOONBILL Platalea leucorodia leucorodia	**A**	**B**	**C**	**Population**	**Trend**
E Atlantic (W Europe/W Africa)	1c			6,500	+
Central & SE Europe (breeding)	2			5,000-15,000	-
Platalea leucorodia archeri					
Red Sea				500-1,500	?
Platalea leucorodia major					
SW & S Asia				23,000	?

European population are not completely understood; presumably, they are related to improved protection along the birds' migratory routes and in its winter quarters (HAGEMEIJER & BLAIR 1997, RASMUSSEN et al. 2000). The positive development of the western European breeding population contrasts with a sharp decrease of the south-eastern European population (TUCKER & HEATH 1994). Because the bird's range consists of a number of separate "islands", and because European populations account for a large percentage of the species' world population, it is especially important that the white spoonbill be effectively protected in Europe. To carry out its specialised form of tactile feeding, the species requires largely predator-free, disturbance-free breeding sites – such as large reedbeds, riparian-meadow vegetation or islands – near shallow, food-rich water bodies (BEZZEL 1985, TUCKER & HEATH 1994).

Whereas eastern and south-eastern European breeding populations are threatened by habitat changes, wetlands drainage and disturbances in breeding areas, north-west European breeding populations are located in well-secured protected areas (FLEET et al. 1994, TUCKER & HEATH 1994). The primary threats to these populations during the breeding season include disturbances and predation by foxes (RASMUSSEN et al. 2000).

GREATER FLAMINGO *(PHOENICOPTERUS RUBER)*. The world-wide range of the greater flamingo is fragmented into numerous distinct sub-ranges. It comprises the Mediterranean region, eastern and southern Africa, south-west Asia and parts of Central and South America. The European breeding population of the Eurasian sub-species *P.r. roseus* is concentrated on the Mediterranean coasts of France (Camargue), Spain (Andalusia) and Turkey (BEZZEL 1985, HAGEMEIJER & BLAIR 1997). A total of five populations can be relatively clearly differentiated within the AEWA area.

The bird's populations fluctuate widely, as a result of complex migrations depending on seasonal and hydrological factors (TUCKER & HEATH 1994). As a result, population trends for the species are difficult to assess. Nonetheless, the west Mediterranean breeding population is assumed to be experiencing real growth. In addition, there are indications that the species has been expanding its range, since the end of the 1980s, via use of new breeding sites in Italy and Greece (TUCKER & HEATH 1994).

Greater flamingos regularly appear in Germany in small numbers. In all likelihood, such birds are escapees from captivity, and thus their relationship to the west Mediterranean population is unclear. A small population, consisting of a few, irregularly breeding pairs, has existed since 1986 at Zwillbrocker Venn, in North Rhine-Westphalia. In 1999, two greater flamingo breeding pairs were sighted in Germany (BAUER et al. pub. pend.). The German breeding birds migrate regularly to the Dutch North Sea coast for the winter (BAUER & BERTHOLD 1996).

GREATER FLAMINGO Phoenicopterus ruber roseus	A	B	C	Population	Trend
W Africa (breeding birds of Mauritania)	3a			40,000	?
E-Africa	3a 3c			35,000	–
S-Africa	3a 3c			55,000	–
W Mediterranean	3a			80,000	+
E Mediterranean, SW & S Asia		2a		500,000	0

MUTE SWAN *(CYGNUS OLOR)*. The mute swan breeds in the temperate zone of the Western Palearctic. Its contiguous range extends from Ireland and the British Isles to south Scandinavia and the Baltic countries, across the north-west European lowlands (north-west France, Benelux countries, Germany, Denmark) and Poland. Other breeding populations are found in the Black Sea and Caspian Sea regions and in central Asia. The mute swan's global distribution has been strongly influenced by its being kept as a decorative species, and thus current breeding populations are descendants, in part, of former park birds that have returned to the wild. The species has also been introduced in the Australasian region and in North America and South Africa, for example (SCOTT & ROSE 1996). In the Western Palearctic, three populations relevant to AEWA are differentiated, apart from the sedentary populations of Ireland and Great Britain (WETLANDS INTERNATIONAL 1999).

After Denmark, Germany is the most important wintering area of the north-west and central European population (DELANY et al. 1999). SUDFELDT et al. (1997) place the mid-winter population of the mute swan in Germany at 30,000 to 40,000 individuals. Between 1974 and 1996, mid-winter populations of the bird increased significantly in both the north-west European and central European census regions (DELANY et al. 1999). This growth is attributed to reduced hunting pressure, milder winters and better availability of winter food (HAGEMEIJER & BLAIR 1997).

The mute swan's important wintering areas in Germany include the Vorpommersche Boddenlandschaft National Park (about 12,500 individuals), the Greifswalder Bodden area (1,500 individuals) and the Wismar Bight (>5,000 individuals) on Mecklenburg-West Pomerania's Baltic Sea coast (SKOV et al. 2000). The mute swan's breeding population in central Europe has increased significantly in recent decades (BAUER & BERTHOLD 1996). In the mid-1990s, it was estimated by WITT et al. (1996) to number 6,800 to 8,300 breeding pairs. In 1999, following additional increases, the population had reached 7,700 to 13,400 pairs (BAUER et al. pub. pend.)

WHOOPER SWAN *(CYGNUS CYGNUS)*. The whooper swan breeds in the boreal zones of Europe and Asia, from Iceland in the west to Kamchatka Peninsula in east Siberia (HAGEMEIJER & BLAIR 1997). Overall, a total of four populations are differentiated: an Icelandic population,

MUTE SWAN Cygnus olor	A	B	C	Population	Trend
NW mainland & C Europe		2d		210,000	+
Black Sea		1		45,000	+
W & C Asia/Caspian Sea		2a 2d		250,000	+

WHOOPER SWAN Cygnus cygnus	A	B	C	Population	Trend
Iceland/United Kingdom & Ireland	2			16,000	? (0)
NW Europe (mainland)		1		59,000	+
N Europe & W Siberia/ Black Sea & E Mediterranean	2			17,000	–
W & Central Siberia/Caspian Sea	2			20,000	–

which winters in Ireland and on the British Isles; a north-west European population, with wintering areas in north-west continental Europe; and west and central Siberian populations, with wintering areas in the Black Sea and Caspian Sea regions (SCOTT & ROSE 1996). Parts of the north-west European mainland population regularly rest and winter in Germany. In addition, small numbers of individuals from the Icelandic breeding population, which winter predominantly on the British Isles, reach Germany and the north-west European mainland (SCOTT & ROSE 1996).

An internationally co-ordinated survey of the north-west European winter population in January 1995 found a total number of 52,000 individuals, a figure that was then extrapolated to about 59,000 individuals because some of the counts were incomplete (LAUBEK et al. 1999). The winter populations of the north-west European population are concentrated in Denmark, Germany, Sweden, Norway and Poland.

The north-west European population of the whooper swan has increased considerably in recent decades (SCOTT & ROSE 1996, DELANY et al. 1999). In keeping with this development, the mid-winter population in Germany grew significantly between 1981 and 1999, with a 5% annual rate of increase. This population is estimated to comprise 10,000 to 11,000 individuals (SUDFELDT et al. 2002). In 1995, about 15,500 individuals, or 26% of the total north-west European population, wintered in Germany. The percentage of the north-west European mainland population that winters in Germany varies from year to year, in keeping with winter severity (LAUBEK et al. 1999).

The whooper swan's most important wintering areas in Germany are located in the Länder Schleswig-Holstein (Schlei, Traveförde and Dassower See), Lower Saxony (Elbniederung Schnackenburg-Lauenburg), Mecklenburg-West Pomerania (Westrügen-Hiddensee-Zingst, Greifswalder Bodden) and Brandenburg (Unteres Odertal, Unteres Elbtal) and North Rhine-Westphalia (Weser, Ems) and Saxony-Anhalt (SKOV et al. 2000, UNSELT et al. 2000, SUDFELDT et al. 2002).

During the course of this survey, the whooper swan expanded its breeding range to the south; in 1995, following new settlement in Estonia, Latvia and Poland, it bred successfully for the first time in Brandenburg (DEUTSCHMANN 1997). As of 1999, the population in Brandenburg had increased to four pairs, and a first breeding pair settled in Saxony. Breeding birds were also sighted in 1999 in Hamburg and Schleswig-Holstein, but these birds, in contrast to those in eastern Germany, were probably escapees from captivity (SUDFELDT et al. 2002).

TUNDRA SWAN *(CYGNUS COLUMBIANUS).* The three sub-species of the tundra swan / Bewick's swan breed in circumpolar regions in Alaska and north Canada and in north Russia; only the sub-species *C. c. bewickii* occurs in the area covered by the agreement. Two populations are differentiated within this sub-species. Birds that breed in the Arctic areas of north-east Europe and west Siberia winter in north-west Europe, while the north Siberian population, whose breeding areas are not yet precisely known, winters in the Caspian region (SCOTT & ROSE 1996, WETLANDS INTERNATIONAL 1999).

TUNDRA SWAN Cygnus columbianus bewickii	A	B	C	Population	Trend
W Siberia & NE Europe/NW Europe		1		29,000	+
N Siberia/Caspian Sea	1c			500	?

Germany is part of the resting and wintering areas of the west Siberian / north-west European population. The mid-winter population is concentrated in a few areas in Denmark, the Netherlands and the British Isles (SCOTT & ROSE 1997, DELANY et al. 1999). The entire north-west European winter population has increased considerably in recent decades. However, recently the population has seemed to be stabilising or even shrinking (although not to a significant degree) (DELANY et al. 1999, SUDFELDT et al. 2002).

The tundra swan's mid-winter population in Germany is strongly dependent on weather; only in mild winters does a significant portion of the population remain in Germany. Pursuant to SUDFELDT et al. (2002) an average of 1,000 to 1,200 individuals, or about 4-5% of the flyway population, winter in Germany. From 1981 to 1999, the population fluctuated widely in size, as a result of weather, and no trends could be identified with any statistical reliability (SUDFELDT et al. 2002).
A considerably larger population, comprising 6,000 to 8,000 individuals, rests in Germany in March, during its homeward journey. In March 1995, a peak number of over 11,000 individuals was counted in Germany (DEGEN et al. 1996, cited from SUDFELDT et al. 2002). In contrast to most other waterbird species, the tundra swan migrates in relatively small groups and family bands, with the result that the total population is broken up into a number of relatively small resting groups, without any larger concentrations, that are distributed among several different areas (SCOTT & ROSE 1996). The tundra swan's most important resting areas in Germany are located in lowlands in Lower Saxony along the Elbe, Ems, Weser and Aller rivers, in Schleswig-Holstein's Eider-Treene-Sorge lowlands, along the Bodden coast of Mecklenburg-West Pomerania and in lowlands of the lower (Untere) Havel and Elbe rivers in Saxony-Anhalt and Brandenburg (UNSELT et al. 2000).

PINK-FOOTED GOOSE *(ANSER BRACHYRHYNCHUS)*. The breeding area of the pink-footed goose is limited to Spitzbergen, the east coast of Greenland and Iceland. Birds that breed in Greenland and Iceland winter almost exclusively in England and Scotland, while Spitzbergen's breeding birds migrate along the Norwegian coast to wintering areas in Denmark, the Netherlands and Belgium (SCOTT & ROSE 1996, MADSEN et al. 1999). Exchanges between the two populations take place, to a limited extent, only in cold winters, when a small part of the Spitzbergen population enters the British wintering areas (MADSEN et al. 1999).

Pink-footed geese of the Spitzbergen population migrate directly from their resting areas on the west coast of Denmark to their winter quarters in the Netherlands and Belgium. In the early 1990s, part of this population began wintering regularly in Denmark, possibly because it found a better food supply there in the form of winter grain (MADSEN et al. 1999). Pink-footed geese from the Danish/Dutch winter population regularly appear in small resting groups in Germany, especially in northern Lower Saxony. The total maximum size of these groups probably does not exceed about 500 individuals (MOOIJ 2000).

PINK-FOOTED GOOSE Anser brachyrhynchus	A	B	C	Population	Trend
E Greenland & Iceland/ United Kingdom		2a		250,000	+
Spitzbergen/NW Europe		1		37,000	+

BEAN GOOSE *(ANSER FABALIS)*. A total of five sub-species of bean goose breed in the northern Palearctic region, from northern Norway to east Siberia. The AEWA area contains two distinct sub-species that differ considerably – morphologically, ecologically and in their migratory behaviour (SCOTT & ROSE 1996).

The taiga bean goose *A. f. fabalis* breeds in the taiga zone of Norway, Finland (including the Kola Peninsula) and west Russia. The eastern extent of the bird's range is unclear (MADSEN et al. 1999), although it is known to include the west Siberian lowlands (SCOTT & ROSE 1996). In October, breeding birds of Scandinavia and the Kola Peninsula gather at resting sites in south Sweden. They then winter at these sites or, with the onset of cold weather, migrate further south to winter quarters in Denmark, Germany and the Netherlands. A small part of these birds spends the winter on the British Isles. Breeding birds that originate further east migrate along the southern coast of the Baltic Sea to winter quarters in Poland and along the German Baltic Sea coast (MADSEN et al. 1999).

The tundra bean goose *A. f. rossicus* breeds in the north Russian tundra zone, from the Kola Peninsula in the west to the Taymyr Peninsula (HAGEMEIJER & BLAIR 1997, MADSEN et al. 1999). This population migrates along the south-eastern Baltic Sea to resting areas in Poland and the eastern German interior; from these areas, part of the population continues on, to more westerly winter quarters in Germany, the Netherlands and France, or heads south-east to the Czech and Slovak republics and to Austria and Hungary (SCOTT & ROSE 1996, MADSEN et al. 1999). Winter populations of both sub-species appear in Germany, with much overlapping, as passage migrants and winter guests (WETLANDS INTERNATIONAL 1999). No discrete data for these two populations is available with regard to the sizes of, and trends for, their resting and wintering groups in Germany.

Both the resting and wintering populations of the bean goose in Germany have increased since the 1960s, in parallel with development for the total Western Palearctic population, following several decades of significant decreases. In the 1990s, this growth gave way to a largely stable population situation, without further growth (MOOIJ 2000). The maximum resting population of simultaneously present bean geese, during the November count of the international waterbird census, amounted to 260,000 individuals (MOOIJ 2000). SUDFELDT et al. (1997) placed the fall resting population of the bean goose (November) at about 300,000 individuals. In mid-winter (January), about 200,000 individuals were in Germany. MOOIJ (2000) assumes that during some of the fall migration the entire flyway population of the bean goose can be found in Germany. Important resting areas are located in the eastern German Länder Mecklenburg-West Pomerania (Greifswalder Bodden, Rügen, Hiddensee), Brandenburg, Saxony-Anhalt (Untere Havel-Schollener See, Unteres Rhinluch-Havelländisches Luch, Unteres Odertal, Havelland near Potsdam, Schorfheide-Chorin) and Saxony

BEAN GOOSE Anser fabalis fabalis	A	B	C	Population	Trend
W Siberia & NE Europe/NW Europe		1		100,000	0
Anser fabalis rossicus					
W & Central Siberia/NE & SW Europe			(1)	600,000	?

(Oberlausitz). The important wintering areas include the Elbe lowlands (Elbniederung) in Lower Saxony, between Schnackenburg and Lauenburg; the Unterer Niederrhein (lower part of the lower Rhine) in North Rhine-Westphalia; Elbaue (Elbe riparian meadow) near Torgau in Saxony and the Wulfender Bruch; Elbaue near Jerichow; and the Zerbster Land area in Saxony Anhalt (UNSELT et al. 2000).

GREATER WHITE-FRONTED GOOSE *(ANSER ALBIFRONS)*. The greater white-fronted goose breeds along the entire Arctic circle, in the Arctic tundra of Eurasia and North America. Of the five described sub-species, the nominate form breeds in the northern Palearctic, from the Kanin Peninsula eastward, to the Kolyma River in north-east Siberia (SCOTT & ROSE 1996). The Greenlandic sub-species *A. a. flavirostris* winters on the British Isles.

Breeding birds of the Western Palearctic, including the area from the Taymyr Peninsula to Chatanga, winter in four main areas in north-west and central Europe, as well as in regions of the Black Sea and Caspian Sea (SCOTT & ROSE 1996, MOOIJ et al. 1999). It is impossible to differentiate discrete flyway populations, however, because the breeding areas completely overlap and because frequent exchanges take place between wintering regions. A total of four wintering groups of the nominate form are differentiated (MADSEN 1999). Germany is part of the wintering area of birds that breed in north-west Siberia.

The north-west European wintering areas are located in the Netherlands and Germany, as well as – to a lesser extent – in France and south England. Since the 1950s, when the first counts of greater white-fronted geese were carried out in the UK, the Netherlands and Germany, the number of greater white-fronted geese that winter in this region has increased from about 10,000 to 50,000 to about 600,000 individuals (in the 1990s; ROSE & SCOTT 1997, MADSEN et al. 1999). This growth in the north-west European winter population contrasts with declines, during the same period, in central and south-east Europe. After analysing the breeding and wintering populations, MOOIJ (1997) and MADSEN et al. (1999) conclude that the total population of greater white-fronted geese in the Western Palearctic has not changed significantly in recent decades. The growth of the north-west European winter population can be explained as a redistribution of the winter population from the central European region to north-west Europe. In keeping with the trend in western Europe, the resting and wintering populations of the white-fronted goose in Germany have increased continuously since the 1960s. This growth did not stop until the 1990s, when the resting and wintering populations stabilised.

GREATER WHITE-FRONTED GOOSE **Anser albifrons albifrons**	A	B	C	Population	Trend
NW Siberia & NE Europe/ NW-EuropE			1	600,000	+
W Siberia /C Europe	3 c*			100,000	–
W Siberia/Black Sea & Turkey			1	650,000	? (0)
N Siberia/Caspian Sea & Iraq	2			15,000	-
Anser albifrons flavirostris					
Greenland/Ireland & United Kingdom	3a*			33,000	+

As is the case for the bean goose, a significant portion of the bird's north-west European winter population can be found simultaneously in Germany (MOOIJ 2000). According to estimates of SUDFELDT et al. (1997), the fall resting population (November) in the first half of the 1990s amounted to 290,000 to a maximum of 500,000, while the mid-winter population (January) comprised about 250,000 individuals. The white-fronted goose's most important wintering areas in Germany include the Unterer Niederrhein (lower part of the lower Rhine) in North Rhine-Westphalia; the Elbe lowlands (Elbniederung) in Lower Saxony, near Schnackenburg and Lauenburg; and the Elbmarsch area near Stade (UNSELT et al. 2000).

GREYLAG GOOSE *(ANSER ANSER)*. The greylag goose breeds in the temperate and boreal zones of Europe and Asia. In central Europe, the breeding range of the western European nominate form gives way, throughout a broad overlapping zone, to the range of the south-eastern European and Asian sub-species *A.a. rubrirostris* (SCOTT & ROSE 1996, HAGEMEIJER & BLAIR 1997). Of the six discrete flyway populations within the Western Palearctic, the north-west European and central European populations have ranges that include part of the Federal Republic of Germany. The north-west European population's breeding range includes the west coast of Norway; south Sweden; the western part of Poland; Denmark and north-west Germany; and Belgium and the Netherlands. The most important winter quarters of this population are found in the delta region of the Netherlands, in France and in Spain and Portugal. The comparatively small central European population breeds in the Czech and Slovak republics and in Austria and Hungary. Because they share the same migration route to north African winter quarters, the breeding birds of Finland, the Baltic countries and the eastern part of Poland are also assigned to this population.

The north-west European population increased from about 30,000 individuals in 1967/68 to about 200,000 individuals in the mid-1990s (SCOTT & ROSE 1996, WETLANDS INTERNATIONAL 1999). The trend for the central European population ranged from stable to slightly increasing (MADSEN et al. 1999, WETLANDS INTERNATIONAL 1999).

In a trend paralleling the development of the flyway populations, the number of greylag geese resting in Germany has increased since the beginning of the 1960s. Since the end of the 1980s, the maximum populations in the fall (September count of the IWC) have fluctuated between 55,000 and 75,000 individuals. This number represents about 30% of the entire western European flyway population. In January between 3,000 and 12,000 individuals – the number depends on the severi-

GREYLAG GOOSE **Anser anser anser**	**A**	**B**	**C**	**Population**	**Trend**
Iceland/ United Kingdom & Ireland		1		80,000	–
NW Europe/SW Europe			1	200,000	+
Central Europe/N Africa	2*			25,000	+
Anser anser rubrirostris					
Black Sea/Turkey		1		85,000	?
W Siberia/ Caspian Sea & Iraq			1	>100,000	+

ty of the winter – can be found in Germany (MOOIJ 2000). This figure is likely to include a large number of descendants of animals released from captivity. The greylag goose's breeding population in Germany has grown, paralleling the species' general increases in north-west Europe. For example, one representative population studied from 1949 to 1994, in Mecklenburg-West Pomerania (HAUFF & ILLMANN 1999), registered continual growth, in numbers of breeding pairs, from 1949 (seven pairs) to the mid-1970s. From that point on, when the area's capacity had been reached, the breeding population fluctuated around a level of about 130 pairs. All in all, Germany's breeding population in the mid-1990s was estimated to number 6,600 to 8,500 breeding pairs (WITT et al. 1996). MOOIJ (2000) places the number in the second half of the 1990s at about 8,000 to 10,000 breeding pairs. BAUER et al. (pub. pend.) estimated that in 1999 the population had grown to 10,000 to 18,000 breeding pairs.

BARNACLE GOOSE *(BRANTA LEUCOPSIS)*. The barnacle goose breeds, in three discrete populations, on the east coast of Greenland, on Spitzbergen and in the Russian Arctic – from the Kola Peninsula eastward to Novaya Zemlaya and Lake Kara. Since the early 1970s, another small breeding population has established itself far outside of the species' original range – in the Baltic region, beginning with the Swedish Island of Gotland. Because it shares the same migration routes and winter quarters, this population, which presumably originated with passage migrants from Russia that settled for breeding, is grouped with the breeding population of the Russia Arctic (MADSEN et al. 1999, SCOTT & ROSE 1996). The wintering areas of the birds that breed in Greenland and Spitzbergen are found on the British Isles. Breeding birds from Russia and the smaller Baltic Sea population winter in north-west Europe, primarily in the Netherlands and Germany.

ROSE & SCOTT (1997) estimated the total Russian-Baltic population to number about 167,000 individuals. A more recent count, taken in January 1997, registered about 276,000 individuals, of which about 13,000 (about 5%) belong to the Baltic breeding population (MADSEN et al. 1999). Following a nadir in the early 1950s, when the Russian population was estimated to number only 10,000 individuals, the population has grown since the beginning of the 1960s at an annual rate of about 7%. In spite of the considerable growth of the Baltic breeding population since the mid-1970s, the overall increase is due primarily to the growth of the Russian breeding population (MADSEN et al. 1999). In the fall, large parts of this population rest on Schleswig-Holstein's and Lower Saxony's Wadden Sea coasts. Following this resting period, as of mid-November, they then move on to their winter quarters in the Netherlands. In mild winters, some of them (between 5,200 and 36,000 individuals in the years 1989 to 1994) remain longer in their German resting areas. In spring, and commencing at the beginning of the year, the resting populations in Schleswig-Holstein's part of the Wadden Sea increase again, reaching a maximum shortly before they leave toward the end of April. When this occurs, up to 50 % of

BARNACLE GOOSE Branta leucopsis	**A**	**B**	**C**	**Population**	**Trend**
E Greenland /Scotland & Ireland		1		40,000	+
Spitzbergen /SW Scotland	2			23,000	+
Russia/Germany & Netherlands			1	267,000	+

the Russian-Baltic population can be in the German part of the Wadden Sea at the same time. And because the turnover rate is high, a considerably larger percentage of the population actually uses this region as a resting area (MADSEN et al. 1999, MOOIJ 2000). SUDFELDT et al. (1997) placed the barnacle goose's spring resting population (March) in Germany at about 100,000 individuals. The resting population grew continually since the 1960s and did not begin to stabilise until the end of the 1980s (MOOIJ 2000). In Schleswig-Holstein's part of the Wadden Sea, the barnacle goose's maximum population in den 1990s reached about 102,000 individuals; further continual increases in the resting population were also observed. The reasons for these latter increases are considered to include both the growth in the total population and the longer times spent by resting geese in their resting areas (GÜNTHER & RÖSNER 2000).

MADSEN et al. (1999) consider the primary reasons for the population's considerable growth in recent decades to be a decrease in anthropogenic pressures such as hunting in the birds' winter quarters, collection of eggs, removal of young birds and capture of adult birds, in their breeding areas, when they are flightless due to moulting. The barnacle goose is also presumed to have profited from an increased food supply brought about by greater fertiliser use in farming, in the birds' Dutch winter quarters.

In the 1970s, wild birds from the Russian breeding population settled on the Swedish island of Gotland (MADSEN et al. 1999). The barnacle goose's first breeding areas in the Baltic were spring resting areas of migrating Russian breeding birds. Since its inception, the Baltic population has grown considerably, in keeping with the extension of its breeding range. Today, barnacle geese breed on islands of Estonia and Denmark as well as on the Swedish, Finnish and German mainland coats. These breeding birds – especially those from the main colonies – consist in part of escapees from captivity. In Germany, the bird began breeding in 1988 at the Großer Plöner See (lake) near the Baltic Sea coast of Schleswig-Holstein. This new breeding influx was followed by additional new arrivals on Schleswig-Holstein's west coast, in Lower Saxony and along the Unterer Niederrhein (lower part of the lower Rhine) in North Rhine-Westphalia (BRÄGER & LUDWICHOWSKI 1995, KOOP 1998, MOOIJ 2000). According to MOOIJ (2000), the barnacle goose's breeding population in Germany in 1999 consisted of about 30 breeding pairs.

BRENT GOOSE *(BRANTA BERNICLA)*. The brent goose breeds in the high Arctic and is widespread throughout the entire Arctic circle regions. In breeds in near-coastal tundra of northern Siberia, Alaska and Canada and well as in Greenland, Spitzbergen and Franz Joseph Land. Of the four described sub-species (including the east-Siberian form *B. b. orientalis*, which some authors do not recognise as a sub-species), both the dark-bellied nominate form and the light-bellied sub-species *B.b. hrota occur* regularly in the Western Palearctic (SCOTT & ROSE 1996).

BRENT GOOSE **Branta bernicla bernicla**	**A**	**B**	**C**	**Population**	**Trend**
W Siberia/W Europe		2b		300,000	+(0)
Branta bernicla hrota					
Spitzbergen/Denmark & United Kingdom	1c			5,000	0
Canada/Ireland	2			20,000	0

The breeding area of the dark-bellied brent goose *B. b. bernicla* is in northern Siberia and extends from the Yamal Peninsula eastward to the Taymyr Peninsula (MADSEN et al. 1999). The bird winters exclusively on western European coasts of the Wadden Sea; in the Netherlands; and on the south-east coast of England, in a region extending southward to the French Atlantic coast. Brent geese use the northern part of the Wadden Sea (Denmark, Schleswig-Holstein and Lower Saxony) primarily as a resting site, in the fall – from mid-September to mid-November – before they move on to their winter quarters in the Netherlands (Rhine delta), west France and south-east England.
The very small Spitzbergen population of the light-bellied brent goose *B. b. hrota*, which numbers about 5,000 individuals (ROSE & SCOTT 1997, MADSEN et al. 1999), migrates along the Norwegian coast to its winter quarters in Denmark and north-east England. In cold winters, part of the population migrates to the Netherlands (MADSEN et al. 1999). The small numbers of light-bellied brent geese that appear in the German Wadden Sea are very likely part of this population (BERNDT & BUSCHE 1991, BUNDESDEUTSCHER SELTENHEITENAUSSCHUSS and DEUTSCHE SELTENHEITENKOMISSION 1992, 1994, 1995, 1996, 1997, 1998, 2000).

In spring, shortly before leaving for its Arctic breeding areas, nearly the entire population of the dark-bellied brent goose gathers in the Wadden Sea. Up to about 50 % of the total population can be found at the same time in Schleswig-Holstein's part of the Wadden Sea (GÜNTHER & RÖSNER 2000). The bird's most important resting areas, shortly before departure for the breeding areas at the end of May, are the saltgrass meadows along Schleswig-Holstein's coast, where the geese have to feed and build up their body reserves for their journey across the White Sea into their high-Arctic breeding areas. The fat and protein reserves that the birds store at this time have a large influence on their reproductive success in the following breeding season (MADSEN et al. 1999).
SUDFELDT et al. (1997) placed the brent goose's spring resting population (May) in Germany at 125,000 individuals in the first half of the 1990s. The average resting population increased from fewer than 20,000 individuals, at the beginning of regular counts in the 1960s, to 115,000-150,000 individuals in the 1990s. The brent goose's mid-winter population in Germany is on the order of several thousand individuals (MOOIJ 2000).

Following a collapse in the 1930s, and a nadir of about 16,500 individuals in the mid-1950s, the dark-bellied brent goose's population increased – slightly, at first, but then considerably as of about 1972. The population collapse in the 1930s was the result of an epidemically related die-off of eelgrass *(Zostera spec.)*, the brent goose's most important food plant outside of the breeding season. The impacts of the food shortage as a result of the Zostera die-off were probably intensified by heavy hunting pressure in the bird's winter quarters and, possibly, in its Siberian breeding areas. The population's considerable growth as of the early 1970s was the re-sult of improved protection, especially a temporary suspension of hunting in Denmark, in 1972. Since about the beginning of the 1990s, the species' population growth has been slowing (MADSEN et al. 1999). A similar trend,

COMMON SHELDUCK *Tadorna tadorna*	**A**	**B**	**C**	**Population**	**Trend**
NW Europe		2a		300,000	+
Black Sea & Mediterranean		1		75,000	+(0/–)
W Asia/Caspian Sea & Middle East		1		80,000	+

and possibly a decrease, was also seen in the brent goose's resting population in Schleswig-Holstein's part of the Wadden Sea between 1988 and 1999 (GÜNTHER & RÖSNER 2000). This trend went hand-in-hand with reduced reproduction, measured in terms of numbers of young birds as a percentage of all birds in the goose's winter quarters (MADSEN et al. 1999).

COMMON SHELDUCK *(TADORNA TADORNA)*. The common shelduck's breeding range in Eurasia forms two differentiable concentrations. A north-west European population breeds on the North Sea and Baltic Sea coasts, on the British Isles and on the Norwegian and French Atlantic coasts (a smaller breeding population, on the Mediterranean coast of France and Spain, may be part of this population SCOTT & ROSE 1996). The second concentration area forms a narrow belt from the Black Sea to west China, along the central Asian steppe zone (SCOTT & ROSE 1996). A total of three populations are differentiated within Europe, with exchanges occurring between the west Asian populations and the population of the Black Sea and Mediterranean, and between this latter population and the north-west European population.

After the breeding season, and beginning about mid-July, most of the breeding birds of north-west Europe, including some breeding birds from the west Mediterranean region, migrate to the Wadden Sea, to the outer Elbe estuary, to moult in large groups. During this period, they are flightless for several weeks and particularly sensitive to disturbances. Up to 180,000 to 200,000 individuals may be found at the same time, during the moult, in this part of the Wadden Sea (NEHLS et al. 1992, SUDFELDT et al. 1997). After completing their moulting, the birds split up into groups that head for the winter to the Danish, German and Dutch Wadden Sea regions and to the coasts of the UK and France. The number of common shelducks that winter in the Wadden Sea fluctuates in keeping with winter severity; in cold winters, a majority of the winter population leaves for milder areas of the British Isles and France (BERNDT & BUSCHE 1991).

The common shelduck's mid-winter population in north-west Europe increased significantly between 1974 and 1996 and then stabilised from 1987 to 1996 (DELANY et al. 1999). SUDFELDT et al. (1997) report a January population of about 40,000 to 85,000 individuals in the first half of the 1990s.

The common shelduck's breeding population in Germany is concentrated on die Wadden Sea coast of Lower Saxony and Schleswig-Holstein, where 4,445 and 4,290 breeding pairs were counted in 1998 and 1999 (SÜDBECK & HÄLTERLEIN 2001). Including breeding pairs further inland, the total population in Germany in 1999 was placed at 5,400 to 6,300 pairs (BAUER et al. pub. pend.) The breeding population on the German North Sea coast has increased significantly in the last ten years, paralleling the growth of the total population (HÄLTERLEIN et al. 2000).

EUROPEAN WIGEON *(ANAS PENELOPE)*. The European wigeon is found throughout the entire northern Palearctic, from Iceland to Kamchatka in eastern

EUROPEAN WIGEON Anas penelope	A	B	C	Population	Trend
W Siberia & NE Europe/NW Europe			1	1,250,000	+
W Siberia & NE Europe/ Black Sea & Mediterranean		2c		560,000	–
W Sibiria/SW Asia & NE Africa		2c		250,000	–

Siberia. Breeding birds from Scandinavia and the western part of Russia, and part of the north Siberian population, winter on the coasts of north-west Europe. The majority of Siberian breeding birds winter in the Mediterranean and Black Sea regions. Another group of breeding birds from west and central Siberia winters in north-east Africa and south-west Asia. A total of three sub-populations are differentiated on the basis of wintering regions (SCOTT & ROSE 1996). This differentiation is not sharp, however, since the north-west European population and the Mediterranean population on the Iberian peninsula engage in exchanges between their wintering regions, especially during cold winters, and since their breeding areas overlap broadly (SCOTT & ROSE 1996).

In Germany, the bird's winter populations are concentrated on the Wadden Sea coasts of Lower Saxony, Hamburg and Schleswig-Holstein (POOT et al. 1996, UNSELT et al. 2000). Smaller resting areas are also found along the Baltic Sea coast of Mecklenburg-West Pomerania (Rügen, Hiddensee, Greifswalder Bodden) and in the Unteres Odertal area (lower Oder River valley) in Brandenburg (UNSELT et al. 2000). For Germany as a whole, SUDFELDT et al. (1997) estimate the maximum fall resting population (October) to number 180,000 to 200,000 individuals, and the mid-winter population to number 125,000 to 135,000 individuals.

The north-west European population's mid-winter populations grew significantly from 1974 to 1996 (DELANY et al. 1999). The European wigeon's population in Schleswig-Holstein's part of the Wadden Sea has also increased considerably, in parallel with this development, since the end of the 1970s. This trend has been interrupted only by irregular population shrinkage during cold winters, when large parts of the population leave for regions further south (BRUNCKHORST & RÖSNER 1998). The European wigeon's maximum population in Schleswig-Holstein's part of the Wadden Sea in the 1990s comprised up to 160,000 individuals, or about 13% of the north-west European winter population (GÜNTHER & RÖSNER 2000).

As a breeding bird, the European wigeon appears in very small numbers, and at irregular intervals, on Germany's North Sea and Baltic Sea coasts; the total group is likely to be considerably smaller than 25 breeding pairs (HÄLTERLEIN et al. 2000). In 1999 a total of 10 pairs of the European wigeon bred in Schleswig-Holstein, and another breeding group was reported from Mecklenburg-West Pomerania (SUDFELDT et al. 2002).

GADWALL *(ANAS STREPERA)*. The gadwall, a Holarctic breeding bird, is found throughout the temperate to Mediterranean zones of Eurasia and North America (SCOTT & ROSE 1996, HAGEMEIJER & BLAIR 1997). Birds that breed in the northern and eastern regions of north-west Europe spend the winter in the more Atlantic regions of the Netherlands, France and the British Isles (SCOTT & ROSE 1996). A total of three flyway populations can be differentiated on the basis of wintering areas: a north-west European population, a central European-Mediterranean (including the Black Sea) population and a south-west Asian / north-east African

GADWELL Anas strepera strepera	A	B	C	Population	Trend
NW Europe		1		30,000	+
NE Europe /Black Sea & Mediterranean		2c		75,000 - 150,000	–
W Siberia/SW Asia & NE Africa			(1)	130,000	?

population (SCOTT & ROSE 1996). The boundary between the north-west European and central European populations passes through Germany. While the majority of the north-west European population migrates to winter quarters further west, large portions of the central European population winter in Baden-Württemberg and Bavaria (SUDFELDT et al. 2000).

According to IWC data for the periods 1974 to 1996 and 1987 to 1996, the mid-winter populations of the north-west and central European populations have increased significantly (DELANY et al. 1999). The largest resting population of the gadwall in Germany was registered in the first half of the 1990s, during the bird's fall migration, in November: about 11,000 individuals (SUDFELDT et. al. 1997). Since then, the gadwall's mid-winter population in Germany has continued to increase, especially in southern Germany, and in 1998 some 13,000 individuals wintered in Germany (SUDFELDT et al. 2000).

The gadwall's most important wintering areas in Germany are located at Lake Constance, along the upper Rhine in Baden-Württemberg and at dammed reservoirs on Bavaria's Isar and Inn rivers (SUDFELDT et al. 2000, UNSELT et al. 2000). In addition, other large resting and wintering populations are found in the lake country (Seenplatte) in the eastern Holstein region (UNSELT et al. 2000).

The breeding population in Germany has also increased considerably since the beginning of the 1970s, in spite of regional fluctuations, and some 2,000 to 2,500 breeding pairs were counted in the mid-1990s (WITT et al. 1996, BAUER & BERTHOLD 1996). In 1999, the breeding population was estimated to be on the order of 2,700 to 5,000 pairs (3,689, SUDFELDT et al. 2002) (BAUER et al. pub. pend.). The gadwall's breeding range in Germany shows a clear concentration in the northern Länder Mecklenburg-West Pomerania (1999: 1,811 pairs), Schleswig-Holstein (1999: 800 pairs), Brandenburg (1999: 225 pairs) and Lower Saxony (1999: 100 pairs). Other large populations are found in Saxony (1999: 265 pairs) and in Bavaria and Baden-Württemberg (1999: 200 pairs in each) (SUDFELDT et al. 2002).

GREEN-WINGED TEAL *(ANAS CRECCA)*. The green-winged teal / common teal, which has two sub-species, is found throughout the temperate and northern latitudes of Eurasia and North America. The wintering areas of the Western Palearctic nominate form extend southward to North Africa and into the Arabian Gulf region (SCOTT & ROSE 1996). As a result of extensive exchanges between wintering regions, and considerable overlapping of breeding areas, the bird's flyway populations in the Western Palearctic cannot be sharply differentiated, and thus SCOTT & ROSE (1996) make a coarse distinction on the basis of the bird's main wintering regions. The breeding and wintering areas of the winter populations of north-west Europe, of the Black Sea region and of the Mediterranean overlap in Germany.

Trend calculations on the basis of the IWC's mid-winter counts show that the north-west European population grew significantly from 1974 to 1996, including

GREEN-WINGED TEAL Anas crecca crecca	A	B	C	Population	Trend
NW-Europe			1	400,000	+
W Siberia & NE Europe/ Black Sea & Mediterranean			1	750,000 - 1,375,000	0
W Siberia/SW Asia & NE Africa		2c		1,500,000	–

stabilisation between 1987 to 1996. No significant trend was identified for the central European mid-winter population during the same period, although a slight decreasing trend was seen between 1987 and 1996 (DELANY et al. 1999). In the first half of the 1990s, the green-winged teal's fall resting population in Germany was estimated to number 40,000 to 65,000 individuals, while its mid-winter population during the same period comprised about 25,000 to 30,000 individuals (SUDFELDT et al. 1997). The green-winged teal's important wintering areas in Germany include Schleswig-Holstein's Wadden Sea, the Untere Weser (lower Weser River) and the Elbmarsch area, from Stade to Otterndorf, in Lower Saxony. Other important resting areas include Lower Saxony's Wadden Sea, the Unteres Odertal (lower Oder River valley) area and the Untersee (lower lake) section of Lake Constance (UNSELT et al. 2000).

WITT et al. (1996) place the green-winged teal's breeding population in the Federal Republic of Germany in the mid-1990s at 4,200 to 5,700 pairs. On the other hand, the bird's development is difficult to interpret, due to survey-related difficulties and differences in trends between different regions. All in all, the population can be assumed stable in the 1990s, and the bird's breeding population in 1999 was placed at 3,700 to 5,800 pairs (BAUER et al. pub. pend., BAUER & BERTHOLD 1996). Pronounced concentrations of the population reported for 1999, comprising 4,637 pairs, were found in the north German Länder Lower Saxony (2,500 pairs), Mecklenburg-West Pomerania (650 pairs) and Schleswig-Holstein (370 pairs), as well as in Bavaria (550 pairs) (SUDFELDT et al. 2002).

MALLARD *(ANAS PLATYRHYNCHOS).* The mallard is the most common and most widely distributed duck species in the Western Palearctic. It is found throughout the entire Holarctic. A total of eight sub-species have been described; of these, six are considered by some authors to be separate species (SCOTT & ROSE 1996). On the basis of wintering areas, SCOTT & ROSE (1996) group birds of the nominate form, in western Eurasia, into five populations, although the differentiations are not sharp, since the birds' breeding and wintering areas exhibit large transition zones. Parts of the north-west European and north-European/west-Mediterranean populations are found in Germany.

Analysis of trends for the mid-winter populations reveals that the north-west European winter population grew significantly overall from 1974 to 1986, including a significant decline beginning in 1987 (to 1996). During the same periods, the central European mid-winter population decreased significantly (DELANY et al. 1999). SUDFELDT et al. (1997) placed the mallard's mid-winter population in Germany at about 1,000,000 to 2,000,0000 individuals.

In contrast to the decreases for the mid-winter population, the mallard's breeding

MALLARD Anas platyrhynchos platyrhynchos	A	B	C	Population	Trend
NW Europe			1	5,000,000	0
N Europe/W Mediterranean			1	1,000,000	+
E Europe/ Black Sea & E Mediterranean		2c		2,250,000	–
W Siberia/SW Asia			(1)	800,000	?

population in Germany, comprising 210,000 to 470,000 breeding pairs (BAUER et al. pub. pend.), is currently considered stable (BAUER & BERTHOLD 1996).

NORTHERN PINTAIL *(ANAS ACUTA)*. The northern pintail is a Holarctic breeding bird. Its range extends across the northern taiga and tundra zone, and along the northern boundary of the temperate latitudes of Eurasia and the North American continent. North-east Germany contains the southern boundary of the bird's contiguous range in the Western Palearctic (SCOTT & ROSE 1996, HAGEMEIJER & BLAIR 1997).

No population differentiation is possible within the bird's contiguous breeding range. Nonetheless, AEWA classifies three groups on the basis of their spatially separate wintering areas: birds of north-west Europe (coastal regions), birds that winter in the Mediterranean region and in west Africa's Sahel region and birds that winter in south-west Asia and east Africa. Birds that breed in countries bordering the Baltic Sea, in Scandinavia and in Iceland make up the largest part of the north-west European winter population, members of which regularly appear in Germany – especially north Germany, but also inland areas in south Germany (BAUER & GLUTZ OF BLOTZHEIM 1990, SCOTT & ROSE 1996). Birds returning home from north-west Africa and south-west Europe also pass through Germany (BAUER & GLUTZ OF BLOTZHEIM 1990).

The northern pintail's mid-winter population in north-west and central Europe was stable – i.e. showed no recognisable trend – from 1974 to 1996. More recently (1987 to 1996), significant population decreases have occurred in north-west Europe, in contrast to the growth of the central European group – a group which is relatively insignificant, however, in light of its absolute mid-winter numbers (DELANY et al. 1999).

In Germany, the northern pintail appears regularly as a passage migrant and winter guest and, rarely, as a breeding bird. Its resting and wintering populations in the first half of the 1990s numbered about 3,500 – 7,000 (October) and 3,300 (January) individuals (SUDFELDT et al. 1997).

In the mid-1990s, the northern pintail bred very rarely in Germany – the total number of breeding pairs was about (WITT et al. 1996). For 1995, 1996 and 1999, MÄDLOW & MODEL (2000) and SUDFELDT et al. (2002) report a total of only about 20 breeding pairs, of which 10 bred in Schleswig-Holstein, while the others were divided between the Länder Mecklenburg-West Pomerania (1999: 1 pair), Lower Saxony (1999: 3 pairs), Brandenburg (1999: 3 pairs) and Hesse (1999: 2 pairs).

NORTHERN PINTAIL Anas acuta	A	B	C	Population	Trend
NW Europe (Winter)		1		60,000	–
W Siberia, NE & E Europe/ S Europe & W Africa		2c		1,200,000	–
W Siberia/SW Asia & E Africa			(1)	700,000	?

GARGANEY *(ANAS QUERQUEDULA).* The garganey breeds in Eurasia's temperate climate zone, from the UK in the west to Kamchatka Peninsula in east Siberia. The wintering areas of Western Palearctic breeding birds lie in tropical Africa, in a narrow, sub-Saharan belt, in the river systems of Senegal and Niger and in the Lake Chad region (SCOTT & ROSE 1996). SCOTT & ROSE (1996) differentiate two populations on the basis of the locations of their wintering areas. Germany is within the breeding range of the west Siberian-European breeding population.

WITT et al. (1996) estimated the garganey-'s breeding population in Germany at 1,300 to 3,100 breeding pairs. The population decreased between 1970 and 1994. As of 1999, a further decrease had occurred, to a level of 1,200 to 1,900 pairs (BAUER et al. pub. pend.). According to data of the Umbrella Association of German Avifaunists (Dachverband Deutscher Avifaunisten), the population reported in 1999 (1,538 pairs) was concentrated in the north-German Länder Lower Saxony (500 pairs), Mecklenburg-West Pomerania (305 pairs) and Schleswig-Holstein (240 pairs), all of which are rich in water bodies. Other larger populations, each with over 100 pairs, were found in Brandenburg, Saxony-Anhalt and Bavaria (SUDFELDT et al. 2002).

The continuing population decline in Germany is paralleled by decreases in other central European countries, and thus it must be assumed that the garganey population is undergoing a general decline (BAUER & BERTHOLD 1996). The causes for the decline are considered to be habitat changes in the bird's breeding areas. Habitat destruction and hunting by humans in the species' west African winter quarters also play a role (BAUER & BERTHOLD 1996, DELANY et al. 1999).

NORTHERN SHOVELER *(ANAS CLYPEATA).* The northern shoveler's breeding range comprises the temperate and northern latitudes of Eurasia and North America. The winter quarters of Western Palearctic breeding birds are in north-west Europe, the Mediterranean region and west and east Africa. Presumably, the relatively small winter population of north-west Europe is made up of birds from Scandinavia and west Russia, which winter predominantly in the coastal regions of France, the Benelux countries and the British Isles. In cold winters, they may head south-east instead, as far as the Iberian peninsula (SCOTT & ROSE 1996). A much larger population migrates from breeding areas further east to wintering areas in the Mediterranean, the Black Sea region and west Africa. The relevant mi-

GARGANEY **Anas querquedula**	**A**	**B**	**C**	**Population**	**Trend**
W Siberia & Europe/W Africa		2c		2,000,000	–
W Siberia/ SW Asia NE & E Africa			(1)	100,000 - 200,000	?

NORTHERN SHOVELER **Anas clypeata**	**A**	**B**	**C**	**Population**	**Trend**
NW & C Europe (win)		1		40,000	0
W Siberia, NE & E Europe/ S Europe & W Africa		(2c)		450,000	?(–)
W Siberia/ SW Asia, NE & E Africa		2c		400,000	–

gration routes overlap considerably, and thus the populations cannot be clearly differentiated. Germany lies within these two populations' migratory overlap (SCOTT & ROSE 1996).

The IWC data, covering the period from 1974 to 1996, show no clearly identifiable long-term trends for the mid-winter populations of north-west and central Europe. Between 1987 and 1996, the central European winter population decreased significantly, but since only a relatively small total number of its birds winter in central Europe (1,316 in the reference year, 1989), this finding is somewhat inconclusive (DELANY et al. 1999). The northern shoveler's fall resting population (October) in Germany numbered 6,000 to 8,000 individuals in the first half of the 1990s. During the same period, the wintering population amounted to 500 to 2,000 individuals (SUDFELDT et al. 1997). The northern shoveler's important wintering areas in Germany include the Elbmarsch areas, from Stade to Otterndorf; Alfsee Lake and the Dümmer area in Lower Saxony; Schleswig-Holstein's Wadden Sea; the Großer and Kleiner Binnensee (inland lakes) on Schleswig-Holstein's east coast and the Unterer Niederrhein (lower section of the lower Rhine) in North Rhine-Westphalia (UNSELT et al. 2000).

In 1994, some 2,700 to 3,500 pairs of northern shovelers bred in Germany (WITT et al. 1996); the breeding population was concentrated in the country's northern Länder (HAGEMEIJER & BLAIR 1997). In 1999, the population was found to be about the same size, from 2,100 to 3,300 pairs, and to be concentrated in Lower Saxony (1,000 pairs), Schleswig-Holstein (700 pairs) and Mecklenburg-West Pomerania (390 pairs) (BAUER et al. pub. pend., SUDFELDT et al. 2002). Like the German winter population, the German breeding population exhibits no clear trend. The increases seen in some Länder, due to an improved food supply as a result of water-body eutrophication, are countered by habitat losses and decreases in other Länder (BAUER & BERTHOLD 1996, HAGEMEIJER & BLAIR 1997).

RED-CRESTED POCHARD *(NETTA RUFINA)*. Unlike the ranges of the other duck species considered in this section, the red-crested pochard's range is concentrated in the south-east of the Western Palearctic, and in west and central Asia. The bird's breeding range, which consists of several distinct "islands", extends from the Iberian peninsula to the steppes of central Asia, across the northern Mediterranean region and the Black Sea and Caspian Sea regions (SCOTT & ROSE 1996, HAGEMEIJER & BLAIR 1997). The European range concentrations are located in Russia, Spain, Turkey and Romania (HAGEMEIJER & BLAIR 1997). The populations in south England, the Netherlands, Germany and Poland represent the northern boundary of the species' range. The origins of these breeding birds have not been reliably identified. Whereas breeding birds of south England may be descendants of escapees from captivity, the populations in the Netherlands, Schleswig-Holstein, Mecklenburg-West Pomerania and Poland are very likely the result of a range expansion that began in the early 20th century, and that has taken place in several waves (BAUER & BERTHOLD 1996, HAGEMEIJER & BLAIR 1997, BERNDT & BUSCHE 1993). Birds that breed in central Europe and the west Mediterranean are either sedentary

RED-CRESTED POCHARD Netta rufina	A	B	C	Population	Trend
SW & C Europe/W Mediterranean	2*			25,000	0/+
Black Sea & E Mediterranean	3c			50,000	–
W & C Asia/SW Asia			1	200,000	0

birds or short-distance migrants (SCOTT & ROSE 1996), while those of north central Europe are mostly migratory birds. For example, Schleswig-Holstein's breeding birds winter in the Mediterranean region, although regular winter populations are also known to exist in Schleswig-Holstein and the Netherlands (BERNDT & BUSCHE 1993, BAUER & BERTHOLD 1996). A total of three populations are differentiated within the Western Palearctic (SCOTT & ROSE 1996).

The red-crested pochard's central European mid-winter population increased significantly from 1974 to 1996, and the northwest European population also exhibited a positive trend. A similar development was also seen, as significant growth in both regions, in the study period 1987 to 1996. This population growth is clearly due to redistribution of winter populations from the west Mediterranean, where a significant population decrease was observed during the same period (DELANY et al. 1999, SUDFELDT et al. 2002).

SUDFELDT et al. (1997) placed the red-crested pochard's resting population in Germany as a whole, during the moulting season in August, at about 4,000 to 6,000 individuals. At Lake Constance, the most important resting area of the red-crested pochard in Germany, the species' resting and wintering populations have increased since the 1960s – slowly, at first, and more rapidly since the 1980s. In the 1990s, up to 7,000 individuals were sighted at Lake Constance in September, undergoing light moulting, and up to 10,000 individuals were observed as January winter guests (HEINE et al. 1999, SCHNEIDER-JACOBY 2000). SUDFELDT et al. (2002) estimate that in mid-winter about 95% of the entire German population, which numbers about 12,500 individuals, can be found at Lake Constance. The most important reasons for this population growth, according to SCHNEIDER-JACOBY (2000), are an improved food supply due to a recovery of filamentous algae (Chara spec.), as a result of improvements in water quality, and establishment of disturbance-free protected zones for breeding and moulting. Other important resting areas of the red-crested pochard in Germany include lakes in Bavaria's Alpine foreland, such as the Chiemsee, Ammersee, Starnberger See and Ismaninger Speichersee (reservoir) (UNSELT et al. 2000).

The red-crested pochard's core population at Lake Constance increased from about 235 breeding pairs in 1980/81 to 367 pairs in 1991/92. In the second half of the 1990s, the population was estimated to number about 400 pairs (including the Swiss and Austrian populations) (HEINE et al. 1999, MÄDLOW & MODEL 2000). For 1999, SUDFELDT et al. (2002) list significant populations other than the one at Lake Constance (Baden Württemberg: 300 pairs), including populations in Bavaria (100 pairs) and in Schleswig-Holstein (40 pairs). The species is also found in Mecklenburg-West Pomerania (13 pairs) and Lower Saxony (10 pairs), and individual breeding pairs have been sighted in Germany's other Länder. Between 1994 and 1999, the species' total population size in Germany was constant, at about 420 to 540 pairs (BAUER et al. pub. pend., WITT et al. 1996).

COMMON POCHARD **Aythya ferina**	**A**	**B**	**C**	**Population**	**Trend**
NE Europe/NW Europe		2c		350,000	–
C & NE Europe/ Black Sea & Mediterranean		2c		1,000,000	–
W Siberia/SW Asia		(2c)		350,000	?(–)

COMMON POCHARD *(AYTHYA FERINA)*. Originally, the common pochard bred in the central Asian steppe zone. As a result of westward expansion, its contiguous range now extends westward from north-east China to Spain and the British Isles (SCOTT & ROSE 1996). The wintering areas of Western Palearctic breeding birds are located in north-west and west Europe, the Mediterranean and Black Sea regions and in the region of the Caspian Sea. Because the bird's breeding areas overlap extensively, and since there is considerable exchange of birds between its wintering regions (partly as a result of movement to escape cold winters), the flyway populations are not sharply differentiated. The AEWA populations are thus differentiated on the basis of winter ranges, which are easier to differentiate. Germany is located within the overlap of the populations of north-west Europe, central Europe and the Black Sea and Mediterranean (SCOTT & ROSE 1996).

Clearly, the shrinkage of the north-west European mid-winter population that was seen in the 1970s and 1980s has not continued; the population can be assumed to have remained stable from 1974 to 1996 and from 1987 to 1996 (DELANY et al. 1999), or to have stabilised at a lower level (SUDFELDT et al. 1997). During the same periods, significant growth was observed in the central European region (DELANY et al. 1999).

In Germany, the common pochard's mid-winter population also grew slightly from 1981 to 1999, at an annual growth rate of about 1.2%. In the 1990s, this population numbered about 80,000 to 100,000 individuals, with a peak of up to 120,000 individuals (SUDFELDT et al. 1997, 2002).
The bird's resting and wintering populations are concentrated at Lake Constance and along the upper Rhine River in Baden-Württemberg, at Bavaria's Alpine foreland lakes and in Baltic Sea coastal waters in Schleswig-Holstein and Mecklenburg-West Pomerania (SUDFELDT et al. 1997, SKOV et al. 2000, UNSELT et al. 2000). The common pochard has been extending its range into western Europe since about 1850. The growth of its population since the middle of the 20th century continued, at a slower rate, until the mid-1990s in many regions of Europe; in some areas, it gave way to population stabilisation (BAUER & BERTHOLD 1996, HAGEMEIJER & BLAIR 1997).

In 1994, a total of 6,300 to 9,500 pairs of common pochards bred in Germany (WITT et al. 1996). As of 1999, the population had decreased slightly, to a level of 4,500 to 7,500 pairs (BAUER et al. pub. pend., SUDFELDT et al. 2002). In 1999, the breeding population was concentrated in the eastern German Länder Saxony (1,220 pairs), Mecklenburg-West Pomerania (1,195 pairs) Saxony-Anhalt, Brandenburg (each with 700 pairs) and Thuringia (130 pairs); all in all, about two-thirds of the total population of 6,007 pairs bred in these Länder (SUDFELDT et al. 2002). The fact that the bird's breeding population is concentrated in eastern German Länder may reflect the bird's eastern origins (HAGEMEIJER & BLAIR 1997).

FERRUGINOUS DUCK *(AYTHYA NYROCA)*. The ferruginous duck breeds in the steppes, semi-deserts and forests of south Eurasia. Its breeding range, apart from those of isolated populations in western Europe (Spain), extends from east and south-east Europe to west China, across

FERRUGINOUS DUCK Aythya nyroca	A	B	C	Population	Trend
W Mediterranean/W Africa	1a 1b 1c			2,000 - 3,000	–
E Europe/E Mediterranean & Africa	1a 1b 3c			10,000 - 50,000	–
W Asia/SW Asia & NE Africa	1a 1b 1c			5,000	–

the Black Sea and Caspian Sea regions and central Asia. The wintering areas of the species' Western Palearctic breeding birds lie in the eastern Mediterranean, in the Black Sea and Caspian regions and in west Africa (SCOTT & ROSE 1996). In Europe, the bird's breeding areas are concentrated in Romania, Moldavia, Ukraine, Hungary and Poland (TUCKER & HEATH 1994, HAGEMEIJER & BLAIR 1997).

Germany is located at the western edge of the eastern European population's breeding range. Small residual populations have been sighted at Lake Constance, including breeding pairs (occasionally: 1979, 1995-1999) as well as small resting and wintering groups (HEINE et al. 1999, SUDFELDT et al. 2002), and in the along the border shared by Brandenburg and Saxony (individual breeding pairs, 1999 and 2000) (REUSSE et al. 2001, RYSLAVY 2001).

The ferruginous duck's population in the Western Palearctic has decreased significantly in recent decades, throughout the bird's entire breeding range. The main reason for this decrease is destruction of wetlands. Hunting also plays a role. Climate changes in parts of the bird's breeding area and its west African winter quarters, causing wetlands to dry out, may also be having a negative on ferruginous duck populations (TUCKER & HEATH 1994, BAUER & BERTHOLD 1996, HAGEMEIJER & BLAIR 1997).

TUFTED DUCK *(AYTHYA FULIGULA)*. The tufted duck breeds in the boreal, temperate and steppe zones of Eurasia. Since the middle of the 20th century, the bird has extended its breeding range far into western Europe. An important reason for this expansion is an improved food supply resulting from benthic biomass growth following water-body eutrophication, and from the spread of the zebra mussel (Dreissena polymorpha) in European waters (the zebra mussel is the duk-k's main food in winter). Construction of dammed reservoirs and other man-made lakes that provide breeding and wintering habitats has also contributed to the duck's range expansion (BEZZEL 1985, HAGEMEIJER & BLAIR 1997).

Because the duck's breeding ranges overlap considerably, it is not possible to differentiate discrete flyway populations. On the other hand, the bird's winter distribution does permit identification of three important wintering regions (SCOTT & ROSE 1996). Germany lies within the overlap between the north-west European winter population and the winter population of central Europe, the Black Sea and the Mediterranean. The most important wintering areas of breeding birds of north-west Europe, Scandinavia and north-west Russia are the shallow bays along Germany's Baltic Sea coast, as well as bordering waters of Poland, Denmark, Sweden and the Netherlands (SCOTT & ROSE 1996). The winter populations of central Europe and of the Black Sea/Mediterranean region consist of local breeding birds and winter guests from regions of Russia (north-east to west Siberia) (ROSE & SCOTT 1997).

TUFTED DUCK Aythya fuligula	A	B	C	Population	Trend
NW Europe (win)			1	1,000,000	+
C Europe, Black Sea & Mediterranean (win)			1	600,000	+ (?)
W Siberia/SW Asia & NE Africa			(1)	200,000	?

The tufted duck's mid-winter populations in north-west Europe did not change significantly, or were stable, between 1974 and 1996, while the central European population grew considerably (DELANY et al. 1999). From 1987 to 1996, the mid-winter populations of both regions grew significantly.

Between 1981 and 1999, the population of tufted ducks wintering in Germany increased significantly – by about 1% per year – paralleling growth of the two populations that occur in Germany (SUDFELDT et al. 2002). SUDFELDT et al. (2002) placed this wintering population, on the basis of IWC data, at 250,000 to 300,000 individuals. The tufted duck's most important resting and wintering areas include waters along the Baltic Sea coast of Schleswig-Holstein and Mecklenburg-West Pomerania, as well as Lake Constance, the upper Rhine and Bavaria's Alpine foreland lakes (SKOV et al. 2000, SUDFELDT et al. 2002, UNSELT et al. 2000).

BAUER et al. (pub. pend.) estimated the breeding population in Germany to number 11,000 to 16,000 breeding pairs. For 1999, SUDFELDT et al. (2002) reported a population of 12,779 pairs, distributed quite evenly among the various Länder, in keeping with water-body abundance.

GREATER SCAUP *(AYTHYA MARILA).* The nominate form of the greater scaup populates the west Eurasian boreal zone, from Iceland and Scandinavian mountain regions to west Siberia, across the northern part of Russia. The sub-species A. m. mariloides occurs in north-west Asia and North America (HAGEMEIJER & BLAIR 1997). On the basis of their wintering regions, breeding birds of Iceland, Scandinavia and Russia (to west Siberia) are assigned to the north-west European flyway population, which numbers about 310,000 individuals. In west Siberia, the population overlaps with the breeding area of the eastern population, which winters in the Black Sea and Caspian Sea regions (SCOTT & ROSE 1996, ROSE & SCOTT 1997).

The greater scaup's preferred wintering areas are shallow bays and coastal estuaries and, to a lesser extent, large central European lakes. The largest winter groups of the north-west European population gather in large numbers, amounting to several thousand individuals, in the southern Baltic Sea region, in coastal waters of Denmark and Germany and the Netherlands (SCOTT & ROSE 1996). According to SUDFELDT et al. (1997, 2002), the greater scaup wintering population in Germany averages 100,000 to 120,000 individuals, or about one-third of the western European winter population. It increased considerably, from 1981 to 1993, but it began decreasing in 1994, and thus no clear conclusions can be drawn regarding the entire period from 1981 to 1999 (SUDFELDT et al. 2002).

The greater scaup's most important wintering area in Germany consists of the coastal waters of the south Baltic Sea. Large wintering populations concentrate in the following areas: Traveförde and Dassower See (60,500 individuals); east Kiel Bight (17,000 individuals); Sagasbank and east coast of Oldenburg (11,000 individuals); Brodtener Ufer (10,200 individuals), on

GREATER SCAUP Aythya marila marila	A	B	C	Population	Trend
N Europe/W Europe			1	310,000	?
W Siberia/ Black Sea & Caspian Sea			1	100,000 - 200,000	?

Schleswig-Holstein's Baltic Sea coast; and in the Wismar Bight (30,000 individuals) and the Greifswalder Bodden area (16,500 individuals) in Mecklenburg-West Pomerania (SKOV et al. 2000).

The greater scaup has bred in small numbers in Germany – on Schleswig-Holstein's North Sea coast – since the beginning of the 1980s. In 1999, a total of five pairs of greater scaup bred there (SUDFELDT et al. 2002). Isolated breeding pairs were sighted in the 1990s on Schleswig-Holstein's Baltic Sea coast and in Lower Saxony (MÄDLOW & MODEL 2000).

COMMON EIDER *(SOMATERIA MOLLISSIMA)*. The common eider breeds in circumpolar coastal regions, at northern Eurasian and North American latitudes (HAGEMEIJER & BLAIR 1997). Breeding birds in the Western Palearctic, in addition to the nominate form, include the sub-species *S. m. islandica*, on Spitzbergen, in Iceland and in Franz Joseph Land, and *S.m. faroeensis*, on the Faeroe, Shetland and Orkney islands (HAGEMEIJER & BLAIR 1997, WETLANDS INTERNATIONAL 1999). The nominate form's breeding range extends eastward from the north coast of Ireland to Novaya Zemlaya, across Scotland and Scandinavia. The Netherlands' and Germany's Wadden Sea coasts, and the south Baltic region, make up the southern limit of the bird's contiguous breeding range (SCOTT & ROSE 1996, HAGEMEIJER & BLAIR 1997). The range of the north-west European population is congruent with the breeding range of the nominate form (SCOTT & ROSE 1996). Most populations of the common eider are quite sedentary. With regard to AEWA, the relevant populations are the predominantly migratory nominate-form populations of the Baltic, Denmark and the Netherlands, the populations of Norway and Russia and the breeding populations, of the sub-species *S. m. islandica*, of Spitzbergen and Franz Joseph Island. Most of the birds that breed and winter in Germany are birds from the Baltic-Danish-Dutch population (ROSE & SCOTT 1997). Their wintering areas are located in the Baltic Sea, Wadden Sea and, to a lesser extent, in areas further south, into France and England. Clearly enough, little exchange takes place between this population and those of the British Isles and Norway and Russia. The breeding birds of Norway and of Russia winter predominantly on the Norwegian coast; to a lesser extent, they also breed in the Baltic and Wadden Sea (SCOTT & ROSE 1996).

The common eider's most important resting and wintering areas in Germany include Lower Saxony's and (especially) Schleswig-Holstein's Wadden Sea areas, as well as coastal waters and shallow-water areas of the Baltic Sea (SKOV et al. 2000, UNSELT et al. 2000). During moulting, which takes place from July to September, up to 140,000 individuals, predominantly males not taking part in rearing young, congregate in undisturbed areas of Schleswig-Holstein's part of the Wadden Sea. The common eider's total resting population in Germany was estimated by SUDFELDT et al. (1997) to number 300,000

COMMON EIDER Somateria mollissima mollissima	A	B	C	Population	Trend
Baltic Sea, Denmark & Netherlands			1	1,350,000 - 1,700,000	0
Norway & Russia			1	300,000 - 550,000	0
Somateria mollissima islandica					
Spitzbergen & Franz Josef Land (breeding)		1		40,000 - 80,000	0

individuals during the moulting period in August and in mid-winter.

The common eider's breeding population in Germany is concentrated along Schleswig-Holstein's and Lower Saxony's Wadden Sea coast; in 1996, a total population of 1,305 pairs bred in these areas. Much smaller groups, amounting to fewer than 20 breeding pairs, are also found on the Baltic Sea coast (1999: 9 pairs) (HÄLTERLEIN et al. 2000, SUDFELDT et al. 2002). The largest single breeding population in the German part of the Wadden Sea, numbering 570 breeding pairs (1996), is found on the island of Amrum. This population's negative trend is offset by increases in other areas – especially in Lower Saxony's part of the Wadden Sea – and thus the breeding population can be assumed to be stable or slightly increasing (HÄLTERLEIN et al. 2000). In 1998 and 1999, 1,027 and 1,257 pairs of common eider, respectively, bred on Germany's North Sea coast (SÜDBECK & HÄLTERLEIN 2001). The common eider's breeding population in the entire Wadden Sea region increased from 6,000 pairs in 1991, when the first complete survey was carried out, to about 10,000 pairs in 1996, an increase of about 40%. This increase is due primarily to growth of the Dutch population, which accounts for the largest share, about 87%, of the total population (RASMUSSEN et al. 2000).

LONG-TAILED DUCK *(CLANGULA HYEMALIS)*. The long-tailed duck breeds in the circumpolar Arctic zone of Eurasia and North America. In the Western Palearctic, the bird's breeding areas extend from Norway's interior mountain region to the Arctic zones of west Siberia, across north Finland and the Kola Peninsula (SCOTT & ROSE 1996, HAGEMEIJER & BLAIR 1997). For practical purposes, in the AEWA region the breeding birds of Iceland and Greenland, on the one hand, and those of west Siberia and northern Europe, on the other, are assigned to two different populations (SCOTT & ROSE 1996, WETLANDS INTERNATIONAL 1999). At the same time, the two groups' wintering ranges overlap considerably, and thus the populations cannot be completely separated (WETLANDS INTERNATIONAL 1999).

Some of the birds that breed in Iceland and Greenland winter off the south-west coast of Greenland and in Icelandic waters, while another group journeys to Scotland. Breeding birds of Scandinavia, north Russia and west Siberia congregate for the winter in open sea areas in the south Baltic; all in all, over 90% of the west Siberian/north-west European population winters in the south Baltic. Other, significantly smaller parts of this population winter off the coasts of north-west Russia, Norway and the British Isles, as well as in the German Bight (SCOTT & ROSE 1996, ROSE & SCOTT 1997).

LONG-TAILED DUCK Clangula hyemalis	A	B	C	Population	Trend
Iceland & Greenland			1	150,000	0
W Siberia/N Europe			1	4,600,000	0

BLACK SCOTER Melanitta nigra nigra	A	B	C	Population	Trend
W Siberia & N Europe/ W Europe & NW Africa		2a		1,600,000	0

The long-tailed duck's most important wintering areas in the Baltic Sea include the Gulf of Riga, Hoburg Bank, south of Gotland, and the Pomeranian Bight (SCOTT & ROSE 1996). SUDFELDT et al. (1997) estimated the long-tailed duck's wintering population (January) in Germany to number about 1,000,000 individuals. The largest concentrations, comprising an average of 837,000 individuals (1988-1995), congregate in the Pomeranian Bight during the migration period. Other important wintering areas include the sea areas of Westrügen, Hiddensee and Zingst, as well as the Darß-Hiddensee sea area, including Plantagenetgrund (SKOV et al. 2000).

BLACK SCOTER *(MELANITTA NIGRA)*. Two sub-species of the black scoter/ common scoter breed in the tundra zones of Eurasia and North America. The breeding range of the Eurasian nominate form extends from Iceland to northern Siberia, across Scotland and north Scandinavia. Outside of the breeding season, large groups of black scoters congregate in shallow-water areas of the open west Baltic Sea and North Sea. A small part of the population winters along the Atlantic coast of France and Portugal, in an area extending south to Morocco and Mauritania (SCOTT & ROSE 1996). No discrete populations are distinguished within the AEWA area (WETLANDS INTERNATIONAL 1999).

In Germany, the black scoter regularly appears as a resting bird and winter guest in the coastal waters of the North Sea and Baltic Sea. SUDFELDT et al. (1997) placed the black scoter's wintering population (January) in Germany at about 300,000 individuals. Significant concentrations of moulting individuals (males: May to August, females: September/October) in the German Bight are found in the area of the outer Eider estuary; off Eiderstedt and Rütergat; in the offshore area near Baltrum, Borkum and Juist; and in the Dutch and east Frisian Wadden Sea, between Terschelling and Juist (NEHLS 1998, MITSCHKE et al. 2001). The species' most important resting and wintering areas in Germany include Schleswig-Holstein's Wadden Sea, the east German Bight and the Pomeranian Bight, Kiel Bight and the Sagasbank area, along the Baltic Sea coast (SKOV et al. 1995, SKOV et al. 2000, UNSELT et al. 2000).

VELVET SCOTER *(MELANITTA FUSCA)*. The velvet scoter's breeding area lies within the Eurasian and North American boreal zones. Along with the Western Palearctic nominate form, two sub-species have been described: *M. f. stejnegeri* in east Asia and *M. f. deglandi* in North America (SCOTT & ROSE 1996). In the Western Palearctic, the velvet scoter breeds in Scandinavia and north Russia. The Scandinavian breeding population is located in a narrow strip along the Swedish and Finnish Baltic Sea coasts and in the central mountain regions of Norway and Sweden (HAGEMEIJER & BLAIR 1997). Outside of the breeding season, the velvet scoter gathers in large groups in shallow, coastal areas of the Baltic Sea, an area in which over 90% of the west Siberian/north-west European population winters (SKOV et al. 1995). A substantially smaller part of the population winters along the North Sea and Atlantic coasts – in areas belonging to Germany, the Netherlands, Belgium and France. In cold winters, the birds sometimes fly to large inland lakes of central Europe (SCOTT & ROSE 1996). In addition to the west Siberian/north-west European

VELVET SCOTER Melanitta fusca fusca	A	B	C	Population	Trend
W Siberia & N Europe/NW Europe		2a		1,000,000	0
Black Sea & Caspian Sea	1c			1,500	0

population, another, substantially smaller, population is recognised: a population of east Turkey, Georgia and Armenia. This population winters on the Black Sea coast (ROSE & SCOTT 1997).

SUDFELDT et al. (1997) estimate that the velvet scoter's winter population in Germany numbers about 350,000 individuals. The bird's most important resting area along the German Baltic Sea coast is the Pomeranian Bight, where resting populations averaging 120,000 individuals in size gather (SKOV et al. 2000).

COMMON GOLDENEYE *(BUCEPHALA CLANGULA)*. The common goldeneye breeds in the boreal zones of Eurasia (nominate form) and North America (subspecies *B. c. americana*). Its breeding range in the Western Palearctic is concentrated in Scandinavia and Russia. Insular breeding populations in Scotland, Germany, Poland, the Czech Republic and the Baltic countries represent the southern limit of the species' breeding range (HAGEMEIJER & BLAIR 1997). The wintering areas of Western Palearctic breeding birds are located in the North Sea and Baltic Sea regions, in central Europe and in south-east Europe – in the Adriatic and Black Sea regions. West Siberian breeding birds winter in the region of the Caspian Sea (SCOTT & ROSE 1996).

A total of four populations are differentiated within the AEWA area, on the basis of wintering areas. In mild winters, the winter population of north-west Europe congregates primarily in the south Baltic Sea (SCOTT & ROSE 1996). This population's wintering area also extends far into central European inland areas, however, and it includes large inland lakes in south Germany and Switzerland (SCOTT & ROSE 1996). In this region, the population probably has contact with the winter population of the Danube-Adriatic region, and thus the differentiation between the populations is not sharp (SCOTT & ROSE 1996). Germany lies within the range of the north-west and central European winter population. The winter population of south-west Europe (Lake Constance) probably engages in exchanges with the winter population of the Adriatic (SCOTT &ROSE 1996). According to IWC data, the common goldeneye's mid-winter population in north-west and central Europe increased significantly from 1976 to 1996 and 1987 to 1996 (DELANY et al. 1999). In a parallel development, the German winter population increased at an annual rate of about 1.9% from 1981 to 1999 (SUDFELDT et al. 2002). In the 1990s, SUDFELDT et al. (1997, 2002) estimated that this population numbered 50,000 to 60,000 individuals. Its most important wintering areas include the coastal waters of the Baltic Sea (SKOV et al. 2000). In addition, most of Germany's inland lakes are also regularly used as winter quarters. Lake Constance, with an average winter population of 5,900 individuals, is the common goldeneye's most important water body for wintering in central European inland areas (HEINE et al. 1999). Another important inland area is Bavaria's Chiemsee lake, where over 1,000 individuals regularly winter (SUDFELDT et al. 2002).

COMMON GOLDENEYE **Bucephala clangula clangula**	**A**	**B**	**C**	**Population**	**Trend**
NW & C Europe (win)			1	300,000	+
NE Europe/Adriatic		1		75,000	?
W Siberia & NE Europe/ Black Sea	2			20,000	?
W Siberia/Caspian Sea		2		25,000	?

In recent decades, the common goldeneye has extended its breeding range to the west. This process has obviously been strongly promoted through provision of suitable nesting sites, in the form of nesting boxes (HAGEMEIJER & BLAIR 1997). The common goldeneye's breeding population in Germany has increased continuously since the 1960s (BAUER & BERTHOLD 1996). WITT et al. (1996) placed this population at 1,300 to 2,000 breeding pairs in 1994. By 1999, it had grown still further, to 1,720 to 3,050 pairs (BAUER et al. pub. pend.). The population reported by SUDFELDT et al. (2002) for 1999, comprising a total of 2,292 pairs, was concentrated in the north-east German Länder Schleswig-Holstein (450 pairs), Mecklenburg-West Pomerania (723 pairs), Brandenburg (550 pairs) and Saxony (500 pairs).

SMEW *(MERGELLUS ALBELLUS)*. The smew inhabits the boreal zone of Eurasia, from Norway to Kamchatka Peninsula, and it winters in the temperate zones of western Europe, the Black Sea and Caspian Sea and central China and Japan (SCOTT & ROSE 1996). In Europe, it breeds in northern Scandinavia and Russia. An isolated breeding population exists outside of the contiguous range, in Belarus (KOZULIN & GRITSCHIK 1996, HAGEMEIJER & BLAIR 1997).

On the basis of the bird's wintering regions, a total of three Western Palearctic populations can be identified; these population cannot be sharply differentiated in their breeding areas, however (SCOTT & ROSE 1996).

The winter group of the north-west and central European population is concentrated in the south Baltic Sea and the Netherlands, where congregations of several thousand individuals can occur (for example, DELANY et al. 1999). The mid-winter populations in the western Baltic and the Netherlands vary strongly in keeping with weather conditions in Baltic wintering areas; in cold winters (for example, in winter 1996) large numbers of individuals move west, especially to the Netherlands (DELANY et al. 1999). The smew's mid-winter population in the Baltic region, and in north-west and central Europe, showed an increasing trend between 1974 and 1996. From 1987 to 1996, the population in north-west Europe and the Baltic increased significantly, while the central European population decreased significantly (DELANY et al. 1999). In a development paralleling the growth of the north-west European population, the smew's mid-winter population in Germany increased at an annual rate of about 3.3 % between 1981 and 1999 (SUDFELDT et al. 2002). In the 1990s, this population was estimated to number an average of 5,000 to 7,000 individuals. However, up to about 15,000 to 16,000 individuals can be in Germany at the same time (SUDFELDT et al. 1997, 2002).

The smew's most important wintering areas in Germany include the coastal waters of Mecklenburg-West Pomerania, especially the Oderhaff (Kleines Haff and Achterwasser) area along the boundary to Poland, the Greifswalder Bodden and west coast of Rügen and the waters around Hiddensee (SUDFELDT et al. 1997, 2002, SKOV et al. 2000).

SMEW **Mergellus albellus**	A	B	C	Population	Trend
NW& C Europe (win)	3a			25,000 - 30,000	0
NE Europe/ Black Sea & E Mediterranean		1		35,000	?
W Siberia/ SW Asia		1		30,000	? (–)

RED-BREASTED MERGANSER *(MERGUS SERRATOR)*. The red-breasted merganser is a Holarctic breeding bird of northern Eurasia and North America. It is questionable whether the Greenland form, *M. s. schioleri*, is truly a sub-species. In the Western Palearctic, the bird's contiguous range extends from Iceland to west Siberia, across the north half of the British Isles and Scandinavia. Small breeding colonies are found in the Netherlands, Germany and Poland, at the southern boundary of the species' breeding range (SCOTT & ROSE 1996, HAGEMEIJER & BLAIR 1997). Breeding birds of south Scandinavia and the British Isles spend the winter primarily in coastal waters near their breeding areas. Breeding birds of northern regions of Scandinavia and of Russia migrate in a south-westerly direction for the winter, heading especially to the south Baltic Sea and even further west, to coastal waters of the Netherlands, France and south England (SCOTT & ROSE 1996).

Part of the north-west and central European winter population regularly winters in Germany. Analysis of the IWC's mid-winter counts showed that the population grew significantly in north-west Europe and the Baltic from 1974 to 1996, growth that, in the Baltic, has more recently (1987–1996) given way to insignificant change or a stable trend (DELANY et al. 1999).

The numbers of red-breasted mergansers that winter in Germany depend strongly on winter severity; in cold winters, most of the birds disperse to the British Isles and the Netherlands. Weather-related fluctuations notwithstanding, the population experienced significant annual growth of 3.7% between 1981 and 1999 (SUDFELDT et al. 2002).

SUDFELDT et al. (2002) place the red-breasted merganser's mid-winter population in Germany at a total of 10,000 to 12,000 individuals (of which 6,000 to 8,000 individuals are outside of the Baltic Sea region). The largest concentrations rest and winter on Mecklenburg-West Pomerania's Baltic Sea coast, in the area of the Pomeranian Bight and the Greifswalder Bodden (SKOV et al. 2000). The entire wintering population of the Baltic Sea, including offshore areas, regularly reaches a size of 10,000 to 12,000 individuals (SUDFELDT et al. 2002). The red-breasted merganser's relatively small breeding population in Germany is concentrated on the North Sea and Baltic Sea coasts. The trends seen in breeding populations in these two areas have been very different, however. In the 1990s, the numbers of breeding pairs on the German North Sea coast increased considerably, beginning in the island of Amrum in Schleswig-Holstein's part of the Wadden Sea (HÄLTERLEIN et al. 2000). This development is related to a population increase and range expansion, throughout the entire Wadden Sea region, that began to emerge at the beginning of the 1990s (FLEET et al. 1994). In 1999, the number of breeding pairs sighted on the German North Sea coast reached 46 – the largest number ever documented there (SÜDBECK & HÄLTERLEIN 2001).

At the same time that the breeding population on the North Sea coast was increasing, the breeding population on the Baltic Sea coast was decreasing significantly – from about 300 to 350 pairs at the end of

RED-BREASTED MERGANSER Mergus serrator serrator	A	B	C	Population	Trend
NW & C Europe (win)			1	145,000	0
NE Europe/ Black Sea & Mediterranean		1		50,000	?
W Siberia /SW & C Asia	1c			<10,000	?

the 1980s to about 150 to 200 pairs in the years 1997 to 1999 (HÄLTERLEIN et al. 2000). In 1999, the total population throughout all of Germany was estimated to number about 340 to 410 pairs (BAUER et al. pub. pend.).

GOOSANDER *(MERGUS MERGANSER)*. The goosander's breeding range extends across the boreal zone of Eurasia (nominate form) and North America (subspecies *M. m. americana*). Another sub-species *(M. m. orientalis)*, inhabits the central Asian highlands – from Afghanistan to west China, across Pamir and Tibet (SCOTT & ROSE 1996, HAGEMEIJER & BLAIR 1997). In the Western Palearctic, the bird's breeding area extends from Iceland to Siberia, across the UK and Scandinavia. The southern limit of the contiguous range stretches from northern Germany through the northern part of Poland and the Baltic countries. The breeding birds of the Alps region, and the isolated populations on Iceland and in south-east Europe, are predominantly sedentary. The three populations within the AEWA area are differentiated on the basis of their main wintering regions: north-west and central Europe, the Black Sea and the Caspian Sea (SCOTT & ROSE 1996).

The north-west and central European winter population includes the UK's breeding birds, which are predominantly sedentary (5,000-8,000 individuals), and the birds of the central European Alps (3,000 individuals). The north-west European winter population is concentrated in the Baltic Sea region and coastal waters of countries bordering the North Sea, although part of the population winters along large rivers and lakes in central European inland areas (SCOTT & ROSE 1996).

According to the IWC's January counts, the mid-winter populations in north-west Europe decreased significantly overall from 1974 to 1996, although the shrinking trend gave way to significant growth during the period from 1987 to 1996 (DELANY et al. 1999). During the same period, exactly opposing trends were seen in central Europe, with significant growth from 1974 to 1996 and significant decreases from 1987 to 1996 (DELANY et al. 1999). On the other hand, these population trends for the goosander must be interpreted cautiously, since the IWC counts were strongly influenced by that part of the population that winters in inland areas, and that fluctuates in accordance with winter severity. In spite of such wide, weather-related fluctuations, the goosander's mid-winter population in Germany remained stable throughout the period from 1981 to 1999, at a level of 25,000 to 30,000 individuals (SUDFELDT et al. 2002).

The wintering populations are concentrated in coastal areas of Schleswig-Holstein (Schlei, Traveförde) and along Mecklenburg-West Pomerania's Baltic Sea coast (Wismar Bight, Oderhaff). While the species also migrates to inland areas, especially in cold winters, such migrations are only of subordinate significance in terms of their numbers (SKOV et al. 2000, SUDFELDT et al. 2002).

As a breeding bird, the goosander appears in Germany in two separate breeding ranges: in the north-eastern Länder Schleswig-Holstein (1999: 120 pairs), Mecklenburg-West Pomerania (1999: 93 pairs) and

GOOSANDER Mergus merganser merganser	A	B	C	Population	Trend
NW & C Europe (win)			1	200,000	0
NE Europe/Black Sea	1c			10,000	?
W Siberia/Caspian Sea	2			20,000	?

Brandenburg (1999: 70 pairs) and in Bavaria (1999: 270 pairs). Including isolated groups, consisting of less than six pairs each, in Saxony-Anhalt, North Rhine-Westphalia, Saxony and Baden-Württemberg, a total of 563 pairs bred in Germany in 1999 (SUDFELDT et al. 2002).

The goosander's breeding population in both German breeding areas has increased significantly since the 1970s (BAUER et al. pub. pend., BAUER & BERTHOLD 1996). The Bavarian breeding population has recovered from a nadir of about 50 pairs, reached in the early 1970s, and has expanded its breeding range again (BAUER & BERTHOLD 1996, MÄDLOW & MODEL 2000). The second-largest German breeding population, located in Schleswig-Holstein and comprising about 120 pairs, has also grown significantly since the beginning of the 1970s. The main reasons given for the population increase are an improved availability of nesting sites, as a result of provision of nesting boxes, and reductions in the bird's flight distance (i.e. wariness) and its sensitivity to human-caused disturbances. In addition, an improved food supply, resulting from water-body eutrophication, may have had a positive effect on the population (BERNDT & BUSCHE 1993, BAUER & BERTHOLD 1996).

COMMON CRANE *(GRUS GRUS)*.
The common crane's range extends across the temperate and boreal zones of Eurasia, from Scandinavia to east Siberia. The nominate form's breeding area in Europe includes Scandinavia, Germany, Poland, the Baltic countries, Poland, Belarus, Ukraine and Russia. A few, more or less isolated, breeding groups are also found in England, France, the Czech Republic and Turkey (HAGEMEIJER & BLAIR 1997). Breeding birds of north and north-east Europe migrate, via two separate flyways, to their separate winter quarters. The migration boundary between the two populations runs through Finland, Poland, and the Baltic countries. Differentiation between the two populations is relatively blurred, because they have a broad transition zone and because, as observations show, they switch between the two migration routes (PRANGE 1999). Most of the Norwegian, Swedish, Polish and German breeding birds migrate, via a westerly route, to winter quarters in France, on the Iberian peninsula and in North Africa. This flyway population, so NOWALD (2001 in lit.), comprises 120,000 individuals. Breeding birds from breeding areas further east, in Finland, Poland, the Baltic countries, Belarus and the European part of Russia, migrate, via an easterly route, to winter quarters in Hungary, the Near East and north and east Africa. A total of about 80,000 individuals use this migration route (PRANGE 1999). The total population of the common crane in Europe (not including Russia), according to PRANGE (1999), probably numbers about 34,000 breeding pairs and 127,000 individuals. The discrepancy between these figures and the flyway-population numbers given above may be due to uncertainties in estimating the size of breeding populations, as well as to the fact that common cranes of Russian origin use the westerly route, in numbers that are not yet known (PRANGE 1999). For the purposes of AEWA, a total of five populations are differentiated (WETLANDS INTERNATIONAL 1999). Common cranes

COMMON CRANE Grus grus	A	B	C	Population	Trend
NW Europe (breeding)		1		60,000 - 70,000	+
NE & C Europe (breeding)		1		>60,000	0/+
Black Sea & E Mediterranean (win)	3c			35,000	–
Black Sea & Turkey (breeding)	1c			200 - 500	–
SW Asia (win)	3c			55,000	–

that breed and rest in Germany are grouped with the north-west European population, although these birds engage in contact and exchange, during their migration, with the population of north-east and central Europe (PRANGE 1999).

The common crane's passage in Germany begins in mid-August, when non-breeding and unsuccessfully breeding birds gather at resting areas. The numbers of birds in these areas increase continuously and reach a maximum in October; in November, the common cranes leave the resting areas. The most important resting areas in Germany are found on the Baltic Sea coast, in the Bock-Hiddensee-Westrügen region in the Vorpommersche Boddenlandschaft National Park; along the Untere Oder (lower part of the Oder river); and in the Linum-Nauen-Kremmen region in Brandenburg. In each of these areas, over 40,000 individuals gather by mid-October, the climax of the resting season (PRANGE 1996, HAFERLAND 1999, SCHREIBER & RAUCH 1999, NOWALD 2001 in lit.). Germany lies at the south-west boundary of the bird's contiguous breeding range. The common crane's breeding population in Germany is concentrated in the northern and eastern Länder Schleswig-Holstein, Hamburg, Lower Saxony, Mecklenburg-West Pomerania, Brandenburg, Saxony and Saxony-Anhalt (MÄDLOW & MODEL 2000).

After reaching a minimum of about 400 pairs at the beginning of the 1970s, the bird's breeding population has increased continuously, and in 1998 a total of about 2,500 common crane pairs bred in Germany (MEWES 1996, PRANGE 1999). For 2001, the working group for the protection of the common crane (Arbeitsgemeinschaft Kranichschutz) placed the breeding population at at least 3,000 pairs (NOWALD 2001 in lit.). The growth of the breeding population has gone hand-in-hand with a westward expansion of the bird's breeding range, in the course of which the bird reinhabited Länder it had previously occupied and then abandoned: Lower Saxony, Schleswig-Holstein and Hamburg (MEWES 1996).

LITTLE CRAKE *(PORZANA PARVA)*. The little crake breeds in the steppe regions of the west and central Palearctic. Its breeding range is spread irregularly throughout east and central Europe, with concentrations in Poland, Belarus and Ukraine and in the central European steppe region shared by Austria, Hungary and Romania; the bird's distribution in other European countries is highly fragmented. The total European breeding population comprises between 16,000 and 20,000 breeding pairs (HAGEMEIJER & BLAIR 1997). Since the 1970s, little crake populations in most European countries have exhibited negative trends; only the Russian population, which is estimated to number 10,000 to 100,000 pairs, is assumed to have undergone a positive development (TUCKER & HEATH 1994, HAGEMEIJER & BLAIR 1997). The little crake winters in Africa, south of the Sahara. From Mauritania and Senegal, its winter range extends eastward to Ethiopia and Kenya and southward to Zambia. Within the AEWA area, the entire west Eurasian breeding population is considered to be a single population (WETLANDS INTERNATIONAL 1999).

Germany is located at the western limit of the little crake's contiguous breeding range in Europe. Because the bird's breeding population is difficult to count, its size in Germany can only be roughly estimated. The largest known groups, comprising 25

LITTLE CRAKE Porzana parva parva	A	B	C	Population	Trend
W Eurasia/Africa		2c		C or D	–

to 50 pairs, were reported in the mid-1990s, from Brandenburg (MÄDLOW & MODEL 2000). In addition, smaller groups, comprising no more than five pairs in each case, also existed in the Länder Mecklenburg-West Pomerania, Saxony-Anhalt and Saxony (DÜRR et al. 1997, MÄDLOW & MODEL 2000). In 1999, no more than 16 calling little crakes were documented in Brandenburg, the centre of the bird's German population (RYSLAVY 2001). WITT et al. (1996) determined that the total population in Germany in 1994 was 35 to 85 pairs. For 1999, BAUER et al. (pub. pend.) assume a population of 50 to 100 pairs.

SPOTTED CRAKE *(PORZANA PORZANA)*. The spotted crake's range extends eastward, across the temperate zone of the Western Palearctic, to central Siberia. Coverage in Europe is extensive but fragmented, extending from Spain to south Finland and from UK to the Urals. The European breeding range is concentrated in the eastern European countries Belarus, Romania, Ukraine and Poland. Another, relatively significant, breeding population is found in France. The breeding population of the spotted crake in Europe comprises between 48,000 and 67,000 pairs (HAGEMEIJER & BLAIR 1997). The species' wintering areas extend southward from the Mediterranean region to South Africa. South-east Africa (Zambia, Malawi, Zimbabwe) harbours the bird's main winter quarters. Winter populations have also been sighted in Senegal (WETLANDS INTERNATIONAL 1999).

In most European countries, and especially in west and central Europe, the spotted crake's breeding population has declined in recent decades – significantly, in some cases. At the same time, the bird has completely abandoned numerous breeding areas. The primary reason for this decline consists of large-scale destruction of wetlands that provide suitable breeding habitats for the bird (TUCKER & HEATH 1994, BAUER & BERTHOLD 1996).

In the mid-1990s, the spotted crake's breeding population in Germany comprised between 500-960 breeding pairs (WITT et al. 1996). Its size in 1999 was estimated to be about 540 to 1,030 pairs (BAUER et al. pub. pend.) .

BLACK COOT *(FULICA ATRA)*. The black coot / common coot, with four subspecies, is widespread throughout the entire Palearctic, including the Indian subcontinent, the Australasian region (Burma, Indonesia, New Guinea, Australia, New Zealand) and North Africa (BEZZEL 1985, HAGEMEIJER & BLAIR 1997). In Europe, the nominate form's breeding range, which is virtually unfragmented, covers the entire Mediterranean and temperate zone and extends far northward, including about the southern half of Finland and Russia (HAGEMEIJER & BLAIR 1997). Throughout much of its European range, the black coot either is sedentary or migrates only short distances. Only populations at the northern and eastern limits of the bird's breeding range migrate over significant distances; these birds head primarily in a

SPOTTED CRAKE Porzana porzana	A	B	C	Population	Trend
Europe/Africa		2c		D	–

BLACK COOT Fulica atra atra	A	B	C	Population	Trend
Black Sea/Mediterranean (win)			1	2,500,000	– (0)

south-westerly direction (BEZZEL 1985, HAGEMEIJER & BLAIR 1997). The wintering grounds of Eurasian black coots extend southward to North Africa, Iraq and the Arabian Gulf. A smaller number of wintering areas are also found in west Africa (Senegal, Chad) and east Africa (Sudan) (WETLANDS INTERNATIONAL 1999). Within the AEWA area, a total of three populations are identified on the basis of the birds' wintering ranges (north-west Europe, Black Sea & Mediterranean, south-west Asia). Of these populations, the agreement applies only to the winter population of the Black Sea and Mediterranean. This population also includes the winter populations of central Europe (WETLANDS INTERNATIONAL 1999).

Germany lies within the winter range of the north-west European winter population, which was not included in AEWA because it has a favourable conservation status. IWC data show that the black coot's mid-winter populations in north-west and central Europe were stable between 1974 and 1996. During the period 1987 to 1996, this stability gave way to significant growth (DELANY et al. 1999). Some of the breeding birds of central Europe also winter in the Black Sea and Mediterranean region (GLUTZ OF BLOTZHEIM et al. 1994; WETLANDS INTERNATIONAL 1999). In recent decades, this winter population shrank considerably, but more recently this decline has given way to a population situation that is presumed stable but cannot be precisely assessed (DELANY et al. 1999, WETLANDS INTERNATIONAL 1999).

WITT et al. (1996) placed the black coot's breeding population in Germany at 75,000 to 135,000 breeding pairs in 1994. In 1999, the population was at about the same level, 61,000 to 140,000 pairs (BAUER et al. pub. pend.). Population trends for the species seem to differ widely from region to region; population increases in some local areas are offset by decreases in other regions. All in all, the black coot may be presumed to have a stable population situation in Germany (BAUER & BERTHOLD 1996).

PIED AVOCET *(RECURVIROSTRA AVOSETTA)*. The pied avocet breeds throughout a fragmented range in the temperate and Mediterranean zone of Europe and in the steppe zone of central Asia. Other breeding populations of the species inhabit parts of east and south Africa. The northern limit of the species' global range is found in north-west Europe (HAGEMEIJER & BLAIR 1997). A total of five main populations are differentiated within the AEWA area. The western European population breeds on the Iberian peninsula, along the French Atlantic coast, in south England and along the North Sea coasts of the Netherlands, Germany and Denmark. Smaller groups are found in south Sweden, Poland and the Baltic countries (HAGEMEIJER & BLAIR 1997). The bird's most important wintering grounds include areas along the French Atlantic coast, in Portugal (estuaries of the Tejo and Sado rivers) and in southern Spain. Overall, these areas extend southward to Mauritania and Senegal.

PIED AVOCET Recurvirostra avosetta	A	B	C	Population	Trend
S Africa (breeding)	2			10,000 - 20,000	+
E Africa (breeding)		(1)		?	?
W Europe & W Mediterranean (breeding)		1		67,000	+
Black Sea & E Mediterranean (breeding)	(3c)			C	? (−)
W & SW Asia/E Africa	2			B	?

Germany is a range state for the western European pied-avocet population. The most important breeding populations are found on Lower Saxony's and Schleswig-Holstein's Wadden Sea coasts. In the 1990s, the population fluctuated, without any clearly recognisable trend, between 5,300 and 7,200 breeding pairs. By contrast, a considerably smaller breeding population on the Baltic Sea coast, consisting of about 300 pairs, decreased significantly in the 1990s (HÄLTERLEIN et al. 2000). The total population in 1999 was determined to be about 6,100 to 6,500 pairs (BAUER et al. pub. pend.).
At the end of the breeding season, breeding birds of the Wadden Sea congregate, in order to moult, at a few long-used areas in the Wadden Sea of Lower Saxony (Jadebusen) and Denmark (Rømø). Another, smaller moulting and resting area has become established, since the 1980s, on Mecklenburg-West Pomerania's Baltic Sea coast (Hiddensee/Bock) (DIETRICH & HÖTKER 1991, KUBE & GRAUMANN 1994).

EUROPEAN GOLDEN PLOVER *(PLUVIALIS APRICARIA)*. The European golden plover breeds in the Northern Palearctic, from Iceland eastward to central Siberia. Smaller breeding groups, comprising about 100 pairs, are found on Ellesmere Island (NE Canada) and Greenland. In the Western Palearctic, the bird inhabits Iceland, the northern half of the UK, Scandinavia, the Baltic countries and the northern region of Russia. The south population breeds on the British Isles, as well as in small, isolated breeding areas in north-west Germany and Denmark (WETLANDS INTERNATIONAL 1999). The wintering areas of breeding birds from Iceland and the Faeroe islands are concentrated on the British Isles, although they extend to the Iberian peninsula. Breeding birds from Spitzbergen and Scandinavia migrate along the North Sea coast, across Denmark, north-west Germany and east England, to winter quarters in the Netherlands and France and further south, in north-west Africa. Their winter range largely overlaps with that of the south population. Breeding birds from west Siberia winter in the Caspian Sea region (BEZZEL 1985, HAGEMEIJER & BLAIR 1997, WETLANDS INTERNATIONAL 1999). For the purposes of AEWA, a total of four populations are differentiated. The populations' wintering areas overlap considerably in western Europe, however (WETLANDS INTERNATIONAL 1999).

Germany is part of the regular resting and wintering area for northern European breeding birds. The birds' preferred resting areas include coastal lowlands of the north-west-German plain and peripheral areas of Schleswig-Holstein's and Lower Saxony's parts of the Wadden Sea (POOT et al. 1996, UNSELT et al. 2000). BURDORF et al. (1997) estimated that the European golden plover's resting population in Germany numbers about 200,000 individuals.

The isolated German breeding population consists of a small breeding group in Lower Saxony's fens. From a size of about 30-40 pairs in the 1970s, it decreased to nine pairs in 1993. This was followed by a slight recovery, and in 1996 a total of 19 breeding pairs were sighted (MÄDLOW & MO-

EUROPEAN GOLDEN PLOVER Pluvialis apricaria altifrons	A	B	C	Population	Trend
Iceland & Faeroe Islands/E Atlantic			1	750,000	(0)
N Europe/ W continental Europe & NW Africa			1	1,000,000	0
British Isles, Denmark & Germany (breeding)	3c*			70,000	–
W Siberia (breeding)		(1)		?	?

DEL 2000). As of 1999, the breeding population had increased still further, to a total of 22 pairs (SÜDBECK in lit. 2001).

GREY PLOVER *(PLUVIALIS SQUATAROLA)*. The breeding range of the grey plover comprises the Arctic tundra of Eurasia and North America. In northern Siberia, the bird's Palearctic breeding areas extend eastward from Kanin Peninsula, all the way to the Bering Strait. The grey plover's wintering areas include coasts in temperate and Mediterranean-to-tropical latitudes, in both the northern and southern hemispheres (HAGEMEIJER & BLAIR 1997).

For the purposes of AEWA, two winter populations are differentiated. One winters along the east-Atlantic flyway, from the coasts of north-west Europe and the Wadden Sea southward to South Africa, via the British Isles, the Mediterranean and the Gulf of Guinea. The breeding areas of birds that migrate through, or winter in, western Europe extend eastward to the Taymyr Peninsula (WETLANDS INTERNATIONAL 1999).

The grey plover appears in Germany in the Wadden Sea, primarily during its homeward migration to its Arctic breeding areas, in April and May, and during its return trip, from August to November. The numbers of grey plover that winter in the German Wadden Sea vary in keeping with winter severity. The largest concentrations form in May, shortly before the birds' departure for their Arctic breeding areas, and when the majority of the entire east-Atlantic flyway population rests throughout the Wadden Sea in order to build up body reserves for migration and the breeding period (MELTOFTE et al. 1994, POOT et al. 1996). The grey plover's resting population in Schleswig-Holstein's part of the Wadden Sea has been decreasing since 1993, following a period of growth (POOT et al. 1996, GÜNTHER & RÖSNER 2000).

RINGED PLOVER *(CHARADRIUS HIATICULA)*. Of the three described sub-species of the (common) ringed plover, the nominate form breeds in north-west Europe, from the British Isles and northern France to Scandinavia, along the North Sea and Baltic Sea coasts. In the tundra of north Scandinavia and Russia, it is supplanted by the sub-species *C. h. tundrae* throughout a broad transition zone. The sub-species *C. h. psammodroma* breeds in an area extending from the east coast of the North American Arctic to the Faeroe Islands, across Greenland and Iceland. The taxonomic status of this sub-species is disputed, however, and it is not recognised by some authors (BEZZEL 1985, HAGEMEIJER & BLAIR 1997, WETLANDS INTERNATIONAL 1999). The wintering

GREY PLOVER **Pluvialis squatarola**	A	B	C	Population	Trend
E Atlantic (win)			1	168,000	+
SW Asia & E Africa (win)		1		50,000	?

RINGED PLOVER **Charadrius hiaticula hiaticula**	A	B	C	Population	Trend
Europe & N Africa (win)		1		47,500	+
W Africa (win)			(1)	195,000	?
Charadrius hiaticula tundrae					
SW Asia, E & S Africa (win)			(1)	200,000	?

areas of breeding birds of north-west Europe (nominate form), and of north-east Canada and Greenland *(C. h. psammodroma)*, extend from the western European Atlantic coast (France, Portugal, Spain) to west Africa (Mauritania, Senegal, Gambia), across the Mediterranean region. The sub-species *C.h. psammodroma* winters at the southern limit of the species' common winter range, and in some cases it reaches South Africa. The nominate form winters at a smaller distance from its breeding areas, primarily on the coasts of western Europe and North Africa (WETLANDS INTERNATIONAL 1999). The wintering areas of the sub-species *C. h. tundrae* are located in south-west Asia, east Africa and south Africa (WETLANDS INTERNATIONAL 1999).

The German Wadden Sea is part of the range of all three populations differentiated within the AEWA area. Arctic breeding birds of the sub-species *C. h. tundrae* pass through it on their homeward journey to breeding areas, in May, and during their return to their winter quarters on the west African coast, in August and September (MELTOFTE et al. 1994). BURDORF et al. (1997) placed the ringed plover's total resting population in Germany at 14,000 individuals, without differentiating sub-species or populations. Larger maximum congregations can appear in the German Wadden Sea, however. For example, a total of 14,900 resting ringed plovers were seen at the same time in Schleswig-Holstein's Wadden Sea area. The resting population in Schleswig-Holstein's part of the Wadden Sea increased between 1988 and 1999 (GÜNTHER & RÖSNER 2000).

The ringed plover's breeding population on the German North Sea coast has exhibited a negative trend since the beginning of the 1990s. The population decreased from over 1,000 pairs, around 1990, to 748 to 792 pairs in 1998/1999. This trend began emerging in the first half of the 1990s, for the entire Wadden Sea population (RASMUSSEN et al. 2000). The breeding population on the Baltic Sea coast remained stable, at about 200 pairs, during the same period (HÄLTERLEIN et al. 2000). Including birds breeding in northern German inland areas (Mecklenburg-West Pomerania, Lower Saxony, Schleswig-Holstein), WITT et al. (1996) estimated the ringed plover's total population in Germany, in the mid-1990s, to number 1,900 to 2,600 pairs. By 1999, this figure had decreased, as a result of the decrease in the Wadden Sea core population, to 1,000 to 1,700 pairs (BAUER et al. pub. pend.).

LITTLE RINGED PLOVER *(CHARADRIUS DUBIUS)*. The little ringed plover breeds throughout the entire Palearctic, from western Europe to Japan, and including north Africa and parts of south-east Asia. Two sub-species in addition to the European sub-species *C. d. curonicus* have been described (BEZZEL 1985, HAGEMEIJER & BLAIR 1997). The little ringed plover is found throughout Europe, with the exception of Ireland and northern regions of Scandinavia (HAGEMEIJER & BLAIR 1997). The species' European breeding birds winter in the west African Sahel zone, south of the Sahara (BEZZEL 1985). Two populations are relevant for the purposes of AEWA. Breeding birds of west and south-west Asia are differentiated from birds that breed in Europe and winter in west Africa. The former population's wintering grounds are located primarily on the Arabian peninsula and in north-east Africa (WETLANDS INTERNATIONAL 1999).

LITTLE RINGED PLOVER Charadrius dubius curonicus	A	B	C	Population	Trend
Europe/W Africa			1	D	? (0)
W & SW Asia/ E Africa			(1)	?	?

The bird's original habitats in Germany consisted of gravel beds and alluvial fans of natural rivers. Since almost all such rivers have been regulated, the little ringed plover now breeds almost exclusively in anthropogenic habitats such as sand or gravel quarries or fresh open-soil areas at construction sites. Because such habitats are ephemeral in nature, and because the bird often uses its breeding sites for only short periods of time, the little ringed plover's long-term population trend in Germany is difficult to assess – local increases made possible through creation of suitable secondary habitats are offset by decreases in other regions (BAUER & BERTHOLD 1996). WITT et al. (1996) estimated the little ringed plover's breeding population in the mid-1990s to number 4,000 to 6,400 pairs. In 1999, the population was at about the same level, 4,300 to 6,800 pairs (BAUER et al. pub. pend.).

KENTISH PLOVER *(CHARADRIUS ALEXANDRINUS)*. The kentish plover is found virtually world-wide, along coasts and in wetlands of steppe regions of Eurasia, north Africa and North and South America. Of the seven described sub-species, the nominate form inhabits the coasts of north-west Europe, including the west Baltic Sea, the North Sea coast, the French and Portuguese Atlantic coast, the coastal regions of the entire Mediterranean region and even the west coast of the Black Sea. Inland breeding populations can be found in Spain, Hungary and the countries of the former Yugoslavia (HAGEMEIJER & BLAIR 1997). The kentish plover's breeding populations have decreased considerably in most European countries. This population decline has gone hand-in-hand with a reduction of the bird's breeding range, especially in north-west Europe (TUCKER & HEATH 1994, HAGEMEIJER & BLAIR 1997).

A total of three populations are differentiated, although migratory populations tend to overlap extensively with southern, sedentary populations in winter. Breeding birds of the European Atlantic coast, from the west Mediterranean to north-west Europe, are migratory birds that winter in the west Mediterranean and in north Africa, as far south as Mauritania and Guinea-Bissau. Breeding birds of the Black Sea and of the eastern Mediterranean winter predominantly in the Near East and in the eastern African Sahel zone. The third population consists of breeding birds of south-west Asia. Their wintering grounds extend from the south Caspian region to north-east Africa, across the Arabian peninsula (WETLANDS INTERNATIONAL 1999).

In Germany, the kentish plover's breeding population is confined almost exclusively to the Wadden Sea coasts of Lower Saxony and Schleswig-Holstein. In Lower Saxony's part of the Wadden Sea, the kentish plover's breeding population has decreased in recent decades, including a number of fluctuations, some of them considerable: from about 600 pairs at the beginning of the 1950s to 60 to 70 pairs in the 1990s (FLORE 1998, RASMUSSEN et al. 2000). In 1998 and 1999, the total breeding populations throughout all of Lower Saxony's and Hamburg's Wadden Sea areas numbered 53 and 61 pairs, respectively (SÜDBECK & HÄLTERLEIN 2001).

KENTISH PLOVER Charadrius alexandrinus alexandrinus	A	B	C	Population	Trend
E Atlantic	3c			67,000	–
Black Sea & E Mediterranean (breeding)	3c			C	–
SW Asia & NE Africa (win)			(1)	C or D	?

In Schleswig-Holstein's part of the Wadden Sea, data from breeding-population surveys taken since 1988, within the framework of trilateral Wadden Sea monitoring, initially showed a slight increase, to nearly 600 pairs, in 1993. This was followed by a rapid decrease, and in 1999 only 180 pairs were counted (HÄLTERLEIN et al. 2000, SÜDBECK & HÄLTERLEIN 2001).

The described population fluctuations are typical for a pioneer species that briefly inhabits new dunes or soil accumulations created by the Wadden Sea's sediment dynamics, only to abandon such habitats as vegetation grows and predatory pressure mounts. Many short-term population increases thus have resulted from settlement of anthropogenic, secondary habitats created as part of coastal-protection measures and dike construction, habitats that the bird abandons as natural succession proceeds and relevant measures are terminated (HÖTKER & KÖLSCH 1993, FLORE 1998).

DOTTEREL *(EUDROMIAS MORINELLUS)*. The dotterel breeds in Arctic and alpine tundras, and it has scattered, isolated range fragments throughout the entire Northern Palearctic, north Siberian tundra and high-mountain regions of Europe and Asia. Its European range comprises Scotland, mountain regions of Scandinavia (Norway, Sweden) and north Russia. In addition, individual, highly isolated breeding populations, never numbering more than ten breeding pairs, are found in the high elevations of the Pyrenees, the Austrian Alps, the Italian Apennines and the mountain regions of Poland, Romania and Greece. The breeding population of European birds (not including Russia), of which over half consists of breeding birds of Norway and Sweden, comprises between 17,000 and 39,000 breeding pairs. The Russian population numbers 10,000 to 50,000 pairs (HAGEMEIJER & BLAIR 1997). The dotterel's winter range is confined to a narrow band extending from north Africa (Morocco) to west Iran, where, as proven by recovery of banded birds, exchanges occur between breeding birds of the Western Palearctic and birds from the most remote breeding areas of east Siberia and Mongolia (HAGEMEIJER & BLAIR 1997, WETLANDS INTERNATIONAL 1999). Two groups are differentiated on the basis of main breeding areas (WETLANDS INTERNATIONAL 1999).

In May, breeding birds of northern Europe migrate, in long stages, from their winter quarters to their breeding areas. Populations resting on this homeward journey are found only at a few known resting areas in the Netherlands and Denmark. Small numbers of birds regularly use a few resting areas in Germany, especially on their slower return trip to their winter quarters (BEZZEL 1985, HAGEMEIJER & BLAIR 1997). In keeping with the species' habitat requirements, such areas consist primarily of large, open landscapes filled with short, scattered vegetation. In addition to a few coastal areas, the birds also show a special preference for farmed Börde landscapes and high-upland regions in Rhineland-Palatinate, Hesse and North Rhine-Westphalia (BUNDESDEUTSCHER SELTENHEITENAUSSCHUSS and DEUTSCHE SELTENHEITENKOMISSION 1992, 1994, 1995, 1996, 1997, 1998, 2000) .

DOTTEREL Eudromias morinellus	A	B	C	Population	Trend
Europe (breeding)		2c		D	–
Asia (breeding)		(1)		B or C	?

NORTHERN LAPWING *(VANELLUS VANELLUS)*. The northern lapwing's Palearctic range extends across all of Europe, from Iceland to north China. It very sparsely populates the Mediterranean, north Africa and large parts of south Russia. Its European breeding population is concentrated in north-western and eastern Europe. The largest European breeding populations, each numbering over 200,000 pairs, are found in the Netherlands, the UK and Belarus; they are followed in size by populations in Germany and the Scandinavian countries (HAGEMEIJER & BLAIR 1997). The total European population has been estimated to number about 1,185,000 to 1,454,000 breeding pairs, and the Russian population is placed at a level of 1,000,000 to 10,000,000 pairs (HAGEMEIJER & BLAIR 1997). Two groups are differentiated, on the basis of the locations of their breeding areas; discrete populations cannot be identified (WETLANDS INTERNATIONAL 1999). The European northern lapwing population's winter range comprises large parts of Atlantic western Europe. It extends from the Netherlands and the British Isles to Portugal, across France; to a smaller extent, it also includes north and west Africa and the Mediterranean region (BEZZEL 1985). Birds that breed in west Asia winter predominantly in south-west Asia (WETLANDS INTERNATIONAL 1999).

In Germany, the northern lapwing breeds primarily in the lowland landscapes of the north-German Länder Lower Saxony and Bremen, Schleswig-Holstein, Mecklenburg-West Pomerania and North Rhine-Westphalia. The other Länder are more sparsely populated (HAGEMEIJER & BLAIR 1997). In the mid-1990s, WITT et al. (1996) placed the northern lapwing's breeding population in Germany at 78,000 to 118,000 pairs, while BAUER & BERTHOLD (1996) report figures of 85,000 to 100,000 pairs. In light of the bird's decline throughout large parts of its core range, a decline which is continuing in spite of intensive efforts to protect the species in wetlands conservation areas (BLÜHDORN 2001, MELTER & WELTZ 2001, NEHLS et al. 2001), in 1999 the population was estimated to number 67,000 to 104,000 pairs (BAUER et al. pub. pend.).

The northern lapwing's breeding population has considerably decreased in Germany, as it has in most northern and western European countries. Stable to increasing populations are found only in eastern European countries (for example, Belarus), which have comparatively extensive forms of agriculture, as well in some countries with small breeding populations at the edge of the overall breeding range (BAUER & BERTHOLD 1996, HAGEMEIJER & BLAIR 1997, BIRDLIFE INTERNATIONAL/EUROPEAN BIRD CENSUS COUNCIL 2000). The reasons for the extensive declines in populations of this species, formerly a typical breeding bird in wet meadow landscapes in north-west Europe, include habitat loss as a result of widespread landscape drainage and intensification of agricultural grassland use. Often, the bird's reproduction rate in today's managed grasslands no longer suffices in order to maintain the population in the long term. On densely planted, food-poor and frequently mechanically worked or intensively grazed grassland areas, the species suffers high rates of brood and young-bird losses as a result of mowing, trampling and poor availability of food for young. In addition, in some areas an increasing predation rate is also considered responsible for unsuccessful breeding (NEHLS 1996, KÖSTER et al. 2001, GIENAPP 2001). The possibility that the

NORTHERN LAPWING Vanellus vanellus	A	B	C	Population	Trend
Europe (breeding)		2c		7,000,000	–
W Asia (breeding)			(1)	C or D	?

bird's reproductive problems are also due to conditional factors, in the form of various hardships the bird encounters on its homeward migration, has not yet been sufficiently studied for the northern lapwing or for other meadow limicolae.

COMMON SNIPE *(GALLINAGO GALLINAGO)*. The common snipe's Holarctic range extends across the temperate and boreal zones of Eurasia and North America. Among the three described sub-species of the northern hemisphere, the nominate form breeds throughout the entire Palearctic, and the sub-species *G.g. faroeensis* breeds on the Atlantic Faeroev Islands and Iceland. In addition, two other sub-species, which some authors consider separate species, are found in Africa and South America (GLUTZ OF BLOTZHEIM et al. 1985). The species' European range extends from Iceland to the Ukraine and the European part of Russia, across the British Isles, north-west Europe, Scandinavia and central Europe (HAGEMEIJER & BLAIR 1997). The European breeding population, comprising about 920,000 breeding pairs, is concentrated in Iceland, Belarus, Scandinavia and the UK. The Russian population numbers some 1,000,000 to 10,000,000 breeding pairs (HAGEMEIJER & BLAIR 1997).

The common snipe is predominantly a sedentary bird or short-distance migrant. Its wintering areas are found in the climatically more favourable regions of its breeding area, especially in Atlantic north-west Europe and on the British Isles. Part of the northern population also migrates to the Mediterranean and even reaches sub-Saharan Africa. The sub-species *G.g. faroeensis* winters predominantly in Ireland. The wintering grounds of west Siberian breeding birds are found in south-west Asia and sub-Saharan Africa (BEZZEL 1985, HAGEMEIJER & BLAIR 1997, WETLANDS INTERNATIONAL 1999). A total of three groups are differentiated within the AEWA area (WETLANDS INTERNATIONAL 1999).

The common snipe's breeding population in Germany, as in large parts of its European range, has decreased – considerably, in part – over the past decades. The main reasons cited for this decrease include habitat loss through drainage of wetlands, intensification of agricultural use in wetlands areas and direct taking in resting and wintering areas (BAUER & BERTHOLD 1996). WITT et al. (1996) estimated the common snipe's breeding population in Germany to number 12,000 to 18,000 pairs in the mid-1990s, although decreases of more than 25 to 50 % within the past 25 years have been reported in most Länder. As of 1999, the population had declined still further, to 6,200 to 9,800 pairs (BAUER et al. pub. pend.)

JACK SNIPE *(LYMNOCRYPTES MINIMUS)*. The jack snipe breeds in the

COMMON SNIPE Gallinago gallinago gallinago	A	B	C	Population	Trend
Europe (breeding)		2c		>20,000,000	–
W Siberia (breeding)			1	E	?
Iceland (breeding) (faroeensis)			1	750,000	0

JACK SNIPE Lymnocryptes minimus	A	B	C	Population	Trend
Europe (brü)	(3c)*			C or D	–
W Siberia (breeding)		(1)		?	?

boreal zone of the Western Palearctic and west Siberia. The extent of its breeding range, and the size of its breeding population, are unknown throughout much of its Russian range. The Russian population has been estimated to number 10,000 to 100,000 individuals. The Scandinavian breeding population, with a clear concentration in Finland, comprises between 13,000 and 24,000 breeding pairs (HAGEMEIJER & BLAIR 1997). Because this species is difficult to survey, both in its breeding areas and wintering grounds, the jack snipe's population situation is difficult to assess. Overall, a population decrease and range shrinkage must be assumed, however, as a result of changes in land use, of industrial peat removal and of drainage of breeding habitats (TUCKER & HEATH 1994, HAGEMEIJER & BLAIR 1997). Two breeding populations are differentiated. Birds that breed in Europe winter in north-west Europe, on the British Isles, in the Mediterranean and in north and west Africa. Birds that breed in west Siberia migrate for the winter to south-west Asia (in most cases) and may even reach north-east Africa (WETLANDS INTERNATIONAL 1999).

Germany lies within the jack snipe's regularly occupied winter range in north-west Europe. The trends for the bird's winter populations, throughout much of its European winter range, are unknown. The British and Danish winter populations experienced considerable decreases (TUCKER & HEATH 1994). No quantitative data on the jack snipe's population situation in Germany is available. It must be assumed, however, that the size estimate reported for the bird's winter population in the early 1990s, 100 to 1,000 individuals, was too low by a significant degree (TUCKER & HEATH 1994).

BLACK-TAILED GODWIT *(LIMOSA LIMOSA)*. Of the three described sub-species of the black-tailed godwit, the nominate form breeds in areas scattered throughout the temperate zones of western, central and eastern Europe, as well as in Russia, including west Siberia. It winters mainly in west and east Africa, and in an area extending from the Middle East to Pakistan and India. The Icelandic sub-species *L. l. islandica* winters on the western European Atlantic coast of the British Isles, France and Portugal, in an area extending south to Morocco. Another sub-species inhabits north-east Siberia and north China (BEZZEL 1985, HAGEMEIJER & BLAIR 1997). The European breeding population (outside of Russia) is estimated to number 135,000 to 158,000 pairs. A majority of this population, comprising 85,000 to 100,000 pairs, breeds in the Netherlands. Other large breeding populations, each comprising over 1,000 pairs, are found in Belarus, Germany, Poland, Ukraine and Hungary. The Icelandic breeding population comprises 7,000 to 10,000 pairs (HAGEMEIJER & BLAIR 1997, BIRDLIFE INTERNATIONAL/ EUROPEAN BIRD CENSUS COUNCIL 2000). Apart from the population of the Icelandic sub-species *L.l. islandica*, a total of three populations of the nominate form are differentiated within the AEWA area. Birds that breed in western Europe winter in north-west and west Africa (Morocco to Senegal), in an area extending eastward to the flood plains of the Niger (Mali). Breeding birds from eas-

BLACK-TAILED GODWIT Limosa limosa limosa	A	B	C	Population	Trend
W Europe/W Africa		2c		350,000	–
E Europe/E Africa		2c		D	–
SW Asia & NE Africa (win)		(1)		C	?
Limosa limosa islandica					
Iceland (breeding)	3a*			65,000	+

tern Europe migrate across the eastern Mediterranean, to wintering areas in east and central Africa. Breeding birds of west and central Siberia winter in south-west Asia and north-east Africa (WETLANDS INTERNATIONAL 1999).

The black-tailed godwit's breeding population in Germany, which numbered about 7,000 to 8,000 pairs in the mid-1990s, is concentrated in the north-west German low plain of the Länder Lower Saxony and Bremen (>5,000 pairs), Schleswig-Holstein (about 1,600 pairs) and North Rhine-Westphalia (about 370 pairs). The eastern German Länder Mecklenburg-West Pomerania, Brandenburg and Saxony-Anhalt, and Bavaria and Hesse, are each sparsely occupied, with fewer than 100 pairs each (BAUER & BERTHOLD 1996, WITT et al. 1996, MÄDLOW & MODEL 2000). For 1999, BAUER et al. (pub. pend.) placed the population at 6,000 to 7,300 pairs. The black-tailed godwit's breeding population in Germany has declined considerably in recent years. However, breeding groups in salt-meadow forelands of Lower Saxony's and Schleswig-Holstein's parts of the Wadden Sea showed stable to slightly increasing trends in the 1990s, presumably due to the bird's abandoning of inland breeding areas in favour of coastal areas (HÄLTERLEIN et al. 2000, MÄDLOW & MODEL 2000, HÖTKER et al. 2001, NEHLS et al. 2001). Like the northern lapwing, which also breeds mainly in wet grasslands, the black-tailed godwit's population has decreased considerably, in recent decades, in most of the countries in its western European range. Increases were registered only in very small peripheral populations (HAGEMEIJER & BLAIR 1997, BIRDLIFE INTERNATIONAL/ EUROPEAN BIRD CENSUS COUNCIL 2000). The main reasons for the population decreases, in countries in the western part of its breeding range and among its core population in the Netherlands, are drainage of wet meadows and large-scale intensification of grassland use (BAUER & BERTHOLD 1996, HAGEMEIJER & BLAIR 1997).

BAR-TAILED GODWIT *(LIMOSA LAPPONICA)*. The bar-tailed godwit breeds in Arctic tundra of the northern Palearctic, from north Scandinavia eastward to the Bering Strait and Alaska. The nominate form breeds in the Western Palearctic, from Scandinavia to the Taymyr Peninsula. In east Siberia and Alaska, it is replaced by the sub-species *L.l. baueri* (HAGEMEIJER & BLAIR 1997, WETLANDS INTERNATIONAL 1999). The wintering areas of breeding birds of Scandinavia, the European part of Russia and west Siberia are the coasts of north-west Europe, especially the Wadden Sea and the coasts of the British Isles (ROSE & SCOTT 1997).

Breeding birds of northern Siberia, in an area extending eastward to the Taymyr Peninsula, migrate through north-west Europe to wintering areas on the west African coast (Guinea Bissau, Gulf of Guinea) as well as southward to South Africa (MELTOFTE et al. 1994; WELTLANDS INTERNATIONAL 1999). Breeding birds of Siberia, east of the Taymyr Peninsula, winter predominantly on the coasts of the Arabian Peninsula, although a few also reach the east coast of Africa. The three AEWA populations are differentiated on the basis of their main wintering populations (WETLANDS INTERNATIONAL 1999).

The German Wadden Sea lies within the flyway and winter range of the Western

BAR-TAILED GODWIT Limosa lapponica lapponica	A	B	C	Population	Trend
W Palearctic (win)		2a		115,000	0/−
W & SW Africa (win)		2a		700,000	?
SW Asia & E Africa (win)			(1)	C or D	?

Palearctic winter population of the bar-tailed godwit. In addition, most of the species' Siberian breeding birds rest in the Wadden Sea on their migrations between their breeding areas and their west African wintering areas (MELTOFTE et al. 1994). In the first half of the 1990s, the bar-tailed godwit's mid-winter population in Lower Saxony's part of the Wadden Sea numbered some 200 to 1,100 individuals, while Schleswig-Holstein's part of the Wadden Sea was estimated to harbour 8,800 and 12,700 individuals (RÖSNER et al. 1994, POOT et al. 1996). Beginning in February, the numbers of bar-tailed godwits resting in the Wadden Sea increase as groups that winter on the coasts of northwest Europe arrive. The entire congregation reaches its maximum size during the passage of the west African winter population. The largest numbers are reached in May, shortly before the birds leave for their breeding areas, and when both populations are in the Wadden Sea at the same time (MELTOFTE et al. 1994).

In the 1990s, the maximum number of bar-tailed godwits seen at the same time in Schleswig-Holstein's Wadden Sea area amounted to 158,000 individuals, or about 19% of the total of both populations. In the same decade, the resting population in Schleswig-Holstein's part of the Wadden Sea exhibited a decreasing trend (GÜNTHER & RÖSNER 2000).

WHIMBREL (NUMENIUS PHAEOPUS). The whimbrel's Holarctic range extends across the entire boreal and subarctic zone of Eurasia and North America, from Iceland and Scandinavia to the Bering Strait, across northern Siberia. Of the four described sub-species, the nominate form inhabits the Western Palearctic, including west Siberia (HAGEMEIJER & BLAIR 1997). The European population of the whimbrel increased in the 1970s, in some parts of the bird's range. This development went hand-in-hand with an extension of the bird's breeding range (Greenland) and the bird's occupation of agricultural habitats – for example, in Finnish breeding areas (HAGEMEIJER & BLAIR 1997). Two populations of the nominate form are differentiated within the AEWA area. Birds that breed in northern Europe (Iceland, Scotland, Scandinavia, the Baltic countries and west Russia) winter predominantly on the west African coast. Breeding birds of west Siberia migrate across the eastern Mediterranean, to wintering areas in Madagascar, east and South Africa. The taxonomic status of the southwest Asian sub-species *N. p. alboaxillaris* is unclear; the sub-species may simply be a colour variant of the nominate form. No data regarding its population situation is available. It is assumed that this form, if it truly is a sub-species, is in immediate danger of extinction (WETLANDS INTERNATIONAL 1999).

Whimbrels of the European/west African population rest regularly in Germany. Large resting groups can be found, during the return-migration period from July to September, in Schleswig-Holstein's and Lower Saxony's parts of the Wadden Sea (POOT et al. 1996). BURDORF et al. (1997) place the whimbrel's resting population in Germany at 2,000 individuals. During the

WHIMBREL **Numenius phaeopus phaeopus**	A	B	C	Population	Trend
Europe/W Africa			1	600,000 - 700,000	+
W Siberia/S & E Africa			(1)	?	?
Numenius phaeopus alboaxillaris					
SW Asia/E Africa	1C			?	?

birds' return trip between mid-April and the end of May, the maximum numbers of passing birds are much lower than they are in the fall; possibly, the birds' spring migration occurs in a broader front across inland areas (BEZZEL 1985).

WESTERN CURLEW *(NUMENIUS ARQUATA)*. The western (Eurasian) curlew breeds in the temperate and boreal zones of Europe and Asia, in an area extending eastward to the upper Amur region. In south-east Europe and the European part of Russia, the European nominate form gives way to the Asian subspecies *N. a. orientalis*. The European range of the nominate form comprises all of north-west Europe, north of a line extending eastward from France and across Switzerland, Austria, Hungary and the northern half of Romania (HAGEMEIJER & BLAIR 1997). Most of the wintering areas of European western curlews are found on the coasts of north-west Europe and the Mediterranean region, in an area extending southward to Mauritania. The sub-species *N. a. orientalis* winters in the Middle East, as well as in east and South Africa (WETLANDS INTERNATIONAL 1999). The population differentiations correspond to the two sub-species' breeding and winter populations within the AEWA area.

In Germany, western curlews of the European breeding population regularly appear as breeding birds and as passage migrants and winter guests. BURDORF et al. (1997) place the resting population in Germany at 107,000 individuals. The most important resting and wintering areas include Lower Saxony's and Schleswig-Holstein's Wadden Sea areas, in each of which about 45,000 individuals winter. Other large wintering populations are found in coastal lowland areas of Lower Saxony (UNSELT et al. 2000). In the 1990s, the maximum number of western curlews present at the same time in Schleswig-Holstein's part of the Wadden Sea reached 61,200 individuals. Overall, the population remained nearly constant from 1988 to 1999 (GÜNTHER & RÖSNER 2000).

In Germany, the western curlew breeds primarily in the north German low plain, in the Länder Lower Saxony and Bremen (<2,000 pairs), North Rhine-Westphalia (about 590 pairs), Schleswig-Holstein (about 250 pairs), Mecklenburg-West Pomerania (about 90 pairs), Brandenburg (about 150 pairs) and Saxony-Anhalt (about 100 pairs). The bird also breeds in the south-German Länder Bavaria and Baden-Württemberg (about 75 pairs). Germany's other Länder harbour either no breeding birds or only a very few (<10) pairs (MÄDLOW & MODEL 2000). The bird's total population in 1999 amounted to between 3,200 and 4,000 pairs (BAUER et al. pub. pend.).

The western curlew has been less strongly affected than other limicolae that breed in wet meadows (northern lapwing, common snipe, black-tailed godwit, common redshank and ruff) by the significant losses and reshaping of wet meadow habitats that have occurred in recent decades. Nonetheless, the population in most of the bird's core areas in north-west Germany has decreased considerably within the past few decades (MELTER & WELTZ 2001, NEHLS et al. 2001, SEITZ 2001).

WESTERN CURLEW **Numenius arquata arquata**	A	B	C	Population	Trend
Europe (breeding)			1	348,000	− (0/+)
Numenius arquata orientalis					
W Asia & E Africa (win)	3c			C	? (−)

SPOTTED REDSHANK *(TRINGA ERYTHROPUS)*. The spotted redshank's range is a narrow band extending eastward from north Scandinavia to the Bering Strait. The range is fragmented in the region of the Taymyr Peninsula and – probably as a result of gaps in relevant inventories – in the European part of Russia. The breeding population of Scandinavia comprises 25,000 to 35,000 breeding pairs, while the Russian breeding population is estimated to number 1,000 to 10,000 pairs (HAGEMEIJER & BLAIR 1997). Apart from a range expansion in Sweden, there are no clear indications that the species' population has changed in recent decades. The European population's wintering areas are located predominantly in Africa, in the Sahel zone region (Mauritania to Ethiopia, and southward to north Zaire, Tanzania and Burundi). Only a small part of the population winters in the Mediterranean region and western Europe. The west Siberian population winters in south-west Asia, the Middle East and north-east Africa (BEZZEL 1985, HAGEMEIJER & BLAIR 1997, WETLANDS INTERNATIONAL 1999).

The spotted redshank crosses Germany on its homeward journey in April/May and, in several waves, on its migration to its wintering grounds, in July to September. The first maximum concentrations of migrating females, which leave their breeding areas immediately after laying their eggs or immediately after their eggs hatch, normally appear on the coast (BEZZEL 1985). Larger resting concentrations are found especially in Lower Saxony's and Schleswig-Holstein's parts of the Wadden Sea and in neighbouring estuaries (MELTOFTE et al. 1994, POOT et al. 1996, UNSELT et al. 2000).

The spotted redshank's resting population in Schleswig-Holstein's part of the Wadden Sea increased continuously between 1988 and 1999. The maximum numbers of simultaneously present birds seen during this period reached 12,400 individuals (GÜNTHER & RÖSNER 2000). Since the birds migrate in a broad front, their young birds (in particular) also rest in many inland wetlands. In these areas, it is not possible to assess the bird's population situation quantitatively on a national level, however.

COMMON REDSHANK *(TRINGA TOTANUS)*. The common redshank's range extends across the entire Eurasian continent, from Iceland to east China. Although the bird's breeding range is concentrated in the temperate and boreal zones, in the Western Palearctic the bird

SPOTTED REDSHANK **Tringa erythropus**	A	B	C	Population	Trend
Europe/W Africa			(1)	75,000 - 150,000	? (0)
SW Asia & E Africa (win)		(1)		B or C	?

COMMON REDSHANK **Tringa totanus totanus**	A	B	C	Population	Trend
E Atlantic (win)		2c		177,000	–
E Europe/E Mediterranean & E Africa		2c		D	–
Tringa totanus ussuriensis					
SW Asia & E Africa (win)			(1)	?	?
Tringa totanus robusta					
Iceland & Faeroe Islands (breeding)			1	150,000-300,000	0/+

also occupies the Mediterranean region and subarctic tundra (HAGEMEIJER & BLAIR 1997). Of the six described sub-species, the nominate form breeds in continental Europe and the British Isles. Breeding birds of the British Isles (which some authors differentiate as the sub-species *T. t. britannica*) are either sedentary or migrate only short distances, to the French Atlantic coast. The wintering area of the breeding birds of Scandinavia, and of north-west and central Europe, comprises the north-west European Atlantic coast, the west Mediterranean and an area extending southward, along the west African coast, to the Gulf of Guinea. Eastern European breeding birds winter predominantly in the eastern Mediterranean and east Africa. The sub-species *T. t. robusta* breeds on Iceland and in the Faeroe Islands. It winters on the British Isles and along the coasts of north-west Europe. The Siberian sub-species *T. t. ussuriensis* winters in south-west Asia and east Africa (BEZZEL 1985, HAGEMEIJER & BLAIR 1997, WETLANDS INTERNATIONAL 1999).

These migration patterns are used to define the populations for purposes of AEWA.

Germany lies within the breeding and resting area of the nominate form's east Atlantic winter population. The common redshank's winter population in Lower Saxony's and Schleswig-Holstein's parts of the Wadden Sea is enlarged by birds of the Icelandic sub-species *T. t. robusta* (MELTOFTE et al. 1994, ZANG et al. 1995). In the 1990s, congregations in each of these Wadden Sea areas amounted to 3,000 to 5,000 individuals (RÖSNER et al. 1994, POOT et al. 1996, UNSELT et al. 2000).

Between 1988 and 1999, the common redshank's resting populations in Schleswig-Holstein's part of the Wadden Sea exhibited a slightly negative trend, following a maximum in 1993. During these two years, the maximum number of simultaneously present individuals of both populations reached 12,500 (GÜNTHER & RÖSNER 2000).

The common redshank's breeding population in Germany is concentrated primarily in the coastal Länder Lower Saxony, Schleswig-Holstein and Mecklenburg-West Pomerania; in the latter of these, it is concentrated in Wadden Sea salt meadows and along the Baltic Sea coast. In the 1990s, the common redshank's total population on the German Wadden Sea coast fluctuated, without any apparent trend, between 8,000 and 10,000 pairs. During the same period some 300 to 400 pairs bred on the Baltic Sea coast (HÄLTERLEIN et al. 2000). While Wadden Sea breeding populations have remained largely stable, or have even exhibited positive trends, as a result of extensivation of salt-meadow grazing, inland breeding populations have decreased considerably in recent decades (NEHLS et al. 2001). Following considerable decreases, breeding populations in non-coastal Länder have dwindled to just a few residual groups. In the mid-1990s, they numbered a total of about 130 pairs, with a clear concentration in Brandenburg, where 60 to 100 pairs bred (MÄDLOW & MODEL 2000). The total population numbered about 9,700 to 12,000 pairs in 1999 (BAUER et al. pub. pend.).

MARSH SANDPIPER *(TRINGA STAGNATILIS)*. The marsh sandpiper breeds in the steppes, forest steppes and southern forest zone of eastern Europe, in

MARSH SANDSNIPER Tringa stagnatilis	A	B	C	Population	Trend
Europe/W Africa		(1)		C or D	?
SW Asia, E& S Africa (win)		(1)		C	?

an area stretching eastward to east Asia. The Western Palearctic contains the western limit of the bird's breeding range. The westernmost breeding populations are found in Ukraine and Russia. As the result of a range expansion in a north-westerly direction, isolated groups, consisting of just a few pairs in each case, were sighted in Finland, Latvia, Poland and Romania (HAGEMEIJER & BLAIR 1997). The marsh sandpiper's wintering grounds extend from the eastern Mediterranean, across east and South Africa, to the Indian subcontinent and the entire south-east Asian region and Australia. Part of the African winter population crosses the Sahara in a south-westerly direction, in order to winter in west African wetlands (BEZZEL 1985, HAGEMEIJER & BLAIR 1997). Two populations are differentiated: breeding birds of eastern Europe, which winter in central and west Africa, and the winter population of south-west Asia, east Africa and South Africa (WETLANDS INTERNATIONAL 1999).

In Germany, small numbers of marsh sandpipers are regularly observed in passage in both migratory directions, and the numbers of annually observed individuals have increased slightly (BUNDESDEUTSCHER SELTENHEITENAUSSCHUSS and DEUTSCHE SELTENHEITENKOMISSION 1992, 1994, 1995, 1996, 1997, 1998, 2000).

COMMON GREENSHANK *(TRINGA NEBULARIA)*. The common greenshank breeds in the boreal zone of the entire Palearctic, from Scotland and Scandinavia eastward to Kamchatka Peninsula. Smaller breeding populations are found, at the southern limit of the bird's range, in the Baltic countries, Belarus and Ukraine. The breeding population of the European population outside of Russia numbers 57,000 to 83,000 pairs, while the Russian breeding population comprises between 10,000 and 100,000 pairs (HAGEMEIJER & BLAIR 1997).

Birds that breed in the Western Palearctic are predominantly long-distance migrants. Their wintering areas extend southward from the Mediterranean to south-west Africa. Breeding birds of the eastern populations winter in east Africa, south-east Asia and Australia (HAGEMEIJER & BLAIR 1997). Two populations are differentiated within the AEWA area: breeding birds of northern Europe, which winter predominantly in south-west Europe, north-west Africa and west Africa, and the winter population of south-west Asia, east Africa and South Africa, which consists mainly of birds from Siberian breeding areas. On the other hand, recovery of banded birds indicates that wintering grounds overlap (WETLANDS INTERNATIONAL 1999).

The common greenshank crosses German inland areas on its homeward journey in April/May and during its return to its wintering grounds, from July to August. In most inland wetlands, it appears either alone or in small groups. Large resting concentrations are found only in the Wadden Sea, on Lower Saxony's and Schleswig-Holstein's North Sea coasts, where resting populations of about 7,300 and 2.200 individuals have been reported (UNSELT et al. 2000). BURDORF et al. (1997) estimated the common greenshank's national resting population to number 6,500 individuals. From 1988 to 1999, in the resting population in Schleswig-Holstein's part of the Wadden Sea was either stable or exhibited no clear trends (GÜNTHER & RÖSNER 2000).

COMMON GREENSHANK Tringa nebularia	A	B	C	Population	Trend
Europe/W Africa			1	D	0
SW Asia, E & S Africa (win)			(1)	C or D	?

Only once, in 1997, has the common greenshank been found breeding in Germany, far outside the species' contiguous breeding area; this occurred in northern Bavaria (RANFTL & DORNBERGER 1998).

GREEN SANDPIPER *(TRINGA OCHROPUS)*. The green sandpiper's range extends across the boreal zone of the entire Palearctic, from Scandinavia to the Asian Pacific coast. Its European range extends from Scandinavia to Russia, across Poland and the Baltic countries, Belarus and Ukraine. Smaller populations are found in central and south-east Europe – in the Czech Republic, Slovenia and Bulgaria (HAGEMEIJER & BLAIR 1997). The European breeding population comprises about 152,000 to 193,000 pairs, and in most of its range countries the species has exhibited positive population trends and has expanded its breeding range (HAGEMEIJER & BLAIR 1997).
The green sandpiper's wintering areas are located in western and central Europe, the Mediterranean, large parts of sub-Saharan Africa and south-west Asia (HAGEMEIJER & BLAIR 1997, WETLANDS INTERNATIONAL 1999).

Germany is located at the western limit of the species' contiguous breeding range. WITT et al. (1996) estimated the total population in 1994 to number 210 to 320 pairs, with an increasing trend especially at the western limit of the range (Schleswig-Holstein, Lower Saxony and Bavaria). Because the species is highly inconspicuous, it is very likely that its actual population has been underestimated, however (KISSLING 2001), and MÄDLOW & MODEL (2000), drawing on more recent survey findings, report a population of over 500 pairs in 1995 and 1996. The bird's range is concentrated in the eastern half of Germany, with populations in Mecklenburg-West Pomerania (about 200 pairs), Brandenburg (180-220 pairs), Saxony (10-20 pairs), Saxony-Anhalt (about 30 pairs), Schleswig-Holstein (about 25 pairs), Lower Saxony (<100 pairs) and Bavaria (about 10 pairs; MÄDLOW & MODEL 2000). Following additional increases, by 1999 the population had reached 650 to 1,050 pairs (BAUER et al. pub. pend.)

WOOD SANDPIPER *(TRINGA GLAREOLA)*. The wood sandpiper breeds in the boreal and subarctic zones of the entire Palearctic, from the Scandinavian peninsula to east Siberia. In Europe, its range reaches across the Scandinavian peninsula, the Baltic countries, Belarus and the northern half of Russia. The total European breeding population comprises 298,000 to 412,000 breeding pairs. Russia, which harbours 100,000 to 1,000,000 breeding pairs, has the largest percentage of the species' total population (HAGEMEIJER & BLAIR 1997). The European breeding population winters mainly in west Africa. Within the AEWA area, the winter population of east and South Africa is differentiated from that of south-west Asia (Iran, Iraq)

GREEN SANDPIPER Tringa ochropus	A	B	C	Population	Trend
Europe/W Africa			1	D or E	0/+
SW Asia & E Africa (win)			(1)	?	?

BRUCHWASSERLÄUFER Tringa glareola	A	B	C	Population	Trend
Europe (breeding)		2c		E	–
SW Asia, E & S Africa (win)			(1)	D or E	?

(WETLANDS INTERNATIONAL 1999). As a bird that requires raised bogs, the wood sandpiper has presumably been extinct as a breeding bird in Germany since 1980, probably as a result of continuing drainage and drying of raised bogs. Measures to restore raised bogs have not been able to change this status to date.

Germany lies within the regular flyway area of the species' northern European breeding birds. Their passages take place in a broad front across central European inland areas, during the birds' homeward journey in April/May as well as during their outward migration, in July to September (BEZZEL 1985). During their migrations, wood sandpipers rest in many different inland wetlands, and thus no data on national resting populations in Germany is available.

COMMON SANDPIPER *(TRINGA HYPOLEUCOS)*. The common sandpiper breeds throughout the entire Palearctic. It occupies all of Europe, with a clear concentration in the northern half of the continent. In central and southern Europe, its range is fragmented. The Scandinavian peninsula, the Baltic countries and the British Isles harbour by far the largest part of the entire European breeding population of 504,000 to 665,000 pairs (HAGEMEIJER & BLAIR 1997). Two populations are differentiated; of these, the breeding population of west and central Europe winters predominantly in west Africa. Breeding birds from eastern Europe and west Siberia migrate across the Black Sea and the eastern Mediterranean, to east, central and South Africa (WETLANDS INTERNATIONAL 1999).

While the common sandpiper's Scandinavian, Baltic and Russian core populations are stable, the species' breeding populations in west and central Europe exhibit strongly negative population trends. As a result of such population decreases, many populations in central Europe have disappeared, save for a few residual populations (BAUER & BERTHOLD 1996, HAGEMEIJER & BLAIR 1997). The primary reasons for the population declines include destruction of suitable breeding habitats, through widening and channelling of watercourses, and human-caused disturbances during the breeding season. In contrast to the little ringed plover, which inhabits similar habitats, the common sandpiper has difficulty finding substitute habitats, even though it is able to occupy secondary habitats quikkly (BAUER & BERTHOLD 1996). At the end of the 1990s, the common sandpiper's breeding population in Germany numbered between 240 and 350 pairs (BAUER et al. pub. pend.).

RUDDY TURNSTONE *(ARENARIA INTERPRES)*. The ruddy turnstone, which has two sub-species, breeds throughout the entire northern Arctic circle region, on the coasts of northern Eurasia, Greenland and North America, and from high-Arctic tundras southward across the boreal zone, to the northern limit of the temperate latitudes. The sub-species *A. i. morinella* breeds on the North American continent. The breeding range of the nominate form extends from north-east Canada to Eurasia, across Greenland. In the Western Palearctic, the bird's breeding range includes the entire Norwegian Atlantic coast, the northern coasts of Finland and Russia and the northern Baltic Sea coasts of south Sweden, Finland and Es-

COMMON SANDPIPER Tringa hypoleucos	A	B	C	Population	Trend
W & C Europe (breeding)			1	E	0
SW Asia & E Africa (win)			(1)	?(E)	?

tonia (HAGEMEIJER & BLAIR 1997, WETLANDS INTERNATIONAL 1999).

Three winter populations are differentiated. Breeding birds of Greenland and north-east Canada winter on the north-west European coasts of the British Isles, the Wadden Sea and the western North Sea, in an area extending southward to Portugal (BEZZEL 1985, MELTOFTE 1994, POOT et al. 1996). Breeding birds of Scandinavia and north-west Russia migrate across western Europe and the west Mediterranean to wintering grounds on the west African coast, in an area extending southward from Morocco to the Gulf of Guinea. Breeding birds of the Siberian tundra migrate across the Caspian Sea to wintering grounds in the eastern Mediterranean, in the Red Sea and Arabian Gulf regions and along the east coast of Africa, in an area extending southward to South Africa (WETLANDS INTERNATIONAL 1999).

In Germany, parts of the Western Palearctic winter population regularly winter in Lower Saxony's and Schleswig-Holstein's Wadden Sea areas. The mid-winter population in Lower Saxony's part of the Wadden Sea was estimated, in the first half of the 1990s (1992-1994), to number some 500 to 800 individuals, while 300 to 700 individuals were counted in Schleswig-Holstein's part of the Wadden Sea (RÖSNER et al. 1994, POOT et al. 1996).

Breeding birds of Scandinavia and north-west Russia use the Wadden Sea as a resting area in April/May and July/September, during migration between their breeding areas and their west African wintering grounds (MELTOFTE et al. 1994).

The resting populations of both populations in Schleswig-Holstein's part of the Wadden Sea were stable in the 1990s, although they exhibited a slight decreasing trend following a maximum in 1996 (GÜNTHER & RÖSNER 2000).

As a breeding bird, the ruddy turnstone appears only in small numbers in the German Wadden Sea. This breeding population is the southernmost part of Scandinavian breeding population, which numbers about 18,000 pairs (HAGEMEIJER & BLAIR 1997). In 1982, the first breeding birds were sighted in the Wadden Sea, in Schleswig-Holstein's waters, since the former breeding population's disappearance in the 19th century. Since then, the population has remained at a low level. In the 1990s, a maximum was reached in 1993, when seven pairs were sighted (HÄLTERLEIN et al. 2000, RASMUSSEN et al. 2000).

RED KNOT *(CALIDRIS CANUTUS)*. The red knot's breeding range comprises the Arctic tundra of North America, Greenland, Spitzbergen, Taymyr Peninsula, Severnaya Zemlaya, the New Siberian is-

RUDDY TURNSTONE Arenaria interpres interpres	A	B	C	Population	Trend
W Palearctic (win)		1		80,000	0 (+)
W Africa (win)		1		50,000 - 100,000	0
SW Asia, E & S Africa (win)		(1)		C	?

RED KNOT Calidris canutus canutus	A	B	C	Population	Trend
W& S Africa (win)		2a 2c		260,000	–
Calidris canutus islandica					
NE Canada & Greenland/NW Europe		2a		400,000	0

lands and Wrangel Island (GLUTZ OF BLOTZHEIM et al. 1999). Of the five described sub-species, the nominate form breeds on Taymyr Peninsula and in Severnaya Zemlaya. It winters on the west and south African coast, in an area extending from Morocco to Namibia and South Africa, across the Gulf of Guinea. The north-east Canadian and Greenlandic sub-species *(C. c. islandica)* winters primarily on the coasts, and in estuaries, of the British Isles and in the southern North Sea (Germany, Netherlands), in a general region extending southward to the French Atlantic coast (HAGEMEIJER & BLAIR 1997, WETLANDS INTERNATIONAL 1999). The populations differentiated for the purposes of AEWA correspond to the two occurring sub-species (WETLANDS INTERNATIONAL 1999).

According to the most recent surveys, the west and south African winter population of the nominate form has decreased considerably and now comprises about 260,000 individuals, possibly only half of the population estimated at the beginning of the 1980s (WETLANDS INTERNATIONAL 1999).

The Dutch-German-Danish Wadden Sea is of outstanding importance, especially as a resting and wintering area for both east-Atlantic flyway populations (MELTOFTE et al. 1994).

BURDORF et al. (1997) estimated the red knot's total resting population in Germany, representing both populations, to number 341,000 individuals. The Canadian/Greenlandic sub-species *C. c. islandica* winters primarily on the British Isles and, in smaller numbers, in the Dutch and German Wadden Sea and on the French Atlantic coast. In the 1980s, the winter population throughout the entire Wadden Sea fluctuated in keeping with winter severity, on a level between 20,000 and 101,000 individuals; of this number, between 10,000 and 25,000 individuals remain in Schleswig-Holstein's part of the Wadden Sea in mild winters (MELTOFTE et al. 1994). Beginning in mid-February, congregations of *C. c. islandica* there increase continually, reaching a maximum at the end of April / beginning of May, shortly before they leave for their breeding areas in Greenland and Canada. During this period, they moult into their breeding feathers and build body reserves for the rest of their journey to their breeding areas. On its return trip, *C. c. islandica* uses the Wadden Sea, from July to October, as a resting area for moulting, which lasts several weeks, and for building body reserves for wintering.

Nearly the entire nominate-form population that winters in west and South Africa uses the German Wadden Sea, in both migration directions, as a resting site for building fat reserves for migration, which takes place in long stages, to breeding and wintering areas. On their homeward journey, these birds do not reach the Wadden Sea until the first half of May, following the departure of the great majority of the *C. c. islandica* population. By the time the birds leave for their Siberian breeding areas, at the end of May, virtually the entire population has gathered in German Wadden Sea areas of Lower Saxony and Schleswig-Holstein. During the return trip, which takes place from July to October, the nominate form rests only briefly in the Wadden Sea before moving on to its west African wintering areas (MELTOFTE et al. 1994).

According to GÜNTHER & RÖSNER (2000), the number of red knots (both popula-

SANDERLING **Calidris alba**	**A**	**B**	**C**	**Population**	**Trend**
E Atlantic, W & S Africa (win)			1	123,000	0 (+)
SW Asia, E & S Africa (win)			(1)	120,000	?

tions) that rest in Schleswig-Holstein's part of the Wadden Sea decreased slightly in the 1990s (through 1999), following a maximum in 1992. The maximum number of 296,000 simultaneously present individuals represents about 34% of the total number for both populations (according to estimates of ROSE & SCOTT 1997).

SANDERLING *(CALIDRIS ALBA)*. The sanderling breeds in several different, relatively small breeding ranges in the high-Arctic tundra of Canada, Greenland and central Siberia. It winters nearly around the globe, on coasts in temperate to tropical latitudes, in North and South America, Europe, Africa, Madagascar and Australasia. The Western Palearctic harbours only a small breeding population, comprising just a few pairs, on Spitzbergen (BEZZEL 1985, HAGEMEIJER & BLAIR 1997).

Breeding birds of Greenland, and possibly some of the birds that breed in eastern Canada, migrate in a south-easterly direction through north-west Europe, to wintering grounds on the west African and south African coast. Siberian breeding birds either migrate along the Atlantic coast, to wintering areas in north-west Europe, as well as southward to the west African coast, or they cross the Russian mainland directly and fly across the Black Sea, Caspian Sea and eastern Mediterranean to wintering areas on the coasts of the Arabian Gulf, the Red Sea and east African coasts, in an area extending from the Indian Ocean to South Africa (BEZZEL 1985, WETLANDS INTERNATIONAL 1999). Since the two groups' wintering areas overlap considerably, and since the birds have been found to switch between the two migration routes, differentiation between the two winter populations is not sharp (WETLANDS INTERNATIONAL 1999).

Sanderlings from northern Siberia and Greenland regularly rest in Germany on their homeward journeys, from March to May, and during their return trips, from July to November; they can be found on Lower Saxony's and (especially) Schleswig-Holstein's Wadden Sea coasts (MELTOFTE et al. 1994). According to MELTOFTE et al. (1994) and POOT et al. (1996), the wintering population in the entire Dutch-German-Danish Wadden Sea comprises between 2,000 and 6,120 individuals.
In the first half of the 1990s, estimated mid-winter populations of about 300 to 1,200 individuals were reported for Lower Saxony's and Schleswig-Holstein's sections of the Wadden Sea (RÖSNER et al. 1994, POOT et al. 1996).
The sanderling's resting population in Schleswig-Holstein's part of the Wadden Sea exhibited no clear trends between 1988 and 1999. The maximum resting population of 27,500 individuals represents about 22.4% of the entire population (GÜNTHER & RÖSNER 2000).

LITTLE STINT *(CALIDRIS MINUTA)*. The little stint breeds in the high-Arctic tundra of Eurasia, from the northern tip of Norway to the Lena Delta. The entire Russian breeding population is on the order of 100,000 to 1,000,000 breeding pairs, and about 300 pairs breed in northern Norway (HAGEMEIJER & BLAIR 1997). Two populations are differentiated. Birds that winter in Europe, at the Black Sea, in the Mediterranean and, especially, in north and west Africa probably originate predominantly from Western Palearctic breeding areas. A second group consists of passage migrants and winter guests from

LITTLE STINT Calidris minuta	A	B	C	Population	Trend
Europe & W Africa (win)			1	211,000	0
SW Asia, E & S Africa (win)			(1)	1,000,000	?

Caspian region, east Africa and South Africa; they are presumed to breed in west Siberia (WETLANDS INTERNATIONAL 1999).

In Germany, the little stint regularly appears during the passage period, with peak numbers during the bird's homeward journey in May and during its outward journey between July and October. Passage occurs in a broad front across central European inland areas, and thus resting populations are widely distributed over coastal and inland wetlands (BEZZEL 1985).

TEMMINCK'S STINT *(CALIDRIS TEMMINCKII)*. The breeding range of Temminck's stint extends westward from the region of the Siberian river Lena to the Norwegian coast, in a narrow band along the tundra zone of the northern Palearctic. On the Scandinavian peninsula, its breeding area reaches southward to the southern tip of Norway, along the central mountain regions of Norway and Sweden and along the Finnish Baltic Sea coast (HAGEMEIJER & BLAIR 1997). No discrete populations can be identified within the AEWA area, and two major groups are differentiated on the basis of their main migration routes and wintering regions. European breeding birds migrate primarily across the Black Sea and the eastern Mediterranean to wintering areas in north and west Africa. This population is differentiated from the winter population of south-west Asia and north-east Africa, which is made up of breeding birds from west Siberia (WETLANDS INTERNATIONAL 1999).

Temminck's stint's population situation is inadequately known. About 14,000 pairs breed in Europe. Only very rough estimates of the size of the important, larger Russian population are available: 1,000,000 to 10,000,000 breeding pairs. The Scandinavian population exhibits a negative trend (HAGEMEIJER & BLAIR 1997).

In Germany, Temminck's stints regularly rest during their passages in April/May and July to September; they rest either alone or in small groups, and both in inland wetlands and on the coast (BEZZEL 1985). Because resting individuals tend to be widely dispersed, and because the species is difficult to inventory, no quantitative data is available for larger regions.

PURPLE SANDPIPER *(CALIDRIS MARITIMA)*. The purple sandpiper's Arctic and alpine breeding area extends eastward to Taymyr Peninsula, from north-east Canada and Greenland, and across Iceland, Spitzbergen and Norway (including the central Scandinavian mountain region). The European breeding population numbers between 27,000 and 52,000 pairs, while the population of the European part of Russia comprises 1,000 to 10,000 pairs. Overall, the European population can be assumed to be stable (HAGEMEIJER & BLAIR 1997). The purple sandpi-

TEMMINCKS´STINT Calidris temminckii	A	B	C	Population	Trend
Europe/W Africa		(1)		?	?
SW Asia & E Africa (win)		(1)		?	?

PURPLE STINT Calidris maritima	A	B	C	Population	Trend
E Atlantic (win)		1		50,500	0

per winters further north than other limicolae species. Its wintering area extends along the coasts of north-west Europe, from the Kola Peninsula southward to north-west France, along the Norwegian coast and the British Isles; less important wintering grounds also reach into Portugal and Spain. Breeding birds of Iceland are largely sedentary. The entire wintering population of the north and north-west European coasts is included in the east-Atlantic winter population (WETLANDS INTERNATIONAL 1999).

In keeping with its habitat requirements, the purple sandpiper chooses resting and wintering areas such as rocky coastlines and stone structures, breakwaters and concrete embankments in coastal areas. Small numbers of the bird winter in Germany, from mid-September to May, in suitable habitats – primarily on the island of Helgoland, where between 100 and 200 birds regularly winter (DIERSCHKE 1994).

DUNLIN *(CALIDRIS ALPINA)*. The dunlin, with a total of six sub-species, breeds circumpolarly, in the Arctic to boreal zones of Eurasia and North America. The nominate form breeds in an area extending from north Scandinavia along the north coast of Russia, into Siberia, east of the Urals. (HAGEMEIJER & BLAIR 1997). The breeding range of the north-west European sub-species *C. a. schinzii* extends from Iceland to south Scandinavia and the Baltic Sea region, across the British Isles and the peninsula comprising Denmark and Schleswig-Holstein. The Greenlandic sub-species *C. a. arctica* also is found within the AEWA area (WETLANDS INTERNATIONAL 1999). A total of five main populations of the dunlin are differentiated. Nominate-form breeding birds from north-west Siberia and north-east Europe winter on the coasts of western Europe, the Mediterranean, the Black Sea and north Africa, in an area extending southward to Morocco. These birds are differentiated from the winter population of south-west Asia, the Caspian region and north-east Africa, which consists of breeding birds of central Siberian origin. Among birds of the sub-species *C. a. schinzii*, breeding birds of Iceland and Greenland, whose wintering grounds are located in north and west Africa, are differentiated from breeding birds of the British Isles and the Baltic region. This latter population winters in south-west and north Africa. Greenlandic breeding birds of the sub-species *C. a. arctica* also winter in west Africa (WETLANDS INTERNATIONAL 1999).

The Dutch-German-Danish Wadden Sea lies within the most important resting area of the north-Siberian / European / African population of the dunlin's nominate form. During the birds' homeward journey, which begins in February/March, the resting population grows continuously, reaching a maximum toward the end of May, when up to 90% of the total population are simultaneously present in the Wadden Sea. The bird's maximum concentration in the German part of the Wadden Sea occurs in September. This is during

DUNLIN **Calidris alpina alpina**	A	B	C	Population	Trend
N Siberia/ Europe & N Africa		2c		1,373,000	–
SW Asia & NE Africa (win)			(1)	150,000	?
Calidris alpina schinzii					
Island & Grönland (brü)			1	800,000	0
Baltic Sea, United Kingdom & Ireland (breeding)	3c			33,000 - 36,000	–
Calidris alpina arctica					
Greenland (breeding)	2			15,000	0

the outward passage, which lasts from July to November, and which is the period when adult birds, the first to return, moult. During September, the highest bird densities are found in the Wadden Sea sections of Denmark and Schleswig-Holstein (MELTOFTE et al. 1994). The number of dunlin that winter in the German Wadden Sea fluctuates in keeping with winter severity. In the first half of the 1990s, mid-winter populations were estimated to number 36,000 to 70,000 individuals in Schleswig-Holstein's part of the Wadden Sea and 26,000 to 44,000 individuals in Lower Saxony's Wadden Sea area (RÖSNER et al. 1994, POOT et al. 1996). In Schleswig-Holstein's Wadden Sea area, the dunlin's resting population initially increased between 1988 and 1999.

After reaching a maximum size in 1992, the population began to decrease, and by 1999 had declined to lower levels (GÜNTHER & RÖSNER 2000).

The breeding population of the sub-species *C. a. schinzii*, except for an Icelandic core population, has been decreasing. The dunlin's breeding population on the German North Sea and Baltic Sea coast has shrunk to small residual groups in Schleswig-Holstein's part of the Wadden Sea and on the Baltic Sea coast of Schleswig-Holstein and Mecklenburg-West Pomerania (HÄLTERLEIN et al. 2000). For example, a core group that consisted of 60 to 80 pairs in 1960, and was found near St. Peter, in Schleswig-Holstein's part of the Wadden Sea, dwindled to 5-6 pairs from 1991 to 1996 and then to only three pairs in 1998 and 1999 (RASMUSSEN et al. 2000, HÄLTERLEIN et al. 2000, SÜDBECK & HÄLTERLEIN 2001). Toward the end of the 1990s, a total of no more than six to seven pairs of dunlins bred in the German Wadden Sea (SÜDBECK & HÄLTERLEIN 2001).
A similar trend was seen in the breeding population of the Baltic Sea coast, although this population is more difficult to assess, since the fineness of surveys in its area has been less than those of Wadden Sea surveys. An indication was perhaps given in the mid-1990s, when the breeding population in well-studied protected areas shrank by half, to about 10 to 20 pairs (HÄLTERLEIN et al. 2000). For 1998, KNIEF et al. (2000) report three pairs in protected areas on Schleswig-Holstein's Baltic Sea coast, and KÖPPEN (2000) report 30 in protected areas on Mecklenburg-West Pomerania's coast.

CURLEW SANDPIPER *(CALIDRIS FERRUGINEA)*. The curlew sandpiper's breeding range consists of a relatively small area in the Arctic tundra of central and east Siberia (BEZZEL 1985, WETLANDS INTERNATIONAL 1999). Its wintering area, on the other hand, extends over broad areas of sub-Saharan Africa, in an area extending to and including South Africa, as well as from the Arabian peninsula to Australia, across the Indian subcontinent and south-east Asia (BEZZEL 1985, WETLANDS INTERNATIONAL 1999).

Two wintering groups are differentiated within the AEWA area. A majority of the south-west European / west African winter population crosses eastern European inland areas and the Mediterranean, in order to winter in west Africa. During its fall journey, part of this population flies in a south-westerly direction from the north coast of Russia to west African wintering

CURLEW SANDSNIPER **Calidris ferruginea**	A	B	C	Population	Trend
SW Europe & W Africa (win)			1	436,000	0
SW Asia, E & S Africa (win)			1	310,000	0

grounds, across Scandinavia and north-west Europe and along the Atlantic coast. During their spring migration, the birds take a direct route across the Sahara and the Mediterranean, and then cross eastern European inland areas in order to reach their Siberian breeding areas (BEZZEL 1985, ZEISKE 1992, WETLANDS INTERNATIONAL 1999). This population is differentiated from the population that winters in east and South Africa, and that reaches its wintering grounds via an eastern route across the Caspian Sea and the Middle East. The Black Sea is an important resting area for both populations (WETLANDS INTERNATIONAL 1999).

Curlew sandpipers rest in Germany primarily during their journey to their wintering grounds, when they cross Scandinavia and fly along the north-west European Atlantic coast. The most important resting area in Germany is the northern Elbe estuary, in Schleswig-Holstein's Wadden Sea area. In the 1990s, the maximum population in this isolated resting area reached 19,400 individuals, with the overall figures either remaining about the same or fluctuating irregularly (GÜNTHER & RÖSNER 2000). Small numbers of curlew sandpipers also regularly rest in inland wetlands (BEZZEL 1985).

RUFF *(PHILOMACHUS PUGNAX)*. The ruff breeds in the entire northern Palearctic, from Scandinavia to the Bering Strait. The southern limit of its European breeding area extends from the Netherlands to the European part of Russia, across northern Germany, Poland, Belarus and Ukraine. Small residual populations are found still further west, on the British Isles, in Belgium and on the west coast of France. Some 95% (about 114,000 pairs) of the entire European population outside of Russia breed on the Scandinavian peninsula. The Russian breeding population accounts for by far the largest part of the world population, or between 1,000,000 and 10,000,000 breeding pairs, however (HAGEMEIJER & BLAIR 1997).

Most of the ruff's breeding populations have shrunk in recent decades, considerably so in some cases, and especially at the western and southern limits of the bird's range. These losses have been caused primarily by habitat destruction resulting from intensification of uses and drainage of wet meadow landscapes.

The ruff's main wintering areas are located in west sub-Saharan Africa (Senegal, Mali, Nigeria), as well as in east and South Africa (WETLANDS INTERNATIONAL 1999). Breeding birds of north and central Europe, and those of west Siberia, migrate across western Europe, the Black Sea and the Mediterranean to wintering grounds in west Africa. These birds are differentiated from the winter population of east and South Africa, which consists of Siberian breeding birds (WETLANDS INTERNATIONAL 1999).

By the mid-1990s, following large losses in previous decades, the ruff's breeding population in Germany had shrunk to a few residual populations in the north German Länder Lower Saxony and Bremen (<20 pairs), Mecklenburg-West Pomerania (12-16 pairs) and Brandenburg (2-3 pairs). The ruff disappeared from North Rhine-Westphalia by 1987 (GRO & WOG 1997, MÄDLOW & MODEL 2000). What is now

RUFF Philomachus pugnax	**A**	**B**	**C**	**Population**	**Trend**
W Africa (win)		2c		E	–
SW Asia, E & S Africa (win)			(1)	D or E	?

the ruff's largest breeding population in Schleswig-Holstein also suffered considerable losses in the 1990s. For example, the population on the North Sea coast, which numbered over 200 pairs in 1990, has dwindled to about 80 pairs, following an enormous drop in 1995 (HÄLTERLEIN et al. 2000). Most of the current breeding population can be found in polders on Schleswig-Holstein's west coast that have been diked for purposes of coastal protection and managed in keeping with nature conservation principles. HÖTKER et al. (2001) estimate that the 48 females seen in this area in the second half of the 1990s (since males do not participate in the brooding work, the breeding population is defined as the number of females present during the breeding season) represented fully half of the entire German breeding population of 109 to 124 pairs (1999) (BAUER et al. pub. pend.).

RED-NECKED PHALAROPE *(PHALAROPUS LOBATUS)*. The red-necked phalarope breeds in arctic and subarctic tundra. It breeds in a circumpolar area, along the coast of the Eurasian Arctic Ocean, and in northern reaches of the North American continent. In the Western Palearctic, its breeding range extends southward to Iceland and, on the Scandinavian peninsula, to south Norway and Finland. A few smaller breeding populations are also found on the British Isles and in Estonia. The European breeding population comprises about 77,000 pairs, of which over half belong to the Icelandic breeding population. The much more important Russian breeding population numbers between 100,000 and 1,000,000 pairs (HAGEMEIJER & BLAIR 1997). Outside of the breeding season, the entire population of the Western Palearctic mainland migrates in a south-easterly direction, across the Black Sea and Caspian Sea, to the Arabian Gulf (and eastward to coastal waters of Pakistan), where it winters on the open sea. It is not known where breeding birds of Iceland and the British Isles winter. Possibly, these birds migrate across the European mainland into the Arabian Gulf, or they winter together with Nearctic breeding birds off the South American Pacific coast (WETLANDS INTERNATIONAL 1999).

Small numbers of red-necked phalarope are regularly seen in Germany, primarily during the birds' journey to their wintering grounds, in August and September (BEZZEL 1985).

MEDITERRANEAN GULL *(LARUS MELANOCEPHALUS)*. The Mediterranean gull breeds in the Western Palearctic. Since the 1940s, and starting from a very small breeding area on Ukraine's Black Sea coast, it has extended its breeding area into the Mediterranean and into central and north-west Europe (HAGEMEIJER & BLAIR 1997). The north-west Euro-

RED-NECKED PHALAROPE Phalaropus lobatus	A	B	C	Population	Trend
W Eurasia (breeding)			1	D or E	?(0)

MEDITERREAN GULL Larus melanocephalus	A	B	C	Population	Trend
W Europe, Mediterranean & NW Africa		2a		D	+

pean breeding population, which comprised over 2,000 pairs in the 1990s, is broken up into numerous isolated groups, each with relatively few breeding pairs. The few large concentrations in north-west Europe are found in the Netherlands and Belgium (HAGEMEIJER & BLAIR 1997). The Mediterranean gull winters in the entire Mediterranean region and, in small numbers, on the Atlantic coast of France, southern Portugal and Morocco (MEININGER et al. 1999, WETLANDS INTERNATIONAL 1999).

In Germany, the Mediterranean gull was first seen as a breeding bird in 1951, on the island of Langenwerder, off Mecklenburg-West Pomerania's Baltic Sea coast. Since then, the number of breeding areas occupied by the bird, and the total number of breeding pairs, have slowly increased, with fluctuations (considerable, in part) in the various Länder. In the 1990s, the Mediterranean gull's total population in Germany was estimated to number 18 to 66 pairs (BOSCHERT 1999b). In the mid-1990s, the total population, numbering about 50 to 60 pairs, was split among smaller groups, each numbering no more than ten breeding pairs, in eight of Germany's 16 Länder (MÄDLOW & MODEL 2000). From 1999 to 2001, the species' total population in Germany, according to surveys, amounted to between 96 and over 130 breeding pairs (BAUER et al. pub. pend., LUTZ in lit.) The largest numbers were found in Lower Saxony, Brandenburg, Saxony-Anhalt, Schleswig-Holstein and Bavaria (LUTZ in lit. 2001). The Mediterranean gull's population trends in Germany are shaped by frequent short-term usage of breeding areas and spatial shifting of populations. The increases in the numbers of breeding pairs are due primarily to growth of a few colonies that have existed for several years (BOSCHERT 1999b).

GULL-BILLED TERN *(STERNA NILOTICA)*. The five sub-species of the gull-billed tern are spread throughout the world in disconnected ranges. The nominate form breeds in Europe, in several isolated areas on the coasts of the Mediterranean and Black Sea and on the Wadden Sea coasts of Germany and Denmark (BEZZEL 1985, HAGEMEIJER & BLAIR 1997). In the early 1990s, Spain harboured most of the European breeding population, or about 1,800 pairs (TUCKER & HEATH 1994). These western European gull-billed terns winter in west Africa, north of the tropical rain-forest zone, from Mauritania to Nigeria and Chad. The breeding population of the Black Sea and the eastern Mediterranean winters in north-east and east Africa, in an area extending from Sudan to Botswana. The winter population of the Arabian peninsula, the Arabian Gulf and Iran/Iraq consists predominantly of breeding birds from the Caspian region, Aral Sea and Kazakhstan (HAGEMEIJER & BLAIR 1997; WETLANDS INTERNATIONAL 1999).

The gull-billed tern's breeding population in north-west Europe consists of only a small population on the German and Danish North Sea coasts (HAGEMEIJER & BLAIR 1997). It is actually the north-west group of the western European / west African main population. In the 1980s, it

GULL-BILLED TERN **Sterna nilotica nilotica**	A	B	C	Population	Trend
W Europe/W Africa	2			12,000	–
Black Sea & E Mediterranean (breeding)	2			15,000 - 25,000	–
SW Asia (win)	2			B	?

fluctuated around a level of 40 to 60 breeding pairs (FLEET et al. 1994). Between 1991 and 1999, it shrank to about 30 pairs, with a maximum of 86 pairs in 1996 (RASMUSSEN et al. 2000). In 1998 and 1999, 43 and 29 pairs of gull-billed terns, respectively, bred in the German part of the Wadden Sea (SÜDBECK & HÄLTERLEIN 2001). In 2000, a total of 49 pairs were sighted in the Elbe estuary area (RASMUSSEN et al. 2001).

Over the past few decades, the gull-billed tern has shifted its Wadden Sea breeding areas considerably. At the beginning of the 1970s, the most important colonies were found on the Eiderstedt peninsula and on the north-Frisian coast. In the 1980s, the colonies moved to Dithmarschen; in the early 1990s, they moved to the Elbe estuary area (FLEET et al. 1994, RASMUSSEN et al. 2000).

The Danish breeding population decreased from about 200 pairs in the first half of the 20th century to about ten pairs in the 1990s. Between 1995 and 1999, two to five pairs of gull-billed terns bred unsuccessfully in the Danish part of the Wadden Sea (RASMUSSEN et al. 2000).

CASPIAN TERN *(STERNA CASPIA)*. Caspian terns breed world-wide, with the exception of South America, in a great many highly fragmented and isolated ranges. The nominate form breeds in the temperate and warm zones of Eurasia, Africa and North America. In the Australasian region, it gives way to the sub-species *S. c. strenua*. In the Western Palearctic, the bird has three range concentrations: on the Baltic Sea coast (Sweden, Finland and the Baltic countries), on Ukraine's Black Sea coast and in the Caspian Sea region (HAGEMEIJER & BLAIR 1997, WETLANDS INTERNATIONAL 1999).

Four populations are differentiated within the AEWA area. The breeding population of southern Africa (Namibia, South Africa and Mozambique) winters in Zambia, Botswana and Angola. Breeding birds of west Africa (Senegal, Mauritania and Guinea Bissau) winter predominantly on the west African coast (WETLANDS INTERNATIONAL 1999). The main wintering areas of the European breeding population (of the Baltic region and Black Sea) are located in the flood plains of the Niger, in Mali (west Africa), in the Gulf of Guinea and, to a lesser degree, in the Mediterranean and along the upper Nile (HAGEMEIJER & BLAIR 1997). Breeding birds of the Caspian region migrate in a south-easterly direction for the winter – to north-east and east Africa, southern Iran, the Arabian Gulf and the coasts of the Indian Ocean (India, Bangladesh) (HAGEMEIJER & BLAIR 1997, WETLANDS INTERNATIONAL 1999).

Germany lies within the breeding range of the Baltic breeding population. Between the beginning of the 1970s (2,200 pairs in 1972) and the more recent past (1,500 pairs in 1992), this population has continuously decreased (HAGEMEIJER & BLAIR 1997). Since the 1920s, when the North Sea population disappeared, breeding populations have been found only on the Baltic Sea coast of Mecklenburg-West Pomerania (BEZZEL 1985, HÄLTERLEIN et al. 2000). In the 1990s, one to two pairs

CASPIAN TERN Sterna caspia caspia	A	B	C	Population	Trend
S Africa (breeding)	1c			1.500	0
W Africa (breeding)	2			15.000	? (–)
Europe (breeding)	1c			5.000 - 7.000	–
Caspian Sea (breeding)	1c			10.000	–

were seen breeding from time to time on the island of Heuwiese, near Rügen. In 1999, two pairs were sighted there, and another was seen in the Beuchel nature conservation area (HÄLTERLEIN et al. 2000, MÄDLOW & MODEL 2000). The breeding population on the island of Heuwiese has been in existence, with interruptions, since 1961 (DITTBERNER & HOYER 1993).

SANDWICH TERN *(STERNA SANDVICENSIS)*. The breeding range of the nominate form comprises the north-west European coasts, from the British Isles and the French Atlantic coast to the Baltic Sea coast of south Sweden and Estonia, including the North Sea coast of Belgium, the Netherlands, Germany and Denmark. Smaller populations are also found on the Spanish and French Mediterranean coasts, on the Italian Adriatic and in Greece. The bird's breeding range in the Western Palearctic is also concentrated along Black Sea coasts (BEZZEL 1985, HAGEMEIJER & BLAIR 1997).

Breeding birds of north-west European coasts and of the west Mediterranean winter on the African Atlantic coast of Mauritania, in an area extending southward to South Africa (HAGEMEIJER & BLAIR 1997, WETLANDS INTERNATIONAL 1999). The breeding population of the Black Sea and the eastern Mediterranean, which is considered another separate main population, winters in the southern Black Sea region and in the south-eastern Mediterranean (WETLANDS INTERNATIONAL 1999). The south-west Asian winter population of the Arabian Gulf and the north-west coast of the Indian Ocean is made up of breeding birds from the Caspian region.

Due to exchange between the three populations, as proven by recovery of banded birds, these population differentiations are not sharp, however (WETLANDS INTERNATIONAL 1999).

The sandwich tern's breeding population in Germany is concentrated within a few colonies in Lower Saxony's and Schleswig-Holstein's sections of the Wadden Sea and on Mecklenburg-West Pomerania's Baltic Sea coast. Since the 1970s, the species has recovered considerably from the losses it suffered as a result of biocide use. Between 1990 and 1999, the population exhibited no clear trend and remained at level of 8,000 to 10,000 pairs. In 1998 and 1999, the breeding population amounted to 7,670 and 8,858 pairs, respectively. The largest concentrations, representing about 70% of this population, bred on the two "bird-protection Halligen" ("Vogelschutzhalligen"), Trischen and Norderoog (HÄLTERLEIN et al. 2000, SÜDBECK & HÄLTERLEIN 2001). In contrast to common terns and arctic terns, which find their food primarily in near-coastal areas of the actual Wadden Sea, sandwich terns feed primarily in offshore areas of the North Sea, within the 20 m bathymetric line. Some 2,400 individuals use the offshore area of the Wadden Sea as feeding grounds both during and after the breeding season (MITSCHKE et al. 2001). The sandwich tern's breeding population on the Baltic Sea coast decreased significantly from 1990 to 1999; by the end of the 1990s, it numbered about 670 to 780 pairs, or only about

SANDWICH TERN **Sterna sandvicenis sandvicensis**	**A**	**B**	**C**	**Population**	**Trend**
W Europe/W Africa	2a		150.000 +		
Black Sea & Mediterranean (breeding)			2a (2c)	130.000	? (–)
SW & S Asia (win)	2a		110.000 ?		

half of its size in 1990 (HÄLTERLEIN et al. 2000, KÖPPEN 2000).

COMMON TERN *(STERNA HIRUNDO)*. The common tern's range comprises the temperate-to-Arctic latitudes of Eurasia and eastern North America. Individual breeding populations can be found in areas as far south as North Africa. The species is widespread throughout Europe, although its population densities decrease in a south-westerly direction. The total European breeding population numbers about 208,000 pairs, and Finland, Sweden, Norway and Belarus are the most densely occupied areas. In contrast to other tern species, the common tern also breeds throughout extensive European inland areas (HAGEMEIJER & BLAIR 1997). The most important wintering areas of European breeding birds include offshore areas off the African west coast, from Senegal to South Africa's cape region (BEZZEL 1985, HAGEMEIJER & BLAIR 1997). Three breeding populations of the Western Palearctic nominate form have been identified. Breeding birds of south-west Europe, the first of these, winter on the west African coast, in Mauritania and Senegal. Breeding birds of north-east Europe winter further south, on the south-west coast of Africa, from Angola southward to South Africa, and on the southern African east coast, all the way to Mozambique. The third population consists of birds that breed in west Asia (Caspian Sea, Middle East to Iran and west Siberia) and that winter in the Indian Ocean, from south-east Africa to Pakistan and north-west India (WETLANDS INTERNATIONAL 1999).
Germany is considered to be part of the breeding range of the common tern's south-west European population (WETLANDS INTERNATIONAL 1999). On the other hand, breeding birds of this population – especially birds from North Sea and Baltic Sea regions – have contact to the considerably larger breeding population of the north-east European population, members of which cross Germany during their migrations.

The common tern's breeding population in Germany is concentrated in the coastal regions of the North Sea and Baltic Sea, where about 80 % of the total German population breed (BECKER & SUDMANN 1998). The country also harbours inland populations – predominantly along rivers in north-east Germany and in Alpine-foreland regions of Baden-Württemberg and Bavaria (HAGEMEIJER & BLAIR 1997, MÄDLOW & MODEL 2000).

The population on the Wadden Sea coast of Lower Saxony and Schleswig-Holstein reached a minimum level in the 1960s, as a result of high pollution levels (pesticides). This was followed by a recovery that then gave way, in the 1980s, to a relatively stable level of about 8,000 to 10,000 pairs. Beginning in the first half of the 1990s, considerable decreases again occurred – especially in 1995 – and thus the overall population trend in the 1990s was significantly negative (SÜDBECK et al. 1998, HÄLTERLEIN et al. 2000). In the second half of the 1990s, the population fluctuated around a level of 6,000 to 7,000 pairs (1998/1999: 6,385/6,375 pairs, SÜDBECK & HÄLTERLEIN 2001). On the Baltic Sea coast, the common tern population also decreased, also following a sharp drop in the first half of the 1990s: from about 1,500 to 2,000 pairs in the 1980s to about 1,000 pairs in the years from 1994 to 1999 (HÄLTERLEIN et al. 2000).

COMMON TERN Sterna hirundo hirundo	A	B	C	Population	Trend
S & W Europe (breeding)			1	180,000	?(0)
N & E Europe (breeding)			1	600,000	?(0)
W Asia (breeding)			(1)	C or D	?

The common tern's breeding population in non-coastal Länder has doubled since the beginning of the 1980s: from 750 pairs in 1980 to about 1,500 pairs in 1996/1997 (BECKER & SUDMANN 1998, MÄDLOW & MODEL 2000). The most important breeding groups are found in the south-German Länder Bavaria (1997: 147 pairs) and Baden-Württemberg (1997: 115 pairs), in North Rhine-Westphalia (1997: 100 pairs) and in the north-east German Länder Schleswig-Holstein (1997: 282 pairs), Mecklenburg-West Pomerania (1997: 500 pairs) and Brandenburg (1997: 229 pairs). Other, smaller breeding populations are found in Rhineland-Palatinate (1997 25-30 pairs), Bremen (1997: about 35 pairs), Saxony-Anhalt (1997: 6 pairs) and Saxony (1997: 13 pairs, all data pursuant to BECKER & SUDMANN 1998). The growth of common tern populations in inland areas is due primarily to creation and management of artificial nesting sites (BECKER & SUDMANN 1998). In 1999, the total population in Germany was about 8,900 to 9,600 pairs (BAUER et al. pub. pend.).

ARCTIC TERN *(STERNA PARADISAEA)*. The arctic tern is a high-Arctic bird species. It breeds primarily on the northern coasts of Eurasia and the North American continents, as well as on Iceland, Greenland, Spitzbergen and the Arctic islands. Its range, in the Western Palearctic, extends across Scandinavia and the Baltic Sea region, as well as southward to the British Isles, the Dutch Delta region and the Wadden Sea (HAGEMEIJER & BLAIR 1997).

The arctic tern travels further than all other migratory birds. Breeding birds of Europe, west Siberia and the eastern parts of arctic North America migrate along the European and African west coast to wintering grounds in the Antarctic ice-pack zone (HAGEMEIJER & BLAIR 1997, WETLANDS INTERNATIONAL 1999). Because the bird's winter ranges overlap considerably in south ocean areas, the species' total population was initially considered to be one (world) population (ROSE & SCOTT 1997). Annex II of the Bonn Convention on the Conservation of Migratory Species of Wild Animals (CMS) includes only the Atlantic population, however, and thus the Eurasian breeding population was differentiated for the purposes of AEWA (WETLANDS INTERNATIONAL 1999).

The arctic tern's European breeding population comprises about 517,900 breeding pairs, of which about 60 % breed on Iceland (HAGEMEIJER & BLAIR 1997). Up to 5 % of the European population breeds in the Danish-German-Dutch Wadden Sea. In Germany, at the southern limit of the bird's breeding range, the arctic tern breeds on the North Sea and Baltic Sea coasts. Its long-term population trend here must be seen connection with that of the common tern, since the two species are difficult to differentiate in the field; only recently has it become possible to inventory their populations separately with some degree of reliability (as a result of improved optics and taxonomic literature). The population trends for both species seem to have largely paralleled each other since the 1930s. Both species suffered a population minimum in the 1960s, and both have recovered, without returning to their levels of the 1940s, however (SÜDBECK et al. 1998, HÄLTERLEIN et al. 2000). Beginning in the 1980s, the two species' trends diverged. Whereas the common tern experienced a negative population trend, especially in the 1990s, the arctic

ARCTIC TERN Sterna paradisaea	A	B	C	Population	Trend
W Eurasia (breeding)			1	E (1,300,000 - 2,100,000)	(0)

tern population on the North Sea coast has remained stable since the 1980s. In the 1990s, it exhibited no clear trend, even though it fluctuated irregularly, and remained at a basic level of 6,000 to 7,000 breeding pairs (HÄLTERLEIN et al. 2000). In 1998 and 1999, 6,839 and 5,771 pairs, respectively, were sighted in German North Sea coast regions (SÜDBECK & HÄLTERLEIN 2001).

In contrast to this development, the breeding population on the Baltic Sea coast decreased significantly between 1990 and 1999. Overall, it dropped from about 400 pairs in the second half of the 1980s to about 100 pairs in 1999 (HÄLTERLEIN et al. 2000).

LITTLE TERN *(STERNA ALBIFRONS)*. The little tern, of which there are eight sub-species, is found virtually world-wide in temperate-to-tropical latitudes of Eurasia, including the Indian subcontinent, west Africa, south-east Asia, north Australia, the U.S. South and Central America (BEZZEL 1985). In the Western Palearctic, the nominate form breeds in disconnected areas along the North Sea and Baltic Sea coasts, the coasts of the British Isles, the French and Portuguese Atlantic coast and the Mediterranean and Black Sea coasts. Its inland breeding areas are located in eastern Europe (Poland, Baltic countries, Belarus, Ukraine and Russia), France, Spain and Italy, especially along large rivers (HAGEMEIJER & BLAIR 1997). The sub-species *S. a. guineae* breeds in west and central Africa. Three main populations of the nominate form are differentiated within the AEWA area. Breeding birds of western Europe's Atlantic coast (including the North Sea) and north-west Africa winter in west Africa (Senegal, Gulf of Guinea). Breeding birds of the Black Sea and the eastern Mediterranean winter in the Red Sea region, southern Arabian regions and along the east African coast. The third population consists of birds that breed in the Caspian region, at the Aral Sea, and in Iran and Iraq. Their wintering grounds are located in the Arabian Gulf (WETLANDS INTERNATIONAL 1999).

In Germany, little terns of the east Atlantic population breed primarily in North Sea and Baltic Sea coastal areas. Since 1991, an additional, inland breeding colony, comprising up to nine breeding pairs, has been seen on the lower Oder River (DITTBERNER 2001). This colony is part of a population of about 40-45 pairs that returned to the lower Oder, in the Polish / German boundary area, at the end of the 1970s (UHLIG et al. 1998). The breeding population in Lower Saxony's part of the Wadden Sea, which has been well followed since the early 1950s (1952: 595 pairs), has exhibited a long-term decline, in spite of a recovery at the beginning of

LITTLE TERN Sterna albifrons albifrons	A	B	C	Population	Trend
E Atlantic (breeding)	3b			34,000	0/+
Black Sea & E Mediterranean (breeding)	3c			70,000 - 120,000	–
Caspian Sea (breeding)	2			B	?
Sterna albifrons guineae					
W Africa (breeding)	(2)			?	?

WHITE-WINGED BLACK TERN Chlidonias leucopterus	A	B	C	Population	Trend
E Europe & W Asia/Africa		2c		200,000 - 250,000	–

the 1980s. A turnaround did occur in about 1990, but it was not pronounced enough to restore the population to its former levels. In 1998 and 1999, 291 and 264 breeding pairs, respectively, were sighted in Lower Saxony's and Hamburg's Wadden Sea areas (FLORE 1998, POTEL et al. 1998, SÜDBECK & HÄLTERLEIN 2001). The trend in Schleswig-Holstein's part of the Wadden Sea, since 1982, has been similar. A slight recovery began in about 1990, and by 1998 and 1999 the colony had grown to 363 and 433 pairs, respectively (HÄLTERLEIN et al. 2000, SÜDBECK & HÄLTERLEIN 2001). The smaller breeding population on the Baltic Sea coast fluctuated, between 1989 and 1999, at about 200 breeding pairs, without exhibiting any recognisable trend (HÄLTERLEIN et al. 2000).

WHITE-WINGED BLACK TERN *(CHLIDONIAS LEUCOPTERUS)*. The breeding range of the white-winged black tern comprises the forest-steppe and steppe zones of Eurasia, from eastern Europe to north China. The western limit of its contiguous range is located in east Poland. Further west, the species breeds only occasionally, in years in which high water levels create favourable breeding conditions (BEZZEL 1985, HAGEMEIJER & BLAIR 1997). The entire breeding population of eastern Europe and west Asia winters in sub-Saharan Africa (WETLANDS INTERNATIONAL 1999). The white-winged black tern is a very irregular visitor in Germany. In most cases, its visits take the form of spring "invasions" of birds that breed in the east. In 1996, one or two pairs bred along the lower Oder River in Brandenburg – this was the first time since 1936 that the bird had there (DITTBERNER 1996, MÄDLOW & MODEL 2000). In 1997, a second large wave in the second half of May led to isolated instances of breeding in some areas of Schleswig-Holstein and Brandenburg. In Schleswig-Holstein, a total of 35 to 39 pairs were sighted, in four areas. In Brandenburg, five to 12 breeding pairs were sighted (DEUTSCHE SELTENHEITENKOMMISSION 2000).

BLACK TERN *(CHLIDONIAS NIGER)*. The nominate form of the black tern breeds in the temperate zone and steppe zone of Eurasia, from central Europe to Siberia, in the Yenissei region, and in west Mongolia. The sub-species *C. n. surinamensis* represents the nominate form in North America (BEZZEL 1985, HAGEMEIJER & BLAIR 1997). In Europe, the species' breeding range is concentrated in the east (Baltic countries, Poland, Belarus, Ukraine, Romania and the European part of Russia). To the west, the species' contiguous breeding range extends across northern Germany to the Netherlands. Still further west and further south, individual breeding colonies are found in France, Spain and Italy (HAGEMEIJER & BLAIR 1997). For the winter, black terns migrate to west African coastal waters of Senegal and the Gulf of Guinea, as well as further south to coastal waters of Namibia and South Africa and, to a lesser extent, to the Nile valley in Egypt and Sudan (BEZZEL 1985, WETLANDS INTERNATIONAL 1999).

The black tern's breeding population in Germany's southern Länder disappeared in the 1930s (BAUER & BERTHOLD 1996). In Germany, the bird now breeds primarily in the lowland landscapes of the north-German plain, in Brandenburg (300-456 pairs), Mecklenburg-West Pomerania (138-176 pairs), Schleswig-Holstein (80-110 pairs) and Lower Saxony (85-89 pairs), as well as in Saxony-Anhalt (100-150 pairs, data for 1995/1996 pursuant to MÄDLOW & MODEL 2000). The black tern's population

BLACK TERN Chlidonias niger niger	A	B	C	Population	Trend
Europe & Asia (breeding)		2c		200,000	–

trend in Germany, like those in other parts of central and western Europe, has been strongly negative (BAUER & BERTHOLD 1996). WITT et al. (1996) report that in the mid-1990s between 790 and 870 pairs of black terns were still breeding in Germany, and that further population decreases were apparent in Lower Saxony, Schleswig-Holstein and Saxony-Anhalt. A more recent survey, taken in 1999, reports a population of 860 to 1,000 pairs (BAUER et al. pub. pend.).

Since 1997, a small breeding colony of about 40 pairs (2001), originating from a colony in the neighbouring Netherlands, has re-established itself in the Biener Altrhein area in North Rhine-Westphalia. This colony, like a significant part of the Dutch breeding population, breeds exclusively in artificial nesting structures installed as part of nature conservation measures (NIEHUES & SCHWÖPPE 2001).

Annex I

SPECIES THAT OCCASIONALLY OCCUR IN GERMANY

GREAT NORTHERN DIVER *(GAVIA IMMER)*. The great northern diver's range extends from the Aleutian islands, across Alaska and the northern part of the North American continent, all the way to Greenland. Its only regularly occupied breeding colony in the Western Palearctic, comprising about 300 pairs, is located on Iceland (HAGEMEIJER & BLAIR 1997). The great northern diver's wintering areas in European waters are found along the east Atlantic coast of Norway, the British Isles, the Netherlands and France. This wintering population is made up of breeding birds of Iceland, Greenland and, probably, north-east Canada (WETLANDS INTERNATIONAL 1999).

In Germany, small numbers of the great northern diver appear each year in the German Bight and in coastal areas of the North Sea. A few individuals also reach German inland areas and rest in areas such as large lakes in Bavaria's Alpine forelands (BUNDESDEUTSCHER SELTENHEITEN-AUSSCHUSS and DEUTSCHE SELTENHEITENKOMISSION 1992, 1994, 1995, 1996, 1997, 1998, 2000).

GREAT NORTHERN DIVER Gavia immer	A	B	C	Population	Trend
Europe (win)	1c			5,000	?

RED-BREASTED GOOSE Branta ruficollis	A	B	C	Population	Trend
N Siberia/ Black & Caspian Sea	1a 1b 3a			70,000	? (+)

RED-BREASTED GOOSE *(BRANTA RUFICOLLIS)*. The red-breasted goose's very small breeding range is confined to the tundra of the Yamal, Gydan and Taymyr peninsulas, on the Arctic coast of Russia. Some 70% of the total population breeds on the Taymyr Peninsula. The bird's wintering grounds are found in Ukraine, in Romania and in Bulgaria, on the northwest coast of the Black Sea (MADSEN et al. 1999; WETLANDS INTERNATIONAL 1999).

In Germany, red-breasted geese are sighted each year. At least some of these are individuals that have escaped from waterbird reserves (BUNDESDEUTSCHER SELTENHEITENAUSSCHUSS and DEUTSCHE SELTENHEITENKOMISSION 1992, 1994, 1995, 1996, 1997, 1998, 2000).

BAILLON'S CRAKE *(PORZANA PUSILLA)*. Baillon's crake breeds in Eurasia, Africa and the Australasian region (HAGEMEIJER & BLAIR 1997). Of the described sub-species, breeding birds of southern and central Europe (Iberian peninsula to Romania) and of North Africa are classed with the sub-species *P. p. intermedia*. Their wintering areas are located in sub-Saharan Africa, where they overlap with the breeding ranges of the African sub-species *P.p. obscura*. The nominate form breeds predominantly outside of the AEWA area, from eastern Europe eastward to China and Japan. It winters in south Asia (WETLANDS INTERNATIONAL 1999).

Baillon's crake is a very rare, exceptional visitor to Germany. In the 1990s, only 1 to 3 individuals were sighted per year (BUNDESDEUTSCHER SELTENHEITENAUSSCHUSS and DEUTSCHE SELTENHEITENKOMISSION 1992, 1994, 1995, 1996, 1997, 1998, 2000).

GREAT SNIPE *(GALLINAGO MEDIA)*. The great snipe's current range extends across the Eurasian boreal zone, from Norway to the Yennisei region in central Siberia. Beginning in 1850, the bird's range shrank significantly, at the southwest limit of its European range. Now, in the Western Palearctic the bird still inhabits Scandinavia (Norway, Sweden; central mountain regions), Belarus, Ukraine and the European part of Russia. Residual populations, each on the order of about 2,000 breeding pairs, are still found in the Baltic countries and Poland (HAGEMEIJER & BLAIR 1997). The great snipe's wintering area is located in sub-Saharan Africa. The Scandinavian breeding population, presumably, winters predominantly in west

BAILLON´S CRAKE Porzana pusilla intermedia	A	B	C	Population	Trend
Europe (breeding)	2			B	–

GREAT SNIPE Gallinago media	A	B	C	Population	Trend
Scandinavia (breeding)		1		18,000 - 51,000	0
W Siberia & NE Europe (breeding)		2c		D	–

TAREK SANDPIPER Tringa cinerea	A	B	C	Population	Trend
SW Asia & Africa (win)		1		44,000	? (0)

Africa (Mali, Chad). The wintering grounds of the breeding population of west Siberia and north-east Europe are located in south-east Africa (Zaire, Tanzania, Angola, Zambia, Malawi) (WETLANDS INTERNATIONAL 1999).

Small numbers of great snipe regularly appear in Germany – primarily in Brandenburg – as passage migrants during their homeward journey in April/May and on their return journey from August to October. In suitable habitats, some males may carry out mating dances, although actual breeding settlement in Germany is unlikely (BUNDESDEUTSCHER SELTENHEITENAUSSCHUSS and DEUTSCHE SELTENHEITENKOMISSION 1992, 1994, 1995, 1996, 1997, 1998, 2000, HAASE & RYSLAVY 1997).

TAREK SANDPIPER *(TRINGA CINEREA)*. The tarek sandpiper breeds in the boreal zone of Siberia. Small, isolated breeding populations, each totalling no more than 100 breeding pairs, are found in the Western Palearctic, outside of Russia: in Finland, Latvia and Belarus (HAGEMEIJER & BLAIR 1997). The wintering areas of the tarek sandpiper's western populations are located in south-west Asia and Africa, in the Arabian Gulf and Red Sea regions and on the African east coast of the Indian Ocean (WETLANDS INTERNATIONAL 1999).

As they migrate between their breeding and wintering areas, tarek sandpipers fly in a broad swath across south Eurasia. Small numbers of migrating birds are regularly seen in Germany (BUNDESDEUTSCHER SELTENHEITENAUSSCHUSS and DEUTSCHE SELTENHEITENKOMISSION 1992, 1994, 1995, 1996, 1997, 1998, 2000).

BROAD-BILLED SANDPIPER *(LIMICOLA FALCINELLUS)*. The broad-billed sandpiper's breeding area extends from the Scandinavian peninsula and the extreme north-west of Russia to east Siberia. The European breeding population of the nominate form comprises about 16,000 pairs in Scandinavia (about 12,000 of them in Finland) and up to 1,000 pairs in north-west Russia (HAGEMEIJER & BLAIR 1997). East of the Taymyr Peninsula, the nominate form gives way to the sub-species *L. f. sibirica* (HAGEMEIJER & BLAIR 1997). Nominate-form breeding birds from Scandinavia and north-west Russia winter in the Arabian Gulf, India and Sri Lanka. A small part of this population also reaches east Africa (HAGEMEIJER & BLAIR 1997, WETLANDS INTERNATIONAL 1999).

As a result of the south-easterly location of the bird's wintering areas, Germany lies at the western limit of the Scandinavian population's flyway range. Small numbers of broad-billed sandpipers in passage appear each year in Germany. Sightings are most frequent in May and around the end of August / beginning of September, especially along the Baltic Sea coast. Since the 1960s, about 50 to 100 broad-billed

BRAOD-BILLED SANDPIPER Limicola falcinellus falcinellus	**A**	**B**	**C**	**Population**	**Trend**
N Europe/SW Asia & E Africa	3c			40,000 - 60,000	? (–)

GREY PHALAROPE Phalaropus fulicaria	**A**	**B**	**C**	**Population**	**Trend**
African Atlantic coast (win)		(1)	?	?	

sandpipers have been sighted annually, although in some years up to 300 individuals have been observed to arrive (DIERSCHKE 1997).

GREY PHALAROPE *(PHALAROPUS FULICARIA)*. The grey phalarope is widespread outside of Europe, in a circumpolar region including the Arctic tundra of North America and Siberia. The only breeding populations in the Western Palearctic, comprising a total of 145 and 1,045 pairs, are found on Iceland and Spitzbergen. These populations are considered part of the larger breeding population of north-east Canada (HAGEMEIJER & BLAIR 1997). The grey phalarope winters on the open seas of the southern hemisphere, while breeding birds of north-east Canada, Greenland, Spitzbergen and Iceland winter predominantly off the African west coast (BEZZEL 1985, HAGEMEIJER & BLAIR 1997, WETLANDS INTERNATIONAL 1999).

In Germany the grey phalarope is a rather rare guest; small numbers are sighted each year, primarily on the North Sea coast (BUNDESDEUTSCHER SELTENHEITEN-AUSSCHUSS and DEUTSCHE SELTENHEITENKOMISSION 1992, 1994, 1995, 1996, 1997, 1998, 2000).

ROSEATE TERN *(STERNA DOUGALLII)*. The roseate tern, with a total of four sub-species, breeds in tropical and subtropical latitudes. Its breeding areas include the coasts and islands of the Atlantic and Indian oceans, as well as coasts and islands of the Pacific Ocean, in an area extending from Japan, across Australia, to the Melanese islands (BEZZEL 1985, HAGEMEIJER & BLAIR 1997). The nominate form's most important European breeding areas are located on the Azores, in Ireland, along the French Atlantic coast and in the UK (HAGEMEIJER & BLAIR 1997). European breeding birds winter off the west African coast, in an area extending from Mauritania to Nigeria, and primarily in the Gulf of Guinea (Ghana) (WETLANDS INTERNATIONAL 1999).

In Germany, the roseate tern has been sighted occasionally – and exclusively – during the breeding season (BEZZEL 1985). Sightings of breeding birds in the 1990s, for example, included a 1998 sighting on the island of Föhr. The most recent sighting was in 2000, on Minsener Oog in Lower Saxony's part of the Wadden Sea, where an individual banded in Ireland mated with a common tern (HÄLTERLEIN et al. 2000, RASMUSSEN et al. 2001).

ROSEATE TERN Sterna dougallii dougallii	A	B	C	Population	Trend
Europe (breeding)	1c			5,000	-

Annex II

OVERVIEW OF THE POPULATION SITUATION OF AEWA WATERBIRD SPECIES PURSUANT TO DATA OF A FEW GERMAN LÄNDER

Tab. 2.3.1-1: Breeding populations (breeding pairs) of AEWA waterbirds in the Länder Hamburg (HH), Lower Saxony (NI), North Rhine-Westphalia (NW), Saxony (SN) and Saxony-Anhalt (ST).

Species	Scientific name	HH	NI	NW	SN	ST
Red-necked grebe	Podiceps grisegena	2	20		80-100	50
Little bittern	Ixobrychus minutus		0		2-4	10
Eurasian bittern	Botaurus stellaris		10		25-35	
Black stork	Ciconia nigra		42	about 40	40-60	22
White stork	Ciconia ciconia	13	339	10	370-450	574
White spoonbill	Platalea leucorodia		42			
Mute swan	Cygnus olor	100		?	500-650	500
Whooper swan	Cygnus cygnus	2		0		
White-fronted goose	Anser albifrons			0-2		
Greylag goose	Anser anser	144	1,000	>1,000	250-300	400
Barnacle goose	Branta leucopsis		7	>10		
Common shelduck	Tadorna tadorna	135	2.700	90-110	60	
European wigeon	Anas penelope		<5	0		
Gadwall	Anas strepera	22	100	40-60	200-400	10
Green-winged teal	Anas crecca	18	2,500	100-150	100-200	80
Mallard	Anas platyrhynchos	2,800	100,000	?	10,000-20,000	25,000
Northern pintail	Anas acuta	3	0	0 bis 5		
Garganey	Anas querquedula	25	500	ca. 50	40-60	100
Northern shoveler	Anas clypeata	45	1,000	40-50	30-40	100
Red-crested pochard	Netta rufina		10		2	
Common pochard	Aythya ferina	4	300	40-50	1,000-1,500	700
Ferruginous duck	Aythya nyroca		0		2	
Tufted duck	Aythya fuligula	300	1,000	?	1,300-2,000	500
Common eider	Somateria mollissima		775			
Common goldeneye	Bucephala clangula	2	20	0	10	
Red-breasted merganser	Mergus serrator		10			
Goosander	Mergus merganser			0	1-3	
Common crane	Grus grus	7	150	0 bis 1	60-75	109
Little crake	Porzana parva		1		1-3	5
Spotted crake	Porzana porzana	5	200	1 bis 5	40-60	70
Black coot	Fulica atra	620	10,000	?	3,000-6,000	6.000
Pied avocet	Recurvirostra avosetta	10	2,000			
European golden plover	Pluvialis apricaria		22	0		
Ringed plover	Charadrius hiaticula	30	310			
Little ringed plover	Charadrius dubius	45	600	400-600	500-700	800
Kentish plover	Charadrius alexandrinus		61			
Northern lapwing	Vanellus vanellus	650	27,500	12,000-16,000	900-1.600	3.000
Common snipe	Gallinago gallinago	180	2,500	about 75	190-260	500
Black-tailed godwit	Limosa limosa	20	4,500	about 300	10	
Western curlew	Numenius arquata		1,700	about 600	0-1	100
Common redshank	Tringa totanus	45	5,800	49-55	0-6	10
Green sandpiper	Tringa ochropus		100	0	10-20	30
Common sandpiper	Tringa hypoleucos	3	25	0 bis 1	20-40	80
Ruff	Philomachus pugnax		19	0		
Mediterranean gull	Larus melanocephalus	7	8	5	8-13	2
Gull-billed tern	Sterna nilotica		10			
Sandwich tern	Sterna sandvicensis		2,600			
Common tern	Sterna hirundo	?	4,100	130	60-80	33
Arctic tern	Sterna paradisaea		1,100			
Little tern	Sterna albifrons	3	259			
Black tern	Chlidonias niger	6	122	37	137	

Species	Scientific name	NI	NW	ST
Black stork	Ciconia nigra	200		
White stork	Ciconia ciconia	1,400		
Mute swan	Cygnus olor	3,000	about 2000	
Whooper swan	Cygnus cygnus	2,500	180-500	2,500
Tundra swan	Cygnus columbianus	3,000	100 - 250	1,000
Pink-footed goose	Anser brachyrhynchus	50		
Bean goose	Anser fabalis	15,000	about 27,000	90,000
White-fronted goose	Anser albifrons	70,000	about 170,000	60,000
Greylag goose	Anser anser	20,000	about 8,000	
Barnacle goose	Branta leucopsis	60,000	about 1,000	550
Brent goose	Branta bernicla	20,000		
Red-breasted goose	Branta ruficollis			5
Common shelduck	Tadorna tadorna	50,000		
European wigeon	Anas penelope	50,000	4,500-6,000	7,.500
Gadwall	Anas strepera	300	250 - 500	
Green-winged teal	Anas crecca	15,000	4,000 - 5,000	
Mallard	Anas platyrhynchos	100,000	about 90,000	
Northern pintail	Anas acuta	4,000	about 300	
Northern shoveler	Anas clypeata	2,000	about 1,500	
Common pochard	Aythya ferina	3,500	about 7,500	
Tufted duck	Aythya fuligula	4,000	about 12,500	
Common eider	Somateria mollissima	80,000		
Common goldeneye	Bucephala clangula	600	about 750	
Smew	Mergellus albellus	250	200 - 600	250
Red-breasted merganser	Mergus serrator	75		
Goosander	Mergus merganser	3,000	1,200 - 3,000	2,000
Common crane	Grus grus			50,000
Black coot	Fulica atra	10,000	about 35,000	
Pied avocet	Recurvirostra avosetta	20,000		
European golden plover	Pluvialis apricaria	100,000	?	5,000
Grey plover	Pluvialis squatarola	50,000		about 200
Ringed plover	Charadrius hiaticula	6,000		
Kentish plover	Charadrius alexandrinus	200		
Northern lapwing	Vanellus vanellus	180,000	about 100,000	
Common snipe	Gallinago gallinago	15,000		
Black-tailed godwit	Limosa limosa	15,000		
Bar-tailed godwit	Limosa lapponica	35,000		
Whimbrel	Numenius phaeopus	800		
Western curlew	Numenius arquata	70,000		
Spotted redshank	Tringa erythropus	4,000	?	about 300
Common redshank	Tringa totanus	15,000		
Common greenshank	Tringa nebularia	4,000		about 500
Wood sandpiper	Tringa glareola			about 1,500
Ruddy turnstone	Arenaria interpres	1,500		about 100
Red knot	Calidris canutus	45,000		about 100
Sanderling	Calidris alba	3,500		
Little stint	Calidris minuta			about 800
Temminck's stint	Calidris temminckii			about. 50
Dunlin	Calidris alpina	200,000		about 3,000
Curlew sandpiper	Calidris ferruginea	500		about 500
Ruff	Philomachus pugnax	3,000		about 1,800
Sandwich tern	Sterna sandvicensis	10,000		
Common tern	Sterna hirundo	12,000		
Arctic tern	Sterna paradisaea	4,500		
Little tern	Sterna albifrons	1,000		
Black tern	Chlidonias niger	5,500		

Tab. 2.3.1-2: Resting populations (individuals) of AEWA waterbirds in the Länder Lower Saxony (NI), North Rhine-Westphalia (NW) and Saxony-Anhalt (ST).

SOURCES:

HAMBURG:
B. Krebs, Staatl. Vogelschutzwarte Hamburg [Hamburg State Bird Station]. Brutbestände nach (breeding populations pursuant to] MITSCHKE & BAUMUNG (2001).

LOWER SAXONY:
P. Südbeck, Staatl. Vogelschutzwarte Lower Saxony [Lower Saxony State Bird Station]. Brutbestände 1999 nach Entwurf the Neufassung the Roten Liste Niedersachsens; Rastbestände nach [1999 breeding populations pursuant to draft of new edition of the Red List for Lower Saxony; resting populations pursuant to] BURDORF et al. (1997).

NORTH RHINE-WESTPHALIA:
Dr. B. Conrad, Vogelschutzwarte North Rhine-Westphalia [North Rhine-Westphalia State Bird Station]. Saxony: Dr. habil. R. Steffens, Sächsisches Landesamt für Umwelt und Geologie [Saxony State Environmental and Geological Office]. Brutbestände nach [Breeding populations pursuant to] STEFFENS et al. (1998b).

SAXONY-ANHALT:
G. Dornbusch, Ministerium für Raumordnung, Landwirtschaft and Umwelt [Ministry for Regional Planning, Agriculture and the Environment]. Brutbestände Bezugsjahr 1999 [Breeding populations for the reference year 1999].

2.3.1.2 The "White Stork" Species Assistance Programme

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The "White Stork" Species Assistance Programme

Oda Wieding

1 Introduction

The white stork (*Ciconia ciconia*) is a lead species in open, grassy, riparian meadows, lowlands and pond landscapes. As a so-called "culture follower", it is adapted to man-made habitats and even dependent on them. This affinity for areas in and near human settlements, along with the bird's large size and distinctive white plumage, have made the white stork a highly familiar and recognisable bird. Conservation efforts are most likely to meet with public acceptance when they publicly concentrate on species that are evocative symbols (STURM 1995). As an immediately recognisable representative of its environment – and as a positive figure in lore and legend – the white stork is an eminently fitting symbol for efforts to protect its endangered wet, riparian meadow habitats.
Riparian meadows are endangered because they are being used more and more intensively by people – and thus the white stork is itself highly endangered. Use and management of meadows are changing at a rapid pace, a pace that leaves plants and animals adapted to traditional uses no opportunity to adapt.
In 1984, in an effort to stop the white stork population's decline in Bavaria, the Bavarian State Ministry for State Development and Environmental Issues (Bayerisches Staatsministerium für Landesentwicklung und Umweltfragen (StMLU)), in co-operation with Bavaria's state bird-protection and conservation association (Landesbund für Vogelschutz in Bayern e.V. – Verband für Arten- und Biotopschutz (LBV)), established a Bavarian white-stork conservation programme (see also NITSCHE 1989).

2 Biology and habitat requirements

The white stork belongs to the order of wading birds. It reaches 0.80–1 m in size, and it has a wingspan of 2 m. Males can weigh up to 4 kg, while females weigh about 3.5 kg. The birds arrive in their breeding areas from March until early May, with the males usually arriving before the females. White storks begin brooding in early April to early May, after laying 3 to 4 eggs, and sometimes up to 6. Eggs are laid at two-day intervals and then brooded for a total of 30 days. For their first four weeks of life, the young remain under their parents' wings, where they are protected against rain, cold and heat. Young storks are able to fly by the time they reach 8 to 9 weeks of age, and their parents feed them and guide them for a few days after they reach the flight stage. White storks are not picky eaters. They diet includes earthworms, large insects such as beetles, crickets and grasshoppers (locusts), small mammals (moles, mice), young birds, snakes, frogs and carrion. A white stork requires about 500 grams of food per day, the equivalent of about 26 field mice or 1100 earthworms. Young storks usually fly away for the winter at the end of August, while adult storks leave somewhat later – usually by mid-September. The birds' migration routes cross in about the middle of Bavaria. Westward migrants fly over Gibraltar, to west and central Africa, while eastward migrants fly across the Bosporus, to east, central and south Africa (see also BAUER & GLUTZ V. BLOTZHEIM 1966, WÜST 1981).

The white stork has demanding habitat requirements. It requires wet meadows, such as extensively managed agricultural, wet grassland, wet lowlands with natural brooks and rivers or riparian meadows with ankle-deep water levels.
To raise young successfully in Bavaria, a stork pair requires at least 200 hectares of extensive grassland near its nest (BURNHAUSER 1983). Furthermore, the grassland must be diversely structured and, in addition to being subject to moderate use (no fertilisation, twice-yearly mowing, no use of pesticides, no drainage, no rolling or other compression of the land), must comprise many different areas, with many different sub-areas with differing degrees of wetness.

3 Population trends and threats

The figure "White-stork population in Bavaria, 1900 to 1999" (Fig. 1) shows the population data for Bavaria, since 1900, in bar-graph form (regular censuses began in 1980). The trends for Bavaria are seen to be the same as for the rest of Germany (KAATZ 1998). As of 1988, the population in Bavaria had sunk to 58 nesting pairs; since then, it has been growing again. The lines above the bars show the actual numbers of young that have reached the fledgling stage, along with the number of young theoretically needed for population maintenance: an average reproduction rate of at least two fledglings per nesting pair is considered necessary for long-term self-sustainment of the population (BURNHAUSER 1983). Only in a few years has the number of fledglings actually exceeded the threshold of two young per nesting pair – an indication that the population increase in Bavaria has

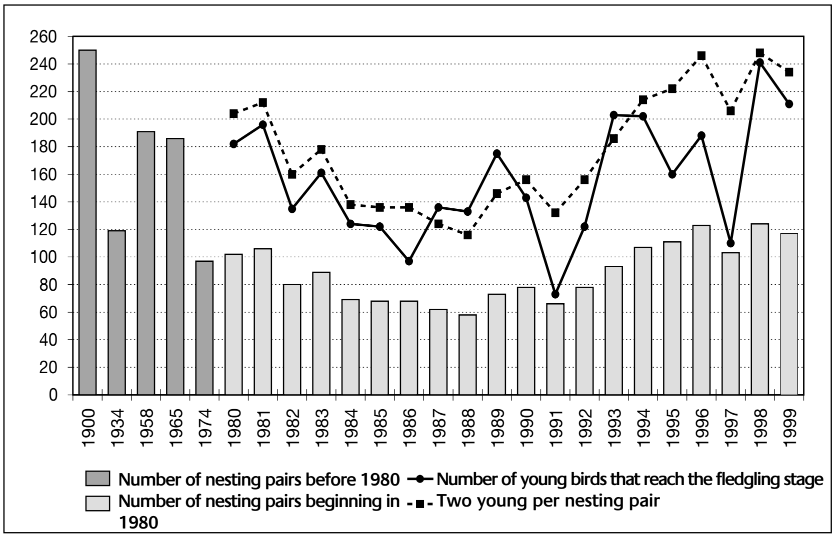

Fig. 1: The development of the white stork's breeding population in Bavaria, 1900 to 1999. Source: Bavarian state bird-protection and conservation association (Landesbund für Vogelschutz in Bayern (e.V.) - Verband für Arten- und Biotopschutz)

depended largely on birds that have moved into the area; Bavaria's own storks are not producing enough young to sustain the species in Bavaria. This clearly points to a lack of adequate feeding habitats. It also highlights the fact that efforts to protect such habitats must be intensified, if the population's growth is to be promoted.

The map of the Bavarian breeding population for 1999 (Fig. 2) provides an overview of nest locations occupied in 1999, including both nests with and without successful reproduction. It also shows nesting sites that were not occupied in 1999, but which were occupied at least once over the preceding five years, as well as nesting sites that have remained unoccupied for decades. The relevant habitats are concentrated in the Franconian lake country (Weihergebiet - Aischgrund), in the Upper Palatinate area of Naabund Regental, including its catchment basin, in the Altmühl and Wörnitz areas and along other Danube tributaries (Mindeltal, Laabertal).

Change's in the white stork's habitats are the most important reason why threats to the bird are increasing. Our low-diversity cultivated landscapes are providing fewer and fewer suitable areas in which white storks can find food. Structural changes in agriculture (plowing of grassland for farming, removal of small-scale structures, drainage of wet meadows), along with past hydrological engineering measures and present expansion of local infrastructures, have eliminated important feeding biotopes. Increasingly intensive use of grassland, and concomitant fertiliser use, have also reduced plant and small-animal diversity on remaining land (see also SCHULZ 1989).

Unfortunately, wet grassland areas in riparian meadows are still being misused as "value-less" cheap land for construction: for commercial properties, urban sprawl and bypass roads. The resulting habitat loss is having a

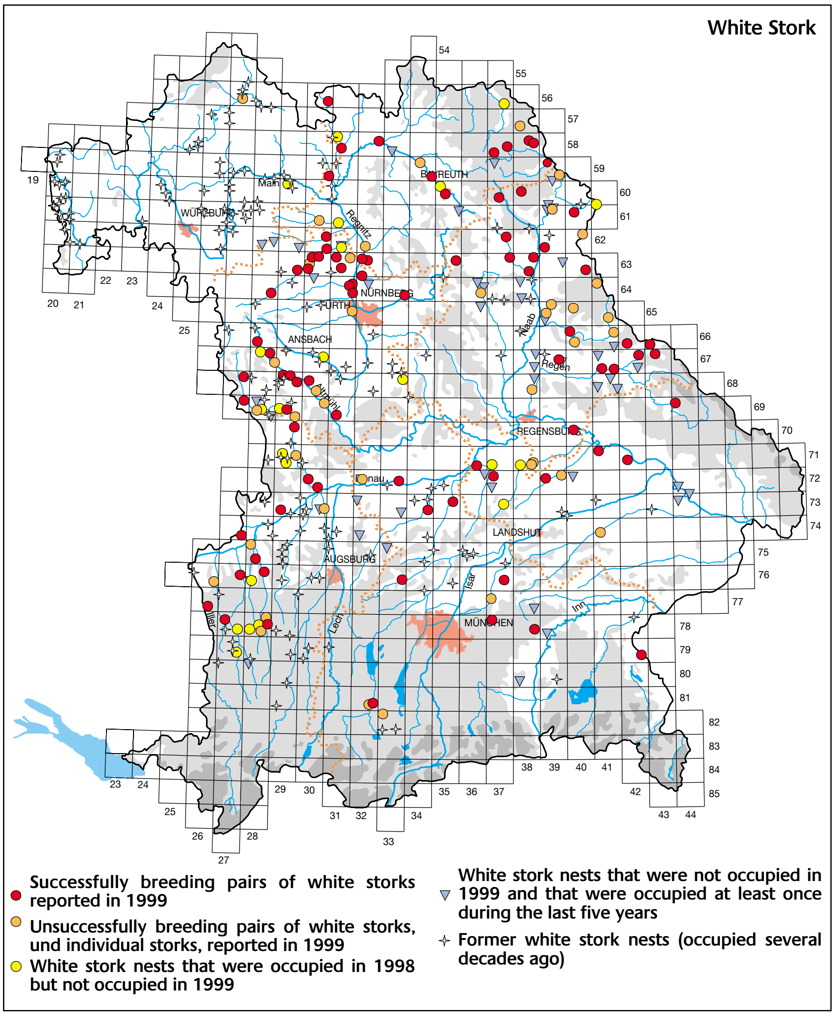

Fig. 2: The white stork's breeding population in Bavaria, 1999. Source: Bavarian state bird-protection and conservation association (Landesbund für Vogelschutz in Bayern (e.V.) - Verband für Arten- und Biotopschutz)

catastrophic impact on white storks: many pairs fail to breed or discontinue their breeding. They encounter food shortages just when they are trying to raise their young, and their young starve.

Threats from power lines

Many storks are killed directly by the power-line networks running through the landscape. Inexperienced young storks in particular are often killed, in their first year of life, through contact with masts and lines. Electrocution accounts for about 50 % of all direct losses (see also FIEDLER & WISSNER 1980). Since not all cases of electrocution are discovered, and since a certain percentage of cases in which the cause of death is unknown are due to electrocution via power lines, the real percentage in this category is likely to be much higher (see also FIEDLER & WISSNER 1989, KÖPPEN 1996). Power masts with standing insulators are particularly dangerous: large birds that perch on the crossbars of such masts can be electrocuted by coming into contact with current-bearing elements. The most effective counter-measures include rewiring, use of hanging insulators, installation of perches above dangerous components, and fitting of guards and plastic covers over relevant parts of lines.
Another danger that is still underestimated consists of "creeping" surface currents, which can flow over supporting insulators and plastic covers covered with wet dirt. While such creeping currents usually do not suffice to kill birds immediately, they cause the birds to go into shock and paralysis, so that they fall from the masts. They then often die as a result of internal injuries, without providing any clues as to their real cause of death.

In general, all outdoor electrical power lines are dangerous for large birds, and thus further efforts are needed to make such lines bird-safe. Such efforts must include intensive co-operation with the responsible power utilities (RICHARZ & HORMANN 1997).

In 1992, the state bird conservation association (Landesbund for Vogelschutz e.V.), acting on behalf of the Bavarian State Agency for State Development and Environmental Affairs (StMLU), mapped locations of power masts in a majority of nesting areas. The results were provided to the responsible power utilities. Conversion of dangerous masts was then accelerated, although it still has not been satisfactorily completed. To date, the DIN standard VDE 0210/12.85 still applies. Its section 8.10, while mandating that new masts must not include any perches for birds, also requires only successive conversion of existing masts; particularly lethal masts are to be converted immediately, while other existing masts are to be converted in the following order of area priority: national parks, nature reserves, landscape reserves (VDEW 1991).

Battles over nests

Each year, birds die in battles over nests. Battles between pairs of storks indicate that too few nests with adequate, suitable feeding habitats are available. Examples from other countries show that stork pairs willingly breed in close proximity to each other when they have enough food. When a pair of storks defends two closely spaced nests, this is a clear indication that the associated feeding habitat suffices for only one pair. In such situations, pairs of storks become highly territorial.

Natural events

Natural events sometimes lead to the death of young storks – for example, late frosts (that can cause the birds to suffer hypothermia), hail and lightning. Such events are part of the birds' natural environment.

Other threats

Occasionally, storks slip and fall into chimneys as they are attempting to land on them. This occurs most frequently on chimneys with broad openings. The best way to prevent such accidents is to equip the chimneys with covers or grates.

4 White stork species assistance programme

In the early 1980s, the Bavarian State Agency for Environmental Protection (Bayerisches Landesamt für Umweltschutz - LfU) responded to the decline in the white stork's population – which had been continuing for decades – by commissioning a comprehensive population inventory. The inventory's findings have been used as a basis (BURNHAUSER 1983) for the species assistance programme for the protection and development of the white stork population. The purpose of the species assistance programme is to ensure the survival in Bavaria of a viable stork population that does not depend on human assistance. Until the 1998/99 contract year, the species assistance programme was commissioned by the StMLU; as of 99/2000 it was commissioned by the LfU. In addition to annual inventories, the programme – primarily with funding from the StMLU – carries out measures, at specific locations, to improve the birds' food situation and nesting sites. Important programme decisions are made by a group consisting of StMLU and LfU staff, of representatives of local district governments, of experts on white storks and of LBV staff. It meets at irregular intervals, as requirements dictate.

If a precise inventory of the white stork population is to be obtained, each nest has to be individually monitored. Local, highly committed volunteers carry out this task, for each nest site. They monitor the progress of the birds' breeding and thus help determine overall breeding results, year in and year out. In the spring, they note when the storks arrive and begin breeding. At the end of the breeding season, and no later than the end of September, additional data, such as numbers of hatched young storks, young storks that reach the fledgling stage, fly-away data and any special events are reported to the state office of the LBV. This data is then compared with long-term survey data, to reveal population fluctuations, trends for individual nest sites and any changes in storks' primary preferences for areas to occupy, etc.. The data is also compared with relevant national and international data (see also KAATZ 1998).

Consequently, the data also provides a basis for targeted protection measures – for example, when the breeding success rate is seen to decline at certain locations. Responses include protection, management and construction of nesting sites as well as measures to conserve and improve the food situation around specific nesting sites.

Maintenance, management and new construction of nesting sites

Measures carried out at nesting sites include installation of new nest platforms, improvement of existing nests and emergency intervention (removal of plastic or twine etc. that has found its way into the nest; only with official permission).

New nest platforms should be installed only in suitable locations, i.e. in areas that provide enough feeding habitat. Each nesting site should be clearly exposed (as high as possible within the relevant location), should be easily accessible to storks for landing and take off and should provide a good overview of the fields and meadows around the nest. Platforms should provide good water drainage (such as wheels, boards, metal framework), should be able to bear the weight of the nest and should also be able to withstand storms. Furthermore, platforms should be at least 130 centimetres in diameter, should have rims/sides and should be filled with twigs and grass, etc...

At the same time, priority should be given to maintenance of existing nests and nest locations (for example, repair of crumbling and cracking chimneys), since storks tend to return to existing nests (where they have bred successfully in the past). Interventions directly at the nest, during the breeding period, may become necessary under certain circumstances that are life-threatening for the storks. In each case, such measures are subject to the approval of the responsible higher nature conservation authority and are to be carried out only in consultation with the LBV. Regular maintenance is permitted only outside of the breeding season, i.e. during the period from October through March.

Foreign material that storks bring to their nest, such as plastic objects or cord, should be removed from the nest (during the winter). An excellent idea is to carry out a thorough litter-pickup campaign within the storks' habitat, prior to the beginning of the breeding season (February to mid-March), with the help of schoolchildren, associations or youth groups, etc..

Improvement of storks' food situation

The most urgent, and most effective, means of protecting the Bavarian white stork population is to conserve and restore wet, large grassland areas with suitable structural diversity. Such measures benefit all communities that live in wet grassland areas, including meadow-breeding birds. All such birds are highly endangered (on the other hand, their habitat requirements are not always exactly the same as those of the white stork). A white stork pair with a brood requires an area of approximately 200 hectares of grassland within a radius of 2-3 kilometres from the nest. In addition, habitat sites must contain a great deal of wet land and extensively farmed areas.

Food biotopes for storks can be protected in the long term by means of long-term leases, with suitable usage agreements. Other important measures include cultivation extensivation and land purchases. Suitable food biotopes for white storks can be created through introduction of extensive agriculture. Normally, such efforts must be carried out co-operatively with affected farmers and with representatives of the relevant lower nature conservation authority and the local agricultural authority.

When feeding biotopes for storks are created or restored, it must be ensured that such areas lie within a stork pair's main radius of action (within about 2-3 kilometres from the nest) and are as free as possible of roads, etc. and thus are not subject to disturbances. Suitable measures include:

- Construction of shallow ponds and lakes: their banks should be so flat that they can easily be managed with environmentally compatible, locally adapted methods.
- Widening of ditches, flattening of embankments and banks (see above).
- Creation of rich structural diversity, with flat depressions, networks of ditches, networks of ponds, on areas subject to natural flood regimes – for example, within bends in watercourses or sunken areas.
- Rewetting of formerly wet meadows.
- Above-ground irrigation of grassland should be co-ordinated with the management schedule.
- Section-wise mowing of bank vegetation along meadow ditches and small water bodies of all types, especially during the periods when the birds' food requirements are greatest – in June and July.
- Mosaic-style mowing of stands of wet tall perennials.
- Thinning of bank vegetation along oxbows.
- Damming of drainage ditches during long dry periods.

- Creation of grassland strips, around ponds and along watercourses, that storks can use – i.e. that are mowed once or twice, on at least one side, between May and August (thick stands of tall perennials should not be allowed to grow!).

Protection of feeding areas should also include control of tourism and recreational activities: people walking dogs through storks' feeding areas create considerable disturbances for storks. The same applies to intensified use of unimproved roads through fields; many such roads have been expanded or paved in connection with measures to re-order rural areas (formerly known as "land consolidation") and are now easily travelled by bicycle, motorcycle, etc.. Accessibility to such roads should be hampered, by means of temporary closure, pursuant to Art. 26 Bavarian Nature Conservation Act (BayNatSchG), or by means of other hindrances, and alternative recreational activities should be developed.

Yet another important element of white stork protection consists of measures to enhance public awareness, including press articles and annual "white stork workshops" for nest managers, authorities' representatives and other interested parties.

5 Outlook

In 1988, as part of implementation of the EU Bird Directive on conservation of wild bird species, an additional project was established in Bavaria for conservation and support of white storks. In each of four selected project areas, each containing two nests, about 3 hectares of grassland were purchased around each of the nests and optimised by means of relevant measures. As a result, this four-year project has enabled white storks to return to three project nest sites. Now, the areas purchased within the framework of the EU project, like all white stork habitats throughout Bavaria, must continue to be protected and managed.

In addition, the LBV and other nature conservation associations are continuing in their efforts to purchase land, to landscape depressions and ponds, to conclude usage agreements with farmers and to carry out many other relevant, useful activities. Land purchases such as those made within the project areas cannot be a state-wide aim for a conservation programme, however.

Care and optimisation of individual feeding areas is by no means enough to secure the areas for the white stork. Bypass roads, new construction areas and industrial zones are still being planned on greenfield areas near communities. What is more, continued management of remaining meadows is threatened as the profitability of various agricultural sectors continues to decrease. These factors reduce or even eliminate the species assistance programme's effectiveness in individual areas, since there is a lack of protection concepts for large areas and since existing concepts are often inadequately enforced – this applies, for example, to implementation of the species and biotope protection programme within the context of physical planning and development planning, etc.

If the continuing habitat loss is to be countered, greater consideration must be given to large-area protection of feeding habitats in areas that harbour white storks. The aim must be to create biotope network systems, at all relevant areas and in all riparian meadows, that offer storks sufficient, diverse feeding biotopes in any weather conditions.

A long-term aim, pursuant to a decision of the white stork steering group – and within the framework of the species assistance program for the white stork – must be to protect and restore large meadow areas in valleys, with wet areas, wet meadows on slopes, shallow ponds with transition zones giving way to land, meandering ditches with bank vegetation and oxbows. The key requirements include:

- No further planning of interventions in grassland areas, especially in wet grasslands, for construction areas, roads, etc. Acreage-equivalent compensation must be provided in cases in which construction is carried out nonetheless; in such cases, real compensation areas must be created, i.e. preference must be given to conversion of farmland into meadows rather than conversion of existing meadows into meadows slated for future extensive use!
- Protection of all of meadows within a radius of three kilometres around the relevant nest; extensivation of sub-areas – for example, through application of the contractual nature conservation programme (Vertragsnaturschutzprogramm - VNP) or the cultural landscape programme (Kulturlandschaftsprogramm - KuLaP). Uses must be oriented to the habitat requirements of the stork, however. In addition, protection should not be limited to meadows currently used by a relevant stork, since the next stork will probably look for other meadows or perhaps not even find areas used by his "predecessor stork". (Storks, like other long-lived animals, typically develop special habitat knowledge – for example, storks have been shown to use pond networks some ten kilometres away from their nests, etc.).
- Introduction of a means of supporting extensive grassland use at current (and former and potential) stork sites. Such use should apply to all of each relevant riparian meadow, should permit early mowing and should be co-ordinated with other grassland-conservation concepts (see also WERRES 1989). This can be achieved via a suitable change in existing programmes or via an additional programme, since the current VNP specifications do not meet the white stork's feeding area requirements.

As in the past, the species assistance programme for the white stork remains an instrument for rapid, targeted protection measures ("fire department function") at nests and on particular areas.

Implementation of large-area protection concepts within Bavaria is being supported by work for the "Stork 2000" action plan, within the "white stork protection in Germany" programme, in which the most important white stork habitats in all of Germany's Länder are being inventoried (SCHULZ 1998). The aim of the project is to develop a national strategy for protecting the white stork, with specific area set-asides and protection recommendations.

6 Summary

The white stork (Ciconia ciconia) is facing extinction in Bavaria. This national bird of Germany has suffered drastic population decreases in this century. Within only 50 years, its population has declined by over 75 %. This decline is due primarily to intensification of agriculture, via use of artificial fertilisers and mechanisation. The extensive meadow landscapes of the past have been transformed into agrarian steppes. Within riparian areas, meadows have been so intensively fertilised and cultivated that they now provide hardly any food for storks. In addition, land has been lost through a wide range of intervention measures.
The species assistance programme for the protection and promotion of white stork populations in Bavaria was established in 1984, on the basis of a research project, and it has carried out a range of measures, including ongoing monitoring. Measures to protect the white stork, as foreseen by the programme, include providing an optimal range of nesting sites and ensuring that birds can land safely at their nests. Most significantly, they include improving the white stork's habitats by means of the various strategies described above.

In the long term, therefore, measures at individual nesting sites must go hand-in-hand with protection of complex wet grassland habitats, in riparian meadows. This may require conversion of existing support programmes as well as the creation of a new programme. In any case, programmes must be integrated with other interests – for example, those of the water resources sector – and must be more effectively integrated in regional planning and relevant implementation.

7 Literature

BAUER, K. M. & U. N. GLUTZ VON BLOTZHEIM (1966): Handbuch der Vögel Mitteleuropas. – Akademische Verlagsgesellschaft. Wiesbaden. Vol. 1, p. 388-415.

BURNHAUSER, A. (1983): Zur ökologischen Situation des Weißstorchs in Bavaria: Brutbestand, Biotopansprüche, Schutz und Möglichkeiten der Bestandserhaltung und Bestandsverbesserung. – Schlussbericht zum Forschungsvorhaben des Bayerischen Landesamtes for Umweltschutz: 488 p. (unpub.).

FIEDLER, G. & A. WISSNER (1980): Freileitungen als tödliche Gefahr for Störche (Ciconia ciconia). – In: Verdrahtung der Landschaft: Auswirkungen auf die Vogelwelt. – Ökologie der Vögel, Vol. 2, special edition 1980.

FIEDLER, G. & A. WISSNER (1989): Weißstorch-Unfälle an Freileitungen und Abhilfemaßnahmen. – In: RHEINWALD, G., J. OGDEN & H. SCHULZ (ed.) (1989): Weißstorch – White Stork. Proc. I. Int. Stork Conerv. Sympos. Schriftenreihe DDA 10: 423-424.

KAATZ, C. (1998): Mitteilungsblatt 90/98 der BAG Weißstorchschutz. – Naturschutzbund Germany e.V.

KÖPPEN, U. (1996): Der Weißstorch (Ciconia ciconia) als Hiddensee-Ringvogel – Ergebnisse aus drei Jahrzehnten und aktuelle Trends. – In: KAATZ, C. & M. KAATZ (Hrsg.) (1996): Jubiläumsband white stork – Jubilee Edition White Stork. – Tagungsbandreihe des Storchenhofes Loburg im MRLU-LSA, 3.Bd, p. 134-140.

NITSCHE, G. (1989): Bestandsentwicklung des Weißstorchs (Ciconia ciconia) in Bavaria 1980 bis 1988. – Schr.- R. Bayer. Landesamt für Umweltschutz 95 (Beiträge zum Artenschutz 8): 167-173.

RICHARZ, K. & M. HORMANN (1997): Wie kann das Vogelschlagrisiko an Freileitungen eingeschätzt und minimiert werden? – Entwurf eines Forderungskataloges für den Naturschutzvollzug. – Vogel und Umwelt. Zeitschrift für Vogelkunde und Naturschutz in Hessen (special edition, Vögel und Freileitungen) 9: 263-271.

SCHULZ, H. (1989): Der Zug des Weißstorchs (Ciconia ciconia) – Ergebnisse eines WWF-Forschungsprojektes. – Schr.-R. Bayer. Landesamt für Umweltschutz 92 (Beiträge zum Artenschutz 8): 77-85.

SCHULZ, H.(1998): Projekt "Storch 2000" Aktionsplan "Weißstorchschutz in Deutschland". – NABU Institut für Wiesen und Feuchtgebiete. Bergenhusen. (unpub.)

STURM, P. (o. J.): Artenhilfsprogramme für bedrohte Tier- und Pflanzenarten – Einführung in die Thematik. – In: Artenhilfsprogramme für stark bedrohte Tier- und Pflanzenarten, Seminar am 21. November 1995 in Wackersdorf. Schr.-R. Bayer. Landesamt für Umweltschutz.

VEREINIGUNG DEUTSCHER ELEKTIRZITÄTSWERKE – VDEW e.V. (1991): Vogelschutz an Starkstrom-Freileitungen mit Nennspannungen über 1 kV. Erläuterungen zu Abschnitt 8.10 "Vogelschutz" der Bestimmung DIN VDE 0210/12.85. – Verlags- und Wirtschaftsgesellschaft der Elektrizitätswerke m.b.H. – VWEW, 2. Auflage 1991.

WERRES, W. (1989): Feuchtwiesenschutz in Niederbayern – Stand des Wiesenbrüterprogramms und Gedanken zu seiner Fortentwicklung. – Schr.-R. Bayer. Landesamt für Umweltschutz 95 (Beiträge zum Artenschutz 9): 153- .

WÜST, W. (Hrsg.) (1981): Avifauna Bavariae Band I. p. 174-187. Munich.

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2.3.2 SPECIES PROTECTION

2.3.2.1 Legal measures

Re 2.1: Has a national policy/strategy or legislation to protect and conserve species covered by the Agreement (Table 1: column A; column B) and their supporting important areas been developed?

In Germany, waterbird protection is centrally integrated within general protection for natural assets and biodiversity (Arts. 1 and 2 Federal Nature Conservation Act - BNatSchG): "The natural and historically grown variety of wild fauna ... shall be conserved since they are a part of the balance of nature". This includes comprehensive legislation – standardisation of which is planned in the form of an environmental code – and a range of special species protection projects. The Länder are responsible for such protection, and they carry out most of the relevant specific nature conservation work. The Federal Government takes action in its capacity as an issuer of framework legislation (ADAMS 2000). BOYE et al. (2000) provides a tabular comparison of the various requirements of AEWA, the EU Bird Directive and the Ramsar Convention.

In September 1998, the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) held a special conference to prepare implementation of AEWA (HAUPT et al. 2000). This event included intensive discussion of Germany's possible strategy to realise the aims of AEWA. One of its results was the finding that Germany's existing nature conservation instruments provide the basis for a co-ordinated strategy for protection of waterbirds and wetlands. The division of competencies between the Federal Government and the country's 16 Länder presents a special problem, however (BOYE et al. 2000).

All of the AEWA species are protected by the EU Bird Directive (79/409/EEC). Germany's most important national strategy for protecting waterbirds is to implement this directive in conjunction with the Fauna, Flora and Habitats Directive (92/43/EEC).

a: What are the main features of the policy/legislation?

The most important measure for protection of migratory waterbird species is to set aside areas, pursuant to Art. 33 BNatSchG (Art. 4 (1) and (2) of the EU Bird Directive), as "Special Protected Areas" (SPA). This enables the most suitable – in terms of size and numbers of birds harboured – breeding, moulting and wintering areas, as well as resting and flyway areas, to be placed under special protection. Such areas are part of the "Natura 2000" network pursuant to Arts. 33 ff. BNatSchG and receive its protection.

All plans, projects and actions that can significantly undermine the protection aims for these areas are prohibited. Exceptions are permitted only where required by important reasons relative to the common good and where suitable measures are taken to protect or restore the coherence of the Natura 2000 network. In such cases, an impact assessment must be carried out (see Chap. 2.3.4.3).

For specially and strictly protected species, the Federal Nature Conservation Act (BNatSchG) mandates comprehensive prohibitions on taking, disturbing, possessing and selling the species. Such prohibitions include injunctions against damaging or destroying bird nests.

b: Which organisations are responsible for implementation?

The relevant Länder agencies are responsible for carrying out specific relevant measures to protect waterbirds. These agencies define the specific aspects of protection in the various protected areas. Such actions normally include designation of protected areas (cf. Chap. 2.3.3.2), although they can also include efforts within the framework of contractual nature conservation, outside the realm of formal set-aside of protected areas (cf. Chap. 1.2.3).

c: How does it relate to other national initiatives (e.g. national Biodiversity Action Plans)?

They are part of the overall strategy for conservation of the diversity of wild animals and plants.

Re 2.2: What legal measures or practices has your country developed to prohibit or regulate for the following?

a: Taking of, and trade in birds listed in Column A and B of Table 1.

Pursuant to Art. 10 (2) No. 10 b) bb) BNatSchG, all European bird species are classified as specially protected species.

In addition to being "specially protected species", some waterbird species are also "strictly protected species". Classification of a species as a strictly protected species results either from its inclusion in Annex A of the EU Wildlife Trade Regulation (Council Regulation (EC) No 338/97 on the protection of species of wild fauna and flora by regulating trade therein) or in Annex I of the Federal species protection ordinance (Bundesartenschutzverordnung). Table 2.3.2-1 lists the AEWA species that are included in Annex A of the EU Wildlife Trade Regulation.

Protection of specially and strictly protected species is defined in Arts. 42 ff. BNatSchG. Pursuant to Art. 42 (1) BNatSchG, such species may not be taken, trapped, captured, injured, or killed, nor may their developmental forms, nests, breeding, living and refuge sites be removed from their natural surroundings, be damaged or be destroyed.

Moreover, the following prohibition also applies to all strictly protected species and

Tab. 2.3.2.1-1: Species that are listed in Annex A of the EU Wildlife Trade Regulation and thus are strictly protected in Germany pursuant to the Federal Nature Conservation Act (BNatSchG), and for which obligations pursuant to AEWA apply.

Scientific name	Common name
Ciconia nigra	Black stork
Anas querquedula	Garganey
Aythya nyroca	Ferruginous duck
Branta ruficollis	Red-breasted goose
Grus grus	Common crane

European bird species (including all native waterbird species): such species must not be disturbed, in their nesting, breeding, living and refuge sites, whether by visits, photography, filming or other similar actions.

It is also prohibited to take, possess or process birds of specially and strictly protected species or parts of such birds (eggs, feathers, skins, products). Species subject to hunting law, where not listed in Annexes A or B of EC Directive 338/97, are

Tab. 2.3.2.1-2: AEWA species that are strictly protected species pursuant to Annex 1 of the Federal species protection ordinance (Bundesartenschutzverordnung).

Scientific name	Common name
Gavia immer	Great northern diver
Podiceps grisegena	Red-necked grebe
Podiceps auritus	Western grebe
Ixobrychus minutus	Little bittern
Botaurus stellaris	Eurasian bittern
Ciconia ciconia	White stork
Cygnus cygnus	Whooper swan
Porzana parva	Little crake
Porzana porzana	Spotted crake
Recurvirostra avosetta	Pied avocet
Pluvialis apricaria	European golden plover
Charadrius hiaticula	Ringed plover
Charadrius dubius	Little ringed plover
Charadrius alexandrinus	Kentish plover
Eudromias morinellus	Dotterel
Vanellus vanellus	Northern lapwing
Gallinago media	Great snipe
Gallinago gallinago	Common snipe
Lymnocryptes minimus	Jack snipe
Limosa limosa	Black-tailed godwit
Numenius arquata	Western curlew
Tringa totanus	Common redshank
Tringa stagnatilis	Marsh sandpiper
Tringa ochropus	Green sandpiper
Tringa glareola	Wood sandpiper
Tringa hypoleucos	Common sandpiper
Calidris alpina	Dunlin
Philomachus pugnax	Ruff
Phalaropus lobatus	Red-necked phalarope
Sterna nilotica	Gull-billed tern
Sterna caspia	Caspian tern
Sterna sandvicensis	Sandwich tern
Sterna dougallii	Roseate tern
Sterna hirundo	Common tern
Sterna paradisaea	Arctic tern
Sterna albifrons	Little tern
Chlidonias niger	Black tern

subject to similar restrictions under the Federal game protection ordinance (Bundeswildschutzverordnung).

Native waterbird species are subject to the restrictions on trade set forth in the EU Wildlife Trade Regulation (Regulation (EC) No. 338/97), if they are listed in Annexes A or B of the Regulation. Species not covered by the EU Wildlife Trade Regulation are subject to restrictions on sale set forth in the Federal Game Protection Ordinance (Bundeswildschutzverordnung), if they are species subject to hunting law, pursuant to Art. 2 (1) of the Federal Hunting Act. Otherwise, the restrictions on trade set forth in Art. 42 (2) Federal Nature Conservation Act (BNatSchG) apply. Art. 4 of Regulation 338/97, which is binding for the entire European Community, regulates imports, into the European Union, of the species listed in the Regulation's four annexes. To import a species listed in Annex A of the Regulation, the importer must present an import permit (among other documents) to the competent import customs office. Import permits may be issued only if:

- the "Scientific Review Group" (SRG) has determined that import of the relevant species will not impair the species' conservation status or its population's range,
- the applicant proves that the relevant specimens have been obtained in compliance with legal provisions for protection of the relevant species,
- the competent scientific authority has determined that, where a living specimen is concerned, suitable provisions have been made for the specimen's housing, protection and care,
- the competent enforcing authority has determined that the specimen is not to be used mainly for commercial purpo
- the competent enforcing authority, after consultation with the scientific authority, has determined that no further species-protection issues stand in the way of the import.

Imports of Annex A species may be permitted only for purposes of advancement of scientific knowledge or for fundamental biomedical purposes. Furthermore, such species may be imported solely for purposes of breeding and reproduction, or of research and education, that support the species' survival. Where the relevant species' survival is not endangered, specimens may also be imported for other purposes.

The competent authorities may issue additional restrictions on imports of Annex A species.

Permits for imports of Annex B species, like permits for imports of Annex A species, may be issued only in cases in which the Scientific Review Group has determined that import of the relevant species will not impair the species' conservation status or its population's range. Other conditions on issue of import permits include

- proof that the relevant specimen, if it is a live animal, will be properly housed at its destination,
- proof that relevant specimens have been obtained in compliance with legal provisions for protection and survival of the relevant species,
- the competent enforcing authority has determined that no further species-protection issues stand in the way of the import.

To import Annex C species, the applicant must present an import notification and, if the relevant species originates in a country listed in connection with Annex C, must present an export certification to prove that the relevant species was obtained in compliance with the regulations of the country of origin. If the relevant species originates in a country not listed in connection with Annex C, the applicant must present an export or re-export certification or a certification of origin.

To import Annex D species, the applicant must present an import notification.

Exports are regulated by Art. 5 of the EU Wildlife Trade Regulation (Regulation (EC) No. 338/97). It mandates that to export or re-export an Annex A species, the exporter must present customs clearance officials with an export permit from the competent authorities. Export permits for Annex A species may be issued only if

1. the competent authority has certified in writing that removal of the specimen from nature, and its export, will not impair the relevant species' conservation status or its population's distribution,

2. the applicant proves that the relevant specimen was obtained in compliance with applicable laws governing protection of the species (also applies to re-exported specimens),

3. the enforcing authority has determined that risks of injury during transport have been reduced to a minimum,

Tab. 2.3.2.1-3: AEWA species listed in Annex A or B of the EU Wildlife Trade Regulation (Regulation (EC) No. 338/97).

Scientific name	Common name	Annex
Pelecanus crispus	Dalmatian pelican	A
Casmerodius albus albus	Great egret	A
Ciconia nigra	Black stork	A
Geronticus eremita	Hermit ibis	A
Platalea leucorodia leucorodia	White spoonbill	A
Platalea leucorodia major	White spoonbill (South American sub-species)	A
Phoenicopterus ruber roseus	Greater flamingo	A
Phoenicopterus minor	Lesser flamingo	B
Oxyura leucocephala	White-headed duck	A
Branta ruficollis	Red-breasted goose	A
Sarkididornis melanotos melanotos	Comb duck	B
Anas querquedula	Garganey	A
Aythya nyroca	Ferruginous duck	A
Grus leucogeranus	Great white crane	A
Grus virgo	Demoiselle crane	B
Grus paradisea	Blue crane	B
Grus carunculatus	Wattled crane	B
Grus grus	Common crane	A
Numenius tenuirostris	Slender-billed curlew	A

4. a) the enforcing authority has determined that, where the species in question is not a species listed in Annex I of the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), the species intended for export is not to be used primarily for commercial purposes, or

   b) for species listed in Annex I of CITES, the applicant possesses an import permit for the destination country, and

5. the competent enforcing authority, after consultation with the scientific authority, has determined that no further species-protection issues stand in the way of the export.

Where Annex A specimens are being re-exported, the exporter must also prove that the relevant specimens have been imported into the Community in compliance with the EU Wildlife Trade Regulation (Regulation (EC) No. 338/97) and must present the relevant import certifications.

In cases of export and re-export of specimens listed in Annexes B and C, the exporter must show the relevant customs-clearance office an export permit or re-export permit from the competent enforcing authority. Permits for export of Annex A species may be issued only if the conditions listed above in 1), 2), 3) and 5) have been met. Permits for re-export of Annex A species may be issued only if the conditions listed above in 3) and 5) have been met. Where specimens are to be re-exported that were imported into another EU Member State, the competent scientific authorities must consult with each other regarding the import permit.

Special provisions apply to import and export of products made from relevant species and acquired more than 50 years ago.

Special provisions, which are set forth in Art. 7, also apply to specimens born and raised in captivity or artificially propagated.

b: Methods of taking

Art. 12 Federal Species Protection Ordinance (Bundesartenschutzverordnung) prohibits the use of the following means to take, lure, capture or kill wild birds (see also Chapter 2.3.4.1.):

- snares, nets, traps, hooks, glue and other adhesives,
- use of live animal decoys,
- crossbows,
- artificial light sources, mirrors or other devices for illuminating or blinding,
- sound-emitting, electrical or electronic devices,
- gas, smoke or poisons, poison or tranquilliser baits or other means of tranquillising,
- semi-automatic or automatic weapons with magazines that can hold more than two cartridges, or night-vision equipment, with electronic image amplifiers or converters, that makes night-firing possible,
- explosives,
- vehicles or aircraft, or boats capable of speeds over 5 km/h.

Violations are subject to fines of up to 10,000 € (20,000 DM).

c: Setting of taking limits and monitoring these limits.

No taking limits have been set for waterbirds in Germany. This also applies to the hunting sector (see Chapter 2.3.4.1).

d: Sustainable hunting of species listed in Column A, Categories 2 and 3 (and marked with an asterisk).

No hunting is permitted of species listed in Column A and occurring in Germany. The Federal Hunting Season Ordinance (Bundesjagdzeitenverordnung) does not differentiate the central-European population of the greylag goose *(Anser anser)*, where members of this population are present in Germany during migration, from other greylag goose populations. Geese of these populations are game animals and may be hunted, in certain Länder, at certain times (see Chapter 2.3.4.1). Such hunting is not centrally controlled.

e: Exemptions to the provisions set out in paragraphs 2.1.1-3

All of the populations listed in Column A are either specially protected under the Federal Nature Conservation Act (BNatSchG) (see above) or are game species with a year-round off season (see Chapter 2.3.4.1). The only exceptions are the light-bellied brent goose *(Branta bernicla hrota)*, which also occurs in Germany, and the central European / north African population of the greylag goose *(Anser anser anser)*. For the following Column B species, at least one German state (Land) has established a hunting season (see Chapter 2.3.4.1): mute swan *(Cygnus olor)*, bean goose *(Anser fabalis)*, brent goose *(Branta bernicla)*, common pochard *(Aythya ferina)*, northern pintail *(Anas acuta)*, Garganey *(Anas querquedula)*, black scoter *(Melanitta nigra)* and velvet scoter *(Melanitta fusca)*. Taking of these species from their natural environments is seasonally restricted, but no bag limits have been established.

Special permits for exceptions are not required under German law.

Exceptions to species-protection provisions of nature conservation law are oriented to Art. 20g Federal Nature Conservation Act (BNatSchG) and are tied to that article's conditions, which conform to the provisions of number 2.1.3 of the AEWA action plan.

2.3.2.2 Single Species Action Plans

Re 2.3: Of the species covered by the Agreement (species listed in Table 1: column A), which spend part or all of their life history in your country, which have formal international or national Single Species Action Plans (and which plans are proposed, in preparation or being implemented)? Please append a list of species and their action plan status.

Germany is required to prepare national single-species action plans for 17 of the populations listed in Table 1, column A of the AEWA Action Plan. These populations are listed in Tab. 2.3.2.2-1.

In Germany, the Länder (states) are responsible for preparing the national single-species action plans. However, precise, conclusive definition of the waterbird populations for which Germany is required to prepare such plans was not possible until the completed version of Table 1 of Annex 3 of the Agreement, which version was adopted at the 1st Meeting of the Parties in 1999, was available.

Amendments to the Agreement made by resolutions of the Meetings of the Parties have to be transposed into national law in order to become applicable in Germany. Work to prepare national single-species action plans for the Eurasian bittern *(Botaurus stellaris)* and the gull-billed tern *(Sterna n. nilotica)* began in early 2002, during the implementation phase for resolutions taken at the Cape Town Meeting of the Parties. The state of Brandenburg is directing preparation of the species action plan for the Eurasian bittern. Schleswig-

Tab. 2.3.2.2-1: AEWA populations listed in Table 1, column A for which Germany is required to prepare national single-species action plans.

Common name	Scientific name.	Population	Cat.
Purple heron	Ardea p. purpurea	West Mediterranean	2
Gr. Eurasian bittern	Botaurus s. stellaris	Europe (breeding)	3c
Black stork	Ciconia nigra	C & E Europe (breeding)	2
White spoonbill	Platalea leucorodia leucorodia	E Atlantic	1c
Flamingo	Phoenicopterus ruber roseus	West Mediterranean	3a
Greylag goose	Anser anser anser	C Europe/N Africa	2*
Brent goose	Branta bernicla hrota	Svalbard/DK & UK	1c
Red-crested pochard	Netta rufina	SW & C Europe/W Mediterranean	2*
Ferruginous duck	Aythya nyroca	E Europe/ E Mediterranean & Africa	1a 1b 3c
Smew	Mergellus albellus	NW & C Europe (win)	3a
European golden plover	Pluvialis apricaria	UK, IRL, DK & DE (breeding)	3c*
Kentish plover	Charadrius a. alexandrinus	E Atlantic	3c
Jack snipe	Lymnocryptes minimus	Europe (breeding)	(3c)*
Dunlin	Calidris alpina schinzii	Baltic Sea, UK & IRL	3c
Gull-billed tern	Sterna n. nilotica	W Europe/W Africa	2
Caspian tern	Sterna caspia caspia	Europe (breeding)	1c
Little tern	Sterna a. albifrons	E Atlantic (breeding)	3b

Holstein is managing work on the action plan for the gull-billed tern. Experience gained through this work will enter into preparation of additional national single-species action plans.

The case of the European golden plover *(Pluvialis apricaria)*, of which two AEWA populations occur in Germany, presents a special situation. The north-European population crosses the country along the coast and over inland regions, on its migrations to and from its wintering areas. Lower Saxony harbours the last German breeding pairs of the southern population. In that state, the birds are threatened by changes in their habitats, and thus the state is making intensive efforts to protect them. At the same time, the European golden plover is still hunted in other European Union Member States. Further west – for example, in France – birds that breed in Germany share their resting and wintering areas with members of the north-European population. As a result of such hunting, the southern population of the European golden plover has been marked with an asterisk in Table 1 of the AEWA Action Plan, with the result that for this population an international single-species action plan must also be prepared.

The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), in co-operation with the German Federal Agency for Nature Conservation (BfN), commissioned Wetlands International to prepare a report on the status of the European golden plover. In its structure and content, this report, which was presented in 2001, is oriented to the "AEWA Conservation Guidelines" recommendations. The information compiled here provides a basis for further protection and management measures.

The German Federal Government is currently attempting, within the framework of relevant European Union bodies, and in co-operation with other range states, to initiate similar effective measures for populations of this species. AEWA requirements, which call for a range of graduated measures for both European golden plover populations, will play a central role in these efforts.

2.3.2.3 Emergency measures

Re 2.4: Describe any bilateral or multilateral co-operative action that your country has undertaken to develop and implement emergency measures to conserve species in response to unfavourable or endangering conditions occurring in the Agreement area.

The Federal Republic of Germany is obligated, via a number of agreements, to co-operate in emergency response to incidents, in the North Sea, in the Baltic Sea and in trans-boundary rivers, that threaten flora and fauna. This also applies to situations that threaten populations of species (pursuant to 2.3 of the AEWA Action Plan) that fall under AEWA.

PROVISIONS FOR CO-OPERATION IN CASE OF INCIDENTS IN THE NORTH SEA AREA. In the interest of joint protection of the North Sea against pollution, the countries bordering the North Sea – Norway, Sweden, Denmark, the UK, Belgium, the Netherlands, France, Germany and the European Union – concluded the Bonn Agreement for co-operation in dealing with pollution of the North Sea by oil and other harmful substances.

This agreement requires the parties to provide mutual assistance and information in order to minimise pollution of the North Sea.

Pursuant to Arts. 3 and 4, the parties are to inform each other about their specific organisations and measures for pollution prevention, and to inform each other as to their competent authorities for managing unexpected pollution events. A common high standard of information is to be achieved via exchange of research findings, knowledge and experience relative to controlling pollution and reducing its effects.

Pursuant to Art. 7, parties to the agreement can call on each other, when affected by unexpected sea pollution, for support in response. Also pursuant to Art. 7, states called on for assistance are required to provide assistance in keeping with their technical resources.

Below the level of the Bonn Agreement, the Federal Republic of Germany has concluded additional agreements, with Denmark and the Netherlands, to guard against sea pollution.

The "Netherlands-German Joint Maritime Contingency Plan on Combating Oil and other Harmful Substances (NETHGER-Plan)" provides for close co-operation in combating sea pollution. Pursuant to point 1.4 of the NETHGER-Plan, the Netherlands and Germany consider themselves mutually responsible for combating threats and occurrences of pollution in the area covered by the agreement, regardless of the degrees to which they are separately affected. Similar provisions apply under the DENGER-Plan that Germany and Denmark have put in place.

PROVISIONS FOR CO-OPERATION IN CASE OF INCIDENTS IN THE BALTIC SEA. The Helsinki Convention (Helcom - Convention on the Protection of the Marine Environment of the Baltic Sea area), which all countries bordering the Baltic Sea are parties to, is similar to the Bonn Agreement for the North Sea. The Convention's most important purpose (as set forth in Art. 4) is to protect the marine environment of the Baltic Sea area.

Pursuant to Article 3, the contracting parties have the fundamental obligation of taking all possible measures to jointly prevent and combat sea pollution. Pursuant to Art. 13, whenever a pollution incident in the territory of a contracting party is likely to cause pollution to the marine environment of the Baltic Sea Area, the contracting party must notify without delay the other contracting parties whose interests are affected or are likely to be affected. Art. 14 of the Convention obligates the contracting parties to combat pollution threats, either individually or jointly.

Annex VII (Response to pollution incidents) of the Helsinki Convention contains further provisions regarding the obligations of the contracting parties. These obligations include

- taking suitable measures that enable the contracting parties to respond effectively to pollution incidents (for example, with trained personnel and suitable equipment),
- in keeping with their technical means, co-operate with other contracting parties in combating pollution,
- prepare detailed national contingency plans, as well as bilateral and multilateral plans with other contracting parties, as appropriate, for response when pollution incidents are likely to occur,
- co-operate in surveillance of the Baltic Sea area (also in order to spot and monitor intentional releases of pollutants into the sea) and
- endeavour to establish response regions outside of national boundaries.

IMPLEMENTATION OF THE CONVENTION FROM THE GERMAN PERSPECTIVE. In connection with the above agreements, two multi-purpose ships are constantly on patrol in the German North Sea area, in order to provide rapid assistance in case of mishaps. In addition to these ships, a blue-water tug boat, chartered by the Federal Ministry of Transport, Building and Housing (BMVBW), is constantly on call. A multi-purpose ship is also stationed in the German Baltic Sea area in order to provide assistance there in case of any mishaps.

The aforementioned multi-purpose ships have the following equipment for combating maritime pollution:

- Systems for collecting oil and separating it from water,
- Tanks for holding oil and chemicals,
- Sonar for locating sunken containers (such as chemical containers),
- Towing winches,
- Fire-fighting equipment,
- Cranes,
- Oil barriers and

In connection with the multi-purpose ships, the Federal Ministry of Transport, Building and Housing (BMVBW) has acquired two special aircraft for air surveillance in the North Sea and Baltic Sea areas. The two DO 228 aircraft are equipped with special sensors for detecting pollutants, and thus can monitor North Sea and Baltic Sea areas from the air and locate ships that illegally discharge harmful substances into the sea. The aircraft gather constant streams of data that they can forward to the multi-purpose ships, to facilitate effective response to pollution incidents.

When coastal radio stations or the Maritime Rescue Co-ordination Centre (MRCC) in Bremen report a pollution incident, a detailed contingency plan is put into action (Federal Waterway and Shipping Administration (WSV), 2001).

Reports of pollution incidents go directly to a central reporting station ("Zentraler Meldekopf") in Cuxhaven. This station assesses the gravity of the incident and determines the resulting competence. For incidents in which

- the volume of oil spilt into the open sea is less than 50 m^3, or,
- the volume of oil spilt in shoreline and coastal areas is less than 10 m^3, or
- the volume of oil spilt in shipping lanes is less than 5 m^3, or,
- when no sensitive water body is affected,

measures to combat the maritime pollution are taken at the local level, by the Länder.

In cases of incidents in which one of the aforementioned thresholds is exceeded, or other substances have been released into the water, a group consisting of Federal and Länder representatives meets in order to co-ordinate measures to combat the resulting pollution.

A "Maritime Response Control Centre" ("Maritimes Lagezentrum"), with permanent decision-making authority, is currently being established.

PROVISIONS FOR CO-OPERATION IN CASES OF INCIDENTS ON TRANS-BOUNDARY RIVERS. To protect trans-boundary European rivers, concerned states have established "International Commissions". The Federal Republic of Germany is a member of commissions for the trans-boundary rivers Oder, Rhine, Elbe, Danube, Moselle and Saar. The commissions established for the above rivers are

- International Commission for the Protection of the Elbe (IKSE), location: Magdeburg,
- International Commission for the Protection of the Rhine (IKSR), location: Koblenz,
- International Commission for the Protection of the Danube (IKSD), location: Vienna,
- International Commission for the Protection of the Oder (IKSO), location: Wroclaw,
- International Commission for the Protection of the Moselle and the Saar (IKSMS), location: Trier

These commissions are charged with monitoring water quality in the relevant rivers. When certain threshold values are exceeded – for example, when accidents occur on the rivers, warning and alerting plans go into effect, providing for forwarding of information to the responsible national authorities. The agencies responsible for combating water pollution from pollution incidents include fire departments, Technisches Hilfswerk (technical assistance agency) and the relevant waterway and shipping administrations.

2.3.2.4 Species re-establishments

Re 2.5: Has a policy on species re-establishments been developed in your country? If yes, please outline the main features of the policy and give details of any re-establishment programmes for species covered by the Agreement.

Planning of re-establishments, like efforts to deal with neozoa (see Chap. 2.3.2.5), must take account of Art. 39 of the Federal Nature Conservation Act (BNatSchG). Pursuant to this provision, the tasks of species protection include establishment of displaced wild animals and plants in suitable biotopes within their natural ranges.

Art. 41 of the Federal Nature Conservation Act (BNatSchG) makes establishment of all animal species – especially including non-native species – subject to permit requirements. As a result, re-establishments are subject to the approval of the competent Länder authorities.

Since the Federal Nature Conservation Act is a framework act, the Länder may enact further provisions relative to re-establishments. The competent Länder authorities are also responsible for re-establishment projects.

In addition to provisions of the Federal Nature Conservation Act, provisions of hunting law also apply, where possible re-establishments involve game animal species (cf. Art. 28 Federal Hunting Act (BJagdG)).

In 1981 in Germany, the predecessor to the Federal Agency for Nature Conservation, the Federal Research Institute for Nature Conservation and Landscape Ecology, issued scientific "Recommendations for the re-establishment of endangered animals" (NOWAK 1982). Its core statements are still valid and are found at the international level, in more recent guidelines (for example, IUCN 2001). It should be noted that these recommendations are not legally binding in Germany, however.

Pursuant to NOWAK (1982), the following aspects must be taken into account in re-establishment of animal species, aspects that largely agree with the requirements set forth in 2.4 of the AEWA Action Plan:

1. Re-establishments may be considered only for species that, in spite of active, intensive efforts to protect their remaining populations, are unable (and will remain so in the foreseeable future) to re-populate their former range areas naturally.

2. Any re-establishment should be preceded by studies to determine the reasons for the disappearance or decline of the relevant species.

3. Re-establishments must take place within the relevant species' current or historical ranges and in suitable biotopes.

4. Before animals are re-established, release sites must be carefully selected for optimal suitability, and any threats must be eliminated and targeted management measures must be carried out.

5. A forecast of the success of the planned re-establishment project must be prepared, making use of scientific methods and comparable experience, and analysing all possible consequences of the re-establishment (economic, epizootic, ecological).

6. The local public and all relevant interest groups must be informed about the aims and procedures of the planned project, in the interest of obtaining such stakeholders' approval or support.

7. No measures may be used that contradict other nature conservation aims – for example, measures to cull or exterminate populations of other species are not permitted.

8. Procurement and release of the relevant species must conform to applicable laws (capture permit, CITES, import-export regulations, animal-welfare law – and, possibly, requirements to obtain a release permit, etc.).

9. Animals should be released only if they are taxonomically and ecologically identical – or at least similar – to the former population.

10. Animals may not be taken, for re-establishment purposes, from populations that would be endangered by such taking.

11. In carrying out of re-establishments, the following must be observed:

    a) suitable preparation must be made in order to facilitate the animals' adjustment to their new habitat,

    b) the animals must be able to behave in a natural way,

    c) the animals must be able to increase their numbers rapidly.

12. Re-established animals must be continually supported and monitored until they are integrated within the local biocoenosis.

13 Projects should be appropriately limited in duration, to ensure that releases do not continue permanently without any chance of real re-establishment.

14. All relevant efforts must be carefully documented. The resulting records should be available for scientific analysis.

15. Re-establishments should take place in two phases:

    a) first, in a closely limited area, until it is known whether true re-establishment is possible and then, if so,

    b) and if suitable biotopes are present, at several points throughout the species' former range.

16. Member States should co-ordinate, and agree on, re-establishments internationally.

Regeneration of habitats, to permit natural re-establishment, is even more important than re-establishment of waterbird species that used to live in certain landscapes (see Chapter 2.3.3.2 and Chap. 2.3.3.3).

Wood Duck

2.3.2.5 Introduction of non-native species

Re 2.6: Has your country developed and implemented legal measures to prohibit the introduction of non-native species? Please provide details, particularly describing measures to control the release or introduction of non-native species (please indicate which species and their status).

Legal provisions and guidelines to prevent threats to native wild plant and animal species, through introduction of non-native species, can be divided into the following categories: provisions of international agreements, provisions of European directives and regulations and provisions of national law.

Like CMS (Art. III 4. c)) and AEWA (Art. III 2. (g)), the Bern Convention (Art II (2) b)) and the Convention on Biological Diversity are international agreements that mandate efforts to prevent or that prohibit introduction of non-native species. At the European level, the EU Wildlife Trade Regulation (Regulation (EC) No. 338/97) can provide a basis for prohibiting introduction of non-native species when such introduction must be considered to present a threat to native animal species.

The EU Wildlife Trade Regulation has a direct effect on national laws. By contrast, the EC Bird Directive (79/409/EEC), which requires transposition into national law, simply calls on Member States to ensure that any introduction of wild bird species does not have a negative effect on native bird species (Art. 11).

At the national level in Germany, the Federal Nature Conservation Act (Bundesnaturschutzgesetz – BNatSchG) regulates introduction of neozoa that could have negative impacts on native animal species. Pursuant to Art. 41 (2) of this act, non-native animals and plants may be released or introduced only with the approval of the competent authority in the Land (state) concerned. Such approval must be denied, if the release or introduction could lead to interbreeding with native animal and plant species or could endanger native species' populations or distributions.

The provisions of the Federal Nature Conservation Act Art. 41 (2) are framework provisions that must be implemented by the Länder. Other laws that regulate releases of non-native species in Germany include the Federal Hunting Act (Bundesjagdgesetz), the Animal Welfare Act (Tierschutzgesetz) and the fisheries laws of the Länder.

Measures and controls to prevent introduction and release of non-native species are difficult to put into practice. Normally, such introduction can be prevented only at national borders and airports, i.e. at points where customs officials carry out random and spot checks. In German seaports, introduced species can be discovered only through random checks.

Animal enclosures and aviaries can also be sources of introduction of non-native species. Legal provisions that permit control of animal enclosures and aviaries (as set forth in 2.5.2 of the AEWA Action Plan), are in place.

Table 1 lists non-native waterbirds found to have become well-established in Germany. "Well-established" in this context means that the species have reproduced within the last 25 years, or within three generations, without influx of additional individuals from their country of origin or from captivity (GEBHARDT et al. 1998).

Tab. 2.3.2.5-1: List of waterbird neozoa that have become well-established in Germany (pursuant to BAUER & BEZZEL 2001).

Scientific name	Common name	Origin	Reason established	Status
Branta canadensis	Canada goose	North America	Introduced	Breeding bird
Alopochen aegyptiacus	Egyptian goose	Africa	Escaped from parks	Breeding bird
Aix galericulata	Mandarin duck	East Asia	Escaped from parks, escaped from captivity	Local breeder

Tab. 2.3.2.5-2: List of waterbird neozoa that have not yet become well-established in Germany (pursuant to BAUER & BEZZEL 2001, supplemented within information from BEZZEL 1985).

Scientific name	Common name	Origin	Reason established	Status
Phoenicopterus ruber	Greater flamingo	Mediterranean & north Africa	Escaped from captivity	Attempting to breed
Phoenicopterus chilensis	Chilean flamingo	South America	Escaped from captivity	Attempting to breed
Cygnus atratus	Black swan	Australia	Released	Breeding colonies
Anser cygnoides	Swan goose	East Asia	Escaped from captivity	Breeding colonies
Branta bernicla	Brent goose	Northern Europe	Escaped from captivity	?
Branta leucopsis	Barnacle goose	Northern Europe	Escaped from captivity	Locally breeding in SH
Tadorna ferruginea	Ruddy shelduck	South-west Asia	Escaped from captivity	Breeding irregularly
Cygnus cygnus	Whooper swan	Northern Europe	Unknown	?
Anser indicus	Bar-headed goose	Central Asian uplands	Escaped from captivity, park bird	Isolated breeding colonies
Anser brachyrhynchus	Pink-footed goose	Greenland, Iceland	Unknown	?
Anser caerulescens	Snow goose	North America	Escaped from captivity	Breeding observed
Cairina moschata	Muscovy duck	South America	Released, escaped from captivity	No breeding observed to date
Aix sponsa	Wood duck	America	Escaped from captivity	In 20th century breeding at Lake Constance
Calonetta leucophrys	Ringed teal	South America	Escaped from captivity	Not yet breeding in Germany
Oxyura jamaicensis	Ruddy duck	North America	Escaped from captivity	In 2001 first instance of breeding in Germany

With regard to the ruddy duck (listed in Table 2), whose appearance has had a negative impact on populations of the white-headed duck, the Standing Committee of the Bern Convention recommends (recommendation no. 61 (1997)) the development of national programmes that can include measures to eliminate the ruddy duck (see also 2.5.3 AEWA Action Plan).

2.3.3 BIOTOP PROTECTION

2.3.3.1 Habitat inventories

Re 3.1: Has your country developed and published inventories of important habitats for species covered by the Agreement?

To date, no German Land has has developed and published an inventory of important habitats for species listed in Table 1 of the AEWA Action Plan (within the meaning of 3.1.1 of the AEWA Action Plan). Table 1 has comprised all AEWA species only since the 1st meeting of the parties (Cape Town, South Africa, 6-9 November 1999). National ratification of this amendment to the agreement had not been completed at the time the present publication was being prepared.

It is assumed that the existing EC special protection areas for birds and Ramsar areas are also the basic areas relevant for AEWA. MITLACHER (1997) has prepared an inventory of Ramsar areas.

Has your country undertaken a strategic review of sites to develop a national network of important sites or areas for species covered by the Agreement?

An R+D project is currently focusing intensively on this question and developing criteria for determining, in light of the abundance and distribution of relevant species, whether an adequate network of special protection areas has been established pursuant to the EC Bird Directive (see Chap. 1.3.3). It is expected that an overview of all protection areas to be set aside under that directive would also include all areas relevant for AEWA species. Ornithological associations have prepared a list of "Important Bird Areas" that provides indications concerning areas that could be relevant for species listed in Table 1 of the agreement. Most of these areas are listed in UNSELT et al. (2000). Areas on the German Baltic Sea coast have been updated with respect to this list as it appears in SKOV et al. (2000). SKOV et al. (1995) provides an overview of North Sea areas that is now somewhat out of date. A new atlas of distributions of seabirds in the North Sea is currently being prepared (see Chap. 1.2.2). Table 2.3.3.1-1 contains a list of German IBA, organised according to relevance for AEWA species. For each species, this table includes all IBA of some importance for the species, in keeping with the IBA criteria (the table is provided in somewhat more detailed form in the Annex).

Tab. 2.3.3.1-1 AEWA species and the IBAs in which the species occur with some importance (pursuant to UNSELT et al. 2000, SKOV et al. 2000 and SKOV et al. 1995).

Species	IBA No.	Area	Land	Season
Red-/Black-throated diver Gavia stellata / G. arctica arctica	40	Pomeranian Bight East German Bight	MV	Mig.
Red-necked grebe Podiceps grisegena grisegena	40	Pomeranian Bight East German Bight	MV	Mig.
Slavonian grebe	40	Pomeranian Bight	MV	Mig.
Podiceps auritus auritus	288	Wismar Bight	MV	Mig.
Little bittern	130	Wulfener Bruch	ST	Breed.
Ixobrychus minutus minutus	256	Isar valley: Gottfrieding-Plattling, including Isar estuary	BY	Breed.
	258	Main valley near Volkach: Fahr Dettelbach	BY	Breed.
	275	Aisch-Regnitz-Grund	BY	Breed.
Eurasian bittern	30	Selent-Plön fish ponds	SH	Yr.-rd.
Botaurus stellaris stellaris	117	Werderland	HB	Breed.
	137	Havelland between Brandenburg and Potsdam	BB	Yr.-rd.
	143	Schorfheide-Chorin	BB	Yr.-rd.
	146	Uckermark lakes area	BB	Yr.-rd.
	151	Untere Havel - Schollener See - Gülper See	ST, BB	Breed.
	205	Oberlausitz heaths and ponds	SN	Yr.-rd.
	255	Rötelsee pond area, including Regen-Aue	BY	Breed.
	275	Aisch-Regnitz-Grund	BY	Yr.-rd.
Black stork	26	Aukrug Nature Park	SH	Breed.
Ciconia nigra	32	Sachsenwald	SH	Breed.
	57	Feldberger-Woldegker Endmoräne	MV	Breed.
	98	Ostenholzer Moor (fen) and Meissendorfer Teiche	NI	Breed.
	126	Landgraben-Dumme lowlands	ST	Breed.
	143	Schorfheide-Chorin	BB	Breed.
	146	Uckermark lakes area	BB	Breed.
	164	Wet meadows and forests near Burbach	NW	Breed.
	167	Medebacher Bight	NW	Breed.

Continuation →

Species	IBA No.	Area	Land	Season
Black stork	170	Kellerwald	HE	Breed
Ciconia nigra	171	Burgwald	HE	Breed.
Ciconia nigra	172	Vogelsberg	HE	Breed.
	173	Rothaargebirge in Hesse	HE	Breed.
	176	Waldeckisches Upland	HE	Breed.
	194	Rhön Biosphere Reserve	HE, BY, TH	Breed.
	202	Vessertal Biosphere Reserve	TH	Breed.
	204	Ponds and Elbe meadows near Torgau	SN	Breed.
	208	Erzgebirgskamm near Satzung	SN	Breed.
	212	Fürstenau	SN	Breed.
White stork	24	Eider-Treene-Sorge lowlands	SH	Breed.
Ciconia ciconia ciconia	57	Feldberger-Woldegker Endmoräne	MV	Breed.
	74	Viehmoor and Leiferder Teiche (ponds)	NI	
	136	Spreewald	BB	Breed.
	143	Schorfheide-Chorin	BB	Breed.
	149	Unteres Elbtal (lower Elbe valley)	BB	Breed.
	151	Untere Havel - Schollener See - Gülper See	ST, BB	Breed.
	204	Ponds and Elbe meadows near Torgau	SN	Breed.
Mute swan	17	East and south-east coast of Fehmarn: Puttgarden-Burgtiefe	SH	Winter
Cygnus olor	37	Westrügen-Hiddensee-Zingst	MV	Yr.-rd.
	44	Greifswalder Bodden	MV	Winter
	288	Wismar Bight	MV	Winter
Whooper swan	5	Schlei	SH	Winter
Cygnus cygnus	13	Großer and Kleiner Binnensee (lakes)	SH	Winter
	23	Traveförde and Dassower See (lake)	SH	Winter
	37	Westrügen-Hiddensee-Zingst	MV	Winter
	44	Greifswalder Bodden	MV	Winter
	46	Kleines Haff and Achterwasser	MV	Winter
	106	Elbe lowlands, between Schnackenburg and Lauenburg, and including Amt Neuhaus	NI	Winter
	119	Mittelwesermarsch (marsh along Weser River)	HB	Winter
	124	Aland-Elbe lowlands	ST	Winter
	142	Unteres Odertal (lower Oder valley)	BB	Mig.
	149	Unteres Elbtal (lower Elbe valley)	BB	Mig.
	151	Untere Havel - Schollener See - Gülper See	ST, BB	Winter
	157	dam on the Weser River), Schlüsselburg	NW	Winter
	287	East part of Kiel Bight	SH	Winter
	288	Wismar Bight	MV	Winter
Tundra swan	11	Warder See (lake)	SH	Mig.
Cygnus columbianus bewickii	24	Eider-Treene-Sorge lowlands	SH	Mig.
	25	Pinneberger Elbmarschen (Elbe marsh area)	SH	Mig.
	37	Westrügen-Hiddensee-Zingst	MV	Mig.
	44	Greifswalder Bodden	MV	Mig.
	48	Lewitz pond area	MV	Mig.
	65	Untere Weser (lower Weser River)	NI	Winter
	81	Groß Fullener Moor (fen) (fen)	NI	Winter
	86	Wesuwer Brook	NI	Winter
	89	Emstal	NI	Mig.
	97	Untere Aller-Niederung (Aller River lowlands)	NI	Mig.

Species	IBA No.	Area	Land	Season
Tundra swan Cygnus columbianus bewickii	106	Elbe lowlands, between Schnackenburg and Lauenburg, and including Amt Neuhaus	NI	Winter
	107	Elbmarsch (Elbe marsh), from Stade to Otterndorf	NI	Winter
	113	Ems lowlands, near Lathen	NI	Winter
	115	Borgfelder Wümmewiesen	HB	Mig.
	116	Blockland – Untere Wümme (lower Wümme) - West Hollerland	HB	Mig.
	124	Aland-Elbe-Niederung	ST	Mig.
	149	Unteres Elbtal (lower Elbe valley)	BB	Mig.
	151	Untere Havel - Schollener See - Gülper See	ST, BB	Winter
	160	lower section of the lower Rhine River	NW	Winter
	288	Wismar Bight	MV	Mig.
Bean goose Anser fabalis fabalis / A. f. rossicus	23	Traveförde and Dassower See (lake)	SH	Winter
	27	Lauenburgische Seen Nature Park, with Schaalsee area	SH	Winter
	37	Westrügen-Hiddensee-Zingst	MV	Mig.
	44	Greifswalder Bodden	MV	Winter
	46	Kleines Haff and Achterwasser	MV	Winter
	53	Peenetalmoor and Anklamer Stadtbruch	MV	Mig.
	63	Ems marsh, from Leer to Emden	NI	Mig.
	68	Rheiderland	NI	Mig.
	79	Klein- und Grossringer Wösten	NI	Mig.
	81	Groß Fullener Moor (fen)	NI	Winter
	86	Wesuwer Brook	NI	Winter
	88	Leinetal near Salzderhelden	NI	Mig.
	89	Emstal	NI	Mig.
	101	Dümmer	NI	Mig.
	106	Elbe lowlands, between Schnackenburg and Lauenburg, and incl. Amt Neuhaus	NI	Winter
	107	Elbe marsh, from Stade to Otterndorf	NI	Winter
	112	Gandersum / Lange Maar	NI	Winter
	113	Ems lowlands, near Lathen	NI	Mig.
	120	Steckby-Lödderitzer Forst	ST	Winter
	121	Zerbster Land	ST	Winter
	124	Aland-Elbe lowlands	ST	Winter
	125	Drömling bird sanctuary	ST	Winter
	127	Milde-Niederung	ST	Winter
	128	Elbaue Jerichow	ST	Winter
	130	Wulfener Bruch	ST	Winter
	132	Fiener Bruch	ST, BB	Winter
	132	Fiener Bruch	ST, BB	Mig.
	133	Salziger See	ST	Mig.
	136	Spreewald	BB	Mig.
	137	Havelland between Brandenburg and Potsdam	BB	Mig.
	138	Oberes Rhinluch-Nauener Luch	BB	Mig.
	140	Rietzer See	BB	Mig.
	141	Peitzer Teiche, with the Bärenbrück pond area and Lasszinswiesen	BB	Mig.
	142	Unteres Odertal (lower Oder valley)	BB	Mig.
	143	Schorfheide-Chorin	BB	Mig.

Species	IBA No.	Area	Land	Season
Bean goose Anser fabalis fabalis / A. f. rossicus	145	Unteres Rhinluch-Dreetzer See - Havelländisches Luch - Belziger Landschaftswiesen	BB	Mig.
	148	Märkische Schweiz	BB	Mig.
	149	Unteres Elbtal (lower Elbe valley)	BB	Mig.
	151	Untere Havel - Schollener See - Gülper See	ST, BB	Mig.
	157	Dam on the Weser River, Schlüsselburg	NW	Winter
	160	Lower section of the lower Rhine River	NW	Winter
	181	Rhine meadows in Hesse	HE	Winter
	203	Presseler Heidewald and Moorgebiet (fen area)	SN	Mig.
	204	Ponds and Elbe meadows near Torgau	SN	Winter
	205	Oberlausitz heaths and ponds	SN	Mig.
	218	Hockenheimer Rheinbogen	BW	Winter
	220	Kehl-Helmingen Rhine lowlands	BW	Mig.
	221	Rhine: Greffern-Murgmündung-Neuburgweiher	BW	Winter
	224	Neuenburg-Breisach Rhine lowlands	BW	Mig.
	288	Wismar Bight	MV	Mig.
White-fronted goose Anser albifrons albifrons	23	Traveförde and Dassower See (lake)	SH	Winter
	27	Lauenburgische Seen Nature Park, with Schaalsee area	SH	Winter
	37	Westrügen-Hiddensee-Zingst	MV	Mig.
	44	Greifswalder Bodden	MV	Winter
	46	Kleines Haff and Achterwasser	MV	Winter
	53	Peenetalmoor and Anklamer Stadtbruch	MV	Mig.
	63	Ems marsh, from Leer to Emden	NI	Winter
	64	Terborg	NI	Mig.
	66	Diked areas at the Weser estuary	NI	Mig.
	68	Rheiderland	NI	Mig.
	89	Emstal	NI	Mig.
	90	Jadebusen	NI	Mig.
	106	Elbe lowlands, between Schnackenburg and Lauenburg, and incl. Amt Neuhaus	NI	Winter
	107	Elbe marsh, from Stade to Otterndorf	NI	Winter
	112	Gandersum/Lange Maar	NI	Winter
	121	Zerbster Land	ST	Mig.
	124	Aland-Elbe lowlands	ST	Mig.
	128	Elbaue Jerichow	ST	Mig.
	132	Fiener Bruch	ST, BB	Mig.
	137	Havelland between Brandenburg and Potsdam	BB	Mig.
	138	Oberes Rhinluch-Nauener Luch	BB	Mig.
	140	Rietzer See	BB	Mig.
	141	Peitzer Teiche, with the Bärenbrück pond area and Lasszinswiesen	BB	Mig.
	142	Unteres Odertal (lower Oder valley)	BB	Mig.
	143	Schorfheide-Chorin	BB	Mig.
	145	Unteres Rhinluch-Dreetzer See - Havelländisches Luch - Belziger Landschaftswiesen	BB	Mig.
	148	Märkische Schweiz	BB	Mig.

Species	IBA No.	Area	Land	Season
White-fronted goose	149	Unteres Elbtal (lower Elbe valley)	BB	Mig.
Anser albifrons albifrons	151	Untere Havel - Schollener See - Gülper See	ST, BB	Mig.
	160	Lower section of the lower Rhine River	NW	Winter
	205	Oberlausitz heaths and ponds	SN	Mig.
	288	Wismar Bight	MV	Mig.
Greylag goose	11	Warder See (lake)	SH	Mig.
Anser anser anser	15	Coastal lakes and fish ponds in south-west Fehmarn	SH	Mig.
	25	Pinneberger Elbmarschen (Elbe marshes)	SH	Mig.
	27	Lauenburgische Seen Nature Park, with Schaalsee area	SH	Winter
	37	Westrügen-Hiddensee-Zingst	MV	Mig.
	44	Greifswalder Bodden	MV	Mig.
	96	Krummhörn-Wesermarsch	NI	Mig.
	101	Dümmer	NI	Winter
	107	Elbe marsh, from Stade to Otterndorf	NI	Winter
	140	Rietzer See	BB	Mig.
	142	Unteres Odertal (lower Oder valley)	BB	Mig.
	151	Untere Havel - Schollener See - Gülper See	ST, BB	Mig.
	160	Lower section of the lower Rhine River	NW	Winter
	288	Wismar Bight	MV	Mig.
Barnacle goose	2	Schleswig-Holstein's Wadden Sea area	SH	Winter
Branta leucopsis	2	Schleswig-Holstein's Wadden Sea area	SH	Mig.
	25	Pinneberger Elbmarschen (Elbe marshes)	SH	Mig.
	58	Lower Saxony's Wadden Sea area	NI	Winter
	63	Ems marsh, from Leer to Emden	NI	Mig.
	64	Terborg	NI	Mig.
	68	Rheiderland	NI	Winter
	94	Norden-Esens	NI	Winter
	96	Krummhörn-Westermarsch	NI	Mig.
	107	Elbe marsh, from Stade to Otterndorf	NI	Winter
	112	Gandersum / Lange Maar	NI	Winter
	160	Lower section of the lower Rhine River	NW	Winter
Brent goose	2	Schleswig-Holstein's Wadden Sea area	SH	Winter
Branta bernicla bernicla /	2	Schleswig-Holstein's Wadden Sea area	SH	Mig.
B. b. hrota	3	Halligen Oland, Langeneß, Nordstrandischmoor, Gröde and Hooge	SH	Winter
	107	Elbe marsh, from Stade to Otterndorf	NI	Winter
Common shelduck	2	Schleswig-Holstein's Wadden Sea area	SH	Winter
Tadorna tadorna	2	Schleswig-Holstein's Wadden Sea area	SH	Mig.
	37	Westrügen-Hiddensee-Zingst	MV	Mig.
	58	Lower Saxony's Wadden Sea area	NI	Winter
	107	Elbe marsh, from Stade to Otterndorf	NI	Winter
European wigeon	2	Schleswig-Holsteinisches Wattenmeer	SH	Winter
Anas penelope	2	Schleswig-Holsteinisches Wattenmeer	SH	Mig.
	3	Halligen Oland, Langeneß, Nordstrandischmoor, Gröde and Hooge	SH	Winter
	37	Westrügen-Hiddensee-Zingst	MV	Mig.
	44	Greifswalder Bodden	MV	Mig.
	58	Lower Saxony's Wadden Sea area	NI	Winter
	95	Wittmund-Wangerland	NI	Mig.

Species	IBA No.	Area	Land	Season
European wigeon	142	Unteres Odertal (lower Oder valley)	BB	Mig.
Anas penelope	288	Wismar Bight	MV	Winter
Gadwall	13	Großer and Kleiner Binnensee (lakes)	SH	Winter
Anas strepera strepera	28	Kührener Teich and Lanker See	SH	Yr.-rd.
	29	Wesseker See	SH	Mig.
	30	Selent-Plön fish ponds	SH	Mig.
	37	Westrügen-Hiddensee-Zingst	MV	Yr.-rd.
	44	Greifswalder Bodden	MV	Mig.
	107	Elbe marsh, from Stade to Otterndorf	NI	Yr.-rd.
	220	Kehl-Helmlingen Rhine lowlands	BW	Mig.
	221	Rhine: Greffern-Murgmündung-Neuburgweiher	BW	Winter
	222	Nonnenweiher-Kehl Rhine lowlands	BW	Mig.
	223	Sasbach-Wittenweiher Rhine lowlands	BW	Mig.
	226	Öpfinger Donaustausee, Rißniederung and Rißtissener Kiesseen	BW	Winter
	231	Untersee Lake part of Lake Constance	BW	Mig.
	254	Mittlere Isar-Stauseen bird sanctuary	BY	Winter
	255	Rötelsee pond area, incl. Regen-Aue	BY	Mig.
	257	Ismaning reservoir and fish ponds	BY	Mauser
	263	Chiemsee	BY	Winter
	264	Donau valley: Regensburg-Vilshofen	BY	Yr.-rd.
	271	Lech-Donau-Winkel: Lechstausee Feldheim and Donaustausee Bertholdsheim	BY	Winter
	282	Lower Inn: Haiming-Neuhaus, incl. Neuhaus, Egglfing, Ering and Simbach reservoirs	BY	Winter
	288	Wismarbucht	MV	breed.
Green-winged teal	2	Schleswig-Holstein's Wadden Sea area	SH	Winter
Anas crecca crecca	2	Schleswig-Holstein's Wadden Sea area	SH	Mig.
	36	Mühlenberger Loch	HH	Mig.
	58	Lower Saxony's Wadden Sea area	NI	Mig.
	65	Untere Weser (lower Weser River)	NI	Winter
	107	Elbe marsh, from Stade to Otterndorf	NI	Winter
	122	Helmesstausee Berga-Kelbra	ST, TH	Mig.
	142	Unteres Odertal (lower Oder valley)	BB	Mig.
	231	Untersee Lake part of Lake Constance	BW	Mig.
Mallard Anas platyrhynchos platyrhynchos	2	Schleswig-Holstein's Wadden Sea area	SH	Winter
Northern pintail	2	Schleswig-Holstein's Wadden Sea area	SH	Mig.
Anas acuta	37	Westrügen-Hiddensee-Zingst	MV	Mig.
Northern shoveller	2	Schleswig-Holstein's Wadden Sea area	SH	Winter
Anas clypeata	2	Schleswig-Holstein's Wadden Sea area	SH	Mig.
	13	Großer and Kleiner Binnensee (lakes)	SH	Winter
	29	Wesseker See	SH	Mig.
	36	Mühlenberger Loch	HH	Mig.
	88	Leinetal near Salzderhelden	NI	Winter
	92	Alfsee	NI	Winter
	101	Dümmer	NI	Winter
	107	Elbe marsh, from Stade to Otterndorf	NI	Yr.-rd.

Species	IBA No.	Area	Land	Season
Northern shoveller	115	Borgfelder Wümmewiesen	HB	Mig.
Anas clypeata	122	Helmesstausee Berga-Kelbra	ST, TH	Mig.
	124	Aland-Elbe lowlands	ST	Mig.
	138	Oberes Rhinluch-Nauener Luch	BB	Mig.
	142	Unteres Odertal (lower Oder valley)	BB	Mig.
	151	Untere Havel - Schollener See - Gülper See	ST, BB	Mig.
	160	Lower section of the lower Rhine River	NW	Winter
	162	Rieselfelder Münster	NW	Mig.
	231	Untersee Lake part of Lake Constance	BW	Mig.
	257	Ismaning reservoir and fish ponds	BY	Moult.
	261	Altmühl valley: Ornbau-Gunzenhausen	BY	Mig.
Red-crested pochard	231	Untersee Lake part of Lake Constance	BW	Mig.
Netta rufina	242	Überling Lake part of Lake Constance	BW	Mig.
	257	Ismaning reservoir and fish ponds	BY	Moult.
	257	Ismaning reservoir and fish ponds	BY	Mig.
	262	Ammersee Lake	BY	breed.
	263	Chiemsee Lake	BY	Mig.
	276	Starnberger See	BY	Winter
Common pochard	5	Schlei	SH	Winter
Aythya ferina	13	Großer and Kleiner Binnensee (lakes)	SH	Winter
	23	Traveförde and Dassower See (lake)	SH	Winter
	37	Westrügen-Hiddensee-Zingst	MV	Mig.
	157	dam on the Weser River, Schlüsselburg	NW	Winter
	181	Rhine meadows in Hesse	HE	Mig.
	204	Ponds and Elbe meadows near Torgau	SN	Yr.-rd.
	226	Öpfinger Donaustausee, Rißniederung and Rißtissener Kiesseen	BW	Winter
	227	Obersee: Konstanzer Bucht area and neighbouring Seerhein	BW	Winter
	231	Untersee Lake part of Lake Constance	BW	Mig.
	242	Überling Lake part of Lake Constance	BW	Mig.
	257	Ismaning reservoir and fish ponds	BY	Moult.
	263	Chiemsee	BY	Winter
	266	Donau-Auen: Neu-Ulm Lauingen incl. Faiminger Stausee, Donaumoos and Gundelfinger Moos	BY	Moult.
Ferruginous duck	47	Kuhlrader Moor and Röggeliner See	MV	breed.
Aythya nyroca	186	Rothenbachteich	HE	Mig.
	191	Affoldern dam	HE	Mig.
	192	Mittlere Horloffaue	HE	Mig.
	261	Altmühl valley: Ornbau-Gunzenhausen	BY	Mig.
	277	Main valley: Eltmann-Hassfurt	BY	Winter
	279	Main valley near Schweinfurt	BY	Mig.
	280	Alter und Neuer See bird sanctuary	BY	Mig.
Tufted duck	4	Flensburg inner and outer firth	SH	Winter
Aythya fuligula	5	Schlei	SH	Winter
	6	South shore of Eckernförder Bight	SH	Winter
	9	Selenter See (lake)	SH	Mauser
	10	Großer Plöner See (lake)	SH	Winter
	17	East and south-east coast of Fehmarn: Puttgarden-Burgtiefe	SH	Winter

Species	IBA No.	Area	Land	Season
Tufted duck Aythya fuligula	18	East bay of Fehmarn Sound: Burger Binnensee-Grossenbroder Binnenhafen	SH	Winter
	22	Brodtener Ufer: Niendorf-Travemünde	SH	Winter
	23	Traveförde and Dassower See (lake)	SH	Winter
	27	Lauenburgische Seen Nature Park, with Schaalsee area	SH	Moult.
	37	Westrügen-Hiddensee-Zingst	MV	Winter
	46	Kleines Haff and Achterwasser	MV	Winter
	227	Obersee: Konstanzer Bucht area with neighbouring Seerhein	BW	Winter
	231	Untersee Lake part of Lake Constance	BW	Mig.
	242	Überling Lake part of Lake Constance	BW	Mig.
	262	Ammersee Lake	BY	Winter
	263	Chiemsee Lake	BY	Winter
	286	Sagasbank and east coast of Oldenburg	SH	Winter
	287	East part of Kiel Bight	SH	Winter
	288	Wismar Bight	MV	Winter
Greater scaup Aythya marila marila	4	Flensburg inner and outer firth	SH	Winter
	6	South shore of Eckernförder Bight	SH	Winter
	8	Probstei coast: Laboe Hubertsberg	SH	Winter
	13	Großer and Kleiner Binnensee (lakes)	SH	Winter
	17	East and south-east coast of Fehmarn: Puttgarden-Burgtiefe	SH	Mig.
	18	East bay of Fehmarn Sound: Burger Binnensee-Grossenbroder Binnenhafen	SH	Winter
	21	Neustädter Bucht	SH	Winter
	22	Brodtener Ufer: Niendorf-Travemünde	SH	Winter
	23	Traveförde and Dassower See (lake)	SH	Winter
	44	Greifswalder Bodden	MV	Winter
	46	Kleines Haff and Achterwasser	MV	Winter
	286	Sagasbank and east coast of Oldenburg	SH	Winter
	287	East part of Kiel Bight	SH	Winter
	288	Wismar Bight	MV	Winter
Common eider Somateria mollissima mollissima	2	Schleswig-Holstein's Wadden Sea area	SH	Winter
	2	Schleswig-Holstein's Wadden Sea area	SH	Mig.
	4	Flensburg inner and outer firth	SH	Winter
	6	South shore of Eckernförder Bight	SH	Winter
	7	Stoller Grund, Gabelsflach and Mittelgrund	SH	Winter
	8	Probstei coast: Laboe Hubertsberg	SH	Winter
	17	East and south-east coast of Fehmarn: Puttgarden-Burgtiefe	SH	Mig.
	286	Sagasbank and east coast of Oldenburg	SH	Winter
	287	East part of Kiel Bight	SH	Winter
	288	Wismar Bight	MV	Winter
Long-tailed duck Clangula hyemalis	37	Westrügen-Hiddensee-Zingst	MV	Winter
	39	Darß-Hiddensee sea area and Plantagenetgrund	MV	Mig.
	40	Pomeranian Bight	MV	Zug
Black scoter Melanitta nigra nigra	2	Schleswig-Holstein's Wadden Sea area	SH	Winter
	40	Pomeranian Bight	MV	Mig.

Species	IBA No.	Area	Land	Season
Black scoter	286	Sagasbank and east coast of Oldenburg	SH	Winter
Melanitta nigra nigra	287	East part of Kiel Bight	SH	Winter
		East German Bight		
Velvet scoter	40	Pomeranian Bight	MV	Mig.
Melanitta fusca fusca				
Common goldeneye	5	Schlei	SH	Winter
Bucephala clangula	6	South shore of Eckernförder Bight	SH	Winter
clangula	22	Brodtener Ufer: Niendorf-Travemünde	SH	Winter
	23	Traveförde and Dassower See (lake)	SH	Winter
	37	Westrügen-Hiddensee-Zingst	MV	Winter
	44	Greifswalder Bodden	MV	Winter
	46	Kleines Haff and Achterwasser	MV	Winter
	287	East part of Kiel Bight	SH	Winter
	288	Wismar Bight	MV	Winter
Smew	5	Schlei	SH	Winter
Mergellus albellus	23	Traveförde and Dassower See (lake)	SH	Winter
	37	Westrügen-Hiddensee-Zingst	MV	Winter
	44	Greifswalder Bodden	MV	Winter
	46	Kleines Haff and Achterwasser	MV	Winter
	88	Leinetal near Salzderhelden	NI	Mig.
Red-breasted merganser	40	Pomeranian Bight	MV	Mig.
Mergus serrator serrator	44	Greifswalder Bodden	MV	Winter
Goosander	5	Schlei	SH	Winter
Mergus merganser	23	Traveförde and Dassower See (lake)	SH	Winter
merganser	37	Westrügen-Hiddensee-Zingst	MV	Winter
	44	Greifswalder Bodden	MV	Winter
	46	Kleines Haff and Achterwasser	MV	Winter
	288	Wismar Bight	MV	Winter
Common crane	27	Lauenburgische Seen Nature Park, with Schaalsee area	SH	breed.
Grus grus	37	Westrügen-Hiddensee-Zingst	MV	Mig.
	57	Feldberger-Woldegker Endmoräne	MV	breed.
	67	Landgraben-Dumme-Niederung	NI	breed.
	70	Lucie and Landwehr	NI	breed.
	106	Elbe lowlands, between Schnackenburg and Lauenburg, and incl. Amt Neuhaus	NI	Mig.
	142	Unteres Odertal (lower Oder valley)	BB	breed.
	142	Unteres Odertal (lower Oder valley)	BB	Mig.
	143	Schorfheide-Chorin	BB	breed.
	146	Uckermark lakes area	BB	breed.
	147	Stechlin	BB	breed.
	151	Untere Havel - Schollener See - Gülper See	ST, BB	breed.
	205	Oberlausitz heaths and ponds	SN	breed.
Spotted crake	33	Oldenburger Graben	SH	breed.
Porzana porzana	35	Duvenstedter Brook	HH	breed.
	61	East Barnbruch	NI	breed.
	62	Wendesser Moor (fen) Nature Reserve	NI	breed.
	88	Leinetal near Salzderhelden	NI	breed.
	101	Dümmer	NI	breed.
	107	Elbe marsh, from Stade to Otterndorf	NI	breed.
	118	Niedervieland, Ochtumniederung	HB	breed.

Species	IBA No.	Area	Land	Season
Spotted crake	136	Spreewald	BB	Breed.
Porzana porzana	142	Unteres Odertal (lower Oder valley)	BB	Breed.
	151	Untere Havel - Schollener See - Gülper See	ST, BB	Breed.
	179	North Wetterau	HE	Breed.
	228	Federsee Lake	BW	Breed.
	231	Untersee Lake part of Lake Constance	BW	Breed.
Black coot	22	Brodtener Ufer: Niendorf-Travemünde	SH	Winter
Fulica atra atra	263	Chiemsee Lake	BY	Winter
Pied avocet	2	Schleswig-Holstein's Wadden Sea area	SH	Breed.
Recurvirostra avosetta	2	Schleswig-Holstein's Wadden Sea area	SH	Mig.
	3	Halligen Oland, Langeneß, Nordstrandischmoor, Gröde and Hooge	SH	Breed.
	15	Coastal lakes and fish ponds in south-west Fehmarn	SH	Breed.
	37	Westrügen-Hiddensee-Zingst	MV	Breed.
	38	Islands of Oie and Kirr	MV	Breed.
	58	Lower Saxony's Wadden Sea area	NI	Mig.
	63	Ems marsh, from Leer to Emden	NI	Breed.
	68	Rheiderland	NI	Breed.
	96	Krummhörn-Westermarsch	NI	Breed.
	96	Krummhörn-Westermarsch	NI	Mig.
	107	Elbe marsh, from Stade to Otterndorf	NI	Breed.
	107	Elbe marsh, from Stade to Otterndorf	NI	Winter
	5	Schlei	SH	Breed.
	287	East part of Kiel Bight	SH	Breed.
	288	Wismar Bight	MV	Breed.
European golden plover	2	Schleswig-Holstein's Wadden Sea area	SH	Mig.
Pluvialis apricaria	58	Lower Saxony's Wadden Sea area	NI	Mig.
	68	Rheiderland	NI	Mig.
	76	Dalum-Wietmarscher Moor (fen)	NI	Yr.-rd.
	80	Georgdorfer Moor (fen)	NI	Yr.-rd.
	83	Esterweger Dose	NI	Yr.-rd.
	91	Engerhafer Meede	NI	Mig.
	100	Diepholzer Moorniederung	NI	Yr.-rd.
	107	Elbe marsh, from Stade to Otterndorf	NI	Winter
Grey plover	2	Schleswig-Holstein's Wadden Sea area	SH	Winter
Pluvialis squatarola	2	Schleswig-Holstein's Wadden Sea area	SH	Mig.
	58	Lower Saxony's Wadden Sea area	NI	Mig.
Ringed plover	2	Schleswig-Holstein's Wadden Sea area	SH	Mig.
Charadrius hiaticula hiaticula / C. h. tundrae	58	Lower Saxony's Wadden Sea area	NI	Mig.
Kentish plover	2	Schleswig-Holstein's Wadden Sea area	SH	Breed.
Charadrius alexandrinus alexandrinus	2	Schleswig-Holstein's Wadden Sea area	SH	Mig.
Northern lapwing Vanellus vanellus	160	Lower section of the lower Rhine River	NW	Winter
Common snipe Gallinago gallinago gallinago	166	Oppenweher Moor (fen)	NW	Breed.
Black-tailed godwit	24	Eider-Treene-Sorge lowlands	SH	Breed.
Limosa limosa limosa	63	Ems marsh, from Leer to Emden	NI	Breed.

Species	IBA No.	Area	Land	Season
Black-tailed godwit	65	Untere Weser (lower Weser River)	NI	Breed.
Limosa limosa limosa	68	Rheiderland	NI	Breed.
	77	Aper Tief	NI	Breed.
	78	Alte Piccardie	NI	Breed.
	82	Leg, Melm and Kuhdam fens	NI	Breed.
	84	Leda-Jümme lowlands	NI	Breed.
	87	Südradde Niederung (lowlands)	NI	Breed.
	101	Dümmer	NI	Breed.
	104	East Frisian sea areas	NI	Breed.
	107	Elbe marsh, from Stade to Otterndorf	NI	Breed.
	108	Fehntjer Tief	NI	Breed.
	116	Blockland - Untere Wümme - Westliches Hollerland	HB	Breed.
	155	Fens and heaths of West Münsterland West Münsterland	NW	Mig.
	160	Lower section of the lower Rhine River	NW	Breed.
Bar-tailed godwit	2	Schleswig-Holstein's Wadden Sea area	SH	Winter
Limosa lapponica	2	Schleswig-Holstein's Wadden Sea area	SH	Mig.
lapponica	3	Halligen Oland, Langeneß, Nordstrandischmoor, Gröde and Hooge	SH	Winter
	58	Lower Saxony's Wadden Sea area	NI	Mig.
	96	Krummhörn-Westermarsch	NI	Mig.
Western curlew	2	Schleswig-Holstein's Wadden Sea area	SH	Winter
Numenius arquata	2	Schleswig-Holstein's Wadden Sea area	SH	Mig.
arquata	58	Lower Saxony's Wadden Sea area	NI	Winter
	63	Ems marsh, from Leer to Emden	NI	Winter
	68	Rheiderland	NI	Winter
	90	Jadebusen	NI	Winter
	93	Butjadingen	NI	Winter
	94	Norden-Esens	NI	Winter
	95	Wittmund-Wangerland	NI	Mig.
	96	Krummhörn-Westermarsch	NI	Mig.
	106	Elbe lowlands, between Schnackenburg and Lauenburg, and incl. Amt Neuhaus	NI	Winter
	160	Lower section of the lower Rhine River	NW	Winter
Spotted redshank	2	Schleswig-Holstein's Wadden Sea area	SH	Mig.
Tringa erythropus	58	Lower Saxony's Wadden Sea area	NI	Mig.
	107	Elbe marsh, from Stade to Otterndorf	NI	Winter
Common redshank	2	Schleswig-Holstein's Wadden Sea area	SH	Yr.-rd.
Tringa totanus totanus /	37	Westrügen-Hiddensee-Zingst	MV	Breed.
T. t. robusta	58	Lower Saxony's Wadden Sea area	NI	Winter
	63	Ems marsh, from Leer to Emden	NI	Yr.-rd.
	68	Rheiderland	NI	Yr.-rd.
	107	Elbe marsh, from Stade to Otterndorf	NI	Yr.-rd.
Common greenshank	2	Schleswig-Holstein's Wadden Sea area	SH	Mig.
Tringa nebularia	58	Lower Saxony's Wadden Sea area	NI	Mig.
Ruddy turnstone	2	Schleswig-Holstein's Wadden Sea area	SH	Winter
Arenaria interpres	2	Schleswig-Holstein's Wadden Sea area	SH	Mig.
interpres	58	Lower Saxony's Wadden Sea area	NI	Mig.

Species	IBA No.	Area	Land	Season
Red knot	2	Schleswig-Holstein's Wadden Sea area	SH	Winter
Calidris canutus canutus /	2	Schleswig-Holstein's Wadden Sea area	SH	Mig.
C. c. islandica	58	Lower Saxony's Wadden Sea area	NI	Mig.
Sanderling	2	Schleswig-Holstein's Wadden Sea area	SH	Mig.
Calidris alba				
Dunlin	2	Schleswig-Holstein's Wadden Sea area	SH	Winter
Calidris alpina alpina /	2	Schleswig-Holstein's Wadden Sea area	SH	Mig.
C. a. schinzii	58	Lower Saxony's Wadden Sea area	NI	Mig.
Curlew sandpiper	2	Schleswig-Holstein's Wadden Sea area	SH	Mig.
Calidris ferruginea				
Mediterranean gull	288	Wismar Bight	MV	Breed.
Larus melanocephalus				
Gull-billed tern	2	Schleswig-Holstein's Wadden Sea area	SH	Breed.
Sterna nilotica nilotica	107	Elbe marsh, from Stade to Otterndorf	NI	Breed.
Caspian tern	37	Westrügen-Hiddensee-Zingst	MV	Mig.
Sterna caspia caspia				
Sandwich tern	2	Schleswig-Holstein's Wadden Sea area	SH	Breed.
Sterna sandvicensis	2	Schleswig-Holstein's Wadden Sea area	SH	Mig.
sandvicensis	37	Westrügen-Hiddensee-Zingst	MV	Breed.
	38	Islands of Oie and Kirr	MV	Breed.
	288	Wismar Bight	MV	Breed.
	A5	East German Bight		
Common tern	2	Schleswig-Holstein's Wadden Sea area	SH	Breed.
Sterna hirundo hirundo	2	Schleswig-Holstein's Wadden Sea area	SH	Mig.
	37	Westrügen-Hiddensee-Zingst	MV	Breed.
Actic tern	2	Schleswig-Holstein's Wadden Sea area	SH	Breed.
Sterna paradisaea	288	Wismar Bight	MV	Breed.
Little tern	2	Schleswig-Holstein's Wadden Sea area	SH	Breed.
Sterna albifrons albifrons	2	Schleswig-Holstein's Wadden Sea area	SH	Mig.
	3	Halligen Oland, Langeneß, Nordstrandischmoor, Gröde and Hooge	SH	Breed.
	5	Schlei	SH	Breed.
	6	South shore of Eckernförder Bight	SH	Breed.
	8	Probstei coast: Laboe Hubertsberg	SH	Breed.
	37	Westrügen-Hiddensee-Zingst	MV	Breed.
	44	Greifswalder Bodden	MV	Breed.
	286	Sagasbank and east coast of Oldenburg	SH	Winter
	287	East part of Kiel Bight	SH	Breed.
	288	Wismar Bight	MV	Breed.
Back tern	45	Gothensee and Thurbruch, islands of Böhmke and Werder	MV	Breed.
Chlidonias niger niger	101	Dümmer	NI	Breed.
	129	Saale-Elster-Aue (meadow)	ST	Breed.
	142	Unteres Odertal (lower Oder valley)	BB	Breed.
	143	Schorfheide-Chorin	BB	Breed.
	144	Deichvorland Oderbruch	BB	Breed.
	151	Untere Havel - Schollener See Gülper See	ST, BB	Breed.
	152	Bänke an der Müggelspree	BE	Breed.

2.3.3.2 Site protection

Re 3.3: Describe the legal frameworks and other measures through which sites (including transfrontier sites) including sites of international importance gain practical protection. (Please append a list of internationally important protected sites.)

In the Federal Republic of Germany, protection of sites is governed by the Federal Nature Conservation Act. The fourth section of this act defines a total of six options for protecting sites that are also important within the meaning of AEWA (3.2.2 in the action plan). The following article provides an overview of the various protection categories. It also presents examples of implementation of protection for sites of international importance with regard to bird migration (see also Chapter 1.2.3).

One important instrument for protecting sites is the **"nature reserve"** (Naturschutzgebiet). Nature reserves, pursuant to Art. 23 Federal Nature Conservation Act, are protected sites established by law to provide special protection for nature and landscapes. In general, areas are set-aside as nature reserves in order to protect their communities and biotopes of wild plants and animals and their areas of special scientific, natural-historical or cultural-historical value. Other criteria for nature-reserve status include rareness (of species), special area characteristics and unusual area beauty.

In nature reserves, all actions are prohibited that could destroy, damage or change the relevant areas. Nature reserves are the most strictly and most comprehensively protected sites under German nature conservation law, since their status makes it possible to enact ordinances that prohibit any and all changes in them.

Nature reserves are usually set aside on a Länder level – usually by the relevant higher or supreme nature conservation authority – via ordinance. An ordinance for set-aside of a nature reserve describes

- the area to be protected,
- the purpose of the protection,
- relevant prohibitions,
- permitted actions,
- management and care measures and
- exemptions and administrative offences.

Depending on the state (Land) nature conservation act in question, ordinances can also be enacted to prohibit actions outside a nature reserve that could endanger the reserve.

When a site is acutely threatened, it can be temporarily set-aside, prior to its actual formal designation as a nature reserve, for a period of two to five years. During this period, no changes are permitted, and nature conservation authorities receive a preemptive right of purchase in any sales of land within the planned nature reserve. Temporary set-asides played an important role in the new German Länder after 1991, when they were used to prevent sites from being destroyed as the infrastructure was rapidly being expanded.

In 1999, Germany had a total of 6,202 nature reserves, taking up a total area of 2.3% of the country's territory. In addition, 579 sites were being formally processed for designation as nature reserves (were already temporarily set-aside); these areas accounted for 0.49% of Germany's area (BUNDESAMT FÜR NATURSCHUTZ (GERMAN FEDERAL AGENCY FOR NATURE CONSERVATION) 1999b).

Large sites that have special, unique characteristics, and that largely meet criteria for nature reserves, can be declared national parks pursuant to Art. 24 Federal Nature Conservation Act. National parks are protected sites, established by law, that receive uniform levels of protection (in zones; see below). At the time it is set aside, a national park must be free, or nearly free, of human impacts, or it must be capable of being developed into a condition in which natural processes can take place undisturbed, with their natural dynamics, throughout most of the park's area.

The first German national park was the Bayerischer Wald (Bavarian Forest) park. It was set aside in 1970. Today, Germany has 13 national parks, as shown in Tab. 1.

Except for the Bayerischer Wald, Berchtesgaden and Jasmund national parks, German national parks, so DAHL et al. (2000), are referred to as "target national parks" (Ziel-Nationalparke). This means that they only partly fulfil criteria for undisturbed natural development and that they have management plans that set forth when the most important aims are to be attained. The IUCN mandates that 75% of a national park's total area must be in a largely semi-natural condition, and must not be subject to any uses, if it is to be internationally recognised in IUCN's category II.
In Germany, set-asides are carried out in Germany by the Länder, in consultation with the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) and the Ministry of Transport, Building and Housing (BMVBW), via the passage of a national park act.

National parks are normally divided into three zones:

- in the **core zone** (zone I), all uses are prohibited – i.e. this zone is given over to natural succession;
- the **development zone** (zone IIa) is to develop into a core zone in the course of time, i.e. initial relevant measures may be carried out in it;
- in the **management zone** (zone IIb), biotope management is permitted for reasons of species and biotope protection; and
- the **recreational zone** (zone III) contains settlements and areas heavily frequented by tourists.

Zoning for each national park is defined by the relevant national -park act. Zone III is not necessarily required – for example, it is not included in the Unteres Odertal National Park.

Sites are protected as biosphere reserves, pursuant to Art. 25 Federal Nature Conservation Act, if they are large, characteristic of certain landscape types and meet criteria, throughout much of their area, for nature reserves and landscape reserve (see below). Biosphere reserves have the purpose of conserving, developing or restoring landscapes shaped by particular types of uses, along with the landscapes' diversity of species and biotopes. Such diversity includes both the wild and cultivated forms of economically used or useful plants and animals.

Tab. 2.3.3.2-1: National parks in Germany (pursuant to GERMAN FEDERAL AGENCY FOR NATURE CONSERVATION 1999b). For abbreviations see Tab. 2.

National park (Land)	Year founded	Total area [ha]	Priority habitats protected	Importance for waterbirds
Bayerischer Wald (BY)	1970	24,250	Mixed mountain forests, mixed subalpine forests, fens, scrub heaths	–
Berchtesgaden (BY)	1978	20,776	Alpine rock communities, alpine meadows, brush, subal-pine, montaneous and submontaneous forests, pastures and lakes	–
Schleswig-Holsteinisches Wattenmeer (SH)	1985	441,500 (including water area)	Wadden Sea, salt marshes, polders; not including islands and inhabited Hallig islands	IBA for many wading birds and waterfowl
Niedersächsisches Wattenmeer (NI)	1986	280,000 (including water area)	Wadden Sea, salt marshes, polders, East Friesian islands	IBA for many wading birds and waterfowl
Hamburgisches Wattenmeer (HH)	1990	13,750 (including water area)	Wadden Sea in the Elbe estuary, with strong tidal and brackish-water impacts	in part, IBA for many wading birds and waterfowl
Jasmund (MV)	1990	3,003 (including water area)	arious beech forests on calcareous soils, chalk cliff coastline	–
Hochharz (ST)	1990	5,868	Subalpine spruce forests, fens, heaths, block fields and rock formations	–
Sächsische Schweiz (SN)	1990	9,300	Forest-rock complexes, warm and dry forests, forests in chasms and on steep slopes, submontaneous forests	Breeding area for the black stork
Müritz (MV)	1990	31,878	Beech forests, fen forests, pine forests, lakes and wetlands	IBA for waterbirds
Vorpommersche Boddenlandschaft (MV)	1990	80,500 (including water area)	Boddens (flat bays), various coastal formations and forests	in part, IBA for many wading birds and waterfowl; in part, IBA for long-tailed duck
Harz (NI)	1994	15,800	High-montaneous spruce forests, beech forests, fens, watercourse	–
Unteres Odertal (BB)	1995	10,500	Riparian meadow landscape, oxbows and meanders, reedbeds and rushes, grassland, flood plains	IBA for many wading birds and waterfowl
Hainich (TH)	1997	7,600	Deciduous and beech forests on calcareous rock, in various stages of succession	–

Biosphere reserves are large, representative sections of nature and landscapes that should serve as models. They should be showcases for exemplary concepts, put into action, for protecting, managing and developing landscapes – also in the context of relationships between people and the environment.

They are divided into three zones – known as core area, buffer zone and transition area. Each zone is defined in terms of the anthropogenic influence it is subject to.

- The **core area**, which must take up at least 3% of the biosphere reserve's area, must be protected as a national park or nature reserve. In the core area of a biosphere reserve, uses are prohibited, as they are in the core zone of a national park.

- The **buffer zone**, which should also be set aside as a national park or nature reserve, is used for conserving and caring for ecosystems that have arisen through human uses and harbour rare plants and animals. Together, the core area and buffer zone should make up at least 20% of the biosphere reserve's area.

- The **transition area** is an area in which the local population live, work and engage in recreation. In comparison with the other two types of zones, the transition area takes up the largest area.

The biosphere reserve protection category was not added to the Federal Nature Conservation Act until 1998. On the international level, UNESCO has recognised biosphere reserves since 1970, in the framework of its "Man and the Biosphere" (MAB) programme. The 13 biosphere reserves recognised in Germany to date are shown in Tab. 2.

Another option in site protection is the **"landscape reserve"**. Unlike nature reserves, landscape reserves, pursuant to Art. 26 Federal Nature Conservation Act, serve to preserve or restore the vitality of the balance of nature, or to preserve or restore the usability of natural resources. Landscape reserves are also set aside on the basis of their diversity, unique characteristics or landscape beauty, as well as their importance in recreation. The Federal Nature Conservation Act prohibits all actions in landscape reserves that could impair or destroy the reserves.

While all changes in nature reserves are prohibited, prohibitions applying to landscape reserves are individually established in the relevant ordinances. In each case, actions not mentioned in the ordinance are considered permissible. When construction or development is planned within the protected area, the ordinance must be suspended, however. Species and biotope protection does not play a primary role in landscape reserves. As described above, landscape reserves can serve as transition areas in biosphere reserves.

As of 1999, a total of 6,200 landscape reserves had been designated in the Federal Republic of Germany. They take up some 25 % of Germany's area (BUNDESAMT FÜR NATURSCHUTZ (GERMAN FEDERAL AGENCY FOR NATURE CONSERVATION) 1999b).

Another category of large protected areas, in addition to national parks and biosphere reserves, is the "nature park". Nature parks, pursuant to Art. 27 Federal Nature Conservation Act, are large sites that are made up largely of areas with landscape-reserve or nature-reserve status, and that have landscape assets that make them particularly suitable for recreation. Areas are set aside as nature parks in order to protect large, semi-natural cultural landscapes and to preserve the relevant sites' unique character and beauty. They serve as regional tourist attractions, and they provide recreational space for city-dwellers.

In western Germany, the nature park has been in existence as a legal instrument since 1956. After German reunification, the new Länder also began designating nature parks. Germany's nature parks can be divided into "old-type" and "new-type" nature parks. Whereas in western Germany nature parks are maintained by sponsors, associations, interest groups or municipal administrations, nature parks in the new Länder tend to be state-supported and to function like biosphere reserves in terms of their protection aims. The Länder Mecklenburg-West Pomerania and Brandenburg have state institutes that co-ordinate tasks in large protected areas.

Tab. 2.3.3.2-2: German biosphere reserves recognised to date by UNESCO (from: BUNDESAMT FÜR NATURSCHUTZ (GERMAN FEDERAL AGENCY FOR NATURE CONSERVATION) 1999b and EUROPARC 2001). Abbreviations: BB = Brandenburg, BE = Berlin, BW = Baden-Württemberg, BY = Bavaria, HE = Hesse, MV = Mecklenburg-West Pomerania, NI = Lower Saxony, NW = North Rhine-Westphalia, RP = Rhineland-Palatinate, SH = Schleswig- Holstein, SL = Saarland, SN = Saxony, ST = Saxony-Anhalt, TH = Thuringia.

Biosphere reserve (Land)	Since	Area [ha]	Description	Importance for waterbirds	Designated by
Flusslandschaft Elbe (BB, MV, NI, SH, ST)	1997	375,000	Unique large semi-natural riparian-forest complexes (hardwood forests) along the Elbe River, with fen forests, semi-natural deciduous forests, wet meadows, pond landscapes, oxbows, breeding and resting sites for numerous waterbirds	Several IBAs for numerous wading birds and waterbirds	UNESCO
Pfälzerwald (RP)	1992	179,800	Deciduous-forest area with species-rich valley meadows, fen forests, wet meadows, fens and transition mires, springs	–	UNESCO

Continuation →

Biosphere reserve (Land)	Since	Area [ha]	Description	Importance for waterbirds	Designa-ted by
Rhön (BY, HE, TH)	1991	184,939	Large, semi-natural deci-duous forests on limestone and basalt, chasm and scree forests, large grazed semi-dry grassland com-munities, semi-natural upland streams and their meadows	IBA for black stork	TH: UNESCO/ BNatSchG, BY / HE: UNESCO
Schorfheide-Chorin (BB)	1990	129,161	Glacially formed landscape (ground and end morai-nes, outwash plains) with bogs, oligo-trophic lakes and old grazed forests and beech forests	IBA for wading birds and water-birds	BNatSchG
Spreewald (BB)	1991	47,492	Large lowland area, with semi-natural alder fen-forest complexes, extensive wet meadows, and a black-stork population	IBA for white stork, bean goose and spotted crake	BNatSchG
Südost-Rügen (MV)	1991	23,500	Extensively cultivated, richly structured and diverse cultural landscape with large, extensive sheep droves on moraine cores, bodden landscape and old deciduous forests	Part of the Greifswalder Bodden IBA; resting area for waterbirds	BNatSchG
Vessertal-Thüringer Wald (TH)	1979	17,242	Extensive mountain mea-dows, remains of semi-natural mixed mountain forests with firs at the nor-thern limit of their natural range, silicate block fields, rocks, raised bogs and semi-natural watercourses	IBA for black stork	UNESCO / BNatSchG
Oberlausitzer Heide- und Teichlandschaft (SN)	1996	30,102	Lake-rich, oligotrophic heath landscapes with mires	IBA for Eurasi-an bittern, bean goose, white-fronted goose and common crane	UNESCO
Berchtesgaden (BY)	1990	46,742	Typical landscape of the northern calcareous Alps, with mixed mountain forests and montaneous spruce-forest complexes; includes the Berchtesgaden National Park as its core area and buffer zone	–	UNESCO

Biosphere reserve (Land)	Since	Area [ha]	Description	Importance for waterbirds	Designated by
Niedersächsisches Wattenmeer (NI)	1992	240,000	Diverse habitats: permanently running rivulets and channels, salt marshes of forelands in front of dikes, diverse islands, breeding, rearing and resting areas for many bird species, seal habitat, identical area as national park of the same name	IBA for numerous wading birds and waterbirds	UNESCO
Schleswig-Holsteinisches Wattenmeer (SH)	1990	441,000	Important resting area for wading birds (up to 1.3 million birds, of over 30 species), dunlin, western curlew, pied avocet, oystercatcher; central landscape element: Hallig islands and semi-natural salt marshes; common saltmarsh grass, sea lavender, over 2,000 species, including ende-mic species, largest protected area in Germany, identical area as national park of the same name	IBA for numerous wading birds and waterbirds	UNESCO
Hamburgisches Wattenmeer (HH)	1992	11,700	Large populations of fish and waterbirds, supported by natural nutrient influx into the Elbe estuary; each year, up to 10,000 breeding pairs of various, endangered tern species on Scharhörn dune island; numerous fens, semi-natural watercourses, identical areas as national park of the same name	In part, IBA for numerous wading birds and waterbirds	UNESCO
Bayerischer Wald (BY)	1981	24,250	Numerous fens, semi-natural watercourses, natural block and scree fields, identical areas as national park of the same name	-	UNESCO

Tab. 2.3.3.2-3: Overview of nature parks established to date in Germany (from VERBAND DEUTSCHER NATURPARKE E.V. 2001). (for abbreviations, see Tab. 2)

Name (Land)	Area [ha]
Altmühltal (Südl. Frankenalb) (BY)	296,240
Arnsberger Wald (NW)	48,200
Augsburg - Westliche Wälder (BY)	117,500
Aukrug (SH)	38,400
Barnim (BB/ BE)	79,000
Bayerische Rhön (BY)	124,500
Bayerischer Spessart (BY)	171,000
Bayerischer Wald (BY)	302,000
Bergisches Land (NW)	191,000
Bergstraße-Odenwald (HE/ BY)	162,850
Colbitz-Letzlinger Heide (ST)	48,000
Dahme-Heideseen (BB)	59,375
Diemelsee (HE/ NW)	33,421
Drömling (ST)	27,821
Dübener Heide (ST/ SN)	90,000
Dümmer (NI/ NW)	47,210
Ebbegebirge (NW)	77,736
Eggegebirge und südlicher Teutoburger Wald (NW)	68,000
Eichsfeld-Hainich-Werratal (TH)	87,000
Elbufer-Drawehn (NI)	75,000
Elm-Lappwald (NI)	47,000
Erzgebirge/ Vogtland (SN)	149,500
Feldberger Seenlandschaft (MV)	36,000
Fichtelgebirge (BY)	102,800
Frankenhöhe (BY)	110,450
Frankenwald (BY)	102,250
Fränkische Schweiz – Veldensteiner Forst (BY)	230,970
Habichtswald (HE)	47,428
Harz (NI)	79,000
Harz (ST)	-
Haßberge (BY)	80,400
Hessische Rhön (HE)	70,000
Hessischer Spessart (HE)	73,000
Hochtaunus (HE)	120,000
Hohe Mark (NW)	104,087
Hoher Fläming (BB)	82,731
Hoher Vogelsberg (HE)	38,447
Hohes Venn-Eifel (Deutsch-Belgischer Naturpark) (NW, RP, Ostbelgien)	175,116
Holsteinische Schweiz (SH)	63,300
Homert (NW)	55,000
Hüttener Berge (SH)	21,900
Insel Usedom (MV)	63,000
Kellerwald-Edersee (HE)	40,600
Kottenforst-Ville (NW)	88,000
Kyffhäuser (TH)	23,000
Lauenburgische Seen (SH)	47,400
Lüneburger Heide (NI)	23,440
Mecklenburgische Schweiz und Kummerower See (MV)	67,350
Mecklenburgisches Elbetal (MV)	42,600
Meißner-Kaufunger Wald (HE)	42,058
Münden (NI)	38,000
Märkische Schweiz (BB)	20,500
Nassau (RP)	59,000
Neckartal – Odenwald (BW)	130,000
Niederlausitzer Heidelandschaft (BB)	49,000
Niederlausitzer Landrücken (BB)	58,200
Nossentiner / Schwinzer Heide (MV)	36,500
Nuthe-Nieplitz (BB)	62,300
Nördlicher Oberpfälzer Wald (BY)	64,110
Nördlicher Teutoburger Wald –Wiehengebirge (NI/ NW)	122,000
Obere Donau (BW)	85,710
Oberer Bayerischer Wald (BY)	173,800
Oberpfälzer Wald (BY)	81,700
Pfälzerwald (RP)	179,800
Rhein-Taunus (HE)	80,789
Rhein-Westerwald (RP)	44,600
Rothaargebirge (NW)	135,500
Saale-Unstrut-Triasland (ST)	71,167
Saar-Hunsrück (RP/ SL)	195,069
Schlaubetal (BB)	22,700
Schwalm-Nette (NW)	43,500
Schwarzwald Mitte / Nord (BW)	360,000
Schwäbisch-Fränkischer Wald (BW)	90,400
Schönbuch (BW)	15,564
Siebengebirge (NW)	4,800
Solling-Vogler (NI)	53,000
Stechlin-Ruppiner Land (BB)	80,000
Steigerwald (BY)	128,000
Steinhuder Meer (NI)	31,000
Steinwald (BY)	24,645
Stromberg-Heuchelberg (BW)	32,830
Südeifel (RP)	43,210
Südheide (NI)	50,000
Südschwarzwald (BW)	333,000
Thüringer Schiefergebirge / Obere Saale (TH)	80,000
Thüringer Wald (TH)	220,000
Uckermärkische Seen (BB)	89,000
Unteres Saaletal (ST)	
Weserbergland, Schaumburg-Hameln (NI)	112,500
Westensee (SH)	25,000
Westhavelland (BB)	136,596
Wildeshauser Geest (NI)	155,400

The nature parks set aside in Germany to date take up an area of about 19 % of the country's total surface area. Tab. 3 provides an overview of nature parks established in Germany to date.

Art. 28 of the Federal Nature Conservation Act provides another instrument for site protection – one that is of little importance with regard to waterbirds, however. So-called **"natural monuments"** tend to be small – only in certain cases do they reach sizeable areas of up to 3-5 ha. Natural monuments can consist of springs, kettles and other small wet biotopes, as well as groups of trees or even individual trees. Under natural monument status, all changes are prohibited.

Art. 30 of the Federal Nature Conservation Act provides another instrument for biotope protection. The biotopes listed in this paragraph are protected by virtue of their being listed, without further designation as protected areas. The important protected biotopes with regard to protection of AEWA species include:

- moorlands, swamps, reeds, wet meadows covered with sedges and rushes, headwater regions, natural undeveloped sections of brooks and rivers, terrestrialisation zones of standing waters,
- fen forests, marshy and riparian forests and
- rocky and steep coastlines, beach embankments and dunes, salt marshes and Wadden Sea areas in coastal regions.

In their own state (Land) nature conservation acts, the Länder may specify additional biotopes that are to be protected.

All measures that can impair or destroy protected biotopes are prohibited. Additional protection for the aforementioned biotopes – for example, via set-aside as a nature reserve – is not necessary (general protection for the biotopes).

The Länder prepare maps of the protected biotopes in their territories and use these maps to prepare biotope cadastres.

Arts. 32 ff. of the Federal Nature Conservation Act transpose the Fauna, Flora and Habitats Directive (92/43/EEC) and the European Bird Directive (79/409/EEC) with regard to establishment of the "Natura 2000" network of protected areas in the European Union.

Pursuant to Art. 32 (2) Federal Nature Conservation Act, sites included in the list of sites of Community importance are designated as protected natural and landscape sites in keeping with the relevant conservation aims.

As of 1999, a total of 554 EC special protection areas for birds, taking up 2.4% of Germany's area, had been reported to the European Union.

Under one of the aims included in the Federal Nature Conservation Act, the Länder are obligated to create a network of connected biotopes (**biotope network**) covering at least 10% of the country's area. Overall, the biotope network is to function on a trans-Länder level; the Länder co-ordinate among themselves for this purpose. The purpose of the biotope network is to provide lasting protection for native plants and animals and their populations, including their habitats and communities, and to preserve, restore and develop viable ecological interrelationships.

The biotope network consists of core areas, connecting areas and connecting elements. The elements of the biotope network include:

1. established national parks,

2. biotopes legally protected within the framework of Art. 30,

3. nature reserves, sites within the meaning of Art. 32 and biosphere reserves or parts of such sites,

4. other areas and elements, including parts of landscape reserves and nature parks, if they can contribute to the achievement of the objective mentioned in paragraph 2.

(The required core areas, connecting areas and connecting elements must be legally secured, in order to protect the biotope network in the long term, via set-asides of suitable sites within the meaning of Art. 22 (1), and through planning-law provisions, long-term agreements (contractual nature conservation) or other suitable measures.)

Apart from these protection categories, which build on the Federal Nature Conservation Act – which serves as a framework act – the Länder also have the option of issuing, in their own state (Land) nature conservation acts, more extensive provisions for site protection. On the one hand, this option is oriented to the protection categories listed in the Federal Nature Conservation Act – for example, set-aside of additional protected biotopes. On the other hand, the Länder may temporarily place natural areas and landscapes under protection in order to protect nesting sites or habitats of endangered animal species. Art. 25 of Schleswig-Holstein's state (Land) nature conservation act provides this option, for example. In addition, Art. 34 of Schleswig-Holstein's nature conservation act makes it possible to close sections of beaches for reasons of nature conservation and species protection.

The two aforementioned paragraphs are used annually as a basis for protecting the largest colony of little terns on the German Baltic Sea coast, near Grömitz, from disturbances caused by beach-goers (see Chap. 1.3.1).

PROTECTION-SITE CATEGORIES, BASED ON INTERNATIONAL CONVENTIONS / AGREEMENTS, THAT HAVE NOT BEEN TRANSPOSED INTO GERMAN LAW. The Convention on Wetlands of International Importance especially as Waterfowl Habitat was signed in 1971, in the Iranian city of **Ramsar**. The parties to the "Ramsar Convention" each obligated themselves to designate at least one area, within their own boundaries, that would be protected, via biotope management and balance of uses, with regard to conservation and promotion of a favourable ecological status. In Germany, set-aside of such wetlands of international importance does not confer legally enshrined protection at the national level.

The wetlands of international importance that have been designated in Germany to date were selected in accordance with quantitative criteria. Characteristically, they

- regularly harbour 20,000 waterbirds and wading birds or

- harbour 1% of the individuals of a population, a species or a sub-species of waterbird or wading bird.

About 40% of the total area of all wetlands of international importance lie within nature reserves or national parks.

The Ramsar sites established to date in Germany are listed in Tab. 5. A further area, located in Saxony-Anhalt – the Aland-Elbe-Niederung (lowlands) and the Elbaue (riparian meadow along the Elbe River), near Jerichow – is now undergoing the registration process (Saxony-Anhalt State Ministry for Regional Planning, Agriculture and the Environment, in lit. 2001).

The total area of all Ramsar sites is 671,204 ha, or about 1.9 % of the area of the Federal Republic of Germany.

In 1994, the international protected-site system received an additional protection category. Within the framework of the Helsinki Convention (Helcom, Art. 15 in conjunction with recommendation 15/5), the environment ministers of countries bordering on the Baltic Sea agreed to establish so-called **"Baltic Sea Protected Areas (BSPA)"** in the Baltic region. The BSPA instrument can be used to protect important Baltic Sea areas (for example, on the open sea) as well as inner coastal waters of the Baltic Sea. Since the German parts of the Baltic Sea contain important habitats of AEWA populations (LUTZ 2000), use should be made of this instrument. If protection is to be effective, the relevant sites must be protected via national law – for example, by designating them as nature reserves. Tab. 6 provides an overview of sites reported to HELCOM to date.

Tab. 2.3.3.2-5: Overview of Ramsar sites established in Germany to date (pursuant to BUNDESAMT FÜR NATURSCHUTZ 1999b). For abbreviations, see Tab. 2.

Area name (Land)	Regis–tration	Typical habitats	Most common guest-bird species (numbers of individuals)	Area [ha]
Wattenmeer, Elbe-Weser-Dreieck (NI)	26.02.76			38,460
Wattenmeer, Jadebusen und westliche Weser-mündung (NI)	26.02.76	Mud and sand flats, coastal dunes, salt marshes	oystercatcher (66,100) dunlin (48,500) common shelduck (31,500)	49,490
Wattenmeer, Ostfrie-sisches Wattenmeer mit Dollart (NI)	26.02.76			121,620
Niederelbe zwischen Barnkrug und Otterndorf (NI)	26.02.76	Mud flats, grassland, cultivated land in the Elbe estuary area	northern lapwing (35,000) barnacle goose (31,600) Eu. golden plover (20,000)	11,760
Elbaue zwischen Schnakenburg und Lauenburg (NI)	26.02.76	Flood plain for the middle Elbe, grassland, remains of riparian forest	bean goose (48,000) white-fronted goose (35,000) mallard (6,500)	7,560

Continuation →

Area name (Land)	Regis–tration	Typical habitats	Most common guest-bird species (numbers of individuals)	Area [ha]
Dümmer (NI)	26.02.76	Shallow, highly eutrophic lake with surrounding grassland	mallard (30,000) northern lapwing (21,500) bean goose (3,700)	3,600
Diepholzer Moorniederung (NI)	26.02.76	Raised bog, grassland	Breeding site for a sub-species of the Eu. golden plover	15,060
Steinhuder Meer (NI)	26.02.76	Groundwater-fed lake with terrestrialisation zones and surrounding grassland	mallard (10,700) northern lapwing (5,000) goosander (2,800)	5,730
Unterer Niederrhein (NW)	28.10.83	River lowlands, oxbows, gravel-bed watercourse, grassland, farmland	white-fronted goose (150,000) northern lapwing (100,000) mallard (15,000)	25,000
Rieselfelder Münster (NW)	28.10.83	Wastewater treatment ponds, shallow water body with mud banks and terrestrialisation zones	black-headed gull (10,000) northern lapwing (4,500) green-winged teal (2,500)	233
Weserstaustufe Schlüsselburg (NW)	28.10.83	Dammed river section, grassland, farmland	northern lapwing (15,000) mallard (10,000) common pochard (4,600)	1,600
Rhein zwischen Eltville und Bingen (HE/ RP)	26.02.76	Central section of the Rhine River, with islands and bank sections, remains of riparian forest, shallow-water zones	common pochard (7,930) mallard (3,155) black coot (2,417)	475
Bodensee: Wollmatinger Ried – Giehrenmoos (BW)	26.02.76	Extensive reedbeds with fronting shallow-water zones, wet meadows	tufted duck (14,134) common pochard (13,784) black coot (12,579)	767
Bodensee: Mindelsee bei Radolfzell (BW)	26.02.76	Alpine forelands, reeds, wet meadows, forest	tufted duck (11,000) goosander (250) great crested grebe (150)	310
Lech-Donau-Winkel (BY)	26.02.76	Dammed reservoir with reeds in its terrestrialisation zone	black-headed gull (3,200) mallard (2,710) black coot (2,030)	230
Donauauen und Donaumoos (BY)	26.02.76	Straightened river, flanked by oxbows and riparian forest, former bog areas that have been stripped of peat, drained and used agriculturally	mallard (15,000) common pochard (6,000) tufted duck (2,000)	8,000
Ismaninger Speichersee mit Fischteichen (BY)	26.02.76	Wastewater-storage lake, fishponds	black-headed gull (12,000) black coot (10,000) mallard (4,950)	955
Ammersee (BY)	26.02.76	Alpine-foreland lake with delta-like bank area on its southern side, and fen complexes on its northern Norden	tufted duck (10,186) black coot (5,035) mallard (2,260)	6,517

Area name (Land)	Regis–tration	Typical habitats	Most common guest-bird species (numbers of individuals)	Area [ha]
Starnberger See (BY)	26.02.76	Alpine-foreland lake (water area), bank zone	black coot (9,956) tufted duck (7,150) black-headed gull (1,803)	5,720
Chiemsee (BY)	26.02.76	Alpine-foreland lake (water area), alluvial delta, shallow-water areas	black coot (17,000) tufted duck (13,000) common pochard (7,000)	8,660
Unterer Inn zwischen Haiming und Neuhaus (BY)	26.02.76	Channelled lower section of the Inn river, with dams, shallow-water areas, islands, riparian forest, reedbeds	black-headed gull (20,000) northern lapwing (10,000) mallard (5,000)	1,955
Boddengewässer Ostufer Zingst, Westküste Rügen-Hiddensee (MV)	31.07.78	Diverse coastal shallow-water areas, steep coastal sections, reedbeds, grassland	dunlin (40,000) common crane (40,000) white-fronted goose (30,000)	25,800
Krakower Obersee (MV)	31.07.78	Lowland lake, islands, reedbed belt, grassland	tufted duck (12,000) white-fronted goose (3,000) greylag goose (3,000)	868
Ostufer der Müritz (MV)	31.07.78	Forest, lake, swamp and marsh area, fens, reedbeds	tufted duck (20,000) bean goose (15,000) common pochard (15,000)	4,832
Galenbecker See (MV)	31.07.78	Lowland lake, reedbeds, fen forest, grassland	white-fronted goose (20,000) bean goose (15,000) black-headed gull (3,000)	1,015
Unteres Odertal bei Schwedt (BB)	31.07.78	River lowlands, oxbows, canals, river estuary, reedbeds, remains of riparian forest, grassland	white-fronted goose (33,000) common pochard (12,300) northern lapwing (10,000)	5,400
Niederung der Unteren Havel mit Gülper See (BB/ ST)	31.07.78	Eutrophic shallow lake, river lowlands, grassland, remains of riparian forest	bean goose (60,000) white-fronted goose (40,000) mallard (12,000)	5,792
Teichgebiet Peitz (BB)	31.07.78	Ponds, belts of rushes	mallard (6,000) common pochard (3,000) black-headed gull (3,000)	1,060
Helmestausee Berga-Kelbra (ST/ TH)	31.07.78	Dammed reservoir, salt springs, grassland	common crane (4,000) green-winged teal (3,000) northern shoveller (750)	1,360
Hamburgisches Wattenmeer (HH)	01.08.90	Waddens, sandbanks, salt marshes	dunlin (171,600) red knot (67,000) common shelduck (52,300)	11,700
Schleswig-Holsteinisches Wattenmeer (SH)	15.11.91	Waddens, sandbanks, marshes, salt marshes	red knot (425,000) dunlin (350,000) common eider (150,000)	299,000
Mühlenberger Loch (HH)	09.06.92	Freshwater mud flats	green-winged teal (8,000) tufted duck (8,000) common pochard (4,500)	675

Tab. 2.3.3.2-6: Established or planned Baltic Sea Protected Areas (pursuant to BUNDESAMT FÜR NATURSCHUTZ (GERMAN FEDERAL AGENCY FOR NATURE CONSERVATION) 1999b). For abbreviations, see Tab. 2, NLP = national park, NSG = nature reserve, * = not yet permanently established.

Name (Land)	Area [ha]	Area description	National protection status	Internation. protection status
Geltinger Birk und Noor mit Kalkgrund (SH)	3,600	Macroalgae on sandy and rocky base with Macoma baltica; feeding ground for various waterbirds; protected coastal biotopes pursuant to Art. 20c Federal Nature Conservation Act	1 NSG (773 ha)	1 SPA = NSG
Oehe-Schleimünde (SH)	1,631	Macroalgae on sandy and muddy base with Macoma baltica; feeding ground for various waterbirds; protec-tected coastal biotopes pursuant to Art. 20c Federal Nature Conservation Act	1 NSG (362 ha)	1 SPA = NSG
Küstenlandschaft Hohwachter Bucht mit Binnenseen (SH)	2,556	Sandy sea bottom with mussels beds, various shallow brackish-water biotopes; resting and feeding ground for various waterbirds; protected coastal biotopes pursuant to Art. 20c Federal Nature Conservation Act	3 NSG (487 ha)	3 SPA = NSG
Westküste Fehmarn mit Orther Bucht und Flügger Sand (SH)	10,750	Macroalgae on sandy and rocky base with Macoma baltica; feeding ground for various waterbirds; protected coastal biotopes pursuant to Art. 20c Federal Nature Conservation Act	3 NSG (824 ha)	3 SPA = NSG
Wismarer Bucht inkl. Salzhaff (MV)	61,000	Seagrass meadows, mud bottom with great biodiversity (macro-zoobenthos), rocky bottom with bladder wrack; main range area in Germany for the endemic Baltic Sea mussels Cerastobyssum hauniense and Ciona intestinalis; wintering and resting grounds for various waterbirds; protected coastal biotopes pursuant to Art. 20c Federal Nature Conservation Act.	5 NSG (895 ha)	1 SPA (19,900 ha)
Nationalpark Vorpommersche Boddenlandschaft (MV)	80,500	Episodical (wind-induced) emerged mud flats in shallow bodden waters; wintering and resting area for various waterbirds; protected coastal biotopes pursuant to Art. 20c Federal Nature Conservation Act.	NLP	1 SPA = NLP; Ramsar-Gebiet (25,800 ha)
Nationalpark Jasmund (MV)	3,000	Chalk coast with active cliff and block-rich coastal hinterland with unusual, highly diverse macroalgae flora.	NLP	-
Strelasund, Greifswalder Bodden, Peenestrom, Oderhaff (MV)	140,000	Shallow bodden waters with mud, sand and rock sub-stra-tes, episodical (wind-induced) emerged mud flats, Oder estuary with pronounced salt-concentration gradients; seagrass meadows and diverse macro-phyte communities; habitat for many endangered animal species, such as European otter and sea eagle, wintering and resting area for various waterbirds; protected coastal biotopes pursuant to Art. 20c Federal Nature Conservation Act	25 NSG (about 12,120 ha)	3 SPA (85,918 ha)

EXAMPLES OF INTERNATIONAL CO-OPERATION WITH REGARD TO THE "NATIONAL PARK" PROTECTED-SITE CATEGORY.

THE GERMAN WADDEN SEA NATIONAL PARKS. In the German North Sea coastal region, three Wadden Sea national parks – Schleswig-Holstein Wadden Sea National Park, Hamburg Wadden Sea National Park and Lower Saxony Wadden Sea National Park – were established in sites oriented to the boundaries of the relevant Länder. These national parks, which cover nearly the entire German North Sea coastline, are complemented to the north (Denmark) and to the south (Netherlands) by additional protected areas.

The Netherlands, Denmark and Germany have been co-operating trilaterally in protection of the Wadden Sea since 1978; in 1982, they signed a "Joint Declaration on the Protection of the Wadden Sea". With this declaration, they pursue the aim of effectively protecting the Wadden Sea and its sand and mud flats, the world's largest wadden area. Within the framework of nature conservation policy and trilateral management, the countries' joint efforts are oriented to the overall aim of protecting the complete diversity of the habitat types that a natural, dynamic Wadden Sea should have. Each of the habitats must exhibit a certain quality (natural dynamics, absence of disturbance, absence of pollution) that can be achieved via suitable protection and management measures. The quality of the habitats is to be maintained or improved "by working towards achieving Targets which have been agreed upon". Targets have been agreed for six habitat types, as well for water quality and sediment quality (targets in these two areas apply to all habitats), and for birds and marine mammals (taken from the Stade Declaration, a ministerial declaration of the Eighth Trilateral Governmental Conference on the Protection of the Wadden Sea, which took place in 1997, COMMON WADDEN SEA SECRETARIAT 2001).

UNTERES ODERTAL, A GERMAN-POLISH INTERNATIONAL PARK. In the final session of the Volkskammer, the parliament of the former GDR, the basis was created for set-aside of the Unteres Odertal (lower Oder River valley) as a national park. From the start, relevant efforts were oriented to the creation of an "international-park" that would include land on both sides of the Oder River. A joint declaration of the environment ministers of Germany and Poland, of the environment minister of Brandenburg and of the Woiwoden of Stettin then paved the way, at an international level, for such an area. The declaration, which is based on guidelines of the IUCN, expressed the parties' intention to establish a contiguous protected area on both sides of the Oder River.

By resolution, a programme council was established to enhance co-operation between the various administrations for the protected area. The programme council's tasks include:

- detailed assessment of the conservation status of the international park, including its buffer zones,
- co-ordination of provisions for protection, as well as of a joint protection, management and development concept,
- development of initiatives for joint scientific studies and for preparation of expert assessments,
- review of investment and business projects on the territory of the international park, as well as of other projects that could have lasting impacts on its conservation value,
- development of proposals for enhancing protection and management of the protected area and

- promoting the interests of the international park and assisting in obtaining supporting funding (as described in the resolution of the environment ministers of Germany and Poland, of the environment minister of the state of Brandenburg and of the Woiwoden of Stettin from 11 December 1992).

The aforementioned declaration was implemented in 1995. Laws were passed to establish the Unteres Odertal National Park on the German side and two landscape reserves on the Polish side. The joint strategy for protection of the Unteres Odertal area thus produced a protected area totalling 117,274 ha in area.

Re 3.4: Has your country developed a management planning process for protected sites? If yes, please outline the types of management plans and organizations responsible for development and implementation.

Re 3.5 a-c: For how many protected sites have formal management plans been proposed, prepared or implemented (please append a list of sites and their management planning status.)

The laws and ordinances that are individually prepared and adopted for each protected site describe the object of the protection, the purpose of the protection, the requirements and prohibitions needed to achieve the protection purpose and, where necessary, the relevant management and development measures or empowerments (Art. 12 (2) Federal Nature Conservation Act).

Such provisions provide authorisation, as necessary, to manage the protected site in keeping with its conservation purpose. Relevant management can include special studies and planning, execution of measures and monitoring of measures' success.

Nature reserves, national parks, biosphere reserves and EC special protection areas for birds play especially important roles as protected sites within the meaning of AEWA. Normally, so-called management and development plans are prepared for nature reserves, while management plans are prepared for national parks, biosphere reserves and EC special protection areas for birds. Such plans set forth measures for management of the relevant protected sites in keeping with their conservation purposes. The relevant site administrations or specialised authorities prepare such management plans and are responsible for ensuring that they are properly implemented.

MEASURES TO ENSURE WISE USE OF WETLANDS AND PREVENT THEIR DEGRADATION.

Re 3.6: What measures does your country have in place to ensure the wise use of wetlands habitats and to prevent habitat degradation e.g. pollution control and managing water resources? Please provide examples of best practice initiatives particularly involving cross-sectoral co-operation or public participation.

As described above, nature reserves are established by ordinances issued by the relevant Länder. National parks are also established by the Länder, via national park acts. Control of uses, prevention of degradation, and pollution control within the meaning of 3.2.3 of the AEWA Action Plan are thus carried out by means of Länder ordinances or acts relative to the protected sites in question, and issued by the competent authorities or institutions. A number of federal laws also contain provisions with regard to pollution control.

ENSURING WISE USE OF PROTECTED SITES. Ordinances on nature reserves can include provisions that expressly prohibit or permit certain actions. As a result, such ordinances provide a means of controlling uses in sites. In each case, it is up to the relevant Land to determine what use is to be made of these options. In the following, two nature-reserve ordinances are cited to illustrate the possible variance in strictness of control of uses.

Art. 6 "Permitted actions" of the ordinance on the nature reserve Nuthe-Nieplitz-Niederung in Brandenburg mandates that agriculture in the area must be in keeping with Brandenburg's nature conservation act. The ordinance also states that conversion of farmland to grassland, and fertilisation of farmland, with no more than 80 kg of pure nitrogen per hectare, are permitted. It also permits fertilisation with farm manure, in amounts corresponding to an animal density of 1.5 large animal units (GVE) per hectare, but it prohibits use of chemical and synthetic compounds, easily soluble phosphates or chlorine-containing fertilisers. Finally, it sets forth that construction of livestock shelters and small, roofed feed-storage structures is permitted only on extensively managed grassland and in consultation with the competent lower nature conservation authority.

Art. 5 (Permitted actions) of the ordinance on the nature reserve "Haseldorfer Binnenelbe mit Elbvorland" in Schleswig-Holstein mandates that grassland use must be oriented to the area's conservation purpose, pursuant to the recommendations of the state conservation and environmental agency. It prohibits any increases in drainage, any plowing of sites and any use of pesticides and fertilisers.

Ordinances for protected sites also contain clauses on prohibited actions, in order to prevent site degradation. Such sections, for example, can mandate that

- construction of or changes in structures,
- changes in the soil,
- changes in site use,
- construction of roads or paths,
- unauthorised vehicles,
- operation of remote-controlled toys,
- horseback riding outside of horse trails,
- camping or
- unleashed dogs

shall be prohibited within the protected site (excerpt from the ordinance on the nature reserve "Nuthe-Nieplitz-Niederung" in Brandenburg). Furthermore, such sections or ordinances can also prohibit certain agricultural uses, such as:

- plowing of meadows or pastures,
- seeding of areas,
- storing synthetic pesticides outside of private property (houses and gardens),
- chemically treating wood or
- applying, discharging or storing liquid manure, fertiliser, silage or sewage sludge.

To protect sites' flora and fauna, ordinances can prohibit release or establishment of animals and/or feeding of fish or waterbirds.

Enforcement of such requirements and prohibitions is normally organised and managed by the competent local nature conservation authorities. In Germany's large protected areas, rangers usually carry out random or regular inspections to enforce compliance with usage restrictions and prohibitions. Nature conservation authorities may also carry out inspections in protected sites, acting either directly or through volunteer staff.

All Länder make use of the option of engaging recognised nature conservation associations to monitor protected sites. Other Land organisations, such as police or waterway police (Wasserschutzpolizei), also help to monitor protected sites. Police, waterway police and trade-supervision authorities also play important roles in general monitoring for pollution control.

CONTRACTUAL NATURE CONSERVATION. Restrictions on agricultural uses can be imposed, at the Länder level, by means of contractual nature conservation (Vertragsnaturschutz). In using this instrument, competent nature conservation authorities conclude agreements with affected farmers regarding extensivation of site usage. Affected farmers can be compensated with state funds for their expected resulting losses.

Contractual nature conservation is used on areas set aside as protected sites. It is also used as a substitute for set-aside of protected sites (i.e. on areas worthy of special protection). Under contractual nature conservation arrangements, affected farmers voluntarily enter into contractual obligations regarding agricultural use of the relevant sites. Normally, the restrictions involve extensivation of grassland management and call for conversion of cultivated land into grassland. Agreements normally have three-year terms, to ensure that the desired conservation aims are achieved and remain in force over significant periods of time. Contractual nature conservation is often divided into different extensivation levels, in keeping with the most suitable aims for the relevant sites – for example, vegetation conservation or meadow-bird protection.

The following restrictions play a particularly important role in connection with wetlands conservation for meadow-breeding birds:

- prohibition of raking, grading, compacting or fertilising after the beginning of the meadow-bird breeding season,
- in general, sharp restrictions on fertilisation, and prohibition of biocides,
- prohibition of plowing of grassland, and requirements to convert farmland to grassland,
- adaptation of livestock densities and grazing periods to needs of breeding birds (pastures),
- selection of the time for initial mowing in keeping with needs of breeding birds (depending on the species, between 1 July and 1 September).

In addition to wet-meadow-oriented contractual nature conservation, which accounts for a majority of use of this instrument, contractual nature conservation may be used to promote conservation-oriented management of fish ponds – this is the case in Saxony, for example. The purpose of such management is to protect the long-term vitality of ponds as ecosystems and habitats for plants and animals. It also aims to preserve naturally managed ponds as traditional landscape elements. Contractual nature conservation in the area of fish ponds represents a first step toward restoring conditions required by

AEWA waterbird species such as the ferruginous duck (Aythya nyroca) and the red-necked grebe (Podiceps grisegena). Restrictions for fish farmers, oriented to waterbird conservation, include:

- mandated stocking densities,
- avoidance of changes in underwater and floating vegetation and in shoreline structures,
- near-complete avoidance of biocides and lime treatments for disinfection purposes, and prohibition of fertilisation,
- prohibition of recreational activities such as boating and fishing (THIEM 1998).

Public-sector purchase of valuable sites is yet another instrument for site protection – for example, for protection of wet meadows. This instrument is used especially when protection aims clash so sharply with agricultural uses that areas can no longer be used economically.

Table 8 lists support programmes relative to contractual nature conservation, including the sizes of the areas covered, the relevant funding and relevant further targets for such public-sector purchases.

In addition to ordinances on protected areas, with their options to control uses in order to prevent wetlands degradation, and contractual nature conservation, two key laws protect wetlands.

The **Federal Water Act** is built on the principle of protecting water bodies as elements of natural cycles and as habitats for plants and animals. Pursuant to the Federal Water Act, water bodies must be managed in a manner that prevents avoidable impairments of their ecological functions. Use of water bodies must be oriented to principles of sustainable management with regard to

- wastewater discharges,
- handling of water-hazardous substances and
- protection of surface waters and groundwaters.

Water bodies that are free, or nearly free, of pollution must not be exposed to threats that could worsen their condition.

Water bodies that are in poor condition, as a result of environmental impacts, must be restored in keeping with legal requirements. The Länder are to support efforts in this area by implementing the Federal Water Act within state provisions (state water acts), as well as by taking other suitable measures.

Water-protection areas (Wasserschutzgebiete) can be established in order to protect the quality of water, a fundamental resource – especially groundwater. Within water-protection areas, certain actions can be prohibited that could threaten groundwater quality. For example, no "water-hazardous" substances may be transported or stored in water-protection areas.

Impacts of air or noise pollution on important sites, within the meaning of AEWA, are controlled via the Federal Immission Control Act.

The purpose of the **Federal Immission Control Act** is to protect people, animals and plants, the soil, water and the air from harmful environmental impacts and to prevent relevant threats. On the strength of this act, certain areas can be declared protected areas in which operation of certain facilities may be prohibited in order to guard against harmful impacts.

Water quality in the Elbe, for example, is monitored by the Working Group for Water Quality in the Elbe River (Arbeitsgemeinschaft for the Reinhaltung the Elbe - ARGE Elbe), in which the seven Länder along the Elbe River, Saxony, Saxony-Anhalt, Brandenburg, Lower Saxony, Mecklenburg-West Pomerania, Hamburg and Schleswig-Holstein participate.

In 1999, in order to promote co-operation to protect the Oder River, Poland and Germany concluded an agreement on the establishment of an "International Commission for the Protection of the Oder". This co-operation makes it possible to monitor the Oder River's water quality on an international basis.

Similar commissions have also been established to protect water quality in other major German rivers (see also Chapter 2.3.2.3).

Tab. 2.3.3.2-8: Wetlands protection and programmes in the various Länder (according to surveys and NEHLS et al. 2001) (BL = Land; for abbreviations, see Tab. 2)

BL	Support programme	Area and period	Financing in € (DM)
BB			
BE			
BW			
BY	Contractual nature conservation programme (VNP)		
HB	Bremen extensivation programme (VN)	550 ha before 2000 (not incl. Agenda 2000)	About 128,000 annually (ca. 250,000)
	Land purchase	2,250 ha (2001 owned by city of HB)	
HE			
HH	Support for extensive grassland management (contractual nature conservation)	1,800 ha (2001)	In 2001: about 562,500 (about 1,100,000)
MV	Directive on support for fen conservation	?	?
	Directive on support for grassland conservation	Aim: up to 60,000 ha	Then, about 13.9 million (27.2 million)
NI	Contractual nature conservation	5,300 ha (1999)	
	Land purchase	>17,000 ha (1999 owned by NI)	
NW	Contractual nature conservation	About 3,000 ha	From 1985 to 1996, total of 15.3 million (30 million)
	Flächenankauf	5,600 ha (1999 owned by NW)	From 1985 to 1996, total of 94.6 million (185 million)
RP			
SH	Contractual nature conservation	6,000 ha (1999)	
	Land purchase	4,000 ha since the mid-1980s	
SL			
SN	Nature conservation and protection of cultural landscapes (Naturschutz und Erhalt Kulturlandschaft - NAK)	5,005 ha (2000)	In 2000: 1.15 million (2.25 million)
	Extensive grassland management (KULAP)		
ST	Contractual nature conservation		
TH			

2.3.3.3 Restoration and regeneration of wetlands

Re 3.7: Does your country have a policy for the identification, rehabilitation and restoration of wetlands important for species covered by the Agreement? Please provide examples of rehabilitation and restoration projects and initiatives undertaken.

A number of research efforts and model projects have been carried out, at the federal level, with a focus on protecting wetlands and their species – and on restoring and regenerating wetlands. One example is provided by ROSENTHAL et al. (1998). This interdisciplinary research project studied the distribution, ecological importance, condition and historical development of, and threats to, wet grasslands in north-German lowlands, and it used the findings to develop nature conservation guidelines and realistic protection and development concepts for the overall area in question. Other projects are described in greater detail in Chapter 1.2.3. Their findings provide a basis and orientation for implementation of measures in the Länder.

This article presents Mecklenburg-West Pomerania's fen-protection concept as an example of how regio-nal guidelines can facilitate effective area protection.

Mecklenburg-West Pomerania's fen-protection concept calls for restoration of important habitats of AEWA limicolae species, as listed in 3.3 of the AEWA Action Plan. Most of these species, which are listed in Tab. 1, are endangered in Germany, and thus they are important focuses of nature conservation in Germany (BOYE et al. 2000).

Fens have been, and continue to be, subject to a wide range of damaging or destructive uses. This is why Mecklenburg-West Pomerania, one of the most fen-rich Länder in Germany (12.6 % of the state's area) adopted a fen-conservation programme in 2000 (UMWELT-MINI-STERIUM DES LANDES MECKLENBURG-WEST POMERANIA 2000). This fen-protection concept is presented here in order to illustrate ways of regenerating areas of importance with regard to AEWA. Other older projects, some of which have been completed, are also presented in this context.

Tab. 2.3.3.3-1: Limicolae species that benefit from Mecklenburg-West Pomerania's fen-protection concept.

Scientific name	Common name
Pluvialis apricaria	European golden plover
Tringa glareola	wood sandpiper
Gallinago gallinago	common snipe
Numenius aquata	western curlew
Limosa limosa	black-tailed godwit
Tringa ochropus	green sandpiper
Tringa totanus	common redshank
Philomachus pugnax	ruff
Calidris alpina	dunlin

The concept adopted by Mecklenburg-West Pomerania is aimed at protecting and restoring the state's remaining semi-natural fens. This means that use of fens, wherever possible, is to made more environmentally compatible or completely discontinued. All in all, a total of 38,000 ha of fens are to be restored, and uses are to be discontinued on 37,000 ha of fens (UMWELTMINISTERIUM DES LANDES MECKLENBURG-WEST POMERANIA 2000). The planned projects are to be carried out with financial support from European, federal and state budgets.
Basic decisions regarding projects' worthiness of support are made on the basis of a state-wide analysis of all fens and their current condition. Decisions on execution of specific projects, within the fen-protection concept, are made by the co-ordination office sited within the State environment, nature conservation and geology agency (Landesamt für Umwelt, Naturschutz und Geologie). This office is advised in such decisions by a "fen" consulting board (Moorbeirat), which functions on the top state level. The state's relevant rural districts, which have competency in matters of water law, and state environmental and nature conservation authorities, have voices in final approval of projects.

Projects normally receive technical support from private planning bureaux. Wherever possible, universities are to be engaged to review projects' success and efficiency.

DESCRIPTION OF PROJECTS. The following section, which presents both completed and ongoing projects of relevance to fen conservation, is organised in keeping with financing arrangements.

COMPLETED OR ONGOING PROJECTS FUNDED LARGELY WITH EU-LIFE FUNDS (SEE ALSO CHAP. 1.2.5). The primary aim of the EU-Life project **"Conservation and restoration of the Trebeltal fen area in Mecklenburg-West Pomerania"** was to restore natural hydrological conditions, to provide the year-round water levels needed to promote expansion of peat-forming reedbeds, consisting of common reeds and sedges (RUNZE 2000). To (re-) create a "growing" fen, operation of bucket-elevators was stopped and the relevant structures were removed. The old meandering watercourse was restored over a 12 km section. In addition, dikes were removed, to reintroduce natural flood regimes in spring and winter. A supportive dam was constructed in the Trebel watercourse, and ditches surrounding the Trebel were dammed, to achieve stable water levels year-round.

In the EU-Life project **"Restoration of the Recknitztal fen area** (EU special protection area for birds)", river meanders, in their former beds, were restored to produce a water-carrying river (MEERGANS 2000). The man-made, straight Recknitz Canal was reconnected, on one side in each case, to the natural meandering watercourses from which it had been severed. In addition, barriers were placed in the canal, at regular intervals, in order to interrupt its water flow. Existing dams were removed and, in order to achieve high water levels throughout the entire restoration area, ditches were filled in and a "supportive" dam was constructed. This project was completed in April 2001.

Like the aims of the two aforementioned projects, the primary aim of the EU-Life project **"Wet-habitat management in the Schaalsee Biosphere Reserve"** is to stop the ongoing drainage (GEBHARD 2000). The planned measures include removal of a bucket-elevator system and closure of ditches and removal of their culverts. The measures are expected to raise the water level in the project area by 30-50 cm, causing water to remain in the area for longer periods of time. Existing fens will profit from the higher water levels and longer water retention and will thus be revitalised.

The EU-Life project **"Fens and bitterns on the upper Havel River"** is aimed at creating a natural water regime that can rewet the existing fen bed. The measures will permit native vegetation to develop again and will stop fen degradation (SPICHER 2000). To achieve this aim, two polders, along with bucket-elevator systems, ditch closures and dams, are to be removed.

The main measure in the EU-Life project **"Restoration of the Galenbecker See natural area"** is to construct a dam 6.9 km in length. This will raise the water level in the Galenbecker See (lake), which is threatened by terrestrialisation, by about one meter. The increase in the water level will also rewet the surrounding fens. All meadows in the project area are to be purchased in order to ensure fens are managed in keeping with conservation principles (SCHIEFELBEIN in lit. 2001).

These EU-Life projects are described in greater detail in Chapter 1.2.5.

PROJECTS FUNDED BY THE GERMAN FEDERAL AGENCY FOR NATURE CONSERVATION, WITHIN THE FRAMEWORK OF FINANCING FOR MAJOR NATURE CONSERVATION PROJECTS AND PROJECTS TO RESTORE NATURAL SHORELINE VEGETATION OF WATER BODIES. In the shoreline-vegetation project **"Peenetal / Peene-Haff-Moor"**, the area's natural or semi-natural condition is to be restored, in its entirety, for purposes of species, biotope and landscape conservation, and the area is to be improved in keeping with scientific conservation principles (STEGEMANN & HENNICKE 1996). Specifically, this means:

- Conservation and extensive restoration of the river-valley fen, as a living fen, via improvement of water regimes, as well as removal of the polders established in recent decades;
- Restoration of damaged fens, through careful introduction of successions;
- Protection and restoration of the biotope diversity created through various traditional extensive forms of management and cultivation;
- Long-term protection of the river lowlands as important passage, resting and breeding areas for avifauna;
- Conservation and long-term protection of the Peene River, as a largely natural watercourse;
- Minimisation of pollution in the Peene, which currently is caused by intensive agriculture and oxidative peat decomposition;
- Set-aside of the entire project area as a landscape reserve, and of the core zone as a nature reserve, by 2005.

According to HENNICKE (1994), the shoreline-vegetation project has already registered initial success. Large sections of grassland have been converted to extensive use, and land has been purchased for water-body restoration.

Schleswig-Holstein and Mecklenburg-West Pomerania are co-operating in a major nature conservation project in the **Schaalsee** area, within the framework of the shoreline-vegetation programme. This project, which is spatially separate from the aforementioned EU-Life project, is to be completed in 2003.

One important aim, as in other major nature conservation projects, is to protect sites (JARMATZ & MÖNKE 1994). To this end, sites that have been temporarily secured, or that are already nature reserves, are to be purchased. In the interest of preparing a detailed catalogue of aims, a management and development plan has been prepared, with funding from the Federal Agency for Nature Conservation. To protect the fens in the area, the water regime within the fens is to be optimised, and overall water levels are to be raised. In addition, nutrient discharges into the fens are to be reduced and peat removal is to be discontinued.

EXAMPLE OF A PROJECT FINANCED SOLELY WITH STATE FUNDS. In 1992, **restoration of the old coastal flood plain fen in the Karrendorfer Wiesen** area was begun, with funding from the state (Land) of Mecklenburg-West Pomerania (HOLZ et al. 1996). The Karrendorfer Wiesen area, which borders the Greifswalder Bodden area to the southwest, was diked and thereby separated from natural flood regimes in the mid-19th century, following a series of serious storm floods. Some 24,000 of the area's 30,000 hectares were affected by the diking.

Since 1992, in three phases of construction, natural flood regimes have been restored in the Karrendorfer Wiesen. In the first phase, a 1.4 km protective dike was constructed to guard the community of Karrendorf from future flooding. The second phase, which took place in 1993, comprised removal of a 6.4 km outer dike that had separated the Karrendorfer Wiesen from the Greifswalder Bodden. In addition, the bucket elevators and ditches installed by the former GDR, within its complex-melioration programme, were removed / filled in, and the old natural rivulet system was at least partially restored. In the years that followed, the vegetation on the formerly intensively managed grassland (vegetation that was typical of such grassland) gradually gave way to valuable, characteristic salt-meadow vegetation.

The positive impacts on the bird world were seen almost immediately following removal of the dike. In 1994, eight new wading bird species and two duck species occupied the Karrendorfer Wiesen area. As of 1998, a total of 11 limicolae and eight waterbird species had been sighted breeding in the area. On the other hand, the observed occupancy densities were low, and breeding success remained very low, due to high predation pressure and nest losses through flooding. In addition, in most cases the new arrivals were birds that had moved in from other parts of the nature conservation area.

The undiked Karrendorfer Wiesen have a far greater importance as resting and passage areas for migrating coastal birds. As of 1998, a total of 37 limicolae species, 31 duck and goose species and various tern and gull species had been sighted. Increasingly, the Karrendorfer Wiesen are being used as a moulting area, by ducks, and as sleeping quarters, by geese, swans, cranes, gulls and terns. Peak levels of several tens of thousands of ducks and geese, and of thousands of limicolae, can be observed in the area (HEINICKE 2000).

Restoration of the Karrendorfer Wiesen enabled the area to fulfil criteria for Ramsar-area status, as well as criteria of Art. 15 (nature conservation and biodiversity) of the Helsinki Agreement. With the help of scientific support provided by the Uni-versity of Greifswald, the project is also to serve as a model project for other, future restoration efforts.

The various projects for fen protection and restoration are creating a biotope network in Mecklenburg-West Pomerania – especially with the inclusion of the Recknitz, Trebel and Peene river-valley fens – that is providing migratory waterbird species with valuable breeding and resting areas.

2.3.4 Intervention

2.3.4.1 Hunting

Re 4.1: Outline the main features of legislation or legal measures in your country to control hunting of the species covered by the Agreement (e.g. use of lead shot and poisoned baits, and to eliminate illegal taking).

LEGAL BASES FOR CONTROLLING HUNTING OF THE WATERBIRD SPECIES COVERED BY AEWA. Hunting of waterbird in the Federal Republic of Germany is regulated by the Federal Hunting Act (Bundesjagdgesetz - BJagdG) and by the hunting laws of the Länder. The Federal Hunting Act, which was issued as a framework act, is specified and supplemented by the state (Land) laws issued within its framework.

In Germany, the right to hunt – unlike the rights conferred by many other countries' hunting license systems – is inseparably linked to ownership of land. Areas open to hunting in Germany are divided, in accordance with the so-called "district" (Revier) system, into precisely parcelled hunting districts. The Federal Hunting Act differentiates, in keeping with property size, between private hunting districts (minimum size of 75 ha) and community hunting districts in which parcels smaller than 75 ha are combined. In private hunting districts, the property owner is entitled to hunt, while in community hunting districts the hunting association, comprising all property owners belonging to the relevant community hunting district, is so entitled. The right to hunt in a hunting district may be leased by the relevant property owner or hunting association. A central feature of the district system is that the person entitled to hunt in a given district is specifically responsible for ensuring that hunting in the district conforms to legal requirements. Pursuant to the Federal Hunting Act, he or she is required to care for the district, with the aims of conserving a diverse, healthy stock of game, adapted to the local landscape and cultural circumstances, and of managing and maintaining its basic resources.

A person who wishes to hunt in Germany must also have a hunting license. To obtain a hunting license, an applicant within the sphere of application of the Federal Hunting Act must pass the hunters' examination, which tests knowledge of subjects such as game biology and management, and laws pertaining to hunting, animal welfare, nature conservation and landscape management.

Art. 2 of the Federal Hunting Act specifies what animal species are subject to hunting law in the Federal Republic of Germany. This group includes AEWA species such as the mute swan (*Cygnus olor)*, wild geese (*Anser Brisson* and *Branta Scopoli*), wild ducks *(Anatinae)* mergansers *(genus Mergus L.)* and the black coot *(Fulica atra)*. Significantly, the majority of bird species subject to hunting law may not actually be hunted.

The hunting seasons for various game species are defined by the Federal hunting season ordinance (Bundesjagdzeitenverordnung). The Länder may suspend or shorten the hunting seasons established by this ordinance and, for special reasons only, may lengthen them. Game species for which no hunting season has been specified may not be hunted at any time of the year – i.e. hunting of them is prohibited (Art. 22 BJagdG). This group of species includes the following waterbirds, nation-wide: Pink-footed goose *(Anser brachyrhynchus)*, barnacle goose *(Branta leucopsis)*, common shelduck *(Tadorna tadorna)*, gadwall *(Anas strepera)*, northern shoveller *(Anas clypeata)*, red-crested pochard *(Netta rufina)*, ferruginous duck *(Aythya nyroca)*, common eider *(Somateria molissima)*, long-tailed duck *(Clangula hyemalis)*, common goldeneye *(Bucephala clangula)*, and the merganser species smew *(Mergellus albellus)*, red-breasted merganser *(Mergus serrator)* and goosander *(Mergus merganser)*.

Taking of eggs of game bird species is generally prohibited. It may be permitted only in individual cases, for scientific, instructional and research purposes or for purposes of breeding.

Species subject to hunting law are also subject to nature conservation law. On the other hand, hunting law takes precedence as special law for game species. Protection provisions under nature conservation law apply only insofar as hunting law contains or provides no special provisions on the protection and management of the relevant species.

The following applies to all wild bird species pursuant to Art. 42 (1) No. 1 of the Federal Nature Conservation Act: they may not be captured, injured, or killed, nor may their developmental forms, or their nesting, breeding, living or refuge structures be removed from their natural surroundings, damaged or destroyed.

SPECIFICATIONS PERTAINING TO USE OF LEAD SHOT AND POISON BAITS. In 1993, and most recently in 2001, the Federal Ministry of Consumer Protection, Food and Agriculture (BMVEL), which is responsible for hunting issues at the federal level, urgently recommended that only non-lead shot be used for hunting game birds near water bodies. Various Länder have since prohibited use of lead shot for hunting of waterbirds at and above water bodies; other Länder are preparing similar provisions.

Use of poison baits, snares or other hunting methods that violate principles of animal welfare, or that are non-selective, has been prohibited in Germany for many decades.

PREVENTION OF ILLEGAL TAKING. As mentioned above in connection with the legal basis for controlling hunting, under the district system pertaining within the framework of the Federal Hunting Act, the person entitled to hunt in a given district is personally and fully responsible for his district (hunting district). He is legally obligated to manage the game properly – in particular, to maintain a diverse, healthy stock of game and to protect the basic resources upon which it depends. He is also personally responsible for fulfilment of, and compliance with, shooting plans, for prevention of epidemics in game and for protection of game against poachers, starvation and other threats.

The **hunting administration** is responsible for monitoring the activities of persons entitled to hunt. It maintains offices on the rural district level, in order to carry out its local tasks. Unlike the situation in countries in which the state provides individual hunting permits (license system), in Germany, persons entitled to hunt have a special local responsibility in fulfilling legal requirements, especially in connection with bagging game.

The **hunting restrictions** set forth by the Federal Hunting Act, such as prohibitions pertaining to places and times for hunting (off-seasons), restrictions pertaining to hunting equipment (use of bird glues, nets, fish traps and poison is prohibited) are to be understood in terms of animal welfare as well as the principle of caring properly for game stocks. The Federal Hunting Act expressly states what animals may be hunted. Hunting seasons are regulated by the Federal hunting season ordinance (Jagdzeitenverordnung). **Hunting seasons** are defined for each game species, in accordance with each species' conservation status. Animal species that are subject to hunting law and are also endangered **may not be hunted at any time of the year**.

Violations of hunting restrictions are strictly prosecuted. Hunting of game subject to a year-round off-season, and hunting of animals with young, are crimes under hunting law.

In some Länder, **bag statistics** are kept in connection with bag notifications. Entitled hunters – who are responsible for their hunting districts – report bag statistics to the responsible hunting authority. In such reports, group designations such as "ducks" or "geese" are increasingly giving way to names of specific species. The bag lists also provide a basis for scientific studies and are evaluated and analysed with respect to necessary population-conserving measures.

Re 4.2: Does your country monitor hunting levels? If so, how is this information collated and reported?

In Germany, levels of hunting of waterbirds are monitored by having entitled hunters collect annual bag statistics for a hunting year (from 1 April to 31 March of the following year) and then report these statistics to the responsible hunting authorities. The Länder keep bag statistics for hunting, usually broken down by species (Tab. 2.3.4.1-3).

Federal authorities do not keep nationwide bag statistics for waterbirds. The German Hunting Association (Deutscher Jagdschutz-verband - DJV) publishes annual nation-wide statistics. These statistics do not break wild ducks and geese down to the species level, however. The number of wild ducks killed annually in the Federal Republic of Germany has averaged about 570,000 individuals since the beginning of the 1980s. In the 2000/2001 hunting year, a total of 516,868 wild ducks (primarily mallards) were shot (Fig. 2.3.4.1-1). The total number of wild geese shot in the 2000/2001 hunting year was 29,720 individuals (DJV 2002).

If hunting bag statistics are to play a useful role in monitoring and protection of waterbird populations, certain requirements must be imposed on their quality; BLEW (2000) described these requirements at the conference for AEWA implementation.

Tab. 2.3.4.1-2: Overview of current Länder regulations restricting use of lead shot in hunting of waterbirds (As of October 2001)

Land	Use of lead shot	Source
Baden-Württemberg	No restrictions relative to Art. 19 BJG -Prohibition in preparation -	Baden-Württemberg hunting act in the version of 1 June 1996, amended by Art. 34 5. amendment ordinance (AnpVO) of 06/17/1997
Bavaria	No restrictions relative to Art. 19 BJG	Bavarian hunting act (BayJG) amended by act of 30 July 1987, act of 9 August 1993, act of 24 May 1996, act of 23 April 1997
Berlin	No restriction relative to Art. 19 BJG -Restriction in preparation -	Berlin state hunting act (LJagdG Bln) of 3 May 1995
Brandenburg	No restriction relative to Art. 19 BJG	Brandenburg state hunting act (LJagdG Bbg) of 3 March 1992, amended by act of 5 November 1997
Bremen	No restriction relative to Art. 19 BJG	Higher hunting authority (orally reported)
Hamburg	No restriction relative to Art. 19 BJG -Amendment planned -	Hamburg state hunting act, in the version promulgated 22 May 1978, and last amended on 21 November 1996
Hesse	No restriction relative to Art. 19 BJG	Hesse hunting act (HJG) of 12 October 1994, last amended by act of 21 December 1999
Mecklenburg-West Pomerania	No restriction relative to Art. 19 BJG	Hunting act of the state of Mecklenburg-West Pomerania (LJagdGM-V) of 22 March 2000
Lower Saxony	Art. 24 1. Apart from Art. 19 of the Federal Hunting Act, it shall be prohibited, ... to use lead shot in hunting waterfowl game at and above water bodies.	Lower Saxony hunting act (NJagdG) of 16 March 2001
North Rhine-Westphalia	No restriction relative to Art. 19 BJG -Prohibition in preparation -	North Rhine-Westphalia state hunting act (LJagdG NW) of 7 December 1994
Rhineland-Palatinate	No restriction relative to Art. 19 BJG	Rhineland-Palatinate state hunting act, Mainz, 5 May 1997
Saarland	No restriction relative to Art. 19 BJG	Saarland hunting act (SJG) of 27 May 1998
Saxony	No restriction relative to Art. 19 BJG -Prohibition being reviewed -	Saxony state hunting act (Sächs. LJagdG)
Saxony - Anhalt	No restriction relative to Art. 19 BJG	320th state hunting act for Saxony-Anhalt of 07/23/1991, last amended by act of 04/16/1997, by Art. 2 Act for amendment of provisions on administrative procedures of 11/21/1997 and by Art. 4 Act for amendment of administrative enforcement of 12/18/1997
Schleswig-Holstein	Art. 29 4. It shall be prohibited, ... to use lead shot in hunting of waterfowl	Schleswig-Holstein state hunting act (LjagdG) of 13 October 1999
Thuringia	No restriction relative to Art. 19 BJG	Thuringia hunting act (ThJG) of 25 August 1999

Re 4.3: Describe action undertaken by hunting clubs and organisations to manage hunting activity e.g. co-operative action, issuing of licences and proficiency testing of individual members.

In the Federal Republic of Germany, training of hunters is carried out by the DJV's member state hunting associations and their subdivisions (DJV in lit. 2001), as well as by state associations of the Ecological Hunting Association (Ökologischer Jagdverein - ÖJV). In most Länder, admission to the hunter's examination is preceded by a 6-to-12 month training period or completion of a training course totalling at least 110 hours. To be permitted to hunt, a hunter must pass a hunter's examination administered by a state or state-accredited examining board. The hunter's examination includes a shooting-proficiency test and written and oral testing of knowledge in the following areas:
Animal species, game biology, game management, proper management of hunting operations, preventing damage caused by game, relevant aspects of agriculture and forestry, gun laws, weapon technology, proper handling of hunting arms and hunting dogs, proper handling of killed game (including proper hygiene), assessment of safe condition (food safety) of killed game and laws pertaining to hunting, animal welfare, nature conservation and landscape management (DJG, DJV 2001).

In addition, hunting associations offer regular refresher and further training courses (DJV in lit. 2001).

Tab. 2.3.4.1-3: Species-specific annual waterfowl bag statistics, for the various Länder (oral and written information provided by responsible officials at supreme hunting authorities, October / November 2001).

Land	Breakdown by species, ducks	Breakdown by species, geese
Baden-Württemberg	Since 2000	Since 2000
Bavaria		
Berlin	Yes	Yes
Brandenburg	Yes	Yes
Bremen	Planned	Planned
Hamburg	Yes	Yes
Hesse	Yes	Yes
Mecklenburg-West Pomerania	Yes	Yes
Lower Saxony	Yes	Yes
North Rhine-Westphalia	Yes	Yes
Rhineland-Palatinate	???	???
Saarland	No	No
Saxony	Yes	Yes
Saxony-Anhalt	Yes	Yes
Schleswig-Holstein	Yes	Yes
Thuringia	Yes	Yes

Tab. 2.3.4.1-1: Overview of hunting seasons for waterbirds in the Federal Republic of Germany (Hunting season ordinance of 2 April 1977, amended 22 March 2001) and in the Länder (DJV 2001, Lower Saxony hunting-season ordinances of 6 August 2001).

	Federal Republic of Germany	Baden-Württemberg	Bavaria	Berlin	Brandenburg	Bremen	Hamburg	Hesse	Mecklenburg-West Pomerania	Lower Saxony	North Rhine-Westphalia	Rhineland-Palatinate	Saarland	Saxony	Saxony-Anhalt	Schleswig-Holstein	Thuringia
Mute swan (Cygnus olor)	–	01.09.-30.11.	01.09.-15.01.	–	01.09.-15.01.	01.09.-15.01.	–	–	01.09.-15.01.	01.11.-30-11.	01.09.-31.12.	01.09.-15.01.	01.09.-15.01.	01.09.-15.01.	01.09.-15.01.	01.09.-30.09.	–
Grey Goose (Anser anser)	01.08.-31.08./01.11.-15.01.	–	01.08.-31.08./01.11.-15.01.	–	01.08.-31.01.*	01.08.-31.08./01.11.-15.01.	01.11.-15.01.	01.11.-15.01.	01.08.-31.08./01.11.-15.01.	1.08.-31.08./01.11.-15.01.	01.08.-31.08.	–	01.08.-31.08./01.11.-15.01.	01.11.-15.01.	01.08.-31.08./01.11.-15.01.	01.08.-31.08./01.11.-15.01.	–
White-fronted Goose (Anser albifrons)	01.11.-15.01.	–	01.11.-15.01.	–	16.09.-31.01.**	01.11.-15.01.	–	–	01.11.-15.01.	–	–	–	01.11.-15.01.	01.11.-15.01.	01.11.-15.01.	01.11.-15.01.	01.11.-15.01.***
Bean Goose (Anser fabalis)	01.11.-15.01.	–	01.11.-15.01.	–	16.09. -31.01.**	01.11.-15.01.	–	–	01.11.-15.01.	–	–	–	01.11.-15.01.	01.11.-15.01.	01.11.-15.01.	01.11.-15.01.	01.11.-15.01.***
Canada Goose (Anser canadensis)	01.11.-15.01.	–	01.11.-15.01.	–	16.09.-31.01	01.11.-15.01.	01.11.-15.01.	01.11.-15.01.	01.11.-15.01.	01.11.-15.01.	–	–	01.11.-15.01.	01.11.-15.01.	01.11.-15.01.	01.11.-15.01.	–
Brent Goose (Branta bernicla)	01.11.-15.01.	–	01.11.-15.01.	–	01.11.-15.01.	01.11.-15.01.	–	–	–	–	–	–	01.11.-15.01.	01.11.-15.01.	01.11.-15.01.	01.11.-15.01.	–
Mallard (Anas platyrhynchos)	01.09.-15.01.	01.09.-15.01.	01.09.-15.01.	01.10-15.12.	01.09.-15.01.	01.09.-15.01.	01.09.-15.01.	01.09.-15.01.	01.09.-15.01.	01.09.-15.01.	01.09.-15.01.	01.09.-15.01.	01.09.-15.01.	01.09.-15.01.	01.09.-15.01.	01.09.-15.01.	01.09.-15.01.
European wigeon (Anas penelope)	01.10.-15.01.	01.10.-15.01.	01.10.-15.01.	–	–	01.10.-15.01.	–	–	01.10.-15.01.	01.10.-15.01.	–	–	01.10.-15.01.	01.10.-15.01.	01.10.-15.01.	01.10.-15.01.	–
Green-winged teal (Anas crecca)	01.10.-15.01.	01.10.-15.01.	01.10.-15.01.	–	01.10.-15.01.	01.10.-15.01.	–	–	01.10.-15.01.	01.10. -15.01.	–	–	01.10.-15.01.	–	01.10.-15.01.	01.10.-15.01.	–
Northern pintail (Anas acuta)	01.10.-15.01.	01.10.-15.01.	01.10.-15.01.	–	–	01.10.-15.01.	–	–	–	–	–	–	01.10.-15.01.	01.10.-15.01.	01.10.-15.01.	01.10.-15.01.	–
Garganey (Anas querquedula)	–	01.10.-15.01.	01.10.-15.01.	–	–	–	–	–	–	–	–	–	01.10.-15.01.	–	01.10.-15.01.	01.10.-15.01.	–

	Federal Republic of Germany	Baden-Württemberg	Bavaria	Berlin	Brandenburg	Bremen	Hamburg	Hesse	Mecklenburg-West Pomerania	Lower Saxony	North Rhine-Westphalia	Rhineland-Palatinate	Saarland	Saxony	Saxony-Anhalt	Schleswig-Holstein	Thuringia
Common Pochard (Aythya ferina)	01.10.-15.01.	01.10.-15.01.	01.10.-15.01.	–	01.10.-15.01.	–	–	–	01.10.-15.01.	–	–	–	01.10.-15.01.	01.10.-15.01.	01.10.-15.01.	01.10.-15.01.	–
Tufted duck (Aythya fuligula)	01.10.-15.01.	01.10.-15.01.	01.10.-15.01.	–	–	–	01.10.-15.01.	–	–	–	–	–	01.10.-15.01.	01.10.-15.01.	01.10.-15.01.	01.10.-15.01.	–
Greater scaup (Aythya marila)	01.10.-15.01.	01.10.-15.01.	01.10.-15.01.	–	–	01.10.-15.01.	–	–	–	–	–	–	01.10.-15.01.	01.10.-15.01.	01.10.-15.01.	01.10.-15.01.	–
Black scoter (Melanitta nigra)	01.10.-15.01.	01.10.-15.01.	01.10.-15.01.	–	–	01.10.-15.01.	–	–	–	–	–	–	01.10.-15.01.	01.10.-15.01.	01.10.-15.01.	01.10.-15.01.	–
Velvet scoter (Melanitta fusca)	01.10.-15.01.	01.10.-15.01.	01.10.-15.01.	–	–	01.10.-15.01.	–	–	–	–	–	–	01.10.-15.01.	01.10.-15.01.	01.10.-15.01.	01.10.-15.01.	–
Black coot (Fulica atra)	01.09.-15.01.	01.09.-15.01.	01.09.-15.01.	01.10.-15.12.	01.09.-15.01.	01.09.-15.01.	–	01.09.-15.01.	01.09.-15.01.	01.09.-15.01.	01.09.-15.01.	01.09.-15.01.	01.09.-15.01.	01.09.-15.01.	01.09.-15.01.	01.09.-15.01.	01.09.-31.12.

*) 01.09.-31.10 and 16.01-31.01 only to prevent crop damage,
**) 16.09.-31.10.and 16.01.-31.01 only to prevent crop damage,
***)08:00-10:00,
****) until 31 March 2005

Fig. 2.3.4.1-1: Annual numbers of wild ducks bagged in the Federal Republic of Germany (Source: DJV 2001/2002).

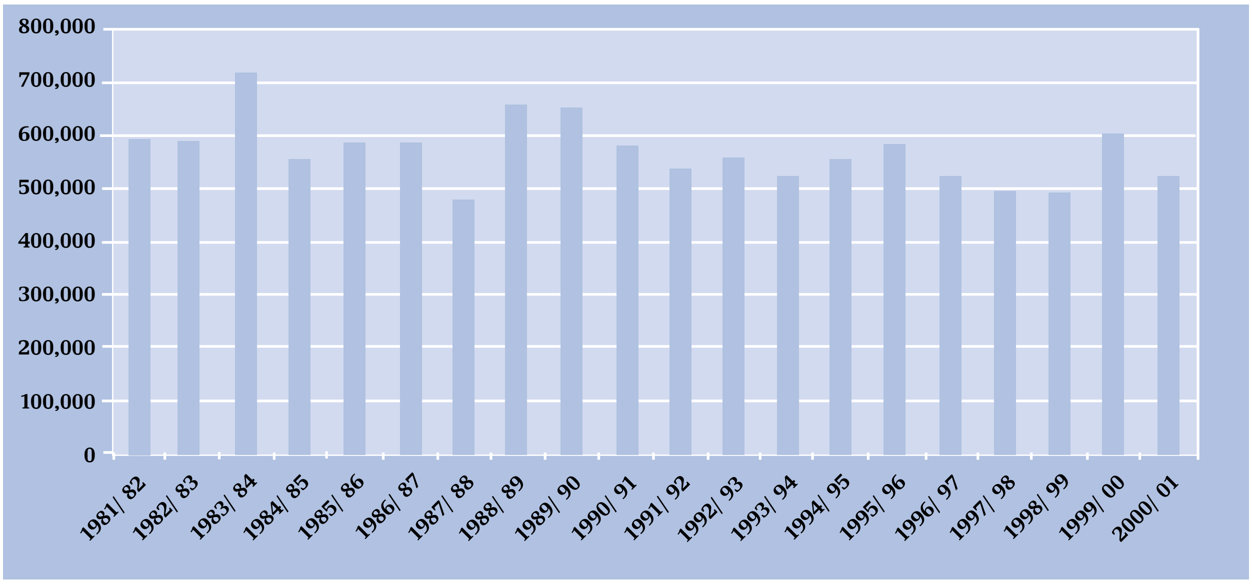
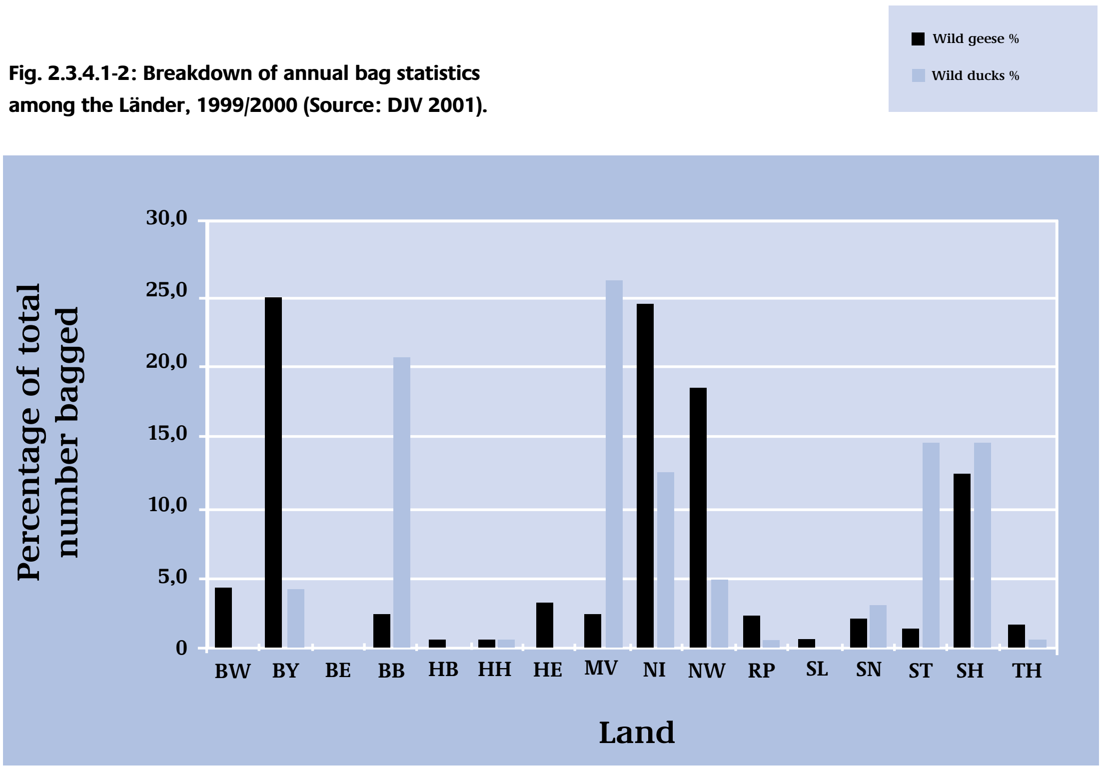


Fig. 2.3.4.1-2: Breakdown of annual bag statistics among the Länder, 1999/2000 (Source: DJV 2001).



2.3.4.2 Eco-tourism

Re 4.4: What is the status of eco-tourism programmes or initiatives in your country? Please provide examples of projects with an indication of the significant outcomes.

Re 4.5: What social and economic benefits accrue to the local communities from the conservation of important waterbird sites?

According to estimates of the World Tourism Organization (WTO), seven percent of all travel expenditures world-wide go to nature tourism – and this figure is growing. The area of nature and special-experience travel is booming like no other: whereas tourism overall is growing by about four percent annually, "eco-tourism" is growing at rates of 10% to 30% (GEO-SCIENCE ONLINE 2001).

In Germany, eco-tourism, in the original sense of the term, is a niche product that has some 2% of the market. Fast growth is not expected.

The Federal Government has been striving to promote sustainable tourism. In October 2001, the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) introduced the "Viabono" environmental label, in which 20 environmental, consumer and tourism associations are participating. This label has the purpose of convincing consumers that environmentally oriented travel can offer quality, comfort and excellent experiences of nature.

Viabono licenses are awarded to tourism associations, hotels and restaurants, large protected areas, campsites, vacation homes etc. in keeping with a specially prepared catalogue of criteria. As of March 2002, a total of over 60 organisations etc. had become licensees.

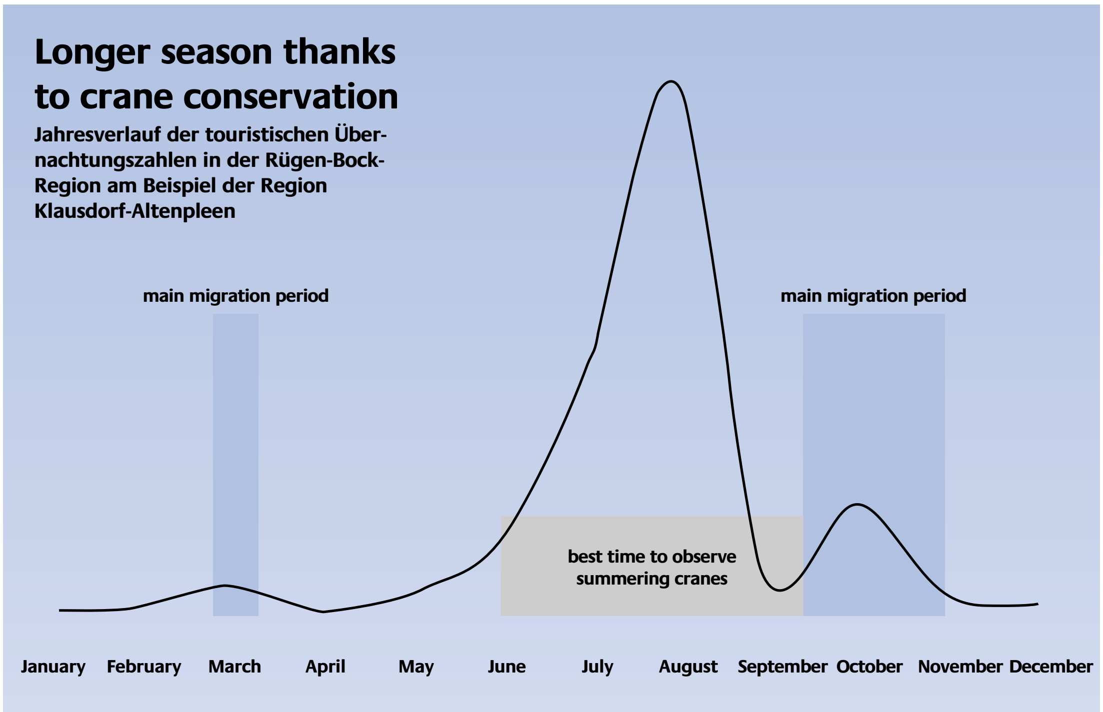
Fig. 2.3.4-1 provides an example of large protected areas' attractiveness for tourists. Consideration of numbers of overnight stays in the Rügen-Bock region on Mecklenburg-West Pomerania's Baltic Sea coast, over the course of a year, shows two additional high-occupancy periods outside of the main summer season (June through August). The first, with the lower of the two levels, occurs in March. The second, which has a much higher level, occurs in October. The October growth in visitor numbers coincides with the main migration of cranes to their wintering areas, an event that lasts considerably longer than the relatively short spring passage. Thanks to a range of conservation efforts, especially in the birds' resting and sleeping areas in the bodden waters of Darß and on the island of Rügen, and thanks to effective measures for guiding visitors and helping them to experience this natural spectacle, crane-migration watching has become a tourist attraction in the region.

A number of institutions also offer day-excursion programmes.

Since the 1980s, "goose tourism" has developed into a factor in the Unterer Niederrhein (lower part of the lower Rhine) region. As the numbers of wintering wild geese there have grown sharply (from about 25,000, in the 1970s and 1980s, to over 150,000 individuals today), public interest in the geese has grown as well. As early as the 1980s, bus tours of the geese' wintering areas were being organised (MOOIJ 1988). But goose tourists who come in their private cars often create major disturbances. Since 1992, the German Nature Conservation Association (NABU) has been carrying out a project for guiding goose tourists, in order to reduce the disruptions (WILLE 1997). Thanks to effective efforts to enhance public awareness, comprehensive visitor service and strict protection of some sensitive areas, goose tourism has developed into an attractive way to enjoy a short vacation. Discounts on railway travel are offered in order to encourage visitors to come by train. At the same time, efforts are being made to strengthen the region's ecological development. New markets for regional organically grown food have been created, for example.

In Lower Saxony, the "Association for the Promotion of Nature Experiences" ("Verein zur Förderung of Naturerlebnissen e.V.") offers day excursions in the Stade rural district. The association's "Vogelkieker-Bus" ("birdwatcher bus") takes visitors to the "Nordkehdingen nature experience" on the lower Elbe River. This double-decker bus, which was specially purchased and painted for this purpose, takes guests on 2-3 hour tours of areas in which tens of thousands of Nordic migratory birds live in the fall and thousands of meadow-breeding birds breed in the spring and early summer (the Nord-kehdingen bank of the Elbe). The bus serves as an excellent observation platform. Professional tour

Fig. 2.3.4-1: Numbers of tourist overnight stays in the Rügen-Bock region (Mecklenburg-West Pomerania) (blue line), throughout the year, in comparison with presence of cranes in the region (SCHMIEDEL in lit. 2001)



guides describe the various stations and provide background information (VEREIN ZUR FÖRDERUNG V. NATURERLEBNISSEN 2001).

2.3.4.3 Other human activities

ENVIRONMENTAL IMPACT ASSESSMENT, INTERVENTION REGULATIONS AND FFH IMPACT ASSESSMENT.

Re 4.6: Does your country carry out Environmental Impact Assessment (EIA) of activities potentially affecting protected sites or areas important for species covered by the Agreement? If yes, briefly describe the main features of your EIA policy and procedures.

Environmental Impact Assessment (EIA) is a legal instrument for assessing projects that can cause environmental damage. It thus is an instrument of precautionary environmental protection. As a dependent part of authorities' administrative procedures, the EIA supports decisions on permissibility of projects.

The Environmental Impact Assessment Act (Umweltverträglichkeitsprüfungsgesetz - UVPG), like the relevant EC Directive, establishes the following aim for EIA: where projects are to be assessed, effective environmental precautions, in keeping with standardised principles, must be taken. Furthermore, at an early project stage, relevant environmental impacts must be comprehensively determined, described and assessed. Results of such assessment must be taken into account, as early as possible, in all decisions taken by authorities.

EIA are carried out for projects as listed in Annex I of the UVPG. Such projects include projects that involve interventions in waterbird habitats, such as widening and straightening of waterways, river channelling and flow correction, construction of dams and port facilities and mining of minerals in water bodies.

The assets to be protected, i.e. the focus of EIA, are:

- Human beings, fauna, flora
- Soil, water, climate, air
- Landscapes
- Cultural and other assets

along with the relevant interrelationships between such assets.

EIA are divided into three main sequential focus areas. The first area comprises definition of the necessary framework for the assessment; the second, and main, area consists of the environmental impact study (Umweltverträglichkeitsuntersuchung - UVU), and the third area includes a summary and assessment of the relevant assets.

An EIA proceeds as follows: once the project backer has notified the competent authority of the planned project and has provided the authority with all decision-relevant materials regarding the nature and location of the project, the authority reviews whether the project is subject to EIA requirements. If this is found to be the case, the assessment framework (pursuant to Art. 5 UVPG) must first be defined. This review, known as the "scoping process", involves the participation of at least the competent authority, the project backer and the relevant specialised authority. The public and nature conservation associations may also be invited to participate. The main EIA process which then follows is the environmental impact study (Umweltverträglichkeitsuntersuchung - UVU), which identifies the various assets concerned, including their interrelationships, and in keeping with requirements as determined in identification of the framework (step 1), and determines the project's possible consequences. The condition of the assets in question is analysed, and the possible project-related environmental threats are described. This is followed by a comprehensive, prognostic comparison of the relevant assets with the project's estimated impacts. This prognosis covers the project's various phases (construction, operation, decommissioning, follow-on uses, disruptions and (hazardous) incidents) and the various spatial and technical variants of the project, always taking the relevant interactions into account. The various impacts and alternatives are then assessed and compared, and a preferred option is identified. Relevant avoidance, reduction, compensation and substitution measures are also described. The final document, with the results of the UVU, is the Environmental Impact Assessment Study (Umweltverträglichkeitsstudie - UVS). The competent authority uses it, following relevant review on the basis of scoping criteria, for public notification.

Following public notification and the resulting discussion, the competent authority then prepares a summary of the project's environmental impacts and a resulting assessment. The final decision regarding the project's permissibility must then take this summary into account in weighing all interests affected by the project (RIEDEL & LANGE 2001).

Intervention regulations, pursuant to Art. 18 Federal Nature Conservation Act (BNatSchG), must be applied, in connection with authorities' permission or licensing, when land forms or uses are changed in such a manner that the vitality of natural systems or the landscape's appearance could be considerably or lastingly impaired. This regulation is meant to reduce unregulated use of natural assets and landscapes, and ensure that all of nature is protected throughout the country. In contrast to the EIA, which support decisions on projects' permissibility, intervention regulations support decisions on the direct legal consequences of projects (BERNADOT & HERBERT 2001).

Where an intervention pursuant to Art. 18 (1) is present, all avoidable impairments must be avoided. All unavoidable considerable or lasting impairments must be compensated for, within a certain period, by means of nature-conservation and landscape-management measures. Where this is not possible, the various interests in question must be weighed. If weighing of all nature and landscape criteria shows that interests of nature conservation and landscape management have priority, the project is not permissible. If the project is permissible, all impairments that cannot be compensated for directly must be compensated for by means of adequately extensive substitution measures.

In protected areas pursuant to the EC Bird Directive or FFH Directive, environmental impact assessment pursuant to Art. 34 BNatSchG (Art. 6 of FFH Directive, 92/43/EEC must be carried out in addition to an EIA. So-called FFH "impact assessments" must be carried out for plans and projects that, either individually or in combination with other plans and projects, could considerably impair an area. Like intervention regulations, they have binding legal consequences.

In contrast to the EIA, FFH impact assessments focus not on nature as a whole, but on specific conservation objectives defined for the area in question – for example, protection of wetlands as resting areas for certain bird species. Consequently, plans and projects are not permissible, if they can considerably impair a protected area for birds, by impairing the area's key elements with regard to its conservation objectives or protection purpose.

Compensation and substitution measures may not be taken into account in impact assessments, since they do not rule out impairments – they simply eliminate or reduce them after the fact. Avoidance and reduction measures, and project alternatives, can and must be assessed. If a project is not permissible, an exception may be granted only in the case of a compelling public interest.

The studies and results carried out in the impact assessments as described above are announced to the public within the framework of the plan-approval procedure, which follows the impact-assessment phase.

2.3.4.4 Other human activities

DAMAGE TO CROPS

Re 4.7: Please describe the main features of your planning policy and provide examples of practical implementation (e.g. activities to minimise disturbance of species populations or limit the impact of species populations on crops or fisheries). Please summarise any land-use conflicts emphasising successful solutions to problems encountered in promoting the wise use of waterbirds and their habitats.

Of the species and populations included in the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA), the primary potential threats to crops are posed by swans *(genus Cygnus)*, geese (*genera Anser* and *Branta*) and, to a lesser extent, by a few dabbling ducks, especially the European wigeon *(Anas penelope)*, and the common crane *(Grus grus)*. The resting and wintering grounds of these species in Germany have grown considerably since the 1960s. On the other hand, this trend seems to have slowed recently (since the end of the 1960s), especially among the goose species. At the same time that populations of these species have been growing, agricultural uses in coastal lowland landscapes and river valleys of the north-German low plain, the species' traditional resting and wintering grounds, have changed considerably. The changes have included conversion – via drainage, nitrogen addition and melioration – of grassland sites into cultivated land, usually for planting of high-yield winter grains and winter oilseed rape (MOOIJ & SÜDBECK 2001).

Furthermore, increasing fragmentation of the open landscape, through construction of traffic infrastructure and structures such as power lines and wind turbines, along with uses by recreationers, has led to the concentration of waterbirds on relatively few sites – with resulting heavy use and heavy damage. This effect is intensified by hunting, since the areas available to birds shrink as the birds' flight distance (i.e. wariness) increases (MOOIJ & SÜDBECK 2001).

In the course of these developments, the numbers of damage reports submitted by farmers have been increasing, especially in the Länder Brandenburg, Mecklenburg-West Pomerania, Lower Saxony, North Rhine-Westphalia, Saxony-Anhalt, Saxony and Schleswig-Holstein. MOOIJ (1992) estimated the state's payments to farmers in Germany in the early 1990s, to compensate them for waterbird damage, totalled 1,500,000 to 2,300,000 € (3,000,000-4,500,000 DM), for a total affected area of 10,000 to 20,000 ha. Some 75% of the reported damage was caused by feeding geese. According to surveys of the Federal Agricultural Research Centre (Biologische Bundesanstalt für Land- und Forstwirtschaft), the annual damage was estimated to reach 25,560,000 € (50,000,000 DM), although this figure is based on affected farmers' own reports and is likely to be considerably exaggerated (GEMMEKE 1998). MOOIJ (1999) places the actual annual damage caused by feeding geese, in the mid-1990s, between 6,650,000 and 17,900,000 € (13,000,000 and 35,000,000 DM) (Table 2.3.4.4-1).

A basic difficulty in assessing farmers' damages from waterbird grazing is to quantify damage on the basis of objective criteria. In particular, waterbird grazing does not necessarily reduce agricultural earnings by reducing harvest yield, since plants regenerate. In most cases, grazing waterbirds cause measurable income losses only after a certain damage threshold has been exceeded. What is more, other factors such as weather, site conditions (soil, water) and site management are often not taken into account in assessing waterbird damage (MOOIJ & SÜDBECK 2001).

Since it is only natural for affected farmers to exaggerate the damage they incur, it is important for independent appraisers to be able to quantify damage using standardised methods (MOOIJ 1999, SPILLING 1999). And yet the costs of such damage assessment can exceed the costs of the damage itself. One practical solution, therefore, is to make lump-sum payments based on objective damage levels. With this approach, damage assessment is oriented to average losses as expressed in balance sheets. To provide a general basis, the differences between grazed-land yields and ungrazed-land yields must be experimentally measured, on a regional basis, the relevant grazing-bird populations must be surveyed and formal damage appraisals must be carried out (SPILLING 1999).

POSSIBLE WAYS OF PREVENTING OR REDUCING WATERBIRD DAMAGE IN GERMANY. 4.3.3 of the AEWA Action Plan calls on the parties to develop procedures for minimising crop damage caused by waterbirds. One promising approach in this area was presented by HAASE (2000) at a conference for preparation of AEWA implementation. A number of strategies for preventing and reducing crop damage caused by waterbirds, especially geese, were also discussed in the 1990s. These strategies were most recently summarised by MOOIJ (1999) and MOOIJ & SÜDBECK (2001). The following section presents a few specific approaches used by affected Länder.

HUNTING. It is often urged that resting waterbirds be hunted in order to reduce local crop damage. This strategy is problematic from both conservational and legal perspectives. In addition, the effectiveness of damage control by hunting is scientifically questionable, since disturbances caused by hunting increase birds' energy consumption (food requirements) and also reduce the available space for geese. These effects result in local concentrations on a very few sites – concentrations beyond the levels that plants can tolerate.

SCARING. Sometimes birds can be scared away from affected areas by persons, vehicles, gunshots or other loud noises or passive devices (scarecrows or flags, etc.). Such measures tend to be ineffective and short-lived in their impacts. Loud noises are a nuisance for the local population. Scaring, like hunting, simply shifts the problem from one area to another and should be used only in connection with other measures, such as establishment of quiet zones, in order to minimise local damage on individual sites.

Tab. 2.3.4.4-1: Extent, estimated value, compensation payments and estimated damage per hectare, for annual crop damage caused by waterbirds (swans, geese, ducks and cranes) in the Federal Republic of Germany in the mid-1990s (figures converted to euros and rounded off, pursuant to MOOIJ 1999)..

Land	Damaged area (ha)	Estimated damage (€)	Compensation paid (€)	Estimated damage/ hectare (€/ha)
Brandenburg	21,784	1,163,000	283,000	513
Mecklenburg-West Pomerania	4,344	879,000	879,000	200
Lower Saxony	3,891	562,000	0	145
North Rhine-Westphalia	9,895	1,094,000	1,095,000	110
Saxony	11,270	0	0	0
Saxony-Anhalt	1,647	76,750	0	47
Schleswig-Holstein	1,702	715,000	112,000	420
Thuringia	303	6,600	0	220

NETWORK OF QUIET ZONES. Networks of quiet zones, in which birds can search for food undisturbed, can spread the risk of waterbird damage over a larger area. This can keep bird densities on surrounding (farm) land from reaching critical levels.

FEEDING AND DIVERSIONARY SITES . Use of diversionary sites, with conditions tailored to food needs of geese, and direct feeding are other strategies for minimising crop damage and, thus, of reducing costs for public budgets. Such measures can concentrate geese on certain areas and prevent damage on neighbouring cropland. On the other hand, they entail considerable practical difficulties (availability and quality of substitute food) and costs, and thus they are useful only as elements of an overall conflict-minimisation concept.

FINANCIAL COMPENSATION FOR DAMAGE. In regularly affected areas, the public sector provides financial compensation to farmers who incur waterbird damage. This practice brings up the difficulty of separating damage actually caused by waterbirds from other types of losses – as well as of quantifying the relevant damage. In most cases, the damage must be locally appraised, and this in turn brings up both theoretical and practical difficulties.

ADAPTATION OF AGRICULTURAL SOIL USE. Selection of suitable uses in waterbird resting areas can reduce conflicts between agricultural uses and requirements of resting waterbirds. For example, plowing of grassland near water bodies, and intensive cultivation of winter grain and winter oilseed rape, has tended to increase damage. Many conflicts can be defused by promoting cultivation of grassland (which is much less sensitive) in strongly affected areas, with the help of suitable contractual nature conservation measures.

Such measures must also include provision of closely linked resting and feeding areas, through restoration of natural water regimes in riparian meadows and coastal lands.

Reductions in yields of particularly threatened crops (winter grain, winter oilseed rape) can be prevented by increasing the amount of sown seed by 5-10%. Another useful tactic is to plant threatened crops, wherever possible, on land near roads and communities, which geese tend to avoid, and not in quiet sites within birds' core range areas.

EXAMPLES OF SOLUTIONS TRIED IN VARIOUS LÄNDER.

MANAGEMENT OF MIGRATORY WATERBIRD SPECIES IN BRANDENBURG. In 1996/1997, the state (Land) of Brandenburg carried out a model project to test measures for reducing bird-caused crop damage, in keeping with the principle of "damage prevention instead of damage compensation" (MINISTERIUM FÜR UMWELT, NATURSCHUTZ UND RAUMORDNUNG DES LANDES BRANDENBURG 1997, HAASE et al. 1999, LANGGEMACH 1999). The test showed that affected farmers can control land use by waterbirds. As a result, farmers can prevent damage to particularly sensitive land (freshly sown fields and fields with grain and oilseed seedlings) and reduce yield losses. The damage management strategy included the basic tactics described below.

I. SCARING OF BIRDS AND SELECTIVE HUNTING ON LAND AT RISK. Field guards regularly monitor particularly sensitive fields (young winter grain and oilseed rape) and scare waterbirds away from them. Visual and acoustical devices (flags, noisemakers) are also used to discourage the birds. Selective hunting is carried out on endangered fields, by agreement between licensed hunters and farmers. No hunting is carried out on areas not at risk (harvested corn, grain, potato and beet fields, fallow land, grassland), nor is it carried out on birds' resting and sleeping areas near water bodies. Avoidance of disturbances in areas not at risk keeps birds from increasing their energy consumption and increasing their flight distance – and thus from moving to sensitive land.

II. USE OF QUIET ZONES AND DIVERSIONARY AREAS TO RELIEVE PRESSURE ON CROPS. In addition to the above-described damage-control measures, quiet zones are created in areas not at risk and along water bodies where the birds sleep. In these quiet areas, the birds are permitted to feed without being disturbed by hunters or visitors. This strategy distributes the birds' grazing pressure over a larger area and thus reduces damage on specific areas. Particularly attractive harvested corn, grain, potato and beet fields are offered to the birds as areas in which they can feed undisturbed.

Farmers can take specific measures to enhance the effectiveness of these diversionary areas. Such measures include:

- Conservation or restoration of non-sensitive grasslands near water bodies where the birds sleep. Rewetting of grassland areas to enhance their attractiveness for waterbirds.
- Timing of harvesting to create a good food supply on freshly harvested fields (corn stalks), at the time when waterbirds feed most intensively.
- Leaving of crop remains on fields, after harvesting, and spreading of left-over feed, especially during cold periods in which birds find little food.
- Adaptation of crop-planting sequences, crop selection and sowing methods to the specific damage situation. Early, especially careful sowing (planting depth, amounts of seed sown), along with avoidance of damage-prone crops near birds' sleeping sites, can prevent at least some expected losses before they occur.

III. CO-OPERATION BETWEEN FARMERS, HUNTERS AND CONSERVATIONISTS, ON PRACTICAL, OFFICIAL AND SCIENTIFIC LEVELS. To be optimally effective, goose management must be able to respond flexibly to local conditions and to co-ordinate measures regionally. All concerned parties must thus co-operate closely in exchanging information. Farmers are responsible for initiating management measures and co-ordinating them with their neighbouring farmers and with hunters (holders of the relevant hunting leases). Hunters should actively support measures by hunting selectively on damaged areas and not hunting on diversionary areas and at water bodies where birds sleep. They should also help guide visitors as necessary. Nature conservation authorities and associations should support measures by carrying out relevant scientific studies and monitoring and by guiding visitors.

Significantly, contractual nature conservation is a useful instrument for creation and management of effective diversionary areas.

GOOSE-DAMAGE MANAGEMENT IN LOWER SAXONY.

"ÄSUNGSFLÄCHEN FÜR GASTVÖGEL IN DER ELBTALAUE (ÄGIDE)". From 1994 to 1999, the state of Lower Saxony carried out the project "Grazing areas for guest birds in the Elbe meadows" ("ÄSUNGSFLÄCHEN FÜR GASTVÖGEL IN DER ELBTALAUE (ÄGIDE)". The aim of the project, which was initiated by Lower Saxony's environment ministry, was to create attractive grazing areas for resting waterbirds in the Elbtalaue (riparian meadows along the Elbe River), one of the most important resting areas for geese and swans in Lower Saxony, in order to reduce damage to farmland in the surrounding area (SÜDBECK & KÖNIGSTEDT 1999).

With instruments of contractual nature conservation (management agreements), a graduated system of diversionary areas was established (Tab. 2.3.4.4-2). On these areas, a sufficient, high-quality supply of food was provided, intended especially for

Tab. 2.3.4.4-2: Types of areas in the ÄgidE project (according to SÜDBECK & KÖNIGSTEDT 1999).

Project area type	Contract subject	Measures
Diversionary areas Contract (two vegetation periods with subsequent stoppage of cultivation or summer crop) Compensation for harvest losses	Ripe winter grain, tilled (grains) Corn, tilled	• No active measures to drive birds away • Extensive management • (reduced use of fertiliser and herbicides) • No cultivation measures during the resting season • Selective hunting
Toleration areas Contract Compensation for increased harvest loss (30%) resulting from toleration	Winter grain seeds Perennial ryegrass seed Winter oilseed rape	• No active measures to drive birds away • No cultivation measures during the resting season • Selective hunting
"Permission areas" No contract	Stubble fields, fallow fields, Permanent grassland, flood plains	• No active measures to drive birds away • No cultivation measures during the resting season • Selective hunting

resting swans and geese. Participating farmers were compensated for their losses (loss of land use) by the public sector and in accordance with a total of three contract options.

In addition, voluntary agreements were reached with holders of hunting leases within the project area. These agreements provided for control of the project areas via hunting as well as for management of water bodies used by the birds for sleeping and resting. For organisational reasons, other management measures, such as active scaring or use of passive devices to discourage the birds, were not carried out.

Some of the established project areas were used very intensively by geese. This provided basic proof of the areas' attractiveness, as desired, for resting herbivorous waterbirds. On the other hand, the project was unable to prove that the areas actually reduced grazing pressure, of resting geese and swans, on neighbouring fields. The reason for this was that geese and swans used many different sites, at widely varying times.

SCHLESWIG-HOLSTEIN. The state (Land) of Schleswig-Holstein is an important passage and resting area for herbivorous waterbirds. The Wadden Sea, including is coastal hinterland, main islands and "Hallig" islands, is of special importance for resting brent geese, barnacle geese, and European wigeons. Three damage-control instruments are being used in the area to defuse conflicts with farmers (FLEET 1999).

- The Halligen programme, which was established in 1987, and is funded by the European Union, the German Federal Government and the state government, is aimed at reconciling interests of coastal protection, nature conservation and agriculture on the Halligen Langeness, Oland, Hooge, Gröde, Nordstrandischmoor, Süderoog and Südfall. Farmers are compensated on a yearly basis for damage caused by brent geese. To this end, an independent appraisal office inspects and maps the damaged areas and sets the resulting compensation for farmers.

- Since 1994, compensations for crop damage have been provided in keeping with the "Guideline for payments to compensate for crop damage caused by sea geese (brent geese and barnacle geese) or European wigeons".

- Since 1998, damage on pastures can be compensated for via the "Feeding areas for geese and ducks" contractual nature conservation package. Under relevant contracts, resting geese and ducks are offered attractive feeding areas in traditional, large, disturbance-free pastures, especially on the North Sea coast.

NORTH RHINE-WESTPHALIA. Since 1981/82, financial assistance to compensate for goose damage in the largest goose resting area in North Rhine-Westphalia, in the Unterer Niederrhein lower-Rhine region, has been provided on the basis of a voluntary agreement between the agricultural sector and the state's environmental ministry. Relevant payments have grown significantly, as the numbers of geese resting in the area have increased. By the mid-1990s, they reached a level of 1,790,000 € (3,500,000 DM). In 1996/97, in an effort to reduce these payments, a programme was launched to reduce goose damage in the Unterer Niederrhein area. This programme, which is to run until 2001, is being managed by the Rhineland Chamber of Agriculture (Landwirtschaftskammer Rheinland) and includes the participation of the three local biological stations (Kleve nature conservation centre, Wesel biological station and NABU nature conservation centre in Kranenburg) (BRÜHNE et al. 1999).

In this programme, as in Lower Saxony, management agreements have been concluded with local farmers, on a voluntary basis, covering the following points:

- Geese are not to be additionally fed.

- Where feed plants for geese are planted, the relevant farm should be in a position to make use of any left-over plants.

- The contract packages should fit well with the relevant farms' operational structures.

- Paying farmers for services rendered in this context – i.e. providing geese with feed plants – is considered preferable to compensating farmers for damage incurred; with payment for services, farmers receive payments earlier than they would by applying for damage compensation.

Farmers are offered a range of different management-contract options. From these, they select the type of agreement that best fits with their own cultivation and management. The "no-tilling" management package is chosen especially often. It calls for farmers to leave remains of sweet-corn or sugar-beet crops on the fields, following harvest, and to plow the fields under only after the field has been grazed by geese. The state government then compensates farmers for any possible losses they incur by complying with the management restrictions.

The measures' success is monitored by means of scientific studies carried out by the biological stations and via surveys to determine participating farmers' satisfaction with the programme.

Preliminary findings from the supporting studies indicate that, under measures carried out to date, geese have been usefully attracted to the diversionary areas. Fields with left-over corn and sugar-beet crops proved particularly attractive and were intensively grazed. It seems likely that the diversionary areas provide a certain measure of control over the birds' land use, especially in the fall and early winter, and thus help prevent grazing damage.

2.3.5 Research and monitoring

STATUS OF RESEARCH AND MONITORING PROGRAMMES FOR SPECIES.

Re 5.1: How are priorities for research identified in your country? Please briefly describe your country's research programmes, including any bilateral or multilateral co-operative action, for wetland habitats and for species covered by the Agreement (e.g. studies into species population, ecology and migratory patterns). Please append a list of research activities initiated, ongoing or completed in the last three years.

The research priorities of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) are set forth in an annual **"Environmental Research Plan" ("Umweltforschungsplan")**, in the form of planned **research and development projects (R+D projects)**.

The plan is prepared by the BMU, the German Federal Agency for Nature Conservation (BfN), and other authorities in these institutions' sphere of competence, under consultation arrangements. At the beginning of each year, the plan is published in the BMU's "Umwelt" journal and in the Internet.

The purpose of research and development projects is to provide a basis and orientation for the Federal Government's nature conservation and environmental protection policy. In particular, projects support preparation, review and refinement of national and international legal provisions and programmes, as well as of national nature conservation tasks. Current R+D projects with relevance to AEWA are presented in the following list (BUNDESAMT FÜR NATURSCHUTZ (GERMAN FEDERAL AGENCY FOR NATURE CONSERVATION) 2001b). Chap. 4 provides an overview of other projects.

List of current research and development projects in connection with AEWA:

- Global study of threatened migratory species, with the aim of preparing a Global Register of Migratory Species (GROMS; international).
- High Sea Marine Protected Areas (conference; international).
- Inventory and assessment of ecologically valuable North Sea habitats (international).
- Study of populations of species that are listed in Annex I of the EU Bird Directive and that occur in Germany, and study of regularly occurring migratory bird species, to provide a basis for assessing sites set aside for protection of such species (national; see Chap. 1.3.3).
- Inventory of the distribution, abundance and migrations of seabirds and waterbirds in the German North Sea, and development of a concept for implementation of international protection objectives (national; see Chap. 1.2.2).
- Seabirds and waterbirds in the German Baltic Sea, and their protection within the framework of international agreements (national; see Chap. 1.2.2).

- Assessment of the contribution of national and international nature conservation projects, in Germany, to conservation of endangered bird species on agricultural land; study of conflicts of interests and potential solutions (national; see Chap. 1.2.3).

- Assessment of the role of environmental factors in breeding success of meadow birds (national; see Chap. 1.2.3).

- Model for an overall concept for Federal species monitoring, illustrated with the example of monitoring of avifauna (national)

The various Länder are also carrying out research projects of their own. Hamburg's national park administration, for example, commissioned a comprehensive survey, from 1995-1999, to provide a basis for an efficient monitoring programme in Hamburg's Wadden Sea areas. The state's Institute for applied environmental biology and monitoring (Institut für angewandte Umweltbiologie und Monitoring) also collected relevant data on wading birds and waterbirds and their habitat conditions in the Wadden Sea (UMWELTBEHÖRDE HAMBURG 2001).

Regional and local research projects with relevance to AEWA species are carried out by many non-governmental organisations – especially in major conservation areas, and at bird stations (banding centres), bird protection centres and universities.

Re 5.2: What monitoring activities does your country undertake, including any bilateral or multilateral co-operative action, of wetland areas and species covered by the Agreement (e.g. national monitoring schemes, International Waterfowl Census)? Please append a list of monitoring activities or programmes initiated, ongoing or completed in the last three years.

The topic of waterbird monitoring in Germany was intensively discussed at a recent conference on implementation of AEWA in Germany (BOYE et al. 2000, RÖSNER 2000). Over the past few years, the BfN has developed a basic concept for structuring of conservation-oriented monitoring. This concept makes a distinction between "areas of value in terms of conservation" and the "normal landscape". Both types of areas are subdivided into species, biotopes and landscapes. This outline provides an overall framework for the various monitoring programmes, and it reveals deficits and overlapping in programmes (BÜRGER & DRÖSCHMEISTER 2001).

In 2001, the research and development project "Model for an overall concept for Federal species monitoring, illustrated with the example of monitoring of avifauna" presented a concept for improving monitoring of animal species. The concept takes special account of the Federal Government's conservation-related and political tasks, as well as of its international obligations to monitor animal species.

Via modules on the areas of "wetlands monitoring", "endangered species" and "migratory species", the data needed to fulfil obligations under AEWA will be obtained. The planned implementation of the concept within a nation-wide monitoring programme calls for integrating and optimising ongoing monitoring carried out by the Länder and relevant associations, and at supplementing this monitoring with new federal programmes. These efforts will provide current information required for nature conservation.

The great majority of current monitoring programmes in Germany do not receive any state financing on an institutional basis. In the main, they consist of censuses and other activities carried out by nature conservation associations and scientific organisations such as the Umbrella Association of German Avifaunists (Dachverband Deutscher Avifau-nisten - DDA). Such efforts may receive state financial support for study of certain issues and / or they may be co-ordinated by Länder institutions. Monitoring programmes are carried out largely by private, volunteer staff and members of the relevant nature conservation organisations. The following section presents international and national monitoring programmes. State-wide and regional programmes are listed in Tab. 2.3.5-1.

TRILATERAL MONITORING AND ASSESSMENT PROGRAMME FOR THE WADDEN SEA (TMAP). The Trilateral Monitoring and Assessment Programme for the Wadden Sea (TMAP) is an international programme carried out by the Wadden Sea countries Denmark, Germany and the Netherlands. The purpose of TMAP is to monitor and assess the ecological condition of the Wadden Sea and the implementation status relative to ecological objectives agreed under trilateral Wadden Sea co-operation. The following section outlines the various national projects being carried out within the TMAP framework, where projects have relevance to AEWA species.

- **Monitoring of breeding populations of coastal birds:** each year, censuses are carried out on Germany's North Sea and Baltic Sea coasts, within the framework of monitoring of coastal bird breeding populations. The term "coastal birds" refers to those species whose breeding range in Germany is limited to, or clearly concentrated in, coastal areas. This group includes nearly all wading birds *(limicolae)*, gulls and terns, some ducks, the white spoonbill *(Platalea leucorodia)*, great cormorant *(Phalacrocorax carbo)*, hen harrier *(Circus cyaneus)* and short-eared owl *(Asio flammeus)*.

The method of breeding-bird monitoring used on the North Sea and Baltic Sea coasts is standardised pursuant to HÄLTERLEIN et al. (1995). On the North Sea coast, complete-coverage survey mapping is carried out for all outer dike areas, islands and important mainland areas, especially recently diked areas. On the Baltic Sea coast, survey mappings are carried out only in protected areas – which are the areas in which most coastal birds in the region breed. The coastal bird surveys monitor population sizes, trends and distributions. Breeding population survey data for the North Sea enters into the TMAP. Population trend data provides indications of habitat quality and facilitates prompt initiation of protection measures (HÄLTERLEIN et al. 2000).

- **Monitoring of breeding success of coastal birds:** In 1996 and 1997, a pilot study was carried out, within the TMAP framework, relative to monitoring of breeding success of coastal birds. Such studies are now to be carried out at five-year intervals; the first follow-on survey was carried out in 2001. The data collected includes hatching and overall breeding success rates and body-mass development of young of various coastal bird species. The overall aim of the efforts is to determine and monitor natural breeding success rates to facilitate prompt action in cases of negative trends (THYEN et al. 2000).

- **Monitoring of contaminants in coastal birds' eggs:** The existing monitoring programme, whose beginnings go back to 1981, has been a top-priority element of TMAP since 1994. Each year, eggs of selected coastal bird species are taken from representative breeding sites throughout the entire German Wadden Sea and analysed for concentrations of contaminants such as mercury, organic chlorine compounds, DDT and DDE. The results provide indications of chemical pollution loads in the environments of selected bird species – such as contaminants in food fish of arctic terns. Because of their position at the top of the food chain, birds are particularly useful indicators in this area. In combination with monitoring of breeding populations and breeding success, the contaminant monitoring system can facilitate development of a early warning system that will enable early detection of negative environmental impacts, early response to such impacts and effective monitoring of success of relevant measures (THYEN & BECKER 2000).

- **Monitoring of resting birds:** The fourth monitoring programme within the TMAP framework is a programme for monitoring resting wading birds and waterbirds in the Wadden Sea. It is aimed at detecting changes in distributions and numbers of wading and waterbirds that come to the Wadden Sea. It is also designed to facilitate estimating the total number of birds present in the Wadden Sea at all times and throughout yearly cycles. Data from the programme will also facilitate estimates of the total population in the east Atlantic flyway. Finally, the programme will also collect data that can help explain observed migratory and resting patterns. On a regional basis, this will facilitate manage-ment of national parks and other protected areas near and in the Wadden Sea (RÖSNER & GÜNTHER 1996, GÜNTHER & RÖSNER 2000).

SEABIRDS-AT-SEA PROGRAMME. The "Seabirds-at-Sea" programme surveys distributions and abundance of seabirds, coastal birds and marine mammals at sea in north-west European waters, especially the North Sea. The data, which is collected via a standardised method, enter into a joint database maintained by the "European Seabirds at Sea Co-ordinating Group" (ESAS). ESAS has already produced a number of atlases of seabird distributions at sea. At present, organisations from the UK, Belgium, the Netherlands, Germany, Denmark and Norway are participating. The programme does not yet have secure financial backing. In 1997-1998, additional surveys were carried out in the German Bight, within the framework of an R+D project (see above and Chap. 1.2.2). The purpose of the monitoring programme is to learn about the distributions and abundance of seabirds and coastal birds and the relevant underlying factors, in order to be able to protect these species effectively. Additional Seabirds-at-Sea programme surveys have been underway since 2000 in the Baltic Sea. Currently, an R+D project (see above) is being carried out (GARTHE & HÜPPOP 2000).

WATERBIRD MONITORING. The national programme for monitoring resting and wintering waterbirds is one of the oldest permanent monitoring programmes established in Germany. It is co-ordinated by the "Centre for Waterbird Research and Wetlands Protection in Germany" ("Zentrale für Wasservogelforschung und Feuchtgebietsschutz in Deutschland" (ZWFD)), which resulted from a merger between the "Rieselfelder Münster" biological station, the biological station in the Wesel district (Biologische Station im Kreis Wesel) and the "Association for the furtherance of waterbird ecology and wetlands protection" ("Förderverein für Wasservogelökologie und Feuchtgebietsschutz"). The programme's aims include estimating the size of national resting populations and of populations relative to the 1% criterion of the Ramsar Convention, managing wetlands and monitoring of the success of relevant measures and identifying trends in breeding and wintering areas that are inaccessible for direct counts. Data and findings of the monitoring will be forwarded to Wetlands International for assessment in the framework of the International Waterbird Census (IWC). The data will also be used in the AEWA and Ramsar-Convention frameworks (SUDFELDT et al. 2000).

GEESE COUNTS. Geese counts are being carried out as a separate monitoring programme parallel to the waterbird counts but having the same aims and focus. Co-ordination and data processing are being managed by the ZWFD c/o Biologische Station im Kreis Wesel and NABU c/o "Förderverein für Wasservogelökologie und Feuchtgebietsschutz" (MOOIJ 2000).

LIMICOLAE COUNTS. The International Limicolae Census was initiated in 1979 by OAG Münster, in co-operation with the Wader Study Group (WSG). One of this programme's aims is to study the phenology of limicolae species that migrate over land, and to do so in a manner that permits differentiation by age and geographic origin. Other aims include study of population fluctuations and trends, species' habitat preferences and species make-up in the various resting areas. Resulting findings will provide a basis for protection concepts. At present, the programme is being co-ordinated by ZWFD. Collected data is forwarded to WSG, which consists of ornithologists, in all continents, who are studying limicolae. In study of limicolae migration along the east-Atlantic flyway, findings of monitoring in Germany and in other countries will facilitate identification of important resting, moulting and wintering areas and improve understanding of limicolae migration and migratory strategies (OAG MÜNSTER 1996).

DDA PROGRAMME FOR SURVEY OF SELECTED ENDANGERED BIRD SPECIES. Since 1977, the Umbrella Association of German Avifaunists (Dachverband Deutscher Avifaunisten – DDA) has conducted surveys to collect population data on selected endangered bird species in Germany, in a DDA programme known as the "Indicator Programme". The range of species covered has been expanded since 1995 and now includes populations of breeding birds that are represented by fewer than 1,000 breeding pairs in Germany (to the extent this can be documented by current data) and a few other rare breeding bird species. The purpose of the monitoring is to assess national population trends for rare bird species in Germany. The data is collected by volunteer staff and provided, by the DDA, to representatives of the various relevant Länder (MÄDLOW & MODEL 2000).

Additional projects are currently being developed within the framework of these extensive monitoring programmes. Two especially important projects are the "Adebar" project and preparation of an atlas of migratory and resting birds.

"ADEBAR" ATLAS OF BREEDING BIRDS. The DDA's "Adebar" project is aimed at producing a Germany-wide atlas of breeding birds in keeping with modern standards. It will use normed survey periods and apply a strictly standardised method (the method is oriented to that used for the Swiss breeding bird atlas). In addition to population sizes and distribution, the atlas will cover regional changes in population sizes and distributions of breeding bird species. A geographic information system (GIS) will make it possible to correlate abundances with biotic and abiotic factors. Additional specific studies will provide indications of reasons for population declines and of relevant threats. Furthermore, the breeding bird atlas is expected to lead into a long-term population monitoring programme that will both complement existing DDA programmes and gradually become the central foundation of breeding bird population monitoring (BAUER & NOTTMEYER-LINDEN 2000).

ATLAS OF MIGRATORY AND RESTING BIRDS. The project for preparation of an atlas of migratory and resting birds is aimed at comprehensively describing and assessing the situation of migratory bird species in Germany with regard to population trends, availability and condition of areas used, migratory behaviour, seasonal appearance patterns for various migratory bird species in various parts of Germany and effective threats. The work will also include proposals for protection and specific guidelines, derived from the project research and from international obligations to protect migratory bird species, as well as a complete overview of all important resting and wintering areas. As a result, it will be a comprehensive reference for all planning oriented to nature conservation, regional planning or landscape development. In addition to their relevance in the CMS and AEWA frameworks, the findings will also be of key importance in the framework of implementation of Germany's obligations under the Ramsar Convention, the EU Bird Directive and the FFH Directive. The atlas is a joint project of the state bird protection stations (Vogelschutzwarten), the DDA, the bird stations (Vogelwarten) and the German Ornithological Society (Deutsche Ornithologen-Gesellschaft - DO-G), under the auspices of the German Council for Bird Protection (Deutscher Rat für Vogelschutz - DRV) (WERNER & BAUER 2000).

Tab. 2.3.5-1: Current monitoring programmes on the international, national and regional levels. (boldface means international or national independent programmes, while normal type means subordinate or similar programmes on the national/regional levels) (expanded in keeping with data from the R+D project "Model for an overall concept for federal species monitoring, illustrated with the example of monitoring of avifauna").

Area names: D = Germany, DK = Denmark, NL = Netherlands; BB = Brandenburg, BE = Berlin, BW = Baden-Württemberg, BY = Bavaria, HB = Bremen, HH = Hamburg, HE = Hesse, MV = Mecklenburg-West Pomerania, NI = Lower Saxony, NW = North Rhine-Westphalia, RP = Rhineland-Palatinate, SL = Saarland, SN = Saxony, ST = Saxony-Anhalt, SH = Schleswig-Holstein, TH = Thuringia.
Other abbreviations: AG = working group; BP = breeding pairs; BS = biological station; CWSS = Common Wadden Sea Secretariat; DDA = Umbrella Association of German Avifaunists ; IWC = International Waterbird Census; NPA = national park administration; OAG = ornithological working group (Ornithologische Arbeitsgemeinschaft); TMAP = Trilateral Monitoring and Assessment Program; VSW = bird protection station; ZWFD = Centre for Waterbird Research and Wetlands Protection in Germany.

Name	Content	Co-ordination	Level/particpating Länder
Trilateral Monitoring and Assessment Programme for the Wadden Sea (TMAP)	Biological, climatic, hydrological, geomorphological, geographic data, contaminants and nutrients in water and sediments, intensity of use of fishing industry, agriculture, tourism	CWSS, NPA, WWF Wadden Sea office in the framework of Wadden Sea co-operation between D, DK, NL.	International; HH, NI, SH
Monitoring of breeding populations	Breeding populations of coastal birds of the North Sea coast	VSW, NPA; AG "Seabird Protection", data provided to TMAP	National; HH, NI, SH
Monitoring of breeding populations	Breeding populations of coastal birds of the Baltic Sea coast, within protected areas	VSW, OAG, AG coastal bird protection MV	National; SH, MV
Monitoring of breeding success	Hatching and breeding success and growth rates of young of selected coastal bird species	NPA, VSW, data provided to TMAP	National; SH, NI
Monitoring of contaminants in coastal birds	Contaminants in eggs of selected coastal bird species	Data provided to TMAP	National; SH, NI
Monitoring of resting birds	Distribution of and changes in resting and wintering populations of wading birds and waterbirds in the North Sea area	WWF Wadden Sea office, NPA, data provided to TMAP	National; SH, NI
Waterbird count	Waterbird counts: divers, cormorants, swans, ducks, mergansers, coots	West-D: ZWFD/DDA, c/o BS "Rieselfelder Münster". East-D: NABU or ZWFD/ DDA, c/o Förderverein für Wasservogelökologie und Feuchtgebietsschutz, Forwarded to IWC	National; All

Continuation →

Name	**Content**	**Co-ordination**	**Level/participa-ting Länder**
Geese counts	Counts of geese	West-D: ZWFD/DDA, c/o BS im Kreis Wesel. East -D: NABU or ZWFD/ DDA; Forwarded to IWC	National; all
Limicolae counts	Populations in inland resting areas, surveys of habitat parameters	ZWFD/DDA, Data forwarded to "Wader Study Group"	National; all
Greylag goose	Breeding, breeding success, resting populations in selected areas	VSW, Environment Ministry	Regional; SH
Seabirds and sea ducks	Resting populations in selected areas	VSW, Environment Ministry	Regional; SH, MV
DDA programme for survey of selec-ted endangered bird species: "Indicator Programme"	Population data for selected species (since 1990, with 36 species), since 1995, expanded to include all species with < 1000 BP in D	DDA	National; all
Meadow breeders "Indicators for meadows and pastures", partly also for "oligotro-phic meadows"	Populations of meadow breeders, indicators of habitat quality	State authorities, nature conservation associations (depending on Land)	Regional; BY, BE, BB, HB, HH, HE, NI, NW, RP, SL, ST, SH, TH
Monitoring of pro-tected areas	Populations of breeding and resting birds in protected areas, large protected areas and SPAs	State authorities, VSW	Regional; BE, BB, HB, HH, MV, NI, SN, ST, SH
Large bird counts	Endangered large bird species, such as black stork	State agencies, VSW (depending on Land)	Regional; BB, RP
Black stork	Breeding population; in part, breeding success, surveys of feeding habitats	State authorities, VSW	Regional: BB, HB, HE, MV, NI, NW, RP, SLSH, TH
White stork	Breeding population; in part, breeding success, surveys of feeding habitats	State authorities, VSW, associations	Regional: BW, BY, BB, HE, MV, NI, NW, RP, SL, SN, ST, SH, TH
Common crane	Breeding population and breeding success	AG Kranichschutz Germany, VSW, WWF	Regional: MV, NI, SH, ST
Great bustard	Breeding population	State authority	Regional: BB
Meadow breeders	Breeding population of meadow breeders	State authorities, NABU	Regional: BY, BE, BB,HB, HH, HE, NW, RP, SL, SH, TH

2.3.6 Training and information

TRAINING AND DEVELOPMENT PROGRAMMES.

Re 6.1: Describe the status of training and development programmes which support waterbird conservation and implement the AEWA Action Plan.

Practical nature conservation, such as management of protected areas or execution of conservation measures – for example, care and maintenance of water bodies in order to protect water birds – is carried out largely by persons trained in the areas of agriculture, forestry, water resources management, horticulture or social pedagogy, as well as by a large number of volunteer staff.

Since 1998, a training course leading to certification as "Certified nature and landscape manager" ("Geprüfter Natur- and Landschaftspfleger"), a non-academic occupational qualification in nature conservation, has been available to this group. This training is designed to impart and improve knowledge and skills in the area of "nature conservation and landscape management". It is also specially designed to provide highly marketable skills for the employment market (MITLACHER 2000a).

The training course imparts professional competence in conserving and protecting endangered habitats as valuable ecological and cultural assets of rural areas. In addition, it teaches people to protect areas and inform visitors in ways that will enhance public awareness of the need for protecting biological and landscape diversity and that will assist people in experiencing nature and thus overcoming the alienation from nature that urban life can bring.

Occupational responsibilities of "Certified nature and landscape managers" can vary widely depending on place and area of assignment. In large protected areas such as national parks and biosphere reserves or sensitive nature reserves, such responsibilities can include managing and guarding sites as well as informing, guiding, teaching and educating visitors. Environmental education and visitor guidance can also be highly relevant in other landscape areas as well, especially when there is a need to protect endangered and/or sensitive plant and animal species, such as disturbance-sensitive waterbirds. Other responsibilities can include co-ordination and execution of landscape management measures as well as efforts to improve protected and/or endangered habitats and their species, such as meadow birds in wetlands, within the framework of contractual nature conservation or in protected areas (MITLACHER 2000b).

Certified nature and landscape managers can find employment as salaried staff or workers in the public sector – for example, in administrations of protected areas – as self-employed farmers within the framework of environmentally oriented agricultural programmes and contractual nature conservation or as freelance staff of municipalities, tourism organisations or nature conservation associations.

The curriculum of the training course for certification as "Certified nature and landscape manager", which comprises 640 hours of instruction, includes the following areas:

- Basic principles of nature conservation and landscape management (aims, species, ecological interrelationships)
- Information and visitor service (environmental education, information regarding management and care measures, events)

- Specific nature conservation and landscape management measures (planting and care of trees and shrubs, use of equipment, species and biotope protection, environmental education facilities)

- Relevant economic, legal and social skills (legal foundations, organisational skills, tendering procedures, tax law) (MITLACHER 2000b)

In addition to this practical course, there are many courses of study that at least touch on areas of nature conservation. Natural science programmes at universities and universities of applied sciences (Fachhochschulen), in areas such as biology, landscape management, ecology, forestry and agriculture, include conservation-related aspects in study of scientific foundations, relevant legal provisions and practical implementation. Engineering studies in the area of technical environmental protection – for example, with an emphasis on water quality management – represent another area of specialisation with relevance to nature conservation and landscape management.

Apart from the above training and study programmes, further training programmes are available from state-supported providers of environmental and conservation training. Such providers are organised within the "Federal working group of state-support educational institutions for nature conservation and environmental protection" ("Bundesweiter Arbeitskreis der staatlich getragenen Bildungsstätten im Natur- und Umweltschutz - BANU)" (GERICKE 2001).

These institutions' central services include education in areas relevant to sustainable development, specialised further training and continuing education and measures to enhance public awareness about nature conservation and environmental protection (NUA 2000). The courses and events offered by such institutions can differ widely in their aims and content. Their focuses can include dissemination of new scientific findings, discussion about nature conservation strategies, application and implementation of laws and regulations and co-ordination and implementation of practical nature conservation measures, also with regard to achievement of AEWA objectives (cf. Point 6 of the Action Plan).

A total of 16 "nature conservation academies" and "environmental centres" belong to this working group. Depending on the Land concerned, the various educational institutions are organised within specific state authorities (Nature conservation and environmental protection academy in North Rhine-Westphalia), ministries (Academy for nature conservation and environmental protection in Baden-Württemberg) or non-profit associations ("Saale-Unstrut e.V." environmental education centre in Nebra, in Saxony-Anhalt) (overview in GERICKE 2001).

Apart from state-funded educational institutions, nature conservation associations and other organisations also offer workshops and events in the areas of nature conservation and environmental protection (in some cases, such programmes and events are open only to the organisations members).

Re 6.2: What bilateral or multilateral co-operative action is your country undertaking to develop training programmes and share examples of good practice?

No bilateral or multilateral co-operation is being undertaken in Germany to develop training programmes and share examples of good practice.

EFFORTS TO RAISE PUBLIC AWARENESS.

Re 6.3: Describe activities to raise public awareness of the objectives of the AEWA Action Plan. Please outline any particular successes generating public interest in, and securing support for, waterbird and wetland conservation (e.g. campaigns, information notes or other initiatives).

As part of their environmental education, large protected areas such as national parks and biosphere reserves, as well as large nature reserves and nature parks, carry out measures to inform visitors and sensitise them to the natural environment and to promote public awareness.

In addition to informative signs and networks of nature trails and walks, many protected areas have information and nature centres that provide important (and popular) information. Each information centre features exhibits and information about the protected area in which it is located, including topics such as the area's origin and historical development, the area's flora and fauna, conflicts in nature conservation and threats to individual species and communities.

Germany's national parks and biosphere reserves currently operate a total of more than 60 nature and information centres, and four additional centres are being planned. The three German Wadden Sea national parks alone have over 30 national-park and information centres. In most cases, information centres are operated by volunteer staff who are members of local nature conservation associations or who are carrying out civil service (as a substitute for military service).

In many protected areas, information centres offer nature walks and tours. Large centres may also have travelling exhibits and nature-oriented events. The following section presents an example of such an information centre – the "Multimar Wattforum" of the Schleswig-Holstein Wadden Sea National Park, located in Tönning.

The "Multimar Wattforum" is one of Germany's newest and most modern information centres. A captivating multi-station exhibit, spread over an area of 800 m², presents the Wadden Sea habitat. A range of photos, films, models, computer graphics, microscopes and games make science come alive for visitors. Animations and hands-on exhibits, such as a display on tidal rhythms, make the general features of Wadden Sea nature phenomena easy to understand. The centre also presents current findings from ongoing monitoring. The aim is to show how scientific findings contribute to protection and conservation of the Wadden Sea. The Multimar concept was developed by the centre's staff, in co-operation with the national park authority and the city of Tönning (MULTIMAR WATTFORUM 2001).

A range of excursions and guided tours in Schleswig-Holstein Wadden Sea National Park begin from the Multimar centre. Special events and materials are offered for school classes. A number of different one-day and multi-day events, tailored to different age groups and with a range of different emphases, are also offered.

In the "Coastwatch Europe" project, people of all ages take a close look at coasts. The project asks people in over 20 different European countries to assess their coasts and provide information on a standardised survey form. In Germany, the "Coastwatch Europe" has been offered for the past 10 years in youth hostels and environmental centres on the coasts; the "Multimar Wattforum" in Tönning and the "Boddenlandschaft National Park Support Association" ("Förderverein Nationalpark Boddenlandschaft") are co-ordinating "Coastwatch" in Germany.

Participants fill out survey forms with regard to coastline sections 500 m in length. The survey questions cover the overall condition of the relevant coastal section, as well as aspects such as usage and development, natural communities and surf zones. "Coastwatch Europe" surveys are carried out in the fall, over a period of four weeks, and simultaneously in 20 different countries.

The purpose of the project is to sensitise participants to nature and problems of nature conservation, and to make them aware of environmental issues pertaining to coasts. In addition, "Coastwatch Europe" seeks to inspire participants to take positive action – for example, to collect trash along beaches.

Other examples of successful efforts to enhance public awareness about nature and nature conservation include excursions within the framework of "goose tourism", as described in detail in Chapter 2.3.4.3.

2.3.7 Final comments

General comments on the implementation of the AEWA Action Plan. Observations concerning the functions and services of the various AEWA bodies. How might the Action Plan be further developed as a practical aid for national and international conservation of migratory waterbirds?

Most of the provisions of the AEWA Action Plan are in keeping with obligations that are already national law – in part, on the basis of the Bern and Bonn conventions or the EU Bird Directive – and national practice. Germany is thus far along in implementing this part of the Action Plan. Many of the basic tasks in waterbird protection have been implemented.

Table 1 of the AEWA Action Plan was supplemented at the 1st CoP in Cape Town. As soon as Germany has ratified this amendment to the agreement, implementation of further parts of the Action Plan will begin; initial preparations for that are already being made.

The AEWA bodies have been in place since the 1st CoP. The technical committee has met twice to date. German representatives took part in the first meeting of the technical committee (Bonn, 23-24 October 2000). It is too early to make any conclusions regarding the functions and service of this body.

It also seems too early for any considerations on ways to improve the action plan for migratory waterbirds.

2.3.8 Progress in implementing resolutions and recommendations of previous meetings of the parties

Please summarise progress in implementing decisions of previous Meetings of the Parties.

The resolutions of previous meetings (with the exception of MOP 1.9, Action Plan) do not affect nature conservation practice in Germany; instead, they refer to actions outside of Germany (1.4 International implementation priorities) or to internal procedures within the agreement or to organisational decisions. Progress with regard to MOP 1.9 (Action Plan) is presented in the answers to earlier points of this report.

2.4 Bats and bat conservation in Germany

Sort version of BfN (1999b)

SUMMARY. Since 1994, the Federal Republic of Germany has been making a special contribution to the "Agreement on the Conservation of Bats in Europe (EUROBATS)". To support implementation of this agreement, which was concluded under the umbrella of the Bonn Convention (CMS), Germany has supported research projects and conferences, initiated protection measures, co-ordinated monitoring programs and supported bat-conservation projects in Germany and abroad. The Länder have carried out a wide range of measures to support bat conservation and have formed a consulting body of experts as required under the agreement. They are also setting aside special protected areas for bat species listed in Annex II of the European Union's Fauna, Flora and Habitats Directive (FFH).

In the mid-20th century, bat populations in Germany were down significantly from their former levels. Targeted conservation measures have since improved the situation of many species, however. Nonetheless, most bat species are still included in the Red List of endangered species, and some are even facing extinction.

On the local level, bat conservation is carried out mainly by volunteer staff. Experts, in some cases members of relevant associations, carry out population surveys, take specific protective measures for habitats or roosts and inform the public about the need for bat conservation. In some Länder, their work is supported by special co-ordination offices for bat conservation.

THE AGREEMENT ON THE CONSERVATION OF BATS IN EUROPE (EUROBATS). The international "Agreement on the Conservation of Bats in Europe (EUROBATS)", positioned within the framework of the "Bonn Convention on the Conservation of Migratory Species of Wild Animals (CMS)", was concluded in order to co-ordinate various European countries' bat-conservation efforts. It came into force on 16 January 1994. EUROBATS covers all bat species listed in Annex II CMS. As of 21 August 2001, a total of 24 European countries had signed EUROBATS.

The EUROBATS Secretariat organises and co-ordinates activities of the Advisory Committee, which meets annually, and takes additional initiatives to implement relevant objectives. This work includes, for example, the holding of the annual European Bat Night, aimed at raising public awareness about bats. It has also included the proposing of a project for study of the population situation and migrations of the bent-winged bat *(Miniopterus schreibersi)* in south-east Europe.

The 1st Meeting of Parties, held in 1995 in Bristol, adopted a conservation and management plan for protection of bats in Europe, and it defined the reporting format for national reports on progress in bat conservation. In 1996, Bonn was chosen as the location for the Secretariat. In addition to the parties to the agreement, a total of eight other European countries, and a number of nature conservation organisations, take part in efforts in the EUROBATS framework.

A total of five additional countries signed the agreement as of the 2nd Meeting of Parties in 1998 in Bonn. Decisions were taken at this conference on issues such as methods for European-wide monitoring of bat populations, important international research projects on species and habitats and an updated version of the conservation and management plan.

The Advisory Committee was requested to focus on the following topics until 2001:

- Defining priorities for conservation-oriented bat research
- Improving information about roosts
- Collecting and processing autecological data on bats for landscape planning
- Enhancing the construction sector's awareness of bat conservation
- Ensuring that pesticides are used in accordance with bat-conservation criteria

Within the EUROBATS framework, Germany is represented by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), which in turn has requested the German Federal Agency for Nature Conservation (BfN) to prepare the current national report. Such reports must summarise the latest findings about distribution and behaviour of, and threats to, native bat species, as well as present the various conservation efforts being made in their behalf (p. 9). All parties to the agreement are required to present such reports at the meetings of the parties.

THE BODY OF EXPERTS. In 1995, the Länder working group on nature conservation, landscape management and recreation (Länderarbeitsgemeinschaft Naturschutz, Landschaftspflege und Erholung - LANA) established a body of experts to prepare basic opinions relative to implementation of the agreement in Germany. This body of experts advises the Federal Environment Ministry in issues related to conservation and support of bats – especially with regard to bats in buildings. To date, the body has considered issues such as

- design and implementation of a national bat-monitoring programme, especially for the mouse-eared bat *(Myotis myotis)* and the lesser horseshoe bat *(Rhinolophus hipposideros)*
- identification of nationally and internationally important underground bat roosts
- options for improving protection of building-dwelling bats
- synergies from implementation of the agreement and provisions of Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (FFH Directive), including synergies in conservation of bat species of Community interest
- rabies in bats in Germany
- organisation and financing for administrations of bat-banding efforts in Germany
- the International Bat Night and Bat Festival in Berlin

With regard to the first point, the body works to fulfil the Advisory Committee's resolutions relative to priority species in Europe for monitoring efforts, and it strives to implement concepts for national ecological monitoring at the federal and Länder levels.

LEGAL FOUNDATIONS OF BAT CONSERVATION IN GERMANY. In Germany, the Federal Nature Conservation Act protects bats against direct human actions and intentional disturbances. Since all bat species occurring in Germany are listed, in Annex IV of Directive 92/43/EEC, as species of Community interest, they have the status of "strictly protected species" in Germany. Prohibitions on keeping, imports and exports, trade in and display of bats are also in force, as well as licensing requirements for capture equipment and banding. Enforcement of legal regulations is the responsibility of the Länder, while imports and exports are controlled by the German Federal Agency for Nature Conservation.

The European Union's Fauna, Flora and Habitats Directive (FFH) (92/43/EEC) provides for set-aside of important bat areas within the framework of the European "Natura 2000" protected area network. Such areas include insect-rich hunting habitats as well as important summer or winter roosts. The Länder have set aside relevant protected areas; in addition, many important bat hunting habitats are already legally protected.

POPULATION SITUATION OF BATS IN GERMANY. A total of 20 bat species with maternity colonies occur in Germany. Of these, only two species are not included on the Red List of Germany's endangered species (*pipistrelle, Pipistrellus pipistrellus* and Daubenton's bat, *Myotis daubentoni*). Populations of all species suffered drastic declines in the mid-20th century, although these declines slowed somewhat, for all species, in the late 1970s and early 1980s. Some population increases have also occurred in recent years. This has been the case for the mouse-eared bat, for example *(Myotis myotis)*. Some species, such as the lesser and greater horseshoe bats (*Rhinolophus hipposideros* and *R. ferrum-equinum*), Geoffroy's bat *(Myotis emarginatus)* and the barbastelle *(Barbastella barbastellus)*, are facing extinction in Germany, while others have already completely disappeared from Germany (for example, bent-winged bat, *Miniopterus schreibersi*).

Many factors have played a role in this decline, not all of which are well understood. They include loss or disturbance of summer and winter roosts and extensive habitat changes over the past few decades. The latter factor reduces food density, since it eliminates hunting habitats and impairs bat's orientation and dispersal behaviour. The habitat changes were brought about by intensive forestry and agriculture, growth of cities and towns and expansion of the traffic infrastructure. House-dwelling species have also been harmed through use of wood preservatives containing DDT and lindan (gammexane). A number of research projects aimed at identifying threats to bats and their relative importance are currently underway. Recovery of populations is due to bans on DDT, decreased use of toxic wood preservatives and plant pesticides, encouragement of insect species useful for bats and general conservation measures. In spite of many improvements, however, populations are still threatened by disturbances in, and losses of, their roosts.

INTERNATIONAL PROTECTION. Germany is fulfilling its EUROBATS obligations in close co-operation with other European countries, and it has intensified its efforts to conserve and protect bats. Within the agreement framework, the Federal Government has promoted and supported the following projects and international activities:

- Research and development project entitled "Population-genetic studies on the structure of bat populations, using the example of the noctule bat *(Nyctalus noctula)*" (completed: 1998)
- Research and development project entitled "Studies and recommendations relative to conservation of bats in forests" (MESCHEDE & HELLER 2000, MESCHEDE et al. 2001)
- An international conference of the EUROBATS Secretariat in Budapest
- Inspection of old bunker systems in the German-Polish boundary area, and review of their suitability as bat winter roosts
- Test and development project for protection of building-dwelling bats via conservation and creation of roost networks
- An international scientific conference on biology and protection of endangered migratory bat species, focusing on Nathusius' pipistrelle and the pond bat

- Training courses for bat conservation experts in eastern and south-eastern European countries
- Publication of an informational brochure and poster for the "International Bat Year 2001"

CONSERVATION MEASURES OF THE LÄNDER. The Länder are responsible for implementing species measures to protect important bat roosts, maternity colonies and feeding habitats. At the same time, inspections and maintenance on the local level are usually carried out by volunteer staff, including private organisations. The measures taken by Länder to protect bats include (selection):

- Special species protection programmes
- Operation of special co-ordination offices for bat conservation in Thuringia, Brandenburg, Baden-Württemberg and Bavaria
- Support for research and nature conservation projects and relevant individual measures
- Financing of monitoring programmes and mapping of bat colonies
- Set-aside of important habitats for certain bat species – either as nature reserves or as natural monuments
- Protection of old bunker systems and mines as bat habitats
- Integration of bat conservation criteria (covering relevant species) in development and management plans for protected areas and in connection with interventions in nature and landscapes

It is now customary to take needs of bat colonies into account in set-asides of large protected areas such as national parks, large nature reserves or biosphere reserves.

Some Länder are revising and amending their forest-management guidelines with the aim of increasing old-tree percentages in forests and expanding deciduous stands – two measures which benefit forest-dwelling bats.

DATA COLLECTION. In all Länder, data collection is carried out in co-operation with nature conservation associations and private conservationists; sometimes, such staff work under commission to the relevant Land. Work is usually carried out on a volunteer basis. Data standardisation, through increasing use of IT resources and special data-collection programmes for nature conservation, is facilitating use of data in protection programmes, intervention planning and faunistic-ecological studies. Within the EUROBATS framework, the body of experts is working to co-ordinate data collection in connection with monitoring of selected roosts of the mouse-eared bat *(Myotis myotis)* and lesser horseshoe bat *(Rhinolophus hipposideros)*.

The German Länder have commissioned suitable institutions to collect and evaluate bat data; as a result, most Länder now have, or are preparing, reference materials such as distribution overviews or regional fauna atlases (Rhineland-Palatinate, Bavaria and Saxony-Anhalt). In 1999, Societas Europaea Mammalogia (SEM; the European Society for Mammalian Studies) published the Atlas of European Mammals (AEM) with overview grid maps for all mammals occurring in Europe.

EFFORTS TO ENHANCE PUBLIC AWARENESS. Efforts to enhance public awareness play a central role in state and volunteer bat conservation. Many types of informational material, reference works, public excursions and exhibitions relative to bats are now offered or available. In 1999, Deutsche Post published a stamp dedicated to bats. Some Länder, and volunteer staff who are also members of the German Nature Conservation Association (NABU), offer workshops and conferences to educate and train bat conservationists. In addition, special training courses are offered for architects, craftsmen, planners, forest rangers and forest owners, to assist such people in enhancing conditions for forest-dwelling and house-dwelling bats.

The great range of relevant educational and "fun" activities available for children and adolescents is also worth of mention. Recently, for example, a special folder with bat projects was prepared for teachers and youth leaders.

Since 1997, the EUROBATS Secretariat has organised the European Bat Night each year. The Bat Night features a broad range of bat-related events.

2.5 Protection of the harbour porpoise in the North Sea and Baltic Sea

The Bonn Convention (CMS) has been playing a more and more important role in international efforts to protect small cetaceans (including dolphins, bottlenose dolphins and some whale species). The parties to the Bonn Convention are urged to conclude agreements oriented to special requirements for protecting the over 30 small cetacean populations listed in Annex II of the Convention. The Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS), which was developed under the direction of Sweden, promotes co-operation between range states – for example, in protecting and managing habitats, in carrying out research projects and in enhancing public awareness. To date, the agreement has eight parties. In 1992, a provisional Secretariat was established, in the "Sea Mammal Research Unit", Cambridge, UK, to co-ordinate all relevant activities. The second Conference of the Parties (Bonn, 17 - 19 November 1997) resolved to move the Secretariat to Bonn. This was done in June 1998.

The harbour porpoise *(Phocoena phocoena)* is a small species of toothed-whale *(Odontoceti)* that occurs throughout much of the North Atlantic and North Pacific. It is also the only cetacean species that is native to German waters. The North Sea and Baltic Sea contain morphologically and gene-tically differentiated harbour-porpoise populations (TIEDEMANN et al. 1996, HUGGENBERGER et al. 1999). Relatively little relevant data is available on the population situation and trends of the harbour porpoise, in part due to the basic technical difficulties in collecting such data. Systematic studies did not begin in Germany until 1990, following an agreement, taken at the Third International Conference on the Protection of the North Sea, for protection of the small cetacean population. Available research data is based primarily on beached-animal finds and supplied by-catches that are inspected for reproduction status, disease, parasites, food remains and contaminant accumulations. For monitoring purposes, the state government of Schleswig-Holstein commissions the West Coast Research and Technology Centre (Forschungs- und Technologiezentrum Westküste) in Büsum to study some 50 dead harbour porpoises – found in the North Sea and Baltic Sea – annually and to keep statistics on beach finds of the animals. In Lower Saxony, beach-find data are kept by the Lower Saxony Wadden Sea National Park administration; in Mecklenburg-West Pomerania, they are kept by the German Marine Museum (Deutsches Meeresmuseum) in Stralsund.

It is generally assumed that harbour porpoises were considerably more common in most European waters in the mid-20th century than they are today (KREMER 1990; BENKE & SIEBERT 1994; BENKE et al. 1998). This is indicated, for example, by statistics on beached animals and by-catches in neighbouring countries (Netherlands, Denmark, Sweden). In Germany, anecdotal evidence suggests that population densities were higher in the past (MOHR 1935; GOETHE 1983). Nonetheless, the populations seem to have remained stable, or even slightly increased, over the past few decades (cf. KREMER 1990; BENKE & SIEBERT 1994). Since 1990, numbers of beach finds on the German North Sea coast have fluctuated around a level of 100 per year, with no apparent increasing or decreasing trend (BENKE et al. 1998; HASSELMEIER 2000). The animals' age distribution (40% are less than one year old) is approximately in keeping with the numbers of deaths that would be expected for a stable population (HASSELMEIER 2000). On Germany's Baltic Sea coast, an average of only 10-20 stranded harbour porpoises are found per year (BENKE et al. 1998).

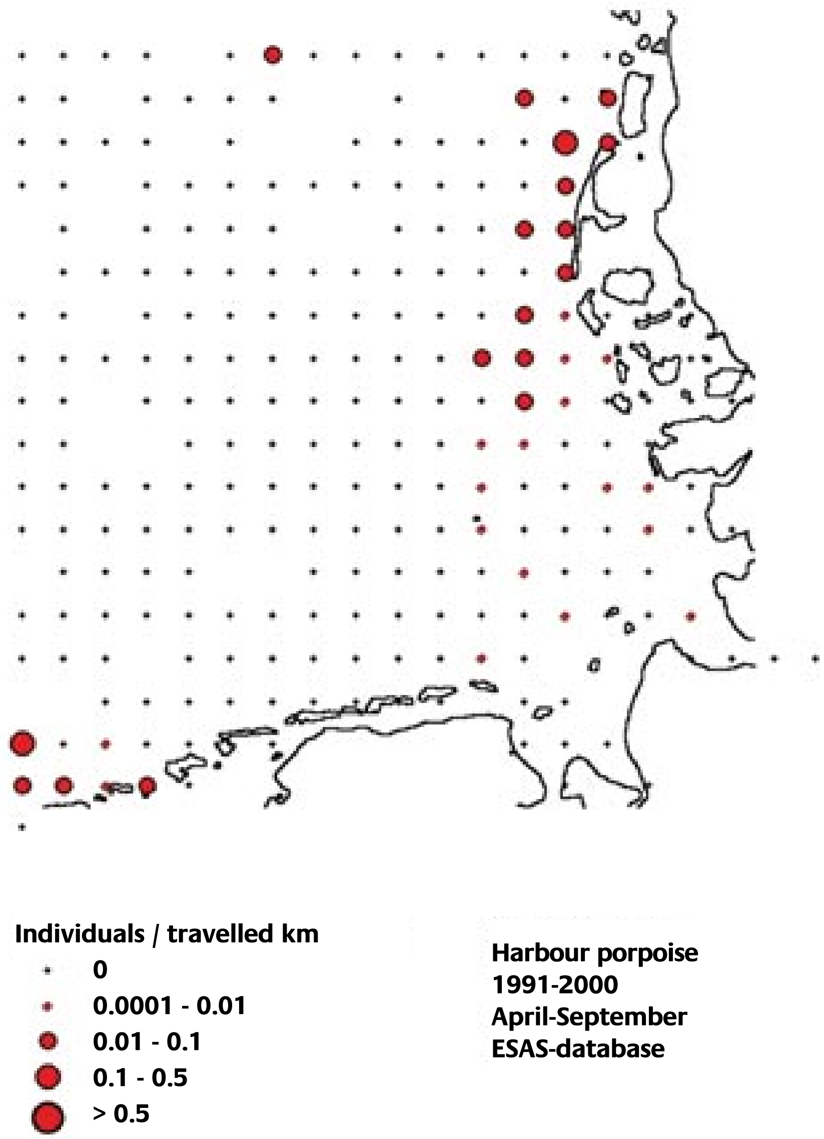
Harbour Porpoise

Some population estimates were made in 1995-1996, on the basis of transect counts from the air (HAMMOND et al. 1995). These estimates have a high level of statistical uncertainty, however, since relatively few sightings – making use of species-specific diving patterns – were used to calculate the population densities. ADELUNG et al. (1997) provide estimates of 4,400-7,400, for Schleswig-Holstein's North Sea areas, and of 900-1,800 for German Baltic Sea areas. These estimates confirm the general impression that the population density in the North Sea is significantly higher than it is in the Baltic Sea. The situation of the Baltic Sea population may be critical. New surveys are being planned. Fig. 2.5-1 presents chance-sighting data obtained within the framework of the "Boffwatt" project (see Chap.1.2.2) and now stored in the "Seabirds-at-Sea" database.

Fishing has been clearly identified as the population's central threat and limiting factor. In the North Sea, this threat consists especially of gillnet fisheries of Denmark and the UK; in the Kattegat, it also consists of Swedish gillnet fisheries. The by-catches are estimated to number 7,000 – 10,000 animals per year (KREMER 1990; BENKE & SIEBERT 1994). The largest by-catches occur in turbot fishing and certain cod fisheries, at certain times of the year (for example, the 3rd quarter). German fisheries accounted for only a very small share of these by-catches. By-catches have been decreasing since 2000, because the fishing intensity in these fisheries has decreased.

In the central Baltic Sea, the population has shrunk under the impacts of heavy winter ice formation (end of the 1920s to early 1940s), of pollution, probably (1950s through 1970s) and of fishing (since the 1950s) – from several tens of thousands to hardly 1,000 today. Swedish forecasts in the ASCOBANS context indicate that the

Fig. 2.5-1: Chance sightings of harbour porpoises (Phocoena phocoena) within the context of seabird surveys in the "Boffwatt" project. The data points represent numbers of individuals sighted per km of patrol (pursuant to GARTHE in lit. 2001).



population will probably die out within 20 to 30 years, even at the relatively low by-catch rates of the past two decades, unless greater efforts to protect it are undertaken. The western limit of the population's range is still assumed to lie at the Darsser Schwelle area.

The population's precarious situation provided the occasion for an ASCOBANS workshop held in Jastarnia (Poland) on 09 - 11 January. At the workshop, a "recovery plan" for the central Baltic Sea was developed that is to be adopted at the ASCOBANS advisory committee meeting in Sweden in June 2002.

In general, the Federal Government and environmental associations, such as WWF (which recently carried out a campaign to publicise this problem), consider by-catches in fisheries to be a particularly serious and urgent problem.

Harbour Porpoise

Other threats are also being discussed, including toxic environmental pollution, regional noise pollution from increasing marine traffic and military activities (VERWEY & WOLFF 1981; KREMER 1990; BENKE & SIEBERT 1994).

Accumulating contaminants in the bodies of harbour porpoises and other marine mammals are assumed to be reducing the animals' vitality and fertility (BENKE & SIEBERT 1994). Some studies seem to confirm this supposition (SIEBERT et al. 1999). On the other hand, it is questionable whether such pathogenic effects play a key role in the species' population size.

Reduction of fish stocks, as a result of commercial fishing, could also have caused the historic decline of harbour porpoise populations in the southern North Sea. Presumably, the herring *(Clupea harengus)* was an important food fish for the harbour porpoise until herring populations collapsed as a result of overfishing (KREMER 1990). In the 1990s, the animals' diets were found to consist largely of flatfish, sandeels and cods (BENKE & SIEBERT 1994; BENKE et al. 1998), fishes which have much lower caloric value than the herring and mackerel *(Scomber scombrus)* the porpoises prefer. In addition, finds of porpoises that have choked to death on common sole *(Solea solea)* (BENKE et al. 1998; FTZ Westküste, unpubl. data) may indicate that harbour porpoises are poorly adapted to this prey. While harbour porpoises can eat a considerable variety of fish, as current studies show (this has also been observed to be the case for other fish-eating marine mammals), food quality is still presumed to have an effect on population.

The Federal Government, represented by the Federal Ministry of Consumer Protection, Food and Agriculture (BMVEL), plans to intensify its efforts to prevent and reduce by-catches in fisheries. It urges that this issue be considered in reform of the EU's Common Fisheries Policy.

As a first measure to protect harbour porpoises, a special 124.000 ha protected area was established in the North Sea off the islands of Sylt and Amrum, as part of the Schleswig-Holstein Wadden Sea National Park. In this whale protection area, it is prohibited – above and beyond the national park's general protection regulations – to impair the welfare of whales in any significant way. More precise protection provisions are currently being prepared by the state government, in keeping with Article 45 (2) of Council Regulation (EC) No 850/98 of 30 March 1998 for the conservation of fishery resources through technical measures for the protection of juveniles of marine organisms and Article 2.2 of the Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS). The Federal Government urges that this protected area be expanded and made into an EU-wide zone (it currently is a national zone).

In light of existing uncertainties about population sizes, trends and limiting factors, it is difficult to monitor the success of protection measures. Currently, a range of instruments that could improve population surveys, including ultrasound detectors and underwater microphones, are being tested. With these new methods, both the whale protection area and possible sites of offshore wind farms in the North Sea and Baltic Sea are to be studied with regard to their importance for harbour porpoises.

The German governmental and scientific sectors strongly welcome plans, in the ASCOBANS framework, for a new survey of small cetaceans in the North Sea, Baltic Sea and adjacent waters ("Small Cetacean Abundance in the North and Baltic Seas and Adjacent Waters, Second Estimation": SCANS II), to be carried out from 2003 - 2004. The plan is also welcomed by scientists of other countries.

In light of the fact that fisheries pose the main threat for harbour porpoises, the Federal Ministry of Consumer Protection, Food and Agriculture (BMVEL) is initiating two research projects aimed at improving the scientific basis for porpoise protection. One project will study the effectiveness of acoustic signals in warning porpoises away from gill nets, and thus in preventing by-catches. A second project seeks to generate maximally precise statistics on harbour-porpoise by-catches in German

Tab. 2.5-1: Current research projects with relevance to protection of harbour porpoises

Topic	Executing institution	Sponsor
Causes of sickness and death in harbour porpoises in the North Sea and Baltic Sea (monitoring of beached animals)	SH: FTZ Westküste NI: Norden-Norddeich seal station	State governments
Statistics on beaching of harbour porpoises along the German North Sea and Baltic Sea coasts	SH: FTZ Westküste MV: Stralsund marine museum NI: Norden-Norddeich seal station	State governments
Studies of harbour porpoises' echo-location behaviour, to provide a basis for protection measures	University of Tübingen	Federal Ministry for the Environment (BMU)
Influence of contaminants harbour porpoises' immune systems in on European waters	FTZ Westküste	Federal Ministry for the Environment (BMU)
Acoustic search for harbour porpoises in the Baltic Sea	Stralsund marine museum	Federal Ministry for the Environment (BMU)
Impacts of offshore wind energy systems on marine mammals – including effects of noise and vibrations	FTZ Westküste	Federal Ministry for the Environment (BMU)
Surveys of harbour porpoise populations in the whale protection area (line-transect counts carried out from ships)	FTZ Westküste	State government of SH (national park authority)
Possibilities for preventing and reducing disturbance of harbour porpoises caused by defence-related testing in the Eckernförd Bight	FTZ Westküste	Federal Ministry of Defence (defence-technical service - Wehrtechnischer Dienst)
Various surveys of populations of harbour porpoises in potential sites of wind farms	Various	Private sponsors of planning for offshore wind farms

gill-net fisheries in the North Sea and Baltic Sea. The results of both projects will be provided to ASCOBANS, the International Council for the Exploration of the Sea (ICES) and the Scientific Technical Committee on Fisheries (STECF).

In closing, one important result of the 5th International Conference on the Protection of the North Sea in Bergen (Norway), which took place from 20 - 21 March 2002, deserves to be mentioned: after intensive preparatory work at the 9th Trilateral Governmental Conference on the Protection of the Wadden Sea, which took place in Esbjerg on 31 October 2001, and which included the participation of Denmark and the Netherlands, the following breakthrough was achieved: to protect harbour porpoises in the North Sea, by-catches are to be limited to no more than 1.7% of the population; a level of 1% is urged as a precaution.

2.6 Harbour seals in the German Wadden Sea

The most important habitats of harbour seals along the North Sea coast are located in the Wadden Sea. In October 1990, Denmark, Germany and the Netherlands concluded the Agreement on the Conservation of Seals in the Wadden Sea, and the agreement entered into force one year later. This agreement provides for development of a conservation and management plan for harbour seals, for protection of seal habitats, for measures to reduce environmental pollution, for co-ordination of research and long-term monitoring, for a basic prohibition on taking of seals and for initiatives to enhance public awareness. The Common Wadden Sea Secretariat, located in Wilhelmshaven, has assumed Secretariat responsibilities relative to this agreement.

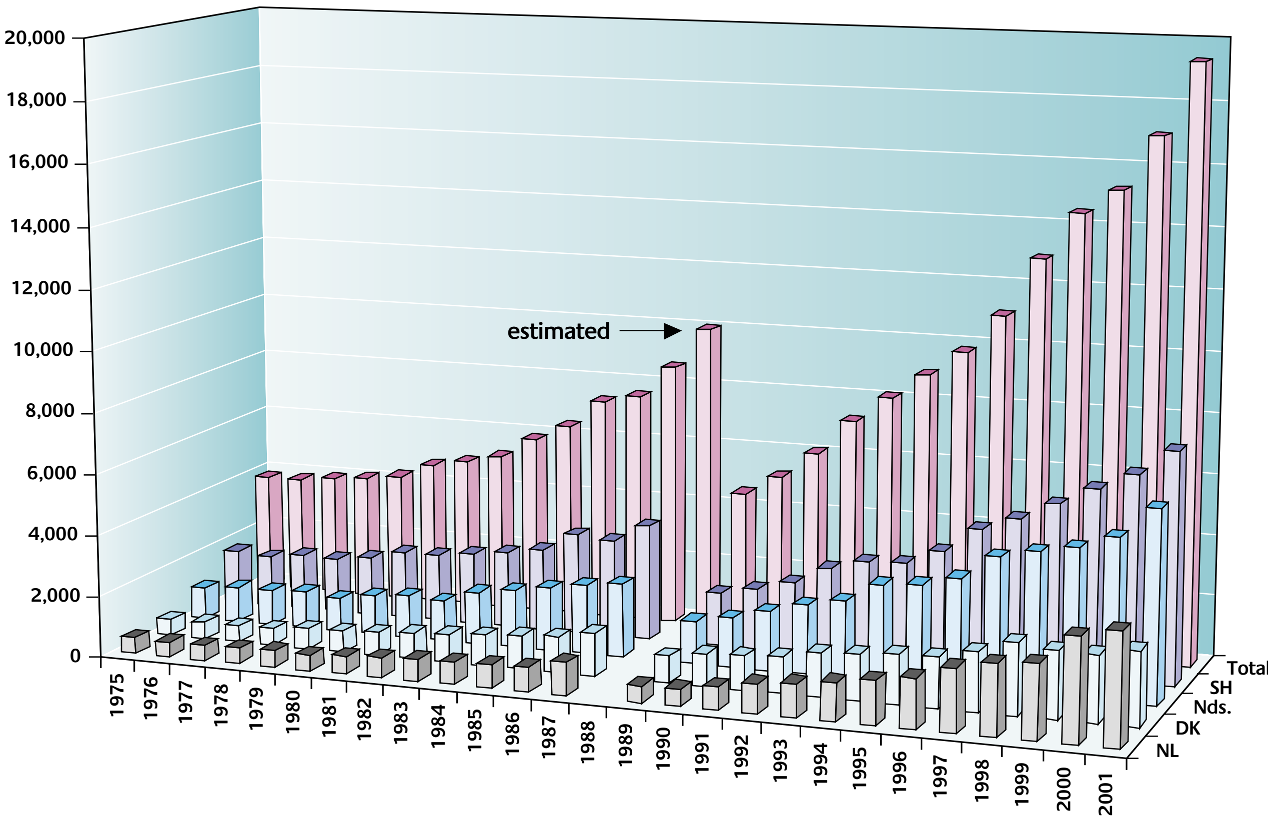
Harbour seals *(Phoca vitulina)* are fish-eating marine mammals that occur in coastal waters in temperate latitudes throughout the entire northern hemisphere. The world-wide population is likely to lie between 500,000 and one million, while the east Atlantic sub-species *P. v. vitulina* probably numbers 70,000-75,000 individuals. These figures are based on counts of basking harbour seals and thus are subject to correction, by about 30-50%, depending on location, to account for unincluded animals. Many populations are currently still increasing. In Germany, harbour seals are found primarily on North Sea coastal areas of Schleswig-Holstein and Lower Saxony. A total of 13,800 counted animals (2001), or 70% of the population found in the Dutch-German-Danish Wadden Sea, live in these areas (Common Wadden Sea Secretariat in lit. 2001). Since counts are assumed to include nearly 70% of all individuals (RIES et al. 1998), the population probably numbers about 20,000. Harbour seals are much rarer on German Baltic Sea coasts, however; the few animals sighted there are vagrants from Swedish and Danish populations.

The historical development of seal populations on the German North Sea coast can be traced through decades of hunting statistics and count data. On the other hand, for methodological reasons, counts made before 1975 are only conditionally comparable with modern counts. The current monitoring plan provides for five counts per year from the air (COMMON WADDEN SEA SECRETARIAT 1996). These counts take place during the populations' two phenological maxima, i.e. three counts are carried out in the late birthing season, around the last week in June, and two counts are carried out during the main fur-replacement phase in mid-August (ABT 2001).

In Schleswig-Holstein, counts are managed by K. Abt, a biologist, while in Lower Saxony they are carried out by the state hunting association (Landesjägerschaft). Furthermore, statistics are kept on finds of dead harbour seals and

Harbour Seals

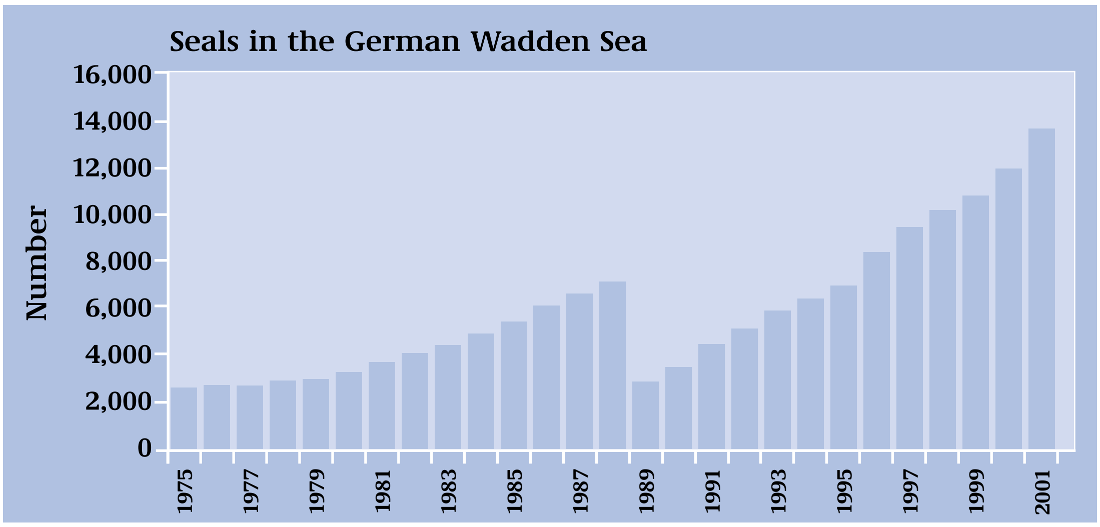
Fig. 2.6-1: Development of the seal population in the Wadden Sea, 1975-2001



orphaned young animals, and cadavers and animals captured alive are examined for disease and infections. In Schleswig-Holstein, this work is the responsibility of the West Coast Research and Technology Centre (Forschungs- und Technologiezentrum Westküste) in Büsum, in co-operation with K. Abt; in Lower Saxony, it is managed by the Norden-Norddeich seal-rearing and research station; and in Mecklenburg-West Pomerania, it is carried out by the German Oceanographic Museum (Museum for Marine Research and Fishery - Deutsches Museum für Meereskunde und Fischerei) in Stralsund. As far as can be determined by the available data, the seal population declined between the early 20th century and the 1970s (REIJNDERS 1992).

For the western part of the Wadden Sea (Lower Saxony and the Netherlands), the negative development in the 1960s is especially well-documented (REIJNDERS et al. 1981). Hunting pressure was long the dominant factor influencing population size (WIPPER 1974; REIJNDERS 1992). By the 1960s at the latest, increasing tourist boat traffic, in combination with the seals' wariness that had developed over centuries of hunting, probably began to play an important role. Frequent disturbances of basking harbour seals interrupt their nursing phases. They can result in separation of young from their mothers, thereby hampering rearing of young. What is more, post-war hunting concentrated especially on young harbour seals (REIJNDERS 1981), whose fur was used in a number of products. Initial comprehensive studies of the population situation in the 1970s showed that weak population growth, as a consequence of increased young-animal mortality, was the direct cause of the decline (WIPPER 1974). In addition, certain types of symptoms were correlated with frequent crawling on land to escape disturbances (flight from sand bars into the water) (DRESCHER 1978). In 1974/75, only 2,800 harbour seals, presumably a historical minimum, were counted in the

Fig. 2.6-2: Seals in the GermanWadden Sea, 1975-2001



German Wadden Sea. The negative trend was then stopped by complete, or near-complete, suspension of hunting (Lower Saxony: 1973, Schleswig-Holstein: 1974). In addition, a number of protected areas were established, and recovery soon ensued: data from the end of the 1970s to 1987 show an average of 10% growth in the seal population per year. In 1988, when a count of about 7,000 individuals was expected, this positive development was interrupted. A European-wide lethal seal epidemic hit the Wadden Sea population and killed about half of its numbers (SCHWARZ & HEIDEMANN 1994). The epidemic was caused by a virus related to canine distemper (*phocine distemper virus*). The virus was probably transmitted by harp seals *(Phoca groenlandica*) that in 1987 had wandered into the region from the Barents Sea, where they had been suffering a food shortage (GOODHART 1988). In 1989, only 3,100 harbour seals were counted in the German Wadden Sea.

The population quickly recovered from this setback, however. Beginning in 1990, growth rates averaging 12-13% per year

Tab. 2.6-1: Current research projects with relevance to protection of harbour seals

Subject	Executing institution	Sponsor
Surveys of seal populations in the Wadden Sea (counts from the air)	SH: K. Abt NI: Landesjägerschaft (hunting association)	State governments: SH (national park authority), NI (Weser-Ems district government)
Causes of sickness and death in seals in the North Sea and Baltic Sea (monitoring of beach finds)	SH: FTZ Westküste NI: Norden-Norddeich seal station	State governments
Health of wild harbour seals in Schleswig-Holstein's Wadden Sea areas (monitoring of animals captured alive)	FTZ Westküste	State government of SH (Supreme hunting authority)
Statistics on beached seals on the German North Sea and Baltic Sea coasts	SH: FTZ Westküste MV: Stralsund marine museum NI: Norden-Norddeich seal station	State governments
Effects of offshore wind energy systems on marine mammals. Impacts of noise and vibration, and use of offshore areas, by harbour seals, as feeding habitats	Institute for Marine Science, Kiel / FTZ Westküste	Federal Environment Ministry
Population dynamics of harbour seals in the Wadden Sea - phenology, demography and mortality	Institute for Marine Science, Kiel / FTZ Westküste	Dissertation
Studies of seal immune systems	FTZ Westküste	Dissertation

were recorded. These growth rates are among the highest ever documented world-wide for harbour seals and related species, and they indicate that the animals are very healthy. The reason for the slower growth from 1979-1987 is not reliably known. Possibly, environmental contaminants (heavy metals, organic halogens) had accumulated in the seals' bodies and negatively affected their health and fertility prior to the mass die-off (cf. REIJNDERS 1986). The surviving group either had lower accumulations of such chemicals (Hall et al. 1992) or was more resistant to their effects. Significantly, pollution discharges into North Sea have decreased considerably since the 1970s and 1980s (BAKKER et al. 1999). And yet the immune-weakening effects of certain chemicals were also held responsible for the enormous number of seals that died in 1988 (SCHUHMACHER et al. 1993). Only in this light does the population's immunological susceptibility to the epidemic seem a plausible explanation. Possibly, the higher growth levels measured after 1989 resulted from establishment of the Wadden Sea national parks, which enhanced protection of seals' nursery areas (Lower Saxony: 1986, Schleswig-Holstein: 1985).

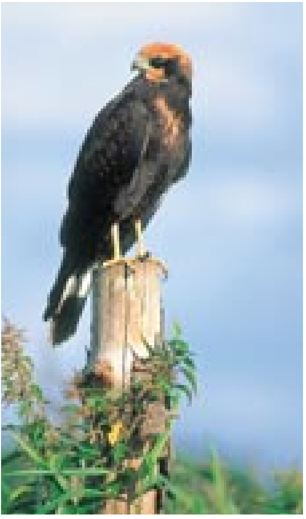
Currently (2001), the seal population is about twice as large as it was in 1987/88, and it will probably continue to grow for some time. It will be up to the continuing trilateral monitoring programme to document the population's long-term development. Ultimately, the available food supply is likely to be the factor that limits the population's size, and this is why policy-makers and scientists alike are watching the conflicts between seal populations and North Sea fisheries more and more intently. Recently, fishing associations called for re-introduction of hunting and a reduction of the increased population. Doing so could not be reconciled with the Agreement on the Conservation of Seals in the Wadden Sea, however. The governments of the relevant Länder have rejected the fishing associations' demands and have reaffirmed their support for natural development of seal populations, in keeping with the national park laws (Nationalparkamt 2001).

The Agreement on the Conservation of Seals in the Wadden Sea was developed and adopted, as the first regional agreement under the aegis of the Bonn Convention (CMS), in response to the seal die-off. It came into force on 1 October 1991 and merges the efforts of Denmark, Germany and the Netherlands to protect seals.

Pursuant to the Federal Hunting Act (Bundesjagdgesetz) seals in Germany are subject to hunting law. Although the Federal hunting season ordinance (Bundesjagdzeitenverordnung) has established a hunting season for seals (1 September – 31 October), no hunting of harbour seals is currently taking place, since the animals occur in the Wadden Sea national parks. Under hunting law, no taking of game animals by other than appropriately licensed persons is permitted.

Officially appointed seal rangers (Seehund-Jagdschutzbeauftragte) decide on the treatment of animals found alive – usually, young seals no more than several days or weeks old. Depending on such animals' condition, and the circumstances relating to the find, they take one of the following actions: a) leave the animal at the site where it was found; b) transport it to a more favourable location; c) transport it to a rearing station for rehabilitation; or d) kill it in keeping with animal-welfare principles. The increasing numbers of abandoned baby seals found each year (known in German as "Heuler" (criers) when still in the nursing stage), confronts authorities and seal rangers with certain problems. Apart from the seal stations' limited capacities, there are good reasons, from scientific and conservation-oriented perspectives, for minimising the numbers of harbour seals raised in stations and then returned to the wild. The most serious problem cited is the epidemiological risk that animals released from human captivity pose for the wild population (REIJNDERS & REINEKING 1999). In 2000, a total of 97 harbour seals were returned to the wild in the German Wadden Sea (Lower Saxony 69, Schleswig-Holstein 28).

In addition to studies of population development health, within the framework of monitoring, the Institute for Marine Research in Kiel and the West Coast Research and Technology Centre in Büsum are currently carrying out studies of habitat use, food ecology and demography (mortality and age composition) of harbour seals in the Wadden Sea. In co-operation with partners in the UK, Denmark, Sweden and the Netherlands, these institutions have applied for EU funding for a comprehensive project on conflicts with North Sea fisheries.



Western Marsh Harrier

Common Stonechat

Spotted Flycatcher

3 Other native migratory bird species listed in CMS Annex II

In addition to listing a range of waterbirds, bats, small cetaceans and seals, Annex II of the Bonn Convention on the Conservation of Migratory Species of Wild Animals (CMS) lists numerous other migratory bird species that are native in Germany. No regional agreement is in place for these birds.

Germany is obligated to provide the meeting of the parties with data relative to the population trends and colony developments for these species. The following overview provides this information:

Phoenicopteriformes and Anseriformes.

PHOENICOPTERIDAE AND ANATIDAE. Of the species not included in the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA), the Chilean flamingo *(Phoenicopterus chilensis)* and the Canada goose *(Branta canadensis)*, among other species, appear in Germany as so-called "neozoa". This term refers to species that, via the direct or indirect agency of human beings, become established, and successfully reproduce, in habitats they had previously not occupied (GEBHARDT et al. 1998).

Currently, only the Canada goose can be considered well-established in Germany, i.e. a species that has been reproducing in its new habitat for over three generations, or at least 25 years, without outside population support (GEBHARDT et al. 1998, BAUER & BEZZEL 2001). MOOIJ (2000) placed the Canada goose's breeding population in Germany at 600 to 800 breeding pairs in 1999. In the same year, the maximum winter population of resting Canada geese in Germany reached about 17,500 individuals (MOOIJ 2000). BAUER et al. (pub. pend.) estimated the breeding population in 1999 to number 470-560 pairs.

Gruiformes

Rallidae

CORN CRAKE *(CREX CREX)*. The corn crake breeds in the temperate zone of the west Palaearctic and west Siberia (HAGEMEIJER & BLAIR 1997). It migrates across the eastern Mediterranean (Egypt) to wintering areas in the savannas of central and south-east Africa. The most important wintering areas are located in Zaire, Zambia, Malawi, Simbabwe and South Africa (STOWE & GREEN 1997).

Russia (> 400,000 calling males), Belarus (26,000 – 30,000 calling males) and Ukraine (25,000 – 55,000 calling males) harbour the largest share of the total European population, estimated to number 505,000 to 1,100,000 calling males. Other large populations are found in Poland, the Baltic (Estonia, Latvia, Lithuania), Bulgaria and Romania (GREEN et al. 1997). With about 800 calling males, Germany has the second largest corn-crake population, after France (1,100 – 1,200 calling males), in western Europe (GREEN et al. 1997). The corn crake's breeding population in Germany, like its breeding population throughout its entire European range, has been declining significantly since at least the 1970s (BAUER & BERTHOLD 1996, GREEN et al. 1997, HAGEMEIJER & BLAIR 1997). The bird's population decreases have been estimated to be on the order of 20% to over 50% in most European countries (BAUER & BERTHOLD 1996, BIRDLIFE INTERNATIONAL/EUROPEAN BIRD CENSUS COUNCIL 2000).

The population declines are due primarily to destruction of breeding habitats, as a result of intensification of agriculture and extensive landscape drainage, and to significant losses of nests and young birds to early, mechanised mowing of meadows (GREEN et al. 1997). Changes in the bird's African flyway and wintering areas have contributed only insignificantly, in spite of regular taking by bird hunters – especially on the Egyptian Mediterranean coast – to the decline of the corn crake's population in Europe (STOWE & GREEN 1997).

BAUER et al. (pub. pend.) estimated the breeding population in Germany to number between 2,000 and 3,100 pairs in 1999. A national survey carried out by the Bavarian state bird protection association (Landesbund für Vogelschutz in Bayern) found at least 734 calling males in 1998, and only 470 and 329 calling males in 1999 and 2000, respectively (although the survey intensity was considerably lower in the latter two years) (MAMMEN & REICH 2001).

Charadriiformes

Burhinidae

STONE-CURLEW *(BURHINUS OEDICNEMUS)*. The stone-curlew's breeding range comprises the south-west Palaearctic, and the European breeding population is concentrated on the Iberian peninsula and in France. Small numbers of the bird are also found in Italy, south-east-Europe (Greece, Romania, Hungary, Bulgaria, Croatia) and south England. Other scattered breeding groups, each numbering no more than ten pairs, are found in Austria, the Czech Republic and the Slovak Republic, Belarus and Poland (HAGEMEIJER & BLAIR 1997, BIRDLIFE INTERNATIONAL/EUROPEAN BIRD CENSUS COUNCIL 2000).

The south European breeding birds are predominantly stationary. Birds that breed in northern areas migrate to southern Europe (Iberian peninsula) for the winter, as well as to north, west and east Africa (BEZZEL 1985, HAGEMEIJER & BLAIR 1997).

As a result of widespread habitat losses, the stone-curlew's breeding population at the northern limit of its former breeding range has decreased considerably since the turn of the century, and central Europe now harbours only residual colonies with just a few pairs each (BAUER & BERTHOLD 1996, HAGEMEIJER & BLAIR 1997). Since the 1970s (at the latest), the bird has also suffered considerable declines in its south-west European core range areas (BIRDLIFE INTERNATIONAL / EUROPEAN BIRD CENSUS COUNCIL 2000).

The stone-curlew's last breeding population in Germany, located in Saxony, disappeared in 1987 (BAUER & BERTHOLD 1996, HAGEMEIJER & BLAIR 1997, STEFFENS et al. 1998a).

Scolopacidae

EURASIAN WOODCOCK *(SCOLOPAX RUSTICOLA)*. The Eurasian woodcock breeds in the temperate and boreal zones of the entire Palaearctic. Its European range extends northward from the Pyrenees and Alps to Scandinavia and the British Isles and eastward to Russia. The Eurasian woodcock's largest breeding populations in Europe live on the Scandinavian peninsula and in Belarus. While breeding birds of Scandinavia and Russia migrate to southern and western Europe for the winter (Spain, Italy, France and the British Isles), birds that breed in central Europe are predominantly stationary birds or short-distance migrants (BEZZEL 1985, HAGEMEIJER & BLAIR 1997).

The Eurasian woodcock's population trends are inadequately known for much of Europe, because its populations are difficult to inventory with current methods. Reports of largely stable populations in most European countries (BIRDLIFE INTERNATIONAL/ EUROPEAN BIRD CENSUS COUNCIL 2000) contrast with reports of decreases – considerable, in part – of the bird's breeding and wintering populations (BAUER & BERTHOLD 1996, HAGEMEIJER & BLAIR 1997). BAUER & BERTHOLD (1996) assumed that the central European population has undergone a general decline in comparison with its size in the 1970s. The reasons they list for the decline, in addition to habitat loss, include intensive hunting in the bird's breeding and (especially) wintering areas. In 1999, the Eurasian woodcock's breeding population in Germany was estimated to number 12,000 to 24,000 pairs (BAUER et al. pub. pend.). In the 1999/2000 hunting season (16 October to 15 January), a total of 7,578 Eurasian woodcock were shot in Germany (DJV 2001).

Falconiformes

Accipitridae

WESTERN HONEY BUZZARD *(PERNIS APIVORUS)*. The western honey buzzard's range comprises large regions of Europe and west Asia. It regularly breeds throughout Germany (HAGEMEIJER & BLAIR 1997). The species' European breeding population numbers some 41,000 to 48,000 breeding pairs (HAGEMEIJER & BLAIR 1997).
The western honey buzzard, a long-distance migrant, winters in sub-Saharan Africa. It remains in its European breeding areas for a total of only about four months, from early May to the end of August. On their journey to their African wintering areas, European breeding birds concentrate within the west Mediterranean migration "funnels" (Gibraltar, Tunesia-Sicily); on the eastern route, they concentrate within flyways over the Bosporus and in Israel (KOSTRZEWA & SPEER 2001).

In 1999, the western honey buzzard's breeding population in Germany was estimated to number 3,800 to 5,200 pairs (BAUER et al. pub. pend.). For the second half of the 1990s, KOSTRZEWA & SPEER (2001) report a population level fluctuating around about 3,600 pairs. In spite of regional differences, the western honey buzzard's current population situation in Germany can be assumed to be stable (MAMMEN & STUBBE 2000, KOSTRZEWA & SPEER 2001).

BLACK KITE *(MILVUS MIGRANS)*. The black kite is one of the most common birds of prey worldwide. Its European range covers nearly the entire continent, with the exception of the British Isles and the Scandinavian peninsula. The entire European breeding population numbers between 25,000 and 29,000 pairs (HAGEMEIJER & BLAIR 1997).

European black kites are strongly migratory, and their wintering areas are located in sub-Saharan Africa (KOSTRZEWA & SPEER 2001).

The species is found throughout Germany, in relatively low densities and with a concentration in east German Länder (HAGEMEIJER & BLAIR 1997, KOSTRZEWA & SPEER 2001). Its population trends have been negative in most Länder since the 1960s (BAUER & BERTHOLD 1996, KOSTRZEWA & SPEER 2001), and only in the early 1990s did it begin recovering slightly, especially in eastern German Länder (MAMMEN & STUBBE 2000, KOSTRZEWA & SPEER 2001). BAUER et al. (pub. pend.) estimated the species' breeding population in Germany, in 1999, to number 2,700 to 4,100 pairs, while ORTLIEB (1998, cited from KOSTRZEWA & SPEER 2001) considers the population to be somewhat larger, between 3,500 and 4,000 pairs.

RED KITE *(MILVUS MILVUS)*. The red kite's entire worldwide range consists of a relatively small area, extending northeast, in a broad belt, from the Iberian peninsula to Poland.

The red kite winters in the southern regions of its breeding range. The largest part of the total population winters on the Iberian peninsula (HAGEMEIJER & BLAIR 1997, KOSTRZEWA & SPEER 2001). Recently, a wintering population averaging about 80 to 90 individuals has become established in the center of the bird's range, in the northern Harz foreland; this group leaves for other regions only during particularly inclement weather (GEORGE 1994).

Over half of the species' European and world population, which numbers some 22,000 breeding pairs, breeds in Germany, with a pronounced concentration in the northern Harz foreland of Saxony-Anhalt (HAGEMEIJER & BLAIR 1997, KOSTRZEWA & SPEER 2001). The red kite's population, following a minimum of about 2,000 pairs in the 1950s, has grown continually. It did not begin decreasing until about 1990, when agricultural structures changed in eastern Germany as a result of German reunification. Although there are indications that this trend is now being reversed, the decline was still continuing as of the end of the 1990s (MAMMEN & STUBBE 2000, KOSTRZEWA & SPEER 2001). BAUER et al. (pub. pend.) placed the the red kite's breeding population in Germany about 10,500 to 14,000 pairs in 1999; for the second half of the 1990s, estimates are somewhat more precise, specifying levels from 10,350 to 12,500 pairs (KOSTRZEWA & SPEER 2001).

WESTERN MARSH HARRIER *(CIRCUS AERUGINOSUS)*. The western marsh harrier is found throughout all of Europe, with the exception of northern parts of Scandinavia and Russia. Its breeding range is concentrated in central and eastern Europe (Germany, Poland, Ukraine, Russia). The entire European population, not including the Russian breeding population (about 31,000 pairs), numbers between 25,000 and 35,000 breeding pairs. In Germany, the western marsh harrier is now found throughout almost the entire country. The highest population densities of the species occur in the waterrich Länder of northern and eastern Germany (HAGEMEIJER & BLAIR 1997). The western marsh harrier's migratory behaviour in Europe varies in keeping with the location of its breeding areas. Breeding birds of northern Europe, including most German breeding birds, migrate in a south-westerly direction, to wintering areas in west Africa, south-west Europe and the Mediterranean (BEZZEL 1985, KOSTRZEWA & SPEER 2001).

The western marsh harrier's breeding population in Germany has recovered significantly, in most relevant areas, since the beginning of the 1970s, when its main threats – hunting and pesticide pollution – were reduced. Persisting local threats include destruction of suitable habitats, human-caused disturbances and the bird's increasing use of fields with winter grain crops as nesting locations – in most cases, the bird cannot breed successfully in such fields without human assistance (protection of nests during harvest) (KOSTRZEWA & SPEER 2001). In spite of these continuing threats, the species' population in Germany was considered larely stable as of the end of the 1990s – at a level of about 5,000 breeding pairs (KOSTRZEWA & SPEER 2001) – and as of 1999 – at a level of 5,500 to 8,400 breeding pairs (BAUER et al. pub. pend.). MAMMEN & STUBBE (2000) do call attention to a negative trend in the 1990s, however.

HEN HARRIER *(CIRCUS CYANEUS)*. The hen harrier breeds throughout the entire Palaearctic, from the British Isles to the Kamchatka peninsula on the Siberian Pacific coast. The European breeding population outside of Russia numbers about 8,000 to 10,000 breeding pairs, of which over two-thirds breed in France, Finland and Sweden (HAGEMEIJER & BLAIR 1997).

The species' central European breeding birds are short-distance migrants that winter in south-west Europe. The hen harrier's winter population in Germany consists of birds that breed in northern and north-eastern-Europe (KOSTRZEWA & SPEER 2001).

Following considerable declines, the hen harrier's breeding population in Germany is now confined almost exclusively to the dune islands in Lower Saxony's Wadden Sea areas, islands on which about 90% of the total population were sighted in 1998 and 1999 – 53 and 47 breeding pairs, respectively (SÜDBECK & HÄLTERLEIN 2001). Apart from six other breeding pairs in Schleswig-Holstein's Wadden Sea areas, all breeding populations, especially those in eastern German Länder, disappeared in the second half of the 1990s (KOSTRZEWA & SPEER 2001).

MONTAGUE'S HARRIER *(CIRCUS PYGARGUS)*. The range of Montague's harrier extends across the Mediterranean, temperate and steppe zones of Europe and west Asia. The bird's European population, numbering 6,900 to 9,600 breeding pairs outside of Russia (20,000 to 30,000 pairs), is concentrated in the Iberian peninsula, France and Belarus (HAGEMEIJER & BLAIR 1997).

Montague's harrier is a highly migratory bird. Central European breeding birds leave their breeding areas no later than September and fly to west African wintering areas (Chad, Mali, Benin, Ivory Coast). They return to their breeding areas starting at the end of April (KOSTRZEWA & SPEER 2001).

The breeding population of Montague's harrier in Germany, like the species' breeding populations in almost all European countries, is in a sharp decline. In the mid-1990s, larger groups of more than ten breeding pairs were found only in Schleswig-Holstein (33-40 pairs), Lower Saxony (about 40 pairs), North Rhine-Westphalia (40-50 pairs) and in Bavaria, whose population increased significantly in the second half of the 1990s – from ten pairs in 1995 to 28 pairs in 1998 (MÄDLOW & MODEL 2000). Montague's harrier's total population in Germany has stablised recently, thanks to intensive efforts to protect breeding populations in agricultural areas (GLIMM et al. 2001). In 1998, the population numbered between 185 and 223 pairs (KOSTRZEWA & SPEER 2001). For 1999, BAUER et al. (pub. pend.) placed the population at 234 to 283 breeding pairs. On the other hand, most breeding birds are found in grain fields, with the result that the population requires continuing human assistance (protection of nests from mowing) if it is to survive.

NORTHERN GOSHAWK *(ACCIPITER GENTILIS)*. The northern goshawk is found virtually throughout all of Europe. In Germany, as in large parts of its European breeding range, it is highly stationary; only the north and north-east European populations are migratory, in degrees that depend on locations of breeding areas, age and food situation (BEZZEL 1985, HAGEMEIJER & BLAIR 1997, KOSTRZEWA & SPEER 2001).

The entire European breeding population outside of Russia is estimated to number 62,000 to 90,000 breeding pairs, of which, so HAGEMEIJER & BLAIR (1997), about 19,000 pairs (as of the 1980s), or the largest population of any single European country, breed in Germany. For reasons of methods, this figure is considerably larger than the more recent, and more precise, figures of other authors, who place the German breeding population at 11,500 to 15,000 pairs (BAUER et al. pub. pend.) or only 8,500 pairs (KOSTRZEWA & SPEER 2001).

In spite of counter-trends in some regions, the northern goshawk's population in Germany has recovered considerably from its nadir of 2,000 pairs in the 1970s, which had resulted from pesticide pollution and hunting by humans (KOSTRZEWA & SPEER 2001). MAMMEN & STUBBE (2000) also term the northern goshawk's population in Germany as stable, on the basis of monitoring programme data for birds of prey (including owls) in the 1990s.

NORTHERN SPARROW HAWK *(ACCIPITER NISUS)*. The northern sparrow hawk is found throughout the entire European continent. Its European breeding population numbers between 148,000 and 167,000 breeding pairs (HAGEMEIJER & BLAIR 1997). In Germany, the northern sparrow hawk is largely a stationary bird that is joined in the winter by other birds from northern populations (KOSTRZEWA & SPEER 2001). Its breeding population in Germany, like those in all European countries, has recovered significantly since the 1970s, when use of DDT and other chlorinated organic pesticides, and hunting, were prohibited, and the current population is estimated to number about 15,000 pairs (KOSTRZEWA & SPEER 2001). This figure is at the lower end of the range found by BAUER et al. (pub. pend.) for 1999, 14,400 to 21,000 pairs. The northern sparrow hawk's general recovery in Germany continued through the end of the 1990s, according to monitoring programme data for birds of prey (including owls) (MAMMEN & STUBBE 2000).

EURASIAN BUZZARD *(BUTEO BUTEO)*. The Eurasian buzzard is the most common bird of prey in Europe and in Germany (the common kestrel is the second-most common bird of prey). It is found throughout all of Europe, with the exception of the far north (HAGEMEIJER & BLAIR 1997). The species' central European breeding birds exhibit no pronounced migratory behaviour. In cold winters, local concentrations can occur through regional movements, concentrations that are enlarged by winter guests from Scandinavia (KOSTRZEWA & SPEER 2001).

In 1999, BAUER et al. (pub. pend.), drawing on survey data, estimated the German breeding population to number 67,000 to 110,000 pairs. Estimates of KOSTRZEWA & SPEER (2001), at 50,000 to 69,000 pairs, are at the lower end of this range. The discrepancy between these two estimates is due largely to differences in methods, and thus the species can be considered to be stable in Germany, in spite of local declines and fluctuations in keeping with fluctuations in the populations of the small mammals on which it feeds (KOSTRZEWA & SPEER 1997, MAMMEN & STUBBE 2000).

ROUGH-LEGGED BUZZARD *(BUTEO LAGOPUS).* The European breeding area of the rough-legged buzzard is confined to the Scandinavian peninsula and the north-Russian tundra zone. The species' European breeding population numbers about 13,000 to 20,000 pairs, while the much larger Russian population comprises about 80,000 to 120,000 pairs (HAGEMEIJER & BLAIR 1997). In Germany, the rough-legged buzzard is a regular winter guest, especially in open landscapes of the north-German low plain (BEZZEL 1985).

GOLDEN EAGLE *(AQUILA CHRYSAETOS).* The golden eagle breeds predominantly in mountain regions of the Iberian and Scandinavian peninsulas, in the Scottish highlands and in the Alps. Other populations are found in France, Italy, Russia and in the Baltic countries and south-east Europe. The total European breeding population has been estimated to number 5,200 to 5,600 pairs (HAGEMEIJER & BLAIR 1997). Breeding birds of the Alps are stationary the year round, apart from local dispersal movements of non-territorial young birds (KOSTRZEWA & SPEER 2001).

The golden eagle's breeding population in the Alps reached a nadir around the turn of the century, as a result of intensive hunting, and with the species' slow reproduction rate it recovered only during the course of the 20th century. The breeding population in the German Alps, which comprised in 45 to 50 pairs in the middle-to-late 1990s, can currently be considered stable (BAUER et al. pub. pend., BAUER & BERTHOLD 1996, KOSTRZEWA & SPEER 2001). On the other hand, the bird's reproduction rate does not suffice to maintain the population, and thus the population depends on regular influxes from neighbouring countries (KOSTRZEWA & SPEER 2001).

LESSER SPOTTED EAGLE *(AQUILA POMARINA).* The lesser spotted eagle's range in Europe is confined to a relatively small area in central and eastern Europe (Belarus, Poland, the Baltic countries and the Czech Republic). The European breeding population consists of about 7,100 to 8,100 pairs, and the Russian population comprises about 50 to 200 additional pairs (HAGEMEIJER & BLAIR 1997).

The European breeding birds are highly migratory. In September, they fly in a south-easterly direction, across the Bosporus and Israel, to wintering areas in southern Africa (Zambia, Zimbabwe, Botswana, Namibia, South Africa), and beginning in mid-April they return to their European breeding areas (KOSTRZEWA & SPEER 2001).

The lesser spotted eagle's breeding population in Germany is located at the western limit of the species' European range. Western German breeding populations disappeared by the mid-20th century, as a result of hunting pressure, habitat destruction and disturbances at their breeding sites (BAUER & BERTHOLD 1996, KOSTRZEWA & SPEER 2001). Currently, breeding populations are found only in the Länder Mecklenburg-West Pomerania (90-96 pairs), Brandenburg (30-32 pairs) and Saxony-Anhalt (four pairs), and the total German population in the second half of the 1990s was estimated to number no more than 130 to 135 pairs (KOSTRZEWA

& SPEER 2001). For 1999, BAUER et al. (pub. pend.) placed the population at 134 to 143 pairs. In areas of Mecklenburg-West Pomerania where the population is concentrated, the population suffered a further slight decline in den 1990s, as a result of increasing intensity of agriculture and forestry, infrastructure development and recreationers' disturbances in the breeding areas (SCHELLER et al. 2001).

Pandionidae

OSPREY *(PANDION HALIAETUS)*. In Europe, the osprey is found primarily on the Scandinavian peninsula and in Germany, Belarus, Scotland, the Baltic countries, Poland and France (HAGEMEIJER & BLAIR 1997). The wintering areas of ospreys banded in Germany, according to a new analysis of recoveries of banded birds by SCHMIDT & ROEPKE (2001), are found primarily on the coasts and inland waters of west Africa. In addition, some ospreys winter on the Iberian peninsula and in north Africa, along the species' main migratory route, which extends in a southwesterly direction.

The total European population has been estimated to number 4,700 to 5,300 pairs (HAGEMEIJER & BLAIR 1997). These figures are likely to be too low in reality, however, given the species' population growth, even considerable growth, in other parts of its European range (LOHMUS 2001, ODSJÖ & SONDELL 2001, SCHMIDT 2001).

The osprey population in Germany has recovered from a minimum of fewer than 100 breeding pairs in the 1970s to a level of 346 pairs in 1998 (KOSTRZEWA & SPEER 2001, SCHMIDT 2001). In 1999, BAUER et al. (pub. pend.) placed the breeding population at 350 to 380 pairs. The reasons for this population growth include intensive nest protection and installation of man-made aeries on high-voltage power lines, as well as the considerable reductions in pesticide use that have occurred since the 1970s. More recently, reductions of mortality during migration and in wintering areas have also been cited as additional reasons (SCHMIDT 2001).

The largest breeding populations are located in the two Länder that remained populated by the bird even during its lowest population levels – Brandenburg and Mecklenburg-West Pomerania. As the population has grown, the bird has also expanded its range and returned to the Länder Saxony-Anhalt, Lower Saxony, Saxony, Thuringia and Bavaria (SCHMIDT 2001).

Falconidae

PEREGRINE FALCON *(FALCO PEREGRINUS)*. The peregrine falcon is unevenly distributed in Europe, with concentrations in southern Europe (Spain, France, Italy), on the British Isles and in northern Scandinavia. Central European breeding birds are predominantly stationary. Only young birds leave the breeding areas, in order to fly to wintering areas in France and on the Iberian peninsula (KOSTRZEWA & SPEER 2001). The European atlas of breeding birds (Brutvogelatlas) places the entire European population at 5,600 to 6,000 breeding pairs (HAGEMEIJER & BLAIR 1997).

Thanks to intensive protection (nest protection, protection against hunting and disturbances), and to the ban on DDT and related pesticides, the breeding population in Germany recovered from a low of about 50 pairs in 1975 to 620 to 640 pairs in 1999, although it has not completely reached its 1950s level of about 830 pairs. Some of the new establishments and population growth are due to release of peregrine falcons raised in captivity (KOSTRZEWA & SPEER 2001).

NORTHERN HOBBY *(FALCO SUBBUTEO).* The northern hobby is spread throughout Europe, with the exception of the Scandinavian highlands and the north of the British Isles. Its wintering areas are located in southern Africa (HAGEMEIJER & BLAIR 1997, KOSTRZEWA & SPEER 2001). The European breeding population comprises about 19,000 to 23,000 pairs. The species is found throughout almost all Germany, with low population densities. Its large-area population trends in Germany are difficult to assess, because the bird is difficult to inventory. Nonetheless, a general decline in breeding populations must be assumed for the past few decades (KOSTRZEWA & SPEER 2001). According to data from the programme for monitoring birds of prey (including owls), the population stabilised in the second half of the 1990s, at a level lower than that seen between 1988 and 1993 (MAMMEN & STUBBE 2000), and in the second half of the 1990s it numbered 2,700 to 3,600 breeding pairs (BAUER et al. pub. pend., KOSTRZEWA & SPEER 2001).

COMMON KESTREL *(FALCO TINNUNCULUS).* The common kestrel is found throughout most of all European countries. Its European breeding population numbers about 256,000 to 324,000 pairs (HAGEMEIJER & BLAIR 1997). In much of central Europe, common kestrels are short-distance migrants or stationary birds. Breeding birds from higher elevations of central Europe, and the northern populations, winter in west and central Europe, the Mediterranean and east and central Africa (BEZZEL 1985, KOSTRZEWA & SPEER 2001).

In Germany, the common kestrel, with a population of about 35,500 pairs, is the second-most common bird of prey, after the Eurasian buzzard (KOSTRZEWA & SPEER 2001). BAUER et al. (pub. pend.) place the population for 1999 at 41,500 to 68,000 pairs. Population trends for the common kestrel depend to varying degrees on food-related and weather-related fluctuations that mask long-term trends and make them difficult to recognise. In general, the population can be assumed stable at present, however (BAUER & BERTHOLD 1996, MAMMEN & STUBBE 2000, KOSTRZEWA & SPEER 2001).

MERLIN *(FALCO COLUMBARIUS).* The merlin's European breeding range comprises Iceland, the British Isles, Scandinavia and the northern part of Russia, and the Baltic countries and Belarus. The total European population is estimated to number about 10,000 to 16,000 pairs (HAGEMEIJER & BLAIR 1997). The merlin is a regular winter guest in Germany, especially in open landscapes of the north-German low plain (BEZZEL 1985).

Galliformes

Phasianidae

COMMON QUAIL *(COTURNIX COTURNIX)*. The common quail's breeding range covers large parts of Europe, with the exception of northern regions of the British Isles, of Scandinavia and of Russia. The European population is concentrated on the Iberian peninsula, in France and in south-east Europe. Its wintering areas are located in the Mediterranean, in north Africa and in the Sahel zone south of the Sahara (BEZZEL 1985, HAGEMEIJER & BLAIR 1997).

The common quail's breeding range and breeding population in Germany are subject to species-specific, irregular fluctuations that hamper assessment of the bird's long-term population trends. The species' breeding population in Germany was estimated to number 12,000 to 32,000 pairs in 1999 (BAUER et al. pub. pend.). In general, common quail populations must be assumed to have declined in recent decades, both on the European level and in Germany (BAUER & BERTHOLD 1996, HAGEMEIJER & BLAIR 1997). The reasons for the decline include climatic factors, habitat damage as a result of intensification of agriculture in the bird's breeding areas, hunting by humans and habitat destruction along the bird's migration routes and in its wintering areas (BAUER & BERTHOLD 1996).

Coraciformes

Meropidae

EUROPEAN BEE EATER *(MEROPS APIASTER)*. The European bee eater's contiguous European breeding area extends across the entire Mediterranean, from the Iberian peninsula to south-eastern and eastern Europe (Bulgaria, Romania, Ukraine), and across southern France and Italy. The wintering areas of south-west European breeding birds are located in west Africa (Gambia to Ivory Coast), while eastern European breeding birds migrate to east and south Africa (BEZZEL 1985, HAGEMEIJER & BLAIR 1997).

In the course of the 20th century, the European bee eater repeatedly visited and briefly established itself in northern central Europe, actions that may be related to climate changes (BAUER & BERTHOLD 1996). In the 1990s, incidences of establishment and breeding increased in frequency in many regions of Germany (BEZZEL 1994, BUNDESDEUTSCHER SELTENHEITENAUSSCHUSS and DEUTSCHE SELTENHEITENKOMISSION 1992, 1994, 1995, 1996, 1997, 1998, 2000). The breeding populations are concentrated in Saxony-Anhalt and in the Kaiserstuhl area of Baden-Württemberg; in these areas, between 1990 and 1998 the population increased from two and seven pairs to 40 and 60 pairs, respectively (TODTE et al. 1999).

In one study area in Saxony-Anhalt, in the course of the population's growth young birds from the local population established themselves in new colonies in the nearby surroundings, and thus the population can be considered self-sustaining (TODTE et al. 1999).

Population estimates for all of Germany, dating from the mid-1990s – 50 to 70 pairs in 1994 (WITT et al. 1996) and 107 to 109 pairs in 1996 (MÄDLOW & MODEL 2000) – are now likely, in light of the significant population growth and numerous local incidences of breeding establishment, to represent the lower limit of the actual population. For example, BAUER et al. (pub. pend.) placed the population in 1999 at 120 to 190 pairs.

Coraciidae

EUROPEAN ROLLER *(CORACIAS GARRULUS)*. In Europe, the European roller has two more or less separate range concentrations – on the Iberian peninsula, including southern France, and in eastern and south-eastern Europe. Its main wintering area is located in the east African savannah region (HAGEMEIJER & BLAIR 1997).

In the 1960s, the European roller's breeding population in Germany had declined to about 150 to 200 pairs, in eastern Germany. Following further declines into the 1980s, and after the last breeding sighting in 1990, it finally disappeared completely (ROBEL 1991, BAUER & BERTHOLD 1996).

Passeriformes

Muscicapidae

European Robin

EUROPEAN ROBIN *(ERITHACUS RUBECULA)*. The European robin occurs throughout almost all of Europe. It is one of the most common breeding birds of central Europe (HAGEMEIJER & BLAIR 1997). Germany's breeding birds are short-distance migrants that winter in western Europe and the Mediterranean. During the winter, they are replaced by winter guests of northern and eastern origins (BEZZEL 1993, GATTER 2000). The European robin's breeding population in Germany, like the breeding populations of other parts of Europe, is stable and has a slightly increasing trend (BERTHOLD et al. 1999, GATTER 2000). At the end of the 1990s, BAUER et al. (pub. pend.) estimated the total population of the species to number from 2,500,000 to 4,000,000 pairs.

THRUSH NIGHTINGALE *(LUSCINIA LUSCINIA)*. The thrush nightingale is found in the eastern half of central Europe and in eastern Europe. Within its range, it is concentrated in Ukraine, Belarus, Romania, Poland and the Baltic countries. In Germany and Denmark, it reaches the eastern limit of its contiguous breeding range. As a result, in Germany the bird is found primarily in the north-east Länder Schleswig-Holstein, Mecklenburg-West Pomerania and Brandenburg (HAGEMEIJER & BLAIR 1997). For the winter, the thrush nightingale, a long-distance migrant, migrates predominantly to east and south-east African countries – to Kenya, Zambia, Malawi, Tanzania and, to a lesser extent, to South Africa and Namibia (BEZZEL 1993, HAGEMEIJER & BLAIR 1997). The German breeding population in 1994 was placed by WITT et al. (1996) at 13,500 to 17,500 pairs, with an increasing trend and range expansion to the west (BECKER 1995, BAUER & BERTHOLD 1996). As a result, BAUER et al. (pub. pend.) found a population of 9,600 to 36,000 pairs in a second national survey.

NIGHTINGALE *(LUSCINIA MEGARHYNCHOS)*. The nightingale supplants the thrush nightingale throughout all of western and southern Europe. Its breeding range, with a broad overlapping zone shared with the thrush nightingale's range, extends eastward to Poland, the Slovak Republic, Hungary and Romania. Its wintering areas are located in Africa, in a belt situated between the southern boundary of the Sahara and tropical rain forest, and extending from the west coast of Senegal and Guinea to Kenya, Tanzania and Somalia (BEZZEL 1993, HAGEMEIJER & BLAIR 1997).

In Germany, the nightingale has a breeding population on the order of 80,000 to 130,000 pairs (BAUER et al. pub. pend.) and is distributed throughout the country, especially in areas with milder climates. Its range thus exhibits gaps in upland elevations and in parts of Bavaria (BAUER & BERTHOLD 1996, HAGEMEIJER & BLAIR 1997). The nightingale's population trends in Germany have exhibited long-term fluctuations that are primarily climatically influenced. In spite of regional variations, the nightingale's population in Germany can currently be considered stable to increasing (BAUER & BERTHOLD 1996, BERTHOLD et al. 1999).

BLUETHROAT *(LUSCINIA SVECICA)*. The bluethroat, including several sub-species, is found throughout Europe: the northern breeding population of the nominate form *L. s. svecica* (red-starred bluethroat) is concentrated in the Scandinavian countries and in high Alpine elevations, while the sub-species *L.s. cyanecula* (white-starred bluethroat) is scattered, incompletely, throughout the central European lowlands (BAUER & BERTHOLD 1996, HAGEMEIJER & BLAIR 1997).

Central European bluethroats' wintering areas are located in south-west Europe (Portugal) and the Mediterranean, and in north and west Africa (BEZZEL 1993).

In Germany, the breeding population of the (white-starred) bluethroat has dwindled to a few residual groups, as a result of habitat destruction lasting into the 1970s (BAUER & BERTHOLD 1996). Beginning in about the mid-1980s, however, this trend was reversed in Germany – as well as in neighouring countries such as the Netherlands, France, Austria and the Czech Republic and Slovak Republic – and considerable increases and new establishment were observed (BAUER & BERTHOLD 1996, HAGEMEIJER & BLAIR 1997). In about 1994, the bluethroat's breeding population in Germany was estimated to number 1,400 to 2,900 pairs (WITT et al. 1996). In keeping with this rapid population growth, FRANZ (1998) arrived at an estimate, for the second half of the 1990s, of at least 3,300 breeding pairs, with concentrations in Bavaria (1,700 pairs), Rhineland-Palatinate (250 pairs) and the following Länder of the north-German low plain: Mecklenburg-West Pomerania (200 pairs), Lower Saxony and Bremen (500 pairs together). In 1999, the bluethroat's breeding population in Germany was between 3,300 and 4,600 pairs (BAUER et al. pub. pend.).

BLACK REDSTART *(PHOENICURUS OCHRUROS)*. The black redstart's range covers all of southern, western and central Europe. The northern and north-eastern limit of its European breeding range passes through south Sweden, the Baltic countries, Belarus and Ukraine, and it shows a trend to expand to the north and east (HAGEMEIJER & BLAIR 1997, LANDMANN 1996). Central European breeding birds are predominantly short-distance migrants that winter in the Mediterranean. They do not leave central Europe until October, and they return to their breeding areas as early as March. Birds of the species have also been known to winter successfully in central Europe (BEZZEL 1993).

An adaptable bird that breeds near or in human settlements, the bird is found throughout all of Germany, and its population in Germany numbers about 600,000 to 1,000,000 breeding pairs (BAUER et al. pub. pend.). The black redstart's breeding population in Germany, like its breeding populations in other parts of central Europe, has considerably increased in recent decades (BERTHOLD et al. 1999, GATTER 2000).

COMMON REDSTART *(PHOENICURUS PHOENICURUS)*. The common redstart is a breeding bird throughout all of Europe. It winters in the savannah zone of west and central Africa, south of the Sahara (BEZZEL 1993, HAGEMEIJER & BLAIR 1997).

In contrast to black redstart populations, the common redstart's breeding population in Germany, and in large parts of Europe, has suffered population decreases, especially in the 1970s. The declines have been due to destruction of breeding habitats, negative changes in the bird's winter areas and droughts in the African Sahel zone (BAUER & BERTHOLD 1996). Following these decreases, in the 1990s, the population stabilised at a lower level or even recovered slightly (GATTER 2000, SCHWARZ & FLADE 2000). BAUER et al. (pub. pend.) estimated the species' breeding population in Germany to number 94,000 to 185,000 pairs.

WHINCHAT *(SAXICOLA RUBETRA)*. In Europe, the whinchat breeds predominantly in open landscapes of the temperate and boreal zones. It is relatively rare in the far north and the Mediterranean. The bird winters in the African savannah zone, south of the Sahara, in an area extending from Gambia and Senegal to Ethiopia and north Zambia, and crossing Sudan (BEZZEL 1993, HAGEMEIJER & BLAIR 1997).

The whinchat is found throughout all Germany, with considerable regional variations in breeding-population densities. As of the end of the 1990s, BAUER et al. (pub. pend.) estimated the whinchat's total population in Germany to number 37,000 to 90,000 pairs. BASTIAN & BASTIAN (1996), in a more precise survey, placed the breeding population within a range of 40,000 to 50,000 pairs. The species' greatest population densities occur in eastern German Länder (especially Mecklenburg-West Pomerania, Saxony-Anhalt and Saxony) and in the two north-west German Länder Schleswig-Holstein and Lower Saxony (BASTIAN & BASTIAN 1996). The whinchat's breeding population has decreased considerably in recent decades, as a result of habitat loss due to intensification of grassland cultivation (BERTHOLD et al. 1999), although differences in management have led to considerable differences in population trends between eastern Germany and western Germany (BASTIAN & BASTIAN 1996, BAUER & BERTHOLD 1996).

COMMON STONECHAT *(SAXICOLA TORQUATA)*. The European range of the common stonechat comprises south and central Europe, including an area extending north to about northern Germany, northern Poland and parts of Ukraine. Some more northerly populations are found in Scotland and on the Norwegian coast. The species' central European breeding birds are predominantly short-distance migrants; they winter primarily in the west Mediterranean, on the Iberian peninsula and in north Africa (BEZZEL 1993, HAGEMEIJER & BLAIR 1997).

In Germany, the common stonechat's range has become highly fragmented, following sharp declines as a result of habitat changes in the face of agricultural intensification since the 1960s and 1970s. Its current German population is concentrated in the western half of Germany, with the greatest concentrations in Lower Saxony and Rhineland-Palatinate (BAUER & BERTHOLD 1996). As of the mid-1990s, WITT et al. (1996) estimated the breeding population in Germany to number no more than 2,000 to 2,800 breeding pairs. BAUER et al. (pub. pend.) provide a higher estimate for 1999 – 3,500 to 4,900 pairs.

NORTHERN WHEATEAR *(OENANTHE OENANTHE).* The northern wheatear is widespread as a breeding bird throughout all of Europe, although its breeding range is highly fragmented on regional levels. In Germany, the bird's breeding range is concentrated in northern and eastern Länder. It is very rare or does not occur in south-west Germany (HAGEMEIJER & BLAIR 1997). Nearly the entire Holarctic northern wheatear population winters in the African savannah zone, in an area extending eastward from Mauritania and Senegal to Ethiopia, Kenya and Tanzania (BEZZEL 1993, HAGEMEIJER & BLAIR 1997).

The northern wheatear's breeding population in Germany has declined considerably since the 1950s as a result of intensification of use of cultural landscapes. In the mid-1990s, the population numbered 9,000 to 20,000 pairs (BAUER & BERTHOLD 1996, WITT et al. 1996). In 1999, the total population was estimated to number about 7,000 to 13,000 pairs (BAUER et al. pub. pend.).

RING OUSEL *(TURDUS TORQUATUS).* The ring ousel's range is limited to the higher mountain elevations of the Pyrenees, the Alps, and the Carpathians (subspecies *T. t. alpestris*), as well as the highlands of Scotland, north-west England and Scandinavia (nominate form). Both subspecies winter in southern France, Spain and the Atlas mountains of north-west Africa (BEZZEL 1993, HAGEMEIJER & BLAIR 1997).

In Germany, large breeding populations of the the ring ousel – apart from smaller breeding populations in upland areas – are found only in the Bavarian Alps (BEZZEL 1993, HAGEMEIJER & BLAIR 1997). The ring ousel's total breeding population in Germany, as of the end of the 1990s, numbered about 11,000 to 16,000 breeding pairs and showed no clear trends (BAUER et al. pub. pend., BAUER & BERTHOLD 1996, WITT et al. 1996).

BLACKBIRD *(TURDUS MERULA).* The blackbird is found throughout all Europe, with the exception of the far north. Central European breeding birds are largely stationary birds and short-distance migrants; in winter months, they also move from open landscapes to milder urban habitats. The percentages of migratory individuals within any given population fluctuates in keeping with weather-related differences in mortality between migratory and non-migratory individuals. Northern and eastern populations migrate in south-westerly to westerly directions, to wintering areas in western Europe and the Mediterranean (BEZZEL 1993, HAGEMEIJER & BLAIR 1997).

Thanks to the blackbird's ability to adapt to anthropogenic habitats, and to its increasing tendency to occupy human settlements, its population in Germany has increased considerably since the turn of the century (BEZZEL 1993, BAUER & BERTHOLD 1996). The bird's urbanisation is clearly still continuing (SCHWARZ & FLADE 2000), and thus the blackbird's population in Germany can be considered stable to increasing (BAUER & BERTHOLD 1996). In 1999, the bird's breeding population was estimated to number 8,000,000 to 16,000,000 pairs (BAUER et al. pub. pend.).

FIELDFARE (TURDUS PILARIS). In the course of the 20th century, the fieldfare has extended its breeding range – which originally covered only northern and eastern Europe and large parts of Russia – in a south-westerly direction. As a result, its range now covers all of central Europe and the eastern part of France (HAGEMEIJER & BLAIR 1997).

In central Europe, the fieldfare is predominantly an occasional migrant – within its breeding range, it migrates in a south-westerly direction, over varying distances, in keeping with food supplies and weather conditions. During particularly cold periods, large portions of northern and eastern populations may move into western Europe, with its Atlantic climate, in search of warmer weather (BEZZEL 1993).

Along with the continuing expansion of the bird's range, the fieldfare's breeding population is again increasing in some areas it already occupies (BAUER & BERTHOLD 1996, HAGEMEIJER & BLAIR 1997). In Germany, the bird's population has increased in most of its areas, in a process continuing into the 1990s, and the bird has filled in a number of the gaps in its range (BAUER & BERTHOLD 1996). As of the end of the 1990s, the breeding population numbererd between 350,000 and 600,000 pairs (WITT et al. 1996).

SONG THRUSH *(TURDUS PHILOMELOS).* The song thrush's range extends from the northern Iberian peninsula, across all of Europe, to the far north of Scandinavia and Russia. Its breeding populations are concentrated in heavily forested countries in the temperate and boreal zones. The bird is found throughout all of Germany. The northern and eastern populations of the song thrush consist predominantly of migratory birds that winter in Atlantic parts of western Europe, on the Iberian peninsula and in the Mediterranean. Western European breeding birds are largely stationary (BEZZEL 1993, HAGEMEIJER & BLAIR 1997).

The song thrush's population trends in Germany, like its population trends in other European countries, vary by region, with population increases and movements into human settlements (cf. the blackbird) contrasting with clearly negative trends in other areas (BAUER & BERTHOLD 1996, GATTER 2000, SCHWARZ & FLADE 2000). In general, the population in Germany can be considered relatively stable to slightly decreasing, and it numbers 1,200,000 to 2,500,000 pairs (BAUER et al. pub. pend.).

REDWING *(TURDUS ILIACUS).* The redwing is a common breeding bird in boreal forest areas of Scandinavia and Russia. The southern limit of its breeding range passes through Scotland, Poland, Belarus and northern Ukraine (HAGEMEIJER & BLAIR 1997). Population trends for the bird, in recent decades, have clearly been positive in large parts of its breeding area, and the species has expanded its breeding range in a southerly direction (BAUER & BERTHOLD 1996, HAGEMEIJER & BLAIR 1997). In Germany, it is a regular passing migrant and winter guest – apart from isolated instances of breeding – and the numbers of passing migrants, according to data from migratory bird monitoring at the Randecker Maar, have exhibited a slightly negative trend, in spite of population increases in the bird's breeding areas (GATTER 2000).

MISTLE THRUSH *(TURDUS VISCIVORUS).* The mistle thrush's breeding range extends over large parts of the European continent. The bird is not found solely in the treeless Scandinavian and Russian tundra zones and in south-east European steppe regions. Breeding birds of central Europe are short-distance migrants; they winter at the western and southern periphery of their breeding range (BEZZEL 1993, HAGEMEIJER & BLAIR 1997).

The mistle thrush occurs throughout Germany, in considerably lower densities than other thrush species, to which it is closely related. Its breeding population, following considerable increases and range expansions in past decades – trends which to some extent are still continuing – numbers about 300,000 to 550,000 breeding pairs (BAUER et al. pub. pend. BAUER & BERTHOLD 1996, GATTER 2000).

GRASSHOPPER WARBLER *(LOCUSTELLA NAEVIA).* The grasshopper warbler is found predominantly in temperate climate regions of west and central Europe. It does not occur in Mediterranean regions or in northern regions of Scandinavia. Pursuant to data of the European Atlas of Breeding Birds, Germany harbours the largest share of the European breeding population. The bird is found throughout almost all of Germany (HAGEMEIJER & BLAIR 1997). The grasshopper warbler's wintering areas are located in tropical west Africa (BEZZEL 1993).

The grasshopper warbler's regional population trends in central Europe are characterised by frequent fluctuations and local shifting, effects which hamper any assessment of the bird's population situation (BAUER & BERTHOLD 1996). After a period of gradual increases and range expansions, considerable population decreases occurred in some regions, probably caused in part by negative impacts in the birds' African wintering areas (BAUER & BERTHOLD 1996, HAGEMEIJER & BLAIR 1997). Other regions, by contrast, show positive trends, due in part to an abundance of habitats in the form of sites undergoing succession and reforestation, as a result of wind damage, clear-cutting and immissions-related forest damage (BAUER & BERTHOLD 1996). BAUER et al. (pub. pend.) estimated the grasshopper warbler's breeding population in Germany at the end of the 1990s at about 55,000 to 120,000 pairs.

RIVER WARBLER *(LOCUSTELLA FLUVIATILIS).* The river warbler's breeding range in the west Palaearctic is concentrated in Belarus, Poland, the Baltic countries, Hungary and the European part of Russia. In Germany, the species reaches the western limit of its contiguous breeding range. The river warbler's wintering areas are located in a relatively small region of south-east -Africa, extending south from Zambia and Malawi to the north-east of South Africa (BEZZEL 1993, HAGEMEIJER & BLAIR 1997). In recent decades, and beginning as early as the 1950s, the species has expanded its breeding range in a westerly direction. This development has been continuing, in spite of considerable fluctuations at the western periphery of the bird's range, and it has had the effect of filling in gaps in the bird's existing, occupied range; as a result, the river warbler's population in Germany has probably increased considerably in recent decades (BAUER & BERTHOLD 1996). In about 1994, the breeding population in Germany was estimated to number about 1,550 to 2,100 pairs (WITT et al. 1996). In light of recent increases, these figures are likely to represent the lower limits of the population's real size. In 1999, the breeding population in Germany was already being placed at about 3,500 to 10,000 pairs (BAUER et al. pub. pend.).

SAVI'S WARBLER (LOCUSTELLA LUSCINIOIDES). Savi's warbler's European range is fragmented. The largest numbers of the species are concentrated in a few extensive reedy wetlands in central and eastern Europe (Romania, Hungary, Poland). In Germany, its breeding range is concentrated in the water-rich regions of northern and eastern German Länder. Savi's warbler winters in Africa, throughout a broad belt between the southern edge of the Sahara and the tropical rain-forest zone (BEZZEL 1993, HAGEMEIJER & BLAIR 1997).

Savi's warbler populations, like those of other warbler species, fluctuate – considerably, in part – over small areas and short periods of time, and such fluctuations hamper assessment of population changes over long periods of time and large areas. While the species has suffered population declines as a result of destruction of breeding habitats and of negative changes in conditions for wintering in the African Sahel zone, it has increased its population and expanded its range, in some central European regions, since the 1970s (BAUER & BERTHOLD 1996). Between 1970 and 1994 in Germany, population increases occurred in Schleswig-Holstein, Hesse and Baden-Württemberg, while decreases occurred in Mecklenburg-West Pomerania, Lower Saxony, Saxony and Rhineland-Palatinate; as a result, by the end of the 1990s, the population was considered stable at about 3,300 to 7,500 pairs (BAUER et al. pub. pend.).

SEDGE WARBLER *(ACROCEPHALUS SCHOENOBAENUS)*. As a breeding bird, the sedge warbler is widespread in the temperate and boreal climate regions of Europe. In Germany, it is found primarily in the water-rich northern and eastern German Länder, and in Alpine forelands, in keeping with its habitat requirements. The species' range exhibits large gaps in west and south-west Germany. Breeding birds of western Europe migrate predominantly in southerly and south-westerly directions, to wintering areas in tropical west Africa, while eastern populations winter in east and central Africa (BEZZEL 1993, HAGEMEIJER & BLAIR 1997).

The sedge warbler's breeding population in Germany and in other central European countries has decreased continually, since the 1960s, as a result of destruction of the bird's wetland habitats in both its European breeding areas and African wintering areas (BAUER & BERTHOLD 1996, BERTHOLD et al. 1999). In about 1994, the sedge warbler's breeding population in Germany was estimated to number 6,000 to 10,000 breeding pairs, although population declines of sometimes more than 50% were found to have occurred in all Länder since the 1970s (WITT et al. 1996). The latest estimate for 1999 places the population at 6,000 to 12,000 pairs (BAUER et al. pub. pend.).

MARSH WARBLER *(ACROCEPHALUS PALUSTRIS)*. The marsh warbler's range comprises the temperate climate zones of western, central and eastern Europe. The bird is found throughout Germany. According to population estimates of the European atlas of breeding birds, Germany harbours the second-largest (after Romania) European breeding population. The marsh warbler is a pronounced long-distance migrant. It winters primarily in south-east Africa, in an area extending from south-east Kenya to South Africa, across Zambia and Malawi (BEZZEL 1993, HAGEMEIJER & BLAIR 1997).

Since about 1900, the marsh warbler has extended its range – primarily to the north, but also at the western periphery of its range – and has increased its total population. This trend was still continuing in the 1990s, in spite of local contrary trends (BAUER & BERTHOLD 1996, HAGEMEIJER & BLAIR 1997). On the other hand, findings from the Mettnau-Reit-Illmitz programme, carried out between 1972 and 1993, point to a significant decrease in marsh warbler populations in central and northern Europe (BERTHOLD et al. 1999). In spite of these conflicting trends, overall the population in Germany can be assumed to be relatively stable, at about 400,000 to 800,000 pairs (BAUER et al. pub. pend.).

REED WARBLER *(ACROCEPHALUS SCIRPACEUS*). The reed warbler's breeding range stretches across all of south, west and central Europe, in an area reaching north to about southern Finland and the Baltic countries. A highly specialised species, its relatively fragmented range marks areas with suitable reedbeds *(Phragmites)*. As a result, the largest densities in Germany are found in the north-German low plain, while gaps in the bird's range are found especially in upland locations. The reed warbler winters in the wet-savannah and wet-forest zone of west and central Africa. It also reaches areas further south, as far as Botswana and Namibia (BEZZEL 1993, HAGEMEIJER & BLAIR 1997).

Like the marsh warbler, the reed warbler increased its population and expanded its range as of the first half of the 20th century, in large parts of Europe, since increasing water-body eutrophication initially promoted the growth of reedbeds. Beginning in the 1960s, initial declining trends began, as a result of habitat destruction, but these trends gave way, thanks to successful nature conservation efforts, to population stability in the 1980s and 1990s (BAUER & BERTHOLD 1996, HAGEMEIJER & BLAIR 1997, BERTHOLD et al. 1999). In keeping with its habitat specialisation, the reed warbler, with 120,000 to 250,000 breeding pairs (BAUER et al. pub. pend.) is considerably rarer in Germany than its close relative, the marsh warbler.

GREAT REED WARBLER *(ACROCEPHALUS ARUNDINACEUS)*. The great reed warbler's fragmented range covers all of Europe, with the exception of the British Isles, Scandinavia and the northern half of Russia. Its wintering areas extend across all of sub-Saharan Africa, excluding only the tropical rain-forest zone. Breeding birds of western Europe migrate in a south-westerly direction, to wintering areas in west Africa (BEZZEL 1993, HAGEMEIJER & BLAIR 1997).

To an even greater extent than the reed warbler, the great reed warbler requires large areas of undisturbed, pure reedbeds located on the water sides of water bodies' terrestrialisation zones; as a consequence, in Germany large colonies are now found only in eastern German Länder and in Bavaria (BAUER & BERTHOLD 1996, HAGEMEIJER & BLAIR 1997). The great reed warbler also initially profited from reedbed expansion resulting from nutrient discharges. In the 1960s, a lasting population decline began, however – a decline that continued, in spite of local recoveries into the 1990s (BAUER & BERTHOLD 1996). In 1994, the great reed warbler's breeding population in Germany was estimated to number about 2,800 to 3,700 pairs (WITT et al. 1996). A more recent estimate for 1999 places the population at 4,500 to 7,000 pairs (BAUER et al. pub. pend.).

ICTERINE WARBLER *(HIPPOLAIS ICTERINA)*. The icterine warbler's European range extends from the Benelux countries, eastern France and Switzerland across all of central and eastern Europe. In south-western Europe, it is supplanted by the melodious warbler, a close relative. For the winter, the icterine warbler migrates in a south-easterly direction, to wintering areas in forest regions of central and south-east Africa (Zaire, Ruanda, Tanzania to Botswana) (BEZZEL 1993, HAGEMEIJER & BLAIR 1997). In terms of the total population, the icterine warbler's German breeding population is the second-largest in Europe, after the population of Belarus (HAGEMEIJER & BLAIR 1997). Apart from short-lived fluctuations and population declines – possibly climatically related – at the western periphery of its range, declines compensated by increases in other regions, the icterine warbler's population in central Europe is currently largely stable (BAUER & BERTHOLD 1996, BERTHOLD et al. 1999). In Germany, the breeding population in 1999 was estimated to number 200,000 to 400,000 pairs, without exhibiting any clear trends (BAUER et al. pub. pend.).

Barred Warbler

MELODIOUS WARBLER *(HIPPOLAIS POLYGLOTTA)*. The melodious warbler supplants the icterine warbler in south-west Europe. Its breeding range is limited to the Iberian peninsula, France and Italy. The bird's wintering range extends across the west-African savannah zone, from Senegal to Cameroon (BEZZEL 1993, HAGEMEIJER & BLAIR 1997).

Since the 1950s, the melodious warbler has expanded its range in a north-easterly direction, and it now breeds in Belgium, Luxembourg, south-west Germany, Switzerland and Slovenia and Croatia (HAGEMEIJER & BLAIR 1997). The largest populations of the melodious warbler in Germany are found in the south-west Länder Rhineland-Palatinate, Saarland and Baden-Württemberg. Since the first incidences of breeding were documented in the mid-1980s, the breeding population has continually increased, and by the mid-1990s the breeding population was placed at 250-350 pairs; by 1999, it was being estimated to number 480 to 690 pairs (WITT et al. 1996). The reasons for the continuing increases at the eastern periphery of the bird's breeding range are not well understood. Apart from climatic factors, an increasing availability of suitable secondary habitats may be a promoting factor (BAUER & BERTHOLD 1996).

BARRED WARBLER *(SYLVIA NISORIA)*. The barred warbler's range comprises the continental climate regions of central and eastern Europe, and Germany contains the western limit to the bird's contiguous breeding range. The species migrates across the east Mediterranean to a relatively small wintering range in the east African region comprising Sudan, Kenya, Uganda and Tanzania (BEZZEL 1993, HAGEMEIJER & BLAIR 1997).

Over the past century, the barred warbler has repeatedly expanded its breeding range westward during warm periods. Such expansions, which also brought the bird to western Germany, tended to be reversed as Atlantic climate influences predominated. In the 1980s and 1990s, the German breeding population exhibited a negative trend, caused by climatic factors as well as by habitat destruction as a result of agricultural restructing (BAUER & BERTHOLD 1996, HAGEMEIJER & BLAIR 1997). The barred warbler's breeding population in Germany, which WITT et al. (1996) estimated to number about 7,000 to 9,600 pairs in 1994, is concentrated in the eastern German Länder Brandenburg, Mecklenburg-West Pomerania, Saxony-Anhalt, Saxony and Thuringia (BAUER & BERTHOLD 1996, HAGEMEIJER & BLAIR 1997). In 1999, a new survey showed a population of about 7,000 to 16,000 pairs (BAUER et al. pub. pend.)

LESSER WHITETHROAT *(SYLVIA CURRUCA).* The lesser whitethroat is widespread throughout Europe, with the exception of the Iberian peninsula, south-western France and Italy and the subarctic regions of Scandinavia and Russia. Like the barred warbler, and unlike most European long-distance migrants, the lesser whitethroat migrates in a south-easterly direction, to its main east African wintering areas, in Sudan and Ethiopia (BEZZEL 1993). The German breeding population is the second-largest national breeding population of the lesser whitethroat in Europe, after the Romanian population (HAGEMEIJER & BLAIR 1997). At the end of the 1990s, the breeding population in Germany was estimated to number 250,000 to 500,000 pairs (BAUER et al. pub. pend.)

The Mettnau-Reit-Illmitz programme revealed that the population of the lesser whitethroat decreased significantly in central Europe in the 1970s and 1980s; the numbers of lesser whitethroat recorded by two of the three capture stations dropped significantly (BERTHOLD et al. 1999).

According to findings of the national monitoring programme, this population decline continued unchanged during the period 1989 to 1998 (SCHWARZ & FLADE 2000). The reasons for the population decline include destruction of breeding habitats and negative changes in the birds' east African wintering areas (BAUER & BERTHOLD 1996).

WHITETHROAT *(SYLVIA COMMUNIS).* The whitethroat's breeding range extends across the entire European continent, with the exception only of northern regions of Scandinavia and Russia and, in the south, the Iberian peninsula. Western populations of the whitethroat winter in west Africa, in areas further north than those chosen by other trans-Sahara migrants – in dry thornbush savannahs at the southern edge of the Sahara. Eastern populations migrate in a south-easterly direction, to similar wintering habitats in east and southern Africa (BEZZEL 1993, HAGEMEIJER & BLAIR 1997). Population trends for the whitethroat are difficult to assess, due to strong annual fluctuations. At the end of the 1960s, serious droughts in the African Sahel zone, the bird's main wintering areas, caused the population to decline considerably in large parts of Europe. Since then, the bird's population in Germany, like the populations of most other European countries, has been unable to recover to its former size, since continuing habitat losses in the bird's European breeding areas are having an additional negative impact on the overall population. In recent decades, the population has fluctuated around a low level (BAUER & BERTHOLD 1996, HAGEMEIJER & BLAIR 1997). In the mid-1990s, the whitethroat's breeding population in Germany was estimated to number 250,000 to 500,000 pairs (BAUER et al. pub. pend.).

GARDEN WARBLER *(SYLVIA BORIN).* The garden warbler is widely distributed throughout Europe, with the exception of Ireland, the southern part of the Iberian peninsula, Italy and south-eastern Europe. Breeding birds of western Europe winter in a broad spectrum of different habitat types in wet savannahs of west and central Africa (BEZZEL 1993, HAGEMEIJER & BLAIR 1997).

The garden warbler is widespread in Germany as a breeding bird, with a population of about 800,000 to 1,400,000 pairs (BAUER et al. pub. pend., HAGEMEIJER & BLAIR 1997). It is less strongly affected than other trans-Saharan migrants by negative changes in its African wintering areas. Due to the breadth of the bird's habitat preferences, landscape changes in its central European breeding areas have not yet had a negative effect on its population, and thus the species' current population situation in Germany can be considered stable (BAUER & BERTHOLD 1996).

BLACKCAP *(SYLVIA ATRICAPILLA).* The blackcap's range comprises all of Europe, with the exception of northern regions of the Scandinavian peninsula and Russia. Central European blackcaps are predominantly medium/long - distance migrants; they winter in Atlantic climate areas of western Europe, as well as in the Mediterranean and in an area extending south to west Africa. Since the 1960s, a increasing share of the population has shifted its migratory route to the west and now winters on the British Isles (BEZZEL 1993, BAUER & BERTHOLD 1996).

With a breeding population on the order of 2,000,000 to 4,000,000 pairs, Germany harbours the largest share of the total European population (HAGEMEIJER & BLAIR 1997). WITT et al. (1996) report a somewhat lower estimate, for the mid-1990s, of 1,300,000 to 3,000,000 pairs. For 1999, the population was estimated to number about 200,000 to 350,000 pairs BAUER et al. pub. pend.)

The blackcap's breeding population is stable throughout much of Europe, and it exhibits an increasing trend. The numbers of passage migrants in south-west Germany have increased significantly, according to sightings at the Randecker Maar site (1974-1998) as well as to monitoring-related captures at the Mettnau station (1972-1993) (BERTHOLD et al. 1999, GATTER 2000). Data from the monitoring programme of the Umbrella Association of German Avifaunists (Dachverband Deutscher Avifaunisten) points to further population growth in the 1990s (SCHWARZ & FLADE 2000). With its relatively unspecific habitats requirements, the blackcap profits from changes in forest management, from its increasing use of urban habitats (cf. blackbird) and from its ability to shift its wintering areas to Atlantic western Europe, which lowers its winter mortality rates (BAUER & BERTHOLD 1996, GATTER 2000, SCHWARZ & FLADE 2000).

BONELLI'S WARBLER *(PHYLLOSCOPUS BONELLI).* The European range of Bonelli's warbler extends across south-western Europe (Iberian peninsula, France), Italy and the Alps region, as well as – via another, possibly completely separate sub-species, across the southern half of south-eastern Europe (Greece, Bulgaria). The wintering area of the western European nominate form lies in the west African Sahel zone, in an area extending from the Senegal estuary to the Chad basin. The south-east European sub-species *P. b. orientalis* winters in a separate area in east Africa, in Sudan and Ethiopia (BEZZEL 1993, HAGEMEIJER & BLAIR 1997).

In Germany, Bonelli's warbler occurs only in warm, deciduous mixed forests in the extreme south-west of the country (Baden-

Württemberg, Bavaria) (GATTER 1997, HAGEMEIJER & BLAIR 1997). WITT et al. (1996) and BAUER et al. (pub. pend.) estimated Bonelli's warbler's breeding population in Germany, in the middle and end of the 1990s, to number 21,000 to 40,000 pairs, while BAUER & BERTHOLD (1996) report a lower estimate of 10,000 to 20,000 breeding pairs.

While the entire south-western European population has remained largely stable or shown slightly increasing trends, the south-western German breeding population has declined continuously, over the last three decades, by 75 to 90 % (BAUER & BERTHOLD 1996, GATTER 1997, HAGEMEIJER & BLAIR 1997). The presumed reasons for this decline include possible changes in the species' African wintering areas (BAUER & BERTHOLD 1996) and, especially, changes in forest management and climatic factors (GATTER 1997).

WOOD WARBLER *(PHYLLOSCOPUS SIBILATRIX)*. The wood warbler is found in forests of European temperate and boreal zones. It winters in the rain forests and wet savannahs of equatorial Africa, in an area extending eastward, from Guinea and the Ivory Coast, to Sudan, Uganda and Kenya (BEZZEL 1993). Its European breeding population is concentrated in Belarus, the Baltic countries and Germany (HAGEMEIJER & BLAIR 1996), where BAUER et al. (pub. pend.), drawing on survey findings, placed the breeding population at 320,000 to 600,000 pairs for the reference year 1999.

Apart from weather-related fluctuations – considerable, in part – the wood warbler's breeding population in Germany and in large parts of Europe is currently stable, with a slightly increasing trend (BAUER & BERTHOLD 1996, HAGEMEIJER & BLAIR 1997).

CHIFF-CHAFF *(PHYLLOSCOPUS COLLYBITA)*. The chiff-chaff is widespread throughout Europe, with the exception of range gaps in southern Spain, on the Scandinavian peninsula and in the arctic tundra. Central European breeding birds are predominantly medium-distance or long-distance migrants that winter in the Mediterranean and in sub-Saharan Africa. Some individuals also winter regularly in central Europe (BEZZEL 1993, HAGEMEIJER & BLAIR 1997). Some 2,400,000 to 4,000,000 pairs of the bird breed in Germany (BAUER et al. pub. pend.), a figure that represents a majority of the entire European breeding population (HAGEMEIJER & BLAIR 1997). Apart from natural fluctuations, the chiff-chaff's breeding population in Germany and throughout Europe has not experienced any significant changes in recent decades (BAUER & BERTHOLD 1996, HAGEMEIJER & BLAIR 1997).

WILLOW WARBLER *(PHYLLOSCOPUS TROCHILUS)*. The willow warbler's breeding range extends across the entire temperate and boreal zones of the European continent, and it has an obvious concentration on the Scandinavian peninsula. The bird's wintering range comprises large parts of sub-Saharan Africa (HAGEMEIJER & BLAIR 1997). Its breeding population in Germany numbers 1,700,000 to 2,800,000 pairs, and the bird is found throughout the country (BAUER et al. pub. pend.).

Although the willow warbler's breeding population in large parts of Europe has been considered largely stable in recent decades, the species suffered considerable regional population declines in the second half of the 1980s; these declines, which clearly were due to increased adult-bird mortality, create a need for further monitoring of the species' long-term population trends (BAUER & BERTHOLD 1996, HAGEMEIJER & BLAIR 1997).

GOLDCREST *(REGULUS REGULUS).* The goldcrest occurs primarily in coniferous forest in temperate and boreal zones of western, central and northern Europe. In large parts of its breeding range, it remains present year-round. Some populations – especially northern populations – carry out short migrations in keeping with weather conditions and food availability (BEZZEL 1993, HAGEMEIJER & BLAIR 1997). Together with the Scandinavian countries, Germany, with a breeding population of 740,000 to 1,200,000 pairs, harbours a majority of the entire European breeding population (BAUER et al. pub. pend., HAGEMEIJER & BLAIR 1997). To date, the goldcrest's breeding population in Germany and Europe has not exhibited any clear changes, apart from natural declines occurring after cold winters, although there are indications of regional declines as a result of immissions-related forest damage (BAUER & BERTHOLD 1996)

FIRECREST *(REGULUS IGNICAPILLUS).* The relatively small range of the firecrest is concentrated in central and western Europe, in an area that includes the Iberian peninsula, Italy and parts of south-eastern Europe. The firecrest migrates predominantly in a south-westerly direction, to wintering areas on the Iberian peninsula, in the west Mediterranean and in north Africa (BEZZEL 1993, HAGEMEIJER & BLAIR 1997).

The firecrest's breeding range is concentrated in the Alps region and south-west German uplands. Low densities of the bird are also found in northern and eastern Germany (HAGEMEIJER & BLAIR 1997). Since the 1950s, the firecrest has expanded its breeding range to the north and north-east. According to BAUER et al. (pub. pend.), its breeding population in Germany numbers about 520,000 to 830,000 breeding pairs and exhibits no clear change trends. Although the bird's breeding population is relatively stable at present, immissions-related forest damage in its central European core range could lead to population decreases (BAUER & BERTHOLD 1996).

SPOTTED FLYCATCHER *(MUSCICAPA STRIATA).* The spotted flycatcher is found virtually throughout the entire European continent, apart from arctic tundra areas. Its wintering areas are located in suitable habitats in the entire southern half of Africa (HAGEMEIJER & BLAIR 1997). The spotted flycatcher's breeding population has decreased significantly since the 1960s in parts of north-west and central Europe. The reasons cited for this trend include destruction of the bird's breeding habitats, climatic factors and biocide use in both its European breeding areas and African winter habitats (BAUER & BERTHOLD 1996, HAGEMEIJER & BLAIR 1997). In 1999, its breeding population in Germany was estimated to number about 200,000 to 440,000 pairs (BAUER et al. pub. pend.).

RED-BREASTED FLYCATCHER *(FICEDULA PARVA).* The red-breasted flycatcher breeds in the temperate and boreal forests of Eurasia. Its European breeding range is concentrated in Belarus, the Baltic countries, the Slovak Republic and Romania. European breeding birds winter in south Asia, primarily in Pakistan and India (BEZZEL 1993, HAGEMEIJER & BLAIR 1997). Germany lies at the western edge of the bird's contiguous breeding range. In 1999, the entire German breeding population was estimated to number about 2,000 to 4,500 breeding pairs, and these birds were located predominantly in eastern German Länder, Lower Saxony and Schleswig-Holstein (BAUER et al. pub. pend.). The red-breasted flycatcher's population situation in Germany and throughout its overall European range can be considered largely stable at present (BIRDLIFE INTERNATIONAL/ EUROPEAN BIRD CENSUS COUNCIL 2000).

COLLARED FLYCATCHER *(FICEDULA ALBICOLLIS).* The collared flycatcher's range is limited to a small area in central and eastern Europe. Its breeding population is concentrated in Romania, Hungary, Czech Republic and Slovak Republic (HAGEMEIJER & BLAIR 1997). The species migrates in a south-to-south-easterly direction, to wintering habitats in tropical Africa (Zaire, Uganda, Zambia). In Germany, its breeding population is concentrated in the two Länder Baden-Württemberg and Bavaria, and extensive surveys in 1994 placed the population in these areas at about 4,000 to 5,500 breeding pairs (BAUER & BERTHOLD 1996, WITT et al. 1996). In 1999, the collared flycatcher's population in Germany was estimated to number about 2,800 to 3,900. In spite of large regional population declines at the western periphery of its range, the collared flycatcher's total European population can be considered stable at present (BAUER & BERTHOLD 1996, BIRDLIFE INTERNATIONAL/EUROPEAN BIRD CENSUS COUNCIL 2000).

PIED FLYCATCHER *(FICEDULA HYPOLEUCA).* The pied flycatcher's European breeding range extends across the forests of the temperate and boreal zones of western, central and northern Europe. The bird's wintering areas are located in tropical west Africa, in an area extending from Gambia to Cameroon and central Africa, across Ivory Coast and Ghana (BEZZEL 1993, HAGEMEIJER & BLAIR 1997). The pied flycatcher is widespread in Germany, in suitable habitats, and its breeding population there numbers about 170,000 to 300,000 breeding pairs (BAUER et al. pub. pend.). In spite of regional differences in population trends, both the overall European population and the German breeding population can be considered largely stable (BAUER & BERTHOLD 1996, HAGEMEIJER & BLAIR 1997, BIRDLIFE INTERNATIONAL/EUROPEAN BIRD CENSUS COUNCIL 2000). On the other hand, modern forest-management techniques have made the pied flycatcher dependent on artificial nesting facilities, in large parts of its breeding range; if such facilities were no longer provided, a sharp decline could thus not be ruled out (BAUER & BERTHOLD 1996).

BEARDED REEDLING *(PANURUS BIARMICUS).* The bearded reedling occupies a fragmented range within the Mediterranean and temperate zones of Europe. Because it has highly specific habitat requirements, its breeding range, which extends northward from Spain, Italy and Greece to south Sweden, the Baltic countries and Ukraine, shows the areas that have suitable, extensive reedbed areas. Under favourable conditions, the bearded reedling can winter throughout its entire breeding range. It does carry out irregular migrations, however, in keeping with food availability, population density and weather conditions, and such migrations can lead to establishment in new breeding areas (BEZZEL 1993, HAGEMEIJER & BLAIR 1997). In Germany, bearded reedlings breed predominantly in the water-rich northern German Länder Schleswig-Holstein, Mecklenburg-West Pomerania and Brandenburg, as well as in Baden-Württemberg. The species' breeding population has recovered from the sharp decline it experienced during the cold winter of 1978/79, and by the mid-1990s the bearded reedling's breeding population in Germany was estimated to number 1,400 to 2,700 pairs (BAUER & BERTHOLD 1996, BAUER et al. pub. pend.).

In the 1980s and 1990s, the bearded reedling's population in Europe, outside of the bird's core range – where its population was largely stable – exhibited strong, non-directed fluctuations and population increases, connected in part to the species' establishment in new breeding range areas. At the same time, the bearded reedling has suffered population declines as a result of habitat changes and cold winters – in the Netherlands, Ukraine and Moldavia (BAUER & BERTHOLD 1996, HAGEMEIJER & BLAIR 1997).

c) Measures carried out in conformance with Article III (4), including conserving and restoring habitats, eliminating obstacles to migration and eliminating factors that endanger species.

Measures to conserve and restore habitats are being carried out, within the framework of the general nature conservation activities of the responsible Länder, for most of the CMS Annex II species that occur in Germany. The most important element of nature conservation efforts in Germany consists of creation of a system of nature reserves, national parks, biosphere reserves, landscape reserves and nature parks, covering all existing biotope types and, thus, the habitats of species listed in Annex II CMS. Section 2.3.3.2 provides an overview of legal provisions to protect areas in the Federal Republic of Germany, with an emphasis on waterbird habitats, in the context of implementation of Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA).

The information provided above, on the population situations of relevant individual species, includes details about species-conservation measures carried out for specific species, especially for certain birds of prey *(Accipitriformes)*. Examples include successful efforts to protect nests of osprey (SCHMIDT 2001), Montague's harrier (GLIMM et al. 2001) and the peregrine falcon (working group on peregrine falcon protection (Arbeitsgemeinschaft Wanderfalkenschutz) and action group on peregrine falcon and owl protection (Aktionsgemeinschaft Wanderfalken- und Uhuschutz)).

For the corn crake, a research and development project entitled "Assessment of the contribution of national and international nature conservation projects in Germany to the protection of highly endangered bird species (for example, corn crake) on extensively managed agricultural land – conflicts of aims and potential solutions" was carried out in Germany, from 1997 to 2000, by the Bavarian state bird conservation association (Landesbund für Vogelschutz). Among its results, the project developed means of improving protection for the corn crake in Germany (MAMMEN et al. in prep.).

d) Measures carried out in conformance with Article III (5), taking of animals, including:

- **Prohibition of taking**
- **Exceptions (reasons for the exceptions, duration of the exceptions, legal basis, statistics).**

All CMS Annex II species that occur in Germany are protected by law. In general, all European bird species are protected in Germany, under the Federal Nature Conservation Act (Bundesnaturschutzgesetz - BNatSchG) (Art. 20 a (1) No. 7 b)bb), as "specially protected" species. All birds of prey *(Accipitriformes)* that regularly occur in Germany are also "strictly protected" species (Art. 20 a (1) No. 8 a BNatSchG).

This status makes it illegal to trap the birds, to capture, injure or kill them, and to remove (from their natural surroundings), damage or destroy their developmental forms, or their nesting, breeding, living and refuge sites (Art. 20 f (1) No. 1 BNatSchG).

Exceptions are permitted in the Federal Republic of Germany only in the cases set forth by Art. 20 g of the Federal Nature Conservation Act.

Pursuant to Art. 2 Federal Hunting Act (Bundesjagdgesetz - BJG), birds of prey (including falcons) *(Accipitriformes)* and the common quail *(Coturnix coturnix)* are subject to hunting law. Since the currently applicable Ordinance on hunting seasons (ordinance of 2 April 1977, amended by the ordinance of 22 March 2000) does not specify any hunting season for these birds, they may not be hunted at any time of the year.

The Eurasian woodcock *(Scolopax rusticola)* is also a game species. Except in the Länder Berlin, Hesse and Saxony, it may be hunted from 16 October to 15 January (Lower Saxony: 16 October to 31 December).

2. With regard to species added to Annex II
Steps taken to develop and conclude regional agreements pursuant to Article IV (3) and under Article IV (4).

ENQUIRY SUBMITTED TO BMU/BFN

3, Actions taken to implement other resolutions of the Conference of the Parties.

The resolutions adopted at the sixth Conference of the Parties to the Convention on the Conservation of Migratory Species of Wild Animals (CMS), which took place in Cape Town, South Africa, have no relevance Annex II (CMS) species that occur in Germany, where such species are not already covered by the other agreements, including AEWA, ASCOBANS, EUROBATS and Wadden Sea Seals.

3.1 Example: Peregrine Falcon

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The Species Assistance Programme for the Peregrine Falcon

Ulrich Lanz

1 Introduction

The current Red List of Bavaria's endangered birds (NITSCHE in BAYERISCHES LANDESAMT FÜR UMWELTSCHUTZ 1992) places the peregrine falcon (Falco peregrinus; Fig. 1) in category 2. This status, that of "endangered" species, normally signals a grave population trend. For the peregrine falcon, this now applied only to a limited extent. While the Bavarian peregrine falcon still faces considerable threats, its conservation status has actually been downgraded from "critically endangered" – for many years, it faced an immediate threat of extinction – and this recategorisation must be considered a success of many years

Fig. 1: Adult peregrine falcon

of species protection. The population's nascent recovery, as reflected in this recategorisation, has made further progress since the currently applicable Red List was prepared. This success is due largely to a species assistance programme supported by hundreds of committed volunteers and funded by the Bavarian State Ministry for State Development and Environmental Issues (Bayerisches Staatsministerium für Landesentwicklung und Umweltfragen (StMLU)). This section presents the content, aims and successes of this programme.

2 Population decline and threats

SCHILLING (1995) estimates that in 1950 the peregrine falcon's population numbered some 900 breeding pairs in the area that is now the Federal Republic of Germany . By the mid-1970s, this population had dwindled to no more than 60 pairs. This group was concentrated in two main areas in southern Germany: the Schwäbische Alb area and the Bavarian Alps, with each area harbouring a residual population of 25 to 30 pairs. In 1975, outside of these two last refuges, a single pair was sighted on the lower Neckar River, and an equally isolated residual fragment with two breeding pairs was found in the Untermain area. Today, we know that the main factor behind this unprecedented population decline was an accumulation of environmental toxins – especially the pesticides DDT and lindan – in the bodies, eggs and young of peregrine falcons, raptors at the top of their food chain. The toxins undermined the birds' fertility and reproductive success. Profit-hungry nest robbers and aggressive pigeon breeders – who considered the peregrine falcon an unwelcome competitor – are considered to have been responsible, during the final phase of the population's collapse (at least), for further decimation of the already greatly weakened population (cf. FISCHER 1973, SCHILLING & KÖNIG 1980, RATCLIFFE 1993, BAUM & HÄDRICH 1995).

3 Range of the peregrine falcon in Bavaria

As a bird that breeds on rocky crags, the peregrine falcon was formerly found throughout Bavaria's upland and Alpine areas (cf. Fig. 2):

- The sandstone quarries in Bavaria's Untermain region, which have not been worked for decades,

[1] Both names – “Bats” conservations programme (“Artenhilfsprogramm Fledermäuse”) and “Develpment and Protection of Bat Populations in Bavaria in Bavaria” (research project) – are used interchangeably in this article; technically speaking, the species-conservation programme involves additional conservation aspects, however, because of the broad range of activities of nature conservation authorities that it provides for.

[2] The addresses of the co-ordination offices are included within the authors´ addresses, which are listed at the end of the article

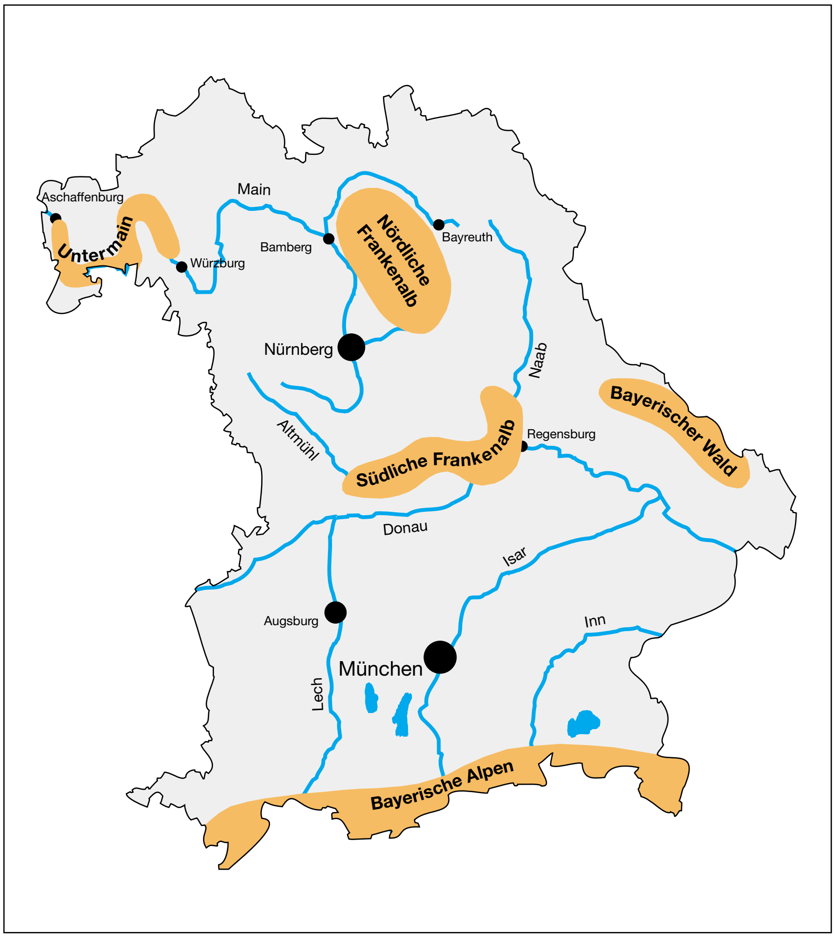

Fig. 2: The peregrine falcon's traditional breeding areas in Bavaria.

have long contained breeding sites for the species. Prior to the collapse of its population, the peregrine falcon had a nationally unparalleled population density in this areas of six breeding pairs in a valley section 12.5 km in length (MEBS 1955). By 1981, the population trend reached a nadir of only one reproducing pair (Cavallo, orally reported).

- In the northern Frankenalb region, the peregrine falcon tends to prefer the limestone cliffs of the Fränkische and Hersbrucker Schweiz area, while in the southern Frankenalb region it is found in the valleys of the Altmühl, Naab and Danube rivers (cf. Fig. 3). Prior to the declines of the 1960s and 1970s, the population throughout the Frankenjura region was probably on the order of 25 to 30 breeding pairs (WÜST 1981). Breeding came to an end there in 1974; it is not known whether the last documented breeding attempt in this former range centre, which occurred in 1976 – after two years with no documented breeding – was successful or not (KRAMER 1991).
- The Bavarian Forest was always on the border of the peregrine falcon's range in Bavaria. Nonetheless, at least four breeding sites were always permanently occupied there (KRAMER 1991). This breeding group of the peregrine falcon in the Bavarian Forest is considered to have disappeared by 1968.
- The true size of the peregrine falcon's breeding population in the Bavarian Alps around 1950 is not known. Various more or less vague estimates place it between "at least 35 breeding pairs" (MEBS 1986) and a maximum figure of at least 100 breeding pairs (KRAMER 1991). This broad range in population figures reflects the topographic and climatic difficulties encountered by a complete-coverage survey under Alpine conditions, but it is also due to the secrecy – usually justified with reasons of species protection – with which those familiar with

Fig. 3: Peregrine falcon breeding biotope in the Weltenburger Enge area (Danube valley).

the area treat many nest locations. As a result, the low figure for the population, about 35 breeding pairs (MEBS in CADE et al. 1988), must probably be taken with caution.

4 Species assistance programme for the peregrine falcon

In 1965, the "working group for peregrine falcon protection" (Arbeitsgemeinschaft Wanderfalkenschutz - AGW), a pioneering effort that set a national example in peregrine falcon protection, was founded in Baden-Württemberg. In 1969, the campaign "peregrine falcon and owl protection" (Wanderfalken- und Uhuschutz - AWU) was launched in Bavaria, with initial protection measures in the Untermain region and in parts of the Bavarian Alps. As time passed, these organizations were joined in efforts to protect the peregrine falcon by numerous persons and small groups – including district and local chapters of the Bavarian State Bird Conservation Association (Landesbund für Vogelschutz in Bayern e.V. (LBV). A lack of overall co-ordination and consultation greatly impaired the effectiveness of these efforts, however. In 1982, the LBV responded to this problem by initiating a Bavarian-wide species assistance programme that has continued to the present day, with financial support from the Bavarian State Ministry for State Development and Environmental Issues. The LBV functions as a coordinator and carries out measures in the Frankenjura area, in the Bavarian Forest and in parts of the Alps, while the AWU, as partner of the LBV, continues working in its traditional work areas in the Untermain region and in the western and eastern parts of the Bavarian Alps.

In its first years, the species assistance programme for the peregrine falcon was oriented strongly to the example set by the AGW and to its proven measures for protecting breeding sites in the Schwäbische Alb region, although it also drew on the AWU's first protection measures in the Untermain area. From this basis, the following current emphases of the species assistance programmes have evolved:

- Bavarian-wide population monitoring via breeding-site monitoring and collection of all available data, the indispensable basis for planning and carrying out any protection measures.
- Around-the-clock guarding of particularly endangered breeding sites throughout the entire breeding season, from the time breeding begins until young birds leave the nest (cf. Fig. 4).
- Regular checks of non-guarded breeding sites, by full-time and volunteer staff.
- Measures to promote new establishment (creation of artificial, optimised breeding sites in quarries and on buildings on which peregrine falcons have already established themselves independently, exposure of rocks and natural breeding niches, etc.)
- Measures to enhance public awareness, and discussion and agreements with relevant groups – especially rock-climbing associations.

This package of measures should address the three main threats that currently are preventing populations from expanding their ranges and re-establishing themselves at former breeding sites and that are posing new threats to growing populations:

Fig. 4: Guarding a peregrine falcon nest in the Danube valley (Poto: LBV Archives).

- The threat of illegal nest-robbing for purposes of falconry; while this threat has diminished, because nests are being guarded and because black-market prices have dropped considerably, it is still serious enough, as the recent incidences of nest-robbing in the southern Frankenjura region prove,
- Persecution by pigeon breeders, which has reached sorry new heights in recent years (in the Palatinate, for example) in the form of intentional poisoning of peregrine falcons, and other raptors, with poison bait (specially prepared pigeons), and
- Disturbances now being caused by increasing numbers of recreationers in the peregrine falcon's natural breeding habitats, which happen to be located in classic, popular hiking and rock-climbing areas in the Frankenjura area.

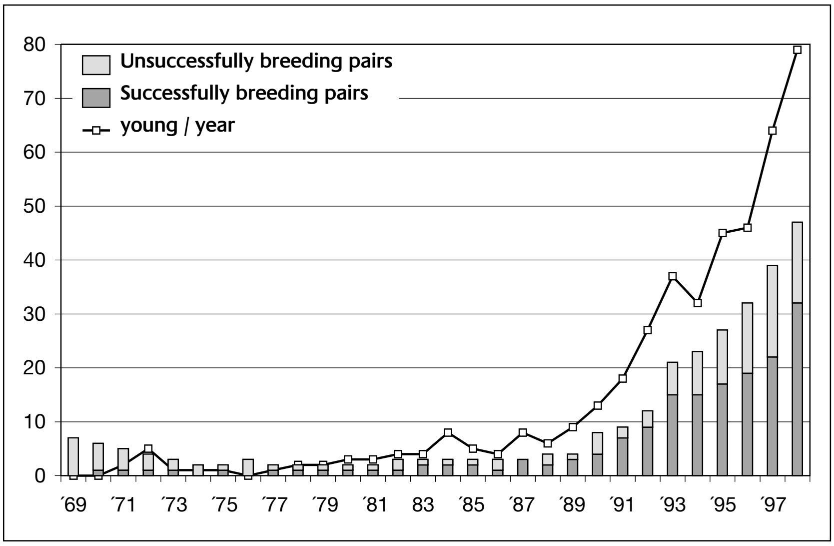

Fig. 5: Development of the peregrine falcon population in non-Alpine breeding area in Bavaria, 1974–1998 (Database: Eschwege 1993, Cavallo by letter and own data).

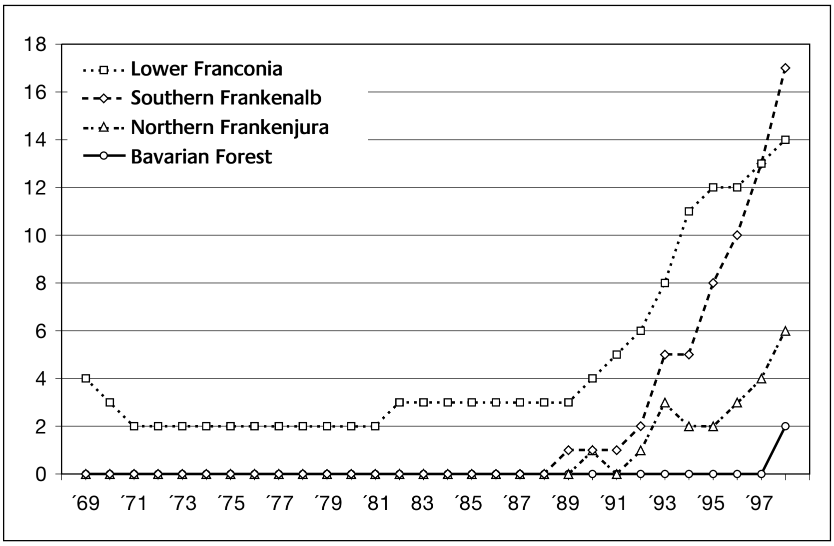

Fig. 6: Development of the peregrine falcon breeding population in the bird's traditional range concentrations in the Bavarian uplands (database: Eschwege 1993, Cavallo by letter and own data).

5 Population development through 1998

In its many years, the species assistance programme for the peregrine falcon has achieved good successes with its measures: beginning in the early 1980s, the numbers of young birds leaving their nests gradually began to increase. In 1989, a clear upswing took place in numbers of breeding pairs in non-Alpine breeding areas – numbers which until then had stagnated at a low level – and this upswing has continued into the present and has reached new maxima from year to year: in 1998 a total of 47 breeding sites were already occupied outside of the Alps; of these, 40 pairs actually bred, and 79 young falcons, from 32 successful broods, were able to leave their nests (cf. Fig. 5).

According to recent estimates of persons familiar with the area (Fünfstück, orally reported), in the Bavarian Alps the population is now likely to number 100 to 120 breeding pairs – a number that is probably comparable to the population figure prior to the population declines of the 1960s and 1970s. At present, no complete-coverage population surveys that could provide more precise data are being carried out there. Detailed figures on population and breeding success, at least approximating complete coverage, are available only for sub-areas such as the Werdenfelser Land. Additional data can be expected from the ongoing surveys for the new Bavarian atlas of breeding birds. This much is already clear, however: in the 16th year of the species assistance programme, 30 of 71 Bavarian rural districts now again have peregrine falcon populations.

Re-establishment in the species' traditional non-Alpine distribution centres took place in several steps (cf. Fig. 6). The population recovery began with the isolated residual population in the Untermain region. The first indications that the trend was being reversed came in the early 1980s, and since then the population throughout all Lower Franconia, comprising 14 breeding pairs (1998), has reached a level that is even higher than the population levels of the 1950s (Cavallo, by letter). While the population density in the Untermain region probably cannot increase any further, new establishment near the border to Hesse, in the Spessart area and in the greater Würzburg area clearly indicates that expansion into neighbouring, potentially suitable habitats has begun.

In the south Frankenalb region, the first new (in this modern era) breeding attempt was noted in 1988. The two young birds that resulted, like the same pair's brood in the following year, were killed by predators (cf. FRANZ 1988). But once this pair moved to a known breeding site in the Weltenburger Enge area, LBV staff were able to report a successful brood with

four fledglings. This brood became the start of rapid re-establishment in the south Frankenalb area. Today (1998), the south Frankenalb area has surpassed Lower Franconia in population development; it now has 17 breeding territories.
In the third traditional breeding area, the northern Frankenalb region, new establishments were observed as of the early 1990s, although their numbers were far below expectations. In 1998, only six breeding pairs were known – far fewer than would have been expected in light of the rich availability of natural breeding sites there. There is reason to presume that the peregrine falcon's re-establishment in the Fränkische and Hersbrucker Schweiz areas is being prevented by high breeding densities of owls there, since the owl competes with the peregrine falcon for breeding sites. It is also conceivable that high levels of disturbance by hikers and rock-climbers are preventing re-establishment in some former breeding sites.
Through 1997, no new breeding pair established itself in the Bavarian Forest, even though the neighbouring Bohemian Forest, in the Czech Republic, has had an occupied breeding site for a number of years and even though peregrine falcons were regularly observed on the Bavarian side. Not until 1998 were successful broods – two – confirmed on the Bavarian side of the border. As in parts of the Frankenalb area, intensive tourism probably reduces the suitability of most of the former breeding sites.

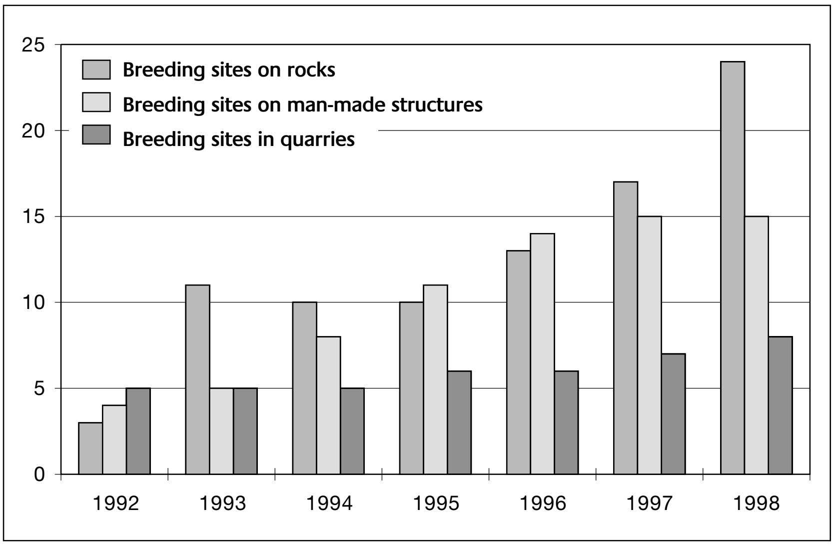

Fig. 7: Peregrine falcon breeding habitats in Bavaria, outside of the Alps, 1992–1998 (Database: Cavallo by letter and own data).

All in all, the development confirms the experience gained in other parts of the bird's range, and repeatedly documented in the literature: new establishment tends to occur in the vicinity of existing breeding populations (cf. NEWTON & MEARNS in CADE et al. 1988, LUBER 1992, WEGNER 1993). Exceptions to this rule exist in the form of eight instances, as of 1998, of establishment on structures outside of traditional range areas. Among these structures, for example, are all three Bavarian nuclear power stations.

6 Habitat use

The peregrine falcon's primary breeding habitats in Bavaria have always consisted of natural rock walls in the Bavarian Alps and in upland areas – especially in the Frankenjura region. The peregrine falcon has used quarries as secondary habitats – at least in the Untermain area – even before the population declines of the 1960s and 1970s. The unused, and unclosed, red sandstone quarries in question have been partially reclaimed by nature, and in some of these AWU has improved the availability of breeding sites by installing nesting boxes. These quarries are still a preferred breeding habitat for the peregrine falcon. In addition, since the early 1990s increasing numbers of birds are breeding on buildings – especially in west Lower Franconia and in some breeding areas outside of the bird's traditional range concentration. This development is also apparent in other Länder (cf. Fig. 7). As of 1998, buildings accounted for 31.9% of all breeding sites. The structures chosen by the peregrine falcon, as secondary habitats, include nuclear power stations (46 % of all structures used for breeding), as well as industrial chimneys, bridges, agricultural storage facilities, etc..

7 Outlook

Bavaria-wide, the peregrine falcon's population can currently be considered secured. This is proven by the relevant population figures, which have been increasing for years, and by the levels of documented breeding success, which are still higher than long-term levels in Baden-Württemberg (cf. Fig. 8). This development represents one of the few major successes that species protection has been able to achieve in this country in the past few years. On the other hand, it cannot be ignored that two of the bird's traditional range areas – the northern Frankenalb area and the Bavarian Forest – are still sparsely populated. What is more, the threats faced by Bavarian peregrine falcon populations – at least at their natural breeding sites – are increasing in Bavaria, as they are in other Länder.

In particular, conflicts between species protection and rock-climbing interests, which cannot be avoided as the peregrine falcon returns to former breeding sites on exposed rocks, will require all concerned authorities and associations to make significant efforts in coming years, if the peregrine falcon is to enjoy long-term security in its natural breeding habitats. Some approaches to date have been promising: for exam-

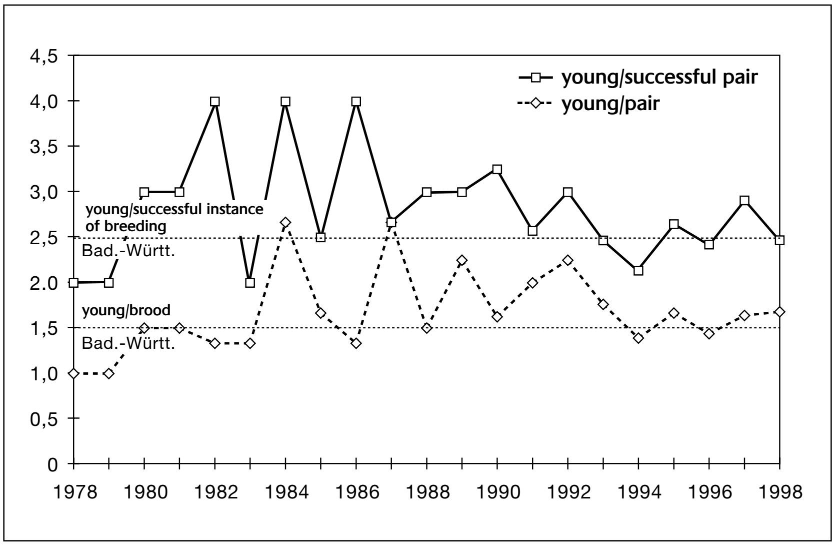

Fig. 8: The peregrine falcon's breeding success in Bavaria (not including the Alps), in comparison with long-term averages in Baden-Württemberg (upper and lower horizonal lines; database: ESCHWEGE 1993, Cavallo by letter and own data).

ple, the German Alpinists' Association (Deutscher Alpenverein) has been helping to guard peregrine falcon breeding sites, and agreements have been reached, via intensive discussions between the involved nature conservation authorities, conservation associations and rock-climbing organisations, on restricting rock-climbing in the Frankenjura area. The most recent examples of such agreements include: a rock-climbing concept for the Pegnitztal (dating from 1997), developed by the LBV working group on "rock-climbing and nature conservation", and a climbing concept, completed in 1998, for the lower Altmühltal and the Danube's transverse valley.

In spite of such highly welcome progress – which also is within the meaning of confidence-building measures involving conservationists and climbers – conventional, around-the-clock monitoring will probably remain indispensable, for some time to come, in protecting the peregrine falcon. In particular, compliance with climbing prohibitions, and with agreed voluntary climbing restrictions (established by climbers themselves), must be monitored at very popular climbing rocks that attract climbers from around the country, since such compliance is not always immediately forthcoming. What is more, the fact that between 1995 and 1997 five nest-robbing attempts – of which four were successful – occurred in the south Frankenjura area alone, shows that site-guarding will have to continue for the time being, at least at certain particularly endangered breeding sites.

8 Summary

In 1982, the Bavarian State Bird Conservation Association (Landesbund für Vogelschutz in Bayern e.V. (LBV) initiated a Bavaria-wide species assistance programme for the peregrine falcon, a programme that is still being continued today, with the support of the Bavarian State Ministry for State Development and Environmental Issues (Bayerisches Staatsministerium für Landesentwicklung und Umweltfragen (StMLU). As of 1998, the number of non-Alpine breeding sites monitored and found occupied increased back up to 47. A total of 40 pairs attempted to breed in 1998, and 32 successful instances of breeding produced 79 young birds that were able to leave their nests. This represents a high point in the upward trend of the Bavarian peregrine falcon population, which has continued since the end of the 1980s. The population in the Bavarian Alps is estimated to number 100 to 120 breeding pairs. In spite of the continuing population recovery, the recovering populations continue to face considerable threats. In addition to the threat of illegal taking, increasing conflicts with rock-climbers require the species protection measures to be continued.

9 Literature

BAYERISCHES LANDESAMT FÜR UMWELTSCHUTZ (1992): Rote Liste gefährdeter Tiere Bayerns. – Schr.-R. Bayer. Landesamt für Umweltschutz 111 (Beiträge zum Artenschutz 15).

BAUM, F. & J. HÄDRICH (1995): CKW- und PCB-Kontamination. Rückstände von Chlorkohlenwasserstoff-Pestiziden und polychlorierten Biphenylen in Eiern wildlebender Vögel, insbesondere südwestdeutscher Wanderfalken. – Beih. Veröff. Naturschutz Landschaftspflege Bad.-Württ. 82: 351-373.

CADE, T. J. et al. (1988): Peregrine Falcon Populations. Their Management and Recovery. – The Peregrine Fund, Inc. Boise, Idaho.

ESCHWEGE, C. V. (1993): Entwicklung der natürlichen Wanderfalkenbestände in Bayern, Hessen und Rheinland-Pfalz. – Vogel und Umwelt 7: 247-254.

FISCHER, W. (1973): Der Wanderfalke. Neue Brehm-Bücherei, Band 380. – Ziemsen-Verlag, Wittenberg-Lutherstadt.

FRANZ, D. (1988): Sperber (Accipiter nisus) schlägt junge Wanderfalken (Falco peregrinus) im Horst. – Anz. Orn. Ges. Bayern 27: 287-289.

KRAMER, S. (1991): Die Situation des Wanderfalken (Falco peregrinus) in Bayern – Bestandsentwicklung, Populationsökologie, Schutzkonzept. – Ber. ANL 15: 177-216.
LUBER, H. (1992): Der Wanderfalke (Falco peregrinus) wieder im Aufwind – ein Situationsbericht aus der Steiermark. – Egretta 35: 111-116.
MEBS, T. (1955): Zum Brutvorkommen des Wanderfalken in Süddeutschland. – Anz. Orn. Ges. Bayern 4: 343-362.
MEBS, T. (1986): Die Wiederkehr des Wanderfalken (Falco peregrinus) im Bereich der Bundesrepublik Deutschland. – DFO-Berichte 1986: 8-12.
RATCLIFFE, D. (1993): The Peregrine Falcon. – T. & A. D. Poyser, London.
SCHILLING, F. (1995): Verbreitung und Bestandsentwicklung des Wanderfalken in Deutschland. – Beih. Veröff. Naturschutz Landschaftspflege Bad.-Württ. 82: 163-178.
SCHILLING, F. & C. KÖNIG (1980): Die Biozidbelastung des Wanderfalken (Falco peregrinus) in Baden-Württemberg und ihre Auswirkung auf die Populationsentwicklung. – J.Orn. 121: 1-35.
WEGNER, P. (1993): Die Populationsdynamik des Wanderfalken in Baden-Württemberg von 1965–1991. – Vogel und Umwelt 7: 209-217.
WÜST, W. (1981): Avifauna Bavariae, Bd. 1. – München.

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4 Current national projects that benefit migratory species of the Bonn Convention

The German Federal Agency for Nature Conservation (BfN) is responsible for implementation of various nation-wide support programmes in the area of nature conservation. Many of these programmes also support migratory species within the CMS framework.

Major **nature conservation projects** of nationally representative importance are aimed primarily at protecting large habitats in natural and cultural landscapes. **Research and development projects** generate new findings in nature conservation that serve the Federal Government as a basis for decisions in the area of nature conservation. **Test and development projects** implement and refine concepts for nature conservation policy.

MAJOR NATURE CONSERVATION PROJECTS. The Federal programme for "Establishment and safeguarding of valuable parts of nature and landscapes with nationally representative importance" ("Errichtung und Sicherung schutzwürdiger Teile von Natur und Landschaft mit gesamtstaatlich repräsentativer Bedeutung") was established in 1979. Within this programme, Germany protects nationally important landscapes, in order to help protect Germany's natural heritage and to fulfil Germany's international nature conservation obligations. The support programme helps protect natural landscapes on a lasting basis, and it helps secure and sustainably develop cultural landscapes with outstanding habitats of important, endangered plant and animal species.

In 1989, this support area within the "major nature conservation projects" category was expanded to include a programme to promote natural vegetation along water bodies (Gewässerrandstreifenprogramm). The purpose of this programme is to help enhance the ecological quality of watercourses and their catchment basins.

Projects are selected in accordance with the criteria representative nature, large size, semi-naturalness, threat level and exemplary character. Major nature conservation projects differ from other nature conservation projects especially in terms of the large areas they cover. The importance of large protected areas is that they minimise the impacts of negative external influences, which can weaken or even undermine the protective functions of small protected areas.

The stated aim of the Federal support programme is to legally secure the core areas, within project areas, by the time projects terminate. A total of 743 km² of core areas have been set aside to date as nature reserves (not including areas temporarily set aside). This area corresponds to 0.2 % of Germany's territory.

The support funding is used primarily for land purchases, as well as for long-term leases, management and development planning, execution of biotope-management measures and personnel and equipment costs. Shoreline vegetation projects also require long-term compensation payments. For major nature conservation and shoreline-vegetation projects, the Federal Government assumes up to 75% of the incurred costs, while the relevant Länder normally assume 15%, and project spon-

Tab. 4.-1: Completed and ongoing major nature conservation projects with important populations of CMS migratory species.

Projects	Migratory species groups/species
Completed projects	
Ochsenmoor (NI)	Limicolae, incl. European golden plover
Altrheinarm Bienen-Praest (NW)	Ducks (incl. geese)
Meerbruch (NI)	Ducks, limicolae
Alte Sorge-Schleife (SH)	Ducks, limicolae
Flumm/Fehntjer Tief (NI)	Limicolae
Bislicher Insel (NW)	Arctic wild geese (white-fronted goose, bean goose)
Nigehörn/Scharhörn (HH)	Limicolae, terns
Borgfelder Wümmewiesen (HB)	Limicolae
Hainholz (NI)	Bats
Wollmatinger Ried (BW)	Ducks (especially common pochard, gadwall)
Wurzacher Ried (BW)	Ducks (incl. green-winged teal, northern pintail, garganey, northern shoveller)
Haseldorfer Marsch (SH)	Limicolae
Hohe Rhön/Lange Rhön (BY)	Corn crake
Neustädter Moor (NI)	Limicolae
Ongoing projects	
Schaalsee-Landschaft (SH/MV)	Ducks, common crane, bats, Eurasian bittern
Ostrügensche Boddenlandschaft (MV)	Bats, ducks, limicolae
Kyffhäuser (TH)	Bats
Muschelkalkhänge Mittl. Saaletal (TH)	Bats
Drömling (ST)	Limicolae, such as European golden plover; bats, common crane
Teichgebiete Niederspree-Hammerstadt (SN)	White-fronted goose, bean goose, bats; ducks
Mündungsgebiet der Isar (BY)	Ducks
Mittlere Elbe (ST)	Ducks
Unteres Odertal (BB)	Limicolae, sedge warbler, corn crake, ducks, geese
Regentalaue (BY)	Limicolae
Nuthe-Nieplitz-Niederung (BB)	Ducks (incl. geese)
Uckermärkische Seen (BB)	Cranes, bats
Fischerhuder Wümmeniederung (NI)	Limicolae
Hammeniederung (NI)	Limicolae
Peenetal/Peene-Haff-Moor (MV)	Ducks
Murnauer Moos (BY)	Bats, corn crake

sors (for example, rural districts, interest groups or associations) pay 10 % of the costs.

Table 4.-1 provides an overview of completed and ongoing Federal major nature conservation projects with project areas in which important populations of CMS migratory species occur.

RESEARCH AND DEVELOPMENT (R+D) PROJECTS. R+D projects provide a basis for, and facilitate, the Federal Government's decisions in the area of nature-conservation and environmental protection policy. In particular, they are used to prepare, review and refine national and international legal provisions and programmes and national nature conservation tasks.

The following projects, which initiated or supported measures to protect migratory species, were supported by the BfN and executed or completed within the reporting period:

- Global analysis of migratory endangered species, with the aim of producing a Global Register of Migratory Species (GROMS)
- High Sea Marine Protected Areas (conference)
- Survey and assessment of ecologically valuable North Sea habitats
- Studies and recommendations relative to conservation of forest bats
- Model for an overall concept for Federal monitoring of animal populations, using the example of avifauna
- Scientific assessment of German EU special protected areas for birds (see Chap. 1.3.3)
- Survey of the distribution, abundance and migrations of seabirds and waterbirds in the German North Sea, and development of a concept for implementation of international conservation objectives (see Chap. 1.2.2)
- Seabirds and waterbirds in the German Baltic Sea, and their protection within the framework of international agreements (see Chap. 1.2.2)
- International support for protection of important resting areas of migratory birds in Middle Eastern countries.
- Assessment of environmental factors in breeding success of meadow birds (see Chap. 1.2.3)
- Assessment of the contribution of national and international nature conservation projects, in Germany, to conservation of endangered bird species on extensively managed agricultural areas (for example, corn crake): conflicts of aims and potential solutions (see Chap. 1.2.3)
- Development of biochemical methods for determining the age of caviar of the species beluga, sevruga and osietra, and for determining origin of caviar

TEST AND DEVELOPMENT (E+E) PROJECTS. The purpose of test and development projects is to contribute to protection of biodiversity. Projects that combine protection and use aspects are of particular importance. E+E projects provide a way to illustrate the Federal Government's concepts in nature conservation policy, to refine such concepts in practice and thus to enhance the bases for making decisions in future work. The relevant funding budget is managed by the BfN, in keeping with both scientific and administrative criteria.

The following E+E projects with relevance for CMS migratory species were carried out or completed during the reporting period:

- Creation of a roost network for building-dwelling bat species
- Restoration of a meadow-breeder habitat in the Osterfeiner Moor (fen)
- Re-establishment and conservation of the Atlantic sturgeon (Acipenser sturio)
- Establishment of a centre for Wadden Sea monitoring and information (Multimar Wattforum Tönning)

OTHER PROJECTS. In addition to the above projects, the German Federal Agency for Nature Conservation, working in co-operation with the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), has supported additional projects to further the aims of the Bonn Convention (CMS) and its regional agreements:

- Training of bat experts in eastern European countries
- European bat festival
- Preparation of a status report on the European golden plover

5 Germany's contributions to supporting and developing the Bonn Convention

Germany as Depositary for the Bonn Convention.

The Federal Republic of Germany is the Depositary for the Bonn Convention. Within the German Federal Government, this function is performed by the Federal Foreign Office. The Depositary holds the original versions of the Convention, in their various language versions. It also provides notification of accessions and other significant events relative to the Convention.

GERMANY AS HOST COUNTRY FOR THE SECRETARIATS OF CMS, EUROBATS, ASCOBANS AND AEWA. The Secretariat of the Bonn Convention has been located in Bonn, without interruption, since 1984. Since December 1996, it has been located on a beautiful United Nations property in Bonn (Address: Martin-Luther-King-Str. 8).

The same office building houses the Secretariats of the AEWA, EUROBATS and ASCOBANS agreements. This close proximity enhances co-operation between the Secretariats.

The German Federal Government, the United Nations and the CMS Secretariat are currently consulting regarding a new agreement that will define the privileges and immunity of these Secretariats.

As a result of the CMS Secretariat's location in Bonn, various bodies – especially including the Standing Committee – choose Bonn almost regularly as the location for their meetings.

GERMANY'S CONTRIBUTIONS TO PROMOTION AND DEVELOPMENT OF THE CONVENTION. The Federal Government is working to enhance the effectiveness of the Bonn Convention on the Conservation of Migratory Species of Wild Animals (CMS) as an international conservation instrument. One important aim in this connection is for the number of parties to the convention, currently 79, to grow; migratory species can be comprehensively protected throughout their habitats only if the relevant range states participate in measures for the species' protection. The Federal Government, and especially the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) and the Federal Foreign Office, support the efforts of the Secretariat, the Standing Committee and other parties, to approach other countries

Executive Director Prof. Dr. Töpfer of UNEP on the occasion of the 20th anniversary of the Bonn Convention in Bonn, 23 June 1999

regarding accession to the Bonn Convention or to its regional agreements.

On 23. June 1999, on the occasion of the 20th anniversary of the Bonn Convention, the Federal Government held a reception in the Redoute in Bonn-Bad Godesberg in order to review the Convention's successes to date and to outline the perspectives for its further development. Some 300 guests of international and national nature conservation institutions, representatives of the parties and of non-party countries, specialised authorities, international and national associations, policy-makers and press representatives took part in this event. The Executive Director of UNEP, Prof. Dr. Klaus Töpfer, State Secretaries Baake (Federal Environment Ministry) and von Ploetz (Federal Foreign Office) and Mr. Kolodziejcok, formerly the responsible department director for nature conservation in the agriculture ministry (and then in the Federal Environment Ministry, which was founded in 1987), all spoke at the event, along with the Chairman of the Scientific Council, Dr. Pierre Devillers, and the Chairman of the Standing Committee, Prof. Abdulaziz Abuzinada.

For the occasion of this jubilee, a film was specially produced on the need to protect migratory animal species and the ways in which the Bonn Convention can help these species. This film was shown to a large TV audience. English and French versions of the film were also produced and are available to interested national representatives.

The contributions regarding the Convention's substantial development include the motions for inclusion of additional animal species in Annex II of the Convention, in order to enable development of special regional agreements. At the 4th Conference of the Parties (Nairobi, Kenya, 7 – 11 June 1994), a total of 50 waterbird species were listed in Annex II of the Convention at Germany's initiative. These species were then later included in the relevant regional agreement, the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA).

At the 6th Conference of the Parties (Cape Town, South Africa, 10 – 16 November 1999), the Federal Government proposed the inclusion of 18 species of sturgeons in Annex II. This motion was unanimously adopted. Since then, the Federal Environment Ministry (BMU), in co-operation with the IUCN's centres for environmental law, has been working on a draft of a Memorandum of Understanding on exchange of information about sturgeons. This work was temporarily suspended in April 2000, however. The reason for this decision was the decision taken at the 11th Conference of the Parties to the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) (Gigiri, Kenya, 10 to 20 April 2000, CITES), to carry out a "Significant Trade Review" for sturgeon species, which are also covered by CITES, and to make efforts to protect sturgeons. Parallel continuation of both initiatives would have led to confusion among the parties, especially among the sturgeon range states. In order to sharpen the international focus of efforts to protect sturgeons, the BMU financially supported a meeting of the sturgeon experts' group within the IUCN Species Survival Commission – the "Meeting to prioritise Sturgeon Conservation Actions" (Moscow, Russian Federation, 10 - 11 February 2001).

Germany is also working to protect its own native sturgeons. A test and development project, which is running from 1999 to 2003, on the topic of "Exemplary measures to protect and support populations of the nearly extinct Atlantic sturgeon *(Acipenser sturio L.)* in Germany" is being carried out by the Society for the rescue of the sturgeon (Gesellschaft zur Rettung des Störs), Rostock. With international participation, population-genetic, reproduction-biological and diet-physiological studies are being carried out and supported by relevant field work. Relevant issues are being studied with regard to closely related species *(Acipenser ruthenus, A. oxyrhinchus)*. Activity patterns are being explored by means of telemetric studies. In addition, potential suitable habitats in the Elbe and Oder rivers are being studied with the help of relevant publications, maps and sampling. All activities are being supported by measures to enhance public awareness at the national and international levels.

CONTRIBUTIONS TO THE 7TH CONFERENCE OF THE PARTIES. For the 7th Conference of the Parties, the Federal Environment Ministry is considering entering a motion relative to prevention of electrocution of large birds on outdoor power lines. Many bird species with large wingspans (white and black stork, owls and many other raptors) meet their death – also in Germany, to some extent – on masts of medium-voltage power lines, which they use as perches. To reduce this threat, and to gradually eliminate it, the Federal Nature Conservation Act (Bundes-Naturschutzgesetz) was amended to include a provision calling for new masts and components of medium-voltage power lines to be designed to protect birds against electrocution. The necessary retrofits of existing bird-threatening masts and medium-voltage power line components are to be carried out within ten years. The planned resolution would urge the parties to the Bonn Convention to take similar steps to eliminate this threat.

Concrete support has been initiated for eastern European countries. The German Nature Conservation Association (NABU) is carrying out intensive studies there of threats to birds from power line networks. Findings from this work will go into recommendations for measures. The measures, then, will be described in a brochure that will be provided to decision-makers and other interested parties in eastern Europe. This work is being financially supported by the BMU.
At the 7th Conference of the Parties, a working group of the Standing Committee will present a report on development of regional agreements under the Bonn Convention. This working group was chaired by Germany. In addition, the BMU brought in and financed external experts who enriched the overall results of the effort. To prepare its report, the working group surveyed all "focal points" regarding the difficulties that persist in development of regional agreements and ways to overcome these difficulties. It is assumed that the report and its recommendations will provide useful support in preparation of further regional agreements.

GROMS (GLOBAL REGISTER OF MIGRATORY SPECIES). Although protection of migratory species that cross international boundaries must be based on international co-operation, our knowledge about animal migrations is inadequate. The number of migratory animal species can only be estimated at present; it is likely to lie between 5,000 and 6,000. To help eliminate this deficit, the Executive Secretary of the UNEP/CMS Secretariat has initiated the development of a relevant database. The Federal Environment Ministry has embraced this idea and is financing a project, scientifically supported by the German Federal Agency for Nature Conservation, entitled "Global Register of Migratory Species" (GROMS). This project is gathering all available current knowledge within a relational database that is integrated with a Geographic Information System (GIS). The project is thus helping to support the Bonn Convention, its regional agreements and the Convention on Biological Diversity. In their efforts, project staff are co-operating with the Zoological Research Institute and the Museum Alexander Koenig in Bonn.

GROMS draws on data from several other information systems, and it co-operates with other systems, including CHM, GBIF, Species 2000 (especially "Fishbase"), IUCN / SSC (2000 IUCN Red List of Threatened Species), UNEP-WCMC, BCIS, Wetlands International and the African Mammal Database (AMD). Structured on this basis, the new database will provide information about migratory species, GIS maps, population data and a bibliography. The data model's basic unit is the "population", in each case defined taxonomically as a subspecies or defined geographically. This differentiation results from the considerable differences in migratory behaviour often found between different populations of the same species. All of the information is completely referenced; a total of over 4,500 sources are used.

The multi-lingual register contains 2,880 migratory vertebrate species. It also lists their threat status pursuant to the International Red List and their conservation status pursuant to CMS and CITES, and it classifies species by migratory types. While bird migrations are comprehensively included, mammal, fish and insect migrations are adequately known only for economically important species. Considerable gaps in knowledge have been found in the areas of bats, Asian antelopes, small cetaceans, fish species of tropical rivers and insects.

Global-scale distribution maps for 545 species, as well as point data for resting areas of Eurasian ducks, have been entered into a geographic information system. This map set now makes it possible to answer the deceptively simple question of what species occur within a defined area. The system is user-friendly and supports area-specific species searches as well as generation of species profiles.

Linking of distribution data with political boundaries, for example, does not shows the frequently observed biodiversity increase in tropical latitudes – it shows a multitude of species in temperate latitudes (cf. Fig. 5-1). For this reason, the current concentration of biodiversity-conservation measures on tropical diversity centres ("hotspot areas") is not adequate to the task of protecting migratory species; a large part of the responsibility lies with the industrialised countries and countries in transformation.

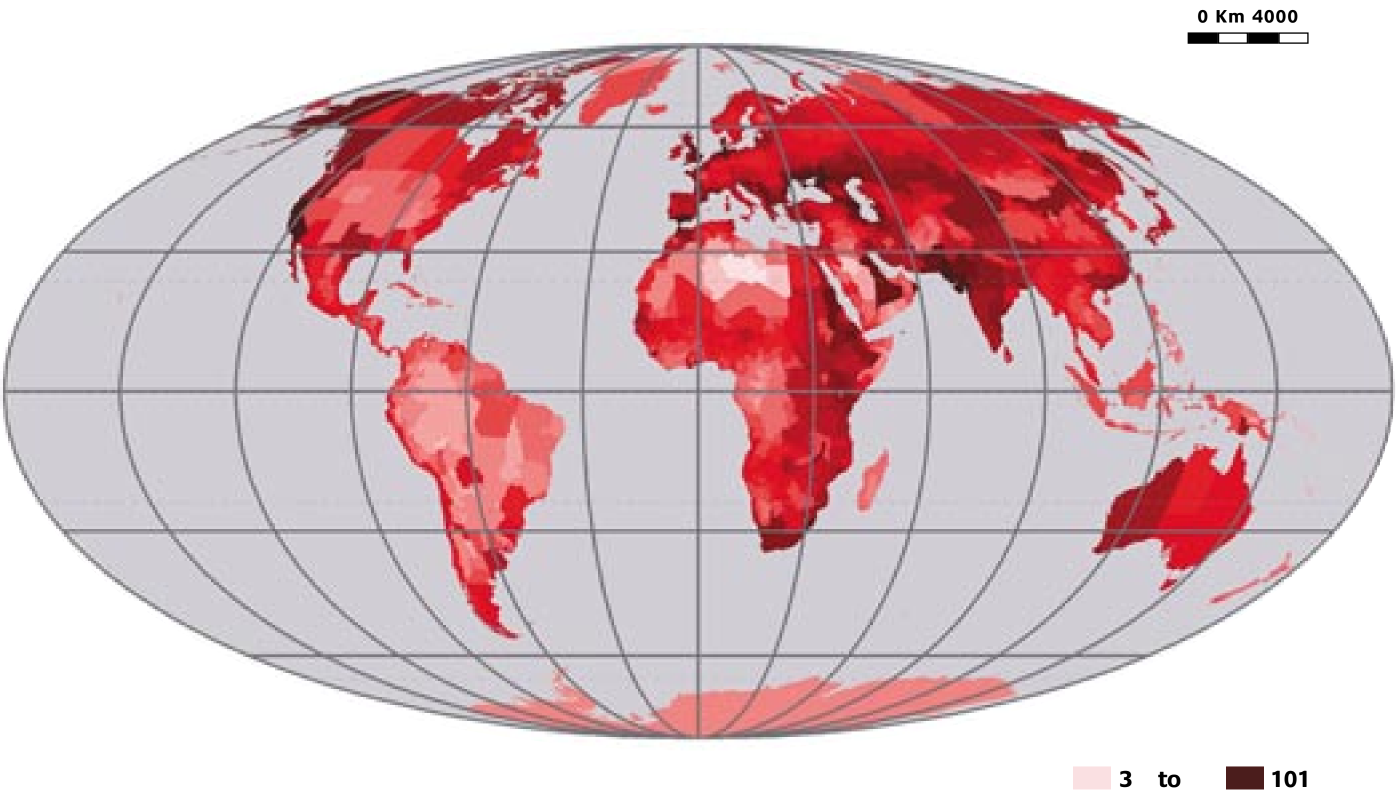
Other possible applications for GIS analysis include diagnosis of potential threats from land-use changes and development, risks from environmental disasters, habitat destruction and impacts of climate change.

EXAMPLES OF QUESTIONS ALREADY CONSIDERED WITH THE HELP OF GROMS INCLUDE:

1) **Identification of threatened migratory species not yet covered by CMS.**
Following integration of threat levels pursuant to the most recent International Red List of the IUCN (2000), 95 endangered species were listed that, as "critically endangered", "endangered" or "vulnerable", have an "unfavourable conservation situation" or must be considered "endangered" (within the meaning of CMS Art I, 1d, e), but were not yet protected by the Bonn Convention.

2) **Identification of gaps in knowledge relative to biology and conservation status of individual species.**
Such gaps are found in the area of migratory behaviour, distribution and population figures (for example, the "data deficient" category used by IUCN). They provide a basis for specific questions directed to the parties; the parties may be able to help answer such questions within the framework of their reporting obligations. GROMs is thus an effective tool for administrating and documenting data exchanges between parties and the Secretariat.

Fig. 5-1: Number of migratory bird and mammal species per administrative unit (provinces). This map was produced by intersecting GIS range maps of 530 species with political boundaries.



3) **Automatic calculation of range states by integration with GIS maps ("range states"; better: "range territories").**
This option has been used to prepared range-state lists for 545 species. An even more important aspect is that a system is now in place for transparent, easily updated administration of range-state lists, the preparation of which is one of the main tasks of the CMS Secretariat. This system now supports
- effective recalculation of lists following changes in boundaries or accession of new parties (states)
- recalculation following receipt of updated distribution data.

Traditional types of party data can also be administrated with the system. GROMS is thus a tool for CMS administration of range state lists.

To date, data has been entered on a global scale. The GROMS data model is fully scalable, however, and it can also be used for administration of regional data and data series. This means that the system would also be highly useful for the Secretariats of the regional agreements. On the other hand, these Secretariats would have to organise and finance their own data input, since input of finely structured data can be very time-consuming and require larger numbers of staff. Conversely, data records generated in individual studies can be relatively easily integrated in GROMS, once such data is in the proper format.

In addition to its core database functions, GROMS provides a comprehensive collection of literature and documents in digital format (for example, applications of individual countries for inclusion of species in the Annexes to the Bonn Convention), administrated within an integrated literature database. It also includes a fund of 300 digital photographs of museum exhibits and ornithological photographs taken in the field. Finally, the GROMS-CD provides software for animated presentation of migration routes. This material is particularly suited to the Secretariat's efforts to enhance public awareness (integration in websites, brochures).

Standard use of the described GROMS components is fully documented and requires no special training. Once the Secretariat staff have completed a training course, many other types of applications will become possible (preparation of reports, maps, document administration). Since GROMS uses ACCESS and ArcView, which are standard software components, staff can be trained within the context of regular training measures.

A comprehensive presentation of the register's structure, content and potential is provided by RIEDE (2002).

Plans call for delegates to the 7th CMS CoP and the 2nd AEWA MoP to receive the database in CD-ROM form, along with an accompanying handbook. "Power user training" will also be offered to guests.

The Convention Secretariats are urged to use this system.

6 Appendix

6.1 Bibliography

ABT, K. F. (2001): Kegelrobbe (Halichoerus grypus) und Seehund (Phoca vitulina). In: FARTMANN, T.; GUNNEMANN, H.; SALM, P. & SCHRÖDER, E. [Hrsg.]: Berichtspflichten in Natura 2000-Gebieten - Empfehlungen zur Erfassung der Arten des Anhangs II und Charakterisierung der Lebensraumtypen des Anhangs 1 der FFH-Richtlinie. - Bundesamt für Naturschutz, Bonn-Bad Godesberg. Angewandte Landschaftsökologie 42: 480 S.

ADAMS, G. (2000): AEWA-Umsetzung in Deutschland: Handlungsbedarf, Aufgabenverteilung und mögliche Überlappungen mit der Ramsar-Konvention und der EG-Vogelschutzrichtlinie. - In: HAUPT, H.; LUTZ, K. & BOYE, P. [Hrsg.]: Internationale Impulse für den Schutz von Wasservögeln in Deutschland. - Bonn (Landwirtschaftsverlag) S. 211-229.

ADELUNG, D.; LICK, R.; SONNTAG, R. & BANDOMIR, B. (1997): Untersuchungen zur Populationsdynamik und Biologie von Kleinwalen in deutschen Gewässern. In: ADELUNG, D. & HEIDEMANN, G. [HRSG.]: Untersuchungen an Kleinwalen als Grundlage eines Monitorings. - Schlussbericht, BMBF-Projekt 03F0139A.

AK FEUCHTWIESENSCHUTZ WESTNIEDERSACHSEN (1998): Wiesenvögel im westlichen Niedersachsen. - Quakenbrück, Osnabrück, 266 S.

AQUATIC WARBLER CONSERVATION TEAM (1999): World population, trends and conservation of the Aquatic Warbler Acrocephalus paludicola. - Die Vogelwelt 120: 65-85.

BAIRLEIN, F. (1996): Ökologie der Vögel. - Stuttgart, Jena, Lübeck, Ulm (G. Fischer) 149 S.

BAIRLEIN, F. (1997): Spatio-Temporal Course, Ecology and Energetics of western Palaearctic-African Songbird Migration - 1994-1996. - Summary Report. European Science Foundation.

BAIRLEIN, F. (1998): The European-African songbird migration network: new challenges for large study of bird migration. - Biol. Cons. Fauna 102: S. 13-27.

BAIRLEIN, F. (2000): Nicht nur Köpfe zählen – Integriertes Monitoring für effektiven Vogelschutz. - Vogelschutz 3: S. 28-30.

BAIRLEIN, F.; BAUER, H. G. & DORSCH, H. (2000): Integriertes Monitoring von Singvogelpopulationen. - Die Vogelwelt 121: S. 217-232.

BAKKER, J. F.; BARTELDS, W.; BECKER, P. H.; BESTER, K.; DIJKHUIZEN, D.; FREDERIKS, B. & REINEKING, B. (1999): 4. Marine Chemistry. In: JONG, F. DE;

BAKKER, J. F.; BERKEL, C. J. M. VAN; DANKERS, N. M. J. A.; DAHL, K.; GÄTJE, C.; MARENCIC, H. & POTEL, P. [HRSG.]: Wadden Sea Quality Status Report. - Wadden Sea Ecosystem No. 9.- Common Wadden Sea Secretariat, Trilateral Monitoring and Assessment Group, Quality Status Report Group. Wilhelmshaven, S. 85-117.

BASTIAN, H.-V. & BASTIAN, A. (1996): Das Braunkehlchen. - Sammlung Vogelkunde. Wiebelsheim (Aula).

BAUER, H.-G. & BERTHOLD, P. (1996): Die Brutvögel Mitteleuropas, Bestand und Gefährdung. - Wiebelsheim (Aula) 715 S.

BAUER, H.-G. & BEZZEL, E. (2001): Neubürger (Neozoen). - In: RICHARZ, K.; BEZZEL, E. & BAUER, H.-G. [Hrsg.]: Taschenbuch für Vogelschutz. - Wiebelsheim (Aula) 630 S.

BAUER, H.-G. & NOTTMEYER-LINDEN, K. (2000): Das Projekt „Adebar" - ein neuer deutscher Brutvogelatlas. - Die Vogelwelt 121: S. 221-222.

BAUER, H.-G.; BERTHOLD, P.; BOYE, P.; KNIEF, W.; SÜDBECK, P. & WITT, K. (i.Dr.): Rote Liste der Brutvögel Deutschlands. 3., überarbeitete Fassung, 32.12.2001. - Berichte zum Vogelschutz.

BAUER, H.-G.; BOSCHERT, M. & HÖLZINGER, J. (1995): Atlas der Winterverbreitung. - In: BAUER, H.-G.; BOSCHERT, M. & HÖLZINGER, J. [Hrsg.]: Die Vögel Baden-Württembergs. - Stuttgart (Ulmer) 557 S.

BAUER, K. M. & GLUTZ VON BLOTZHEIM, U. N. (1969): Anseriformes II. - Handbuch der Vögel Mitteleuropas. - Frankfurt/ Main (Akademische Verlagsgesellschaft) 943 S.

BAUER, K. M. & GLUTZ VON BLOTZHEIM, U. N. (1990): Handbuch der Vögel Mitteleuropas. Band 2 – Anseriformes (1. Teil). - Wiesbaden (Aula) 534 S.

BECKER, J. (1995): Sympatrisches Vorkommen und Hybridisierung von Sprosser Luscinia luscinia und Nachtigall Luscinia megarhynchos bei Frankfurt (Oder), Brandenburg. - Die Vogelwelt 116: S. 109-118.

BECKER, P. H. & ERDELEN, M. (1987): Die Bestandsentwicklung von Brutvögeln der deutschen Nordseeküste 1950-1979. - Journal für Ornithologie 128: S. 1-32.

BECKER, P. H. & SUDMANN, S. R. (1998): Quo vadis Sterna hirundo? Schlußfolgerungen für den Schutz der Flußseeschwalbe in Deutschland. - Die Vogelwelt 119: S. 293-304.

BECKER, P. H.; THYEN, S.; MICKSTEIN, S.; SOMMER, U. & SCHNEIDER, K. R. (1998): Monitoring Pollutants in Coastal Bird Eggs in the Wadden Sea. Final Report of the 1. Pilot Study 1996-1997. - Wadden Sea Ecosystems: S. 59-101.

BEHMANN, H. (1998): Zur Situation der Zwergseeschwalbe (Sterna albifrons) an der schleswig-holsteinischen Ostseeküste unter besonderer Berücksichtigung des NSG Bottsand (Kieler Außenförde). - Seevögel 19 - Sonderband: 1. Deutsches See- und Küstenvögelkolloquium: S. 65-70.

BEHM-BERKELMANN, K. & HECKENROTH, H. (1991): Übersicht der Brutbestandsentwicklung ausgewählter Vogelarten 1900-1990 an der niedersächsischen Nordseeküste. - Naturschutz und Landschaftspflege Niedersachsen: S. 1-97.

BELLEBAUM, J. (2000): Einfluss des Fuchses auf den Bruterfolg von Wiesenbrütern im Nationalpark „Unteres Odertal". - (Unveröff. Bericht) 19 S.

BELLEBAUM, J. (2001): Im Schutz der Dunkelheit: Wer stiehlt die Eier wirklich? - Der Falke 48: S. 138-141.

BELTING, S. & BELTING, H. (1999): Zur Nahrungsökologie von Kiebitz- (Vanellus vanellus) und Uferschnepfen- (Limosa limosa) Küken im wiedervernässten Niedermoor-Grünland am Dümmer. - Vogelkundliche Berichte aus Niedersachsen 31: S. 11-25.

BENKE, H. & SIEBERT, U. (1994): Zur Situation der Kleinwale im Wattenmeer und in der südöstlichen Nordsee. In: LOZÁN, J. L.; RACHOR, E.; REISE, K.; WESTERNHAGEN, H. V. & LENZ, W. [Hrsg.]: Warnsignale aus dem Wattenmeer. - Berlin (Blackwell Wissenschaftsverlag) S. 309-316.

BENKE, H.; SIEBERT, U.; LICK, R.; BANDOMIR, B. & WEISS, R. (1998): The current status of harbour porpoises (Phocoena phocoena) in German waters. - Archive of Fisheries and Marine Research 46: S. 97-123.

BERNATOT, D. & HERBERT, M. (2001): Verhältnis der Prüfung nach §§ 19c, 19d BNatSchG zur Umweltverträglichkeitsprüfung und zur Eingriffsregelung. - UVP-Report Heft 2/ 2001: S. 75-80.

BERNDT, R. K. & BUSCHE, G. (1991): Vogelwelt Schleswig-Holsteins, Entenvögel I. - Ornithologische Arbeitsgemeinschaft in Schleswig-Holstein und Hamburg e.V. [Hrsg.] Neumünster (Wachholtz) 210 S.

BERNDT, R. K. & BUSCHE, G. (1993): Vogelwelt Schleswig-Holsteins, Entenvögel II. - Ornithologische Arbeitsgemeinschaft in Schleswig-Holstein und Hamburg e.V. [Hrsg.] Neumünster (Wachholtz) 228 S.

BERTHOLD, P. (1990): Die Vogelwelt Mitteleuropas: Entstehung der Diversität, gegenwärtige Veränderungen und Aspekte der zukünftigen Entwicklung. - Verhandlungen der deutschen zoologischen Gesellschaft 83: S. 227-244.

BERTHOLD, P. (1998): Vogelwelt und Klima: gegenwärtige Veränderungen. -Naturwissenschaftliche Rundschau 51: S. 337-346.

BERTHOLD, P. (2000): Vogelzug - Eine aktuelle Gesamtübersicht. - Darmstadt (Wissenschaftliche Buchgesellschaft) 280 S.

BERTHOLD, P.; FIEDLER, W.; SCHLENKER, R. & QUERNER, U. (1998): 25 Year Study of the population development of central european songbirds: a general decline, most evident in long distance migrants. - Naturwissenschaften 85: S. 350-353.

BERTHOLD, P.; FIEDLER, W.; SCHLENKER, R. & QUERNER, U. (1999): Bestandsveränderungen Mitteleuropäischer Kleinvögel: Abschlußbericht zum MRI-Programm. - Die Vogelwarte 40: S. 1-10.

BERTHOLD, P.; FLIEGE, G.; QUERNER, U. & SCHLENKER, R. (1991): Wegzug, Rastverhalten, Biometrie und Mauser von Kleinvögeln in Mitteleuropa. - Die Vogelwarte 36: S. 1-221.

BERTHOLD, P.; FLIEGE, G.; QUERNER, U. & WINKLER, H. (1986): Die Bestandsentwicklung von Kleinvögeln in Mitteleuropa: Analyse von Fangzahlen. - Journal für Ornithologie 127: S. 397-437.

BEZZEL, E. (1985): Kompendium der Vögel Mitteleuropas, Nichtsingvögel. - Wiesbaden (Aula) 792 S.

BEZZEL, E. (1993): Kompendium der Vögel Mitteleuropas, Singvögel. - Wiesbaden (Aula) 766 S.

BEZZEL, E. (1994): Werden südliche Gastvögel und Brutgäste nördlich der Alpen häufiger? Versuch eines säkularen Überblicks am Beispiel Bayerns. - Die Vogelwelt 115: S. 209-226.

BIBBY, C.J.; BURGESS, N. D. & HILL, D. A. (1995): Methoden der Feldornithologie. - Radebeul (Neumann) 270 S.

BIRDLIFE INTERNATIONAL / EUROPEAN BIRD CENSUS COUNCIL (2000): European Bird Populations: estimates and trends. - BirdLife Conservation Series No. 10.- Cambridge, UK (BirdLife International) 160 S.

BLAB, J. (1993): Grundlagen des Biotopschutzes für Tiere. - Bundesanstalt für Naturschutz und Landschaftsökologie [Hrsg.] - Greven (Kilda) - Schriftenreihe für Landschaftspflege und Naturschutz Nr. 24: 479 S.

BLEW, J. (2000): Anforderungen an die Jagdstreckenstatistik aus Naturschutzsicht. - In: HAUPT, H.; LUTZ, K. & BOYE, P. [Hrsg.]: Internationale Impulse für den Schutz von Wasservögeln in Deutschland. - Bonn-Bad Godesberg (Bundesamt für Naturschutz) - Schriftenreihe für Landschaftspflege und Naturschutz 60: S. 105-122.

BLÜHDORN, I. (1998): Auswirkungen potentieller Störreize auf das Verhalten brütender und jungeführender Kiebitze Vanellus vanellus. - Die Vogelwelt 119: S. 105-114.

BLÜHDORN, I. (2001): Zum Brutbestand des Kiebitzes (Vanellus vanellus) im nördlichen Münsterland 1999 im Vergleich zu 1972/73 und 1989 / 1990. - Die Vogelwelt 122: S. 15-28.

BÖHNING-GAESE, K. (1992): Ursachen für Bestandseinbußen europäischer Singvögel. Eine Analyse der Fangdaten des Mettau-Reit-Illmitz-Programms. - Journal für Ornithologie 133: S. 413-425.

BOSCHERT, M. (1999a): Bestandsentwicklung des Kiebitzes nach partieller Wiedervernässung und Extensivierung. - Naturschutz und Landschaftsplanung 31: S. 51-56.

BOSCHERT, M. (1999b): Population trends and status of Mediterranean Gull Larus melanocephalus as a breeding bird in Germany. - Proceedings of the 1st International Mediteranean Gull Meeting, Le Portel, Pas -de-Calais, France, 4.-7. September 1998. - Bailleul (EcoNum) S. 43-46.

BOYE, P. (1998): Wachtelkönig, Uferschnepfe, Erdmaus und Rotfuchs - Über die Ziele, Inhalte und Perspektiven eines BfN-Forschungsprojektes zum Wiesenvogelschutz. - Berichte zum Vogelschutz 36: S. 137-139.

BOYE, P. & BAUER, H.-G. (2000): Vorschlag zur Prioritätenfindung im Artenschutz mittels Roter Listen sowie unter arealkundlichen und rechtlichen Aspekten am Beispiel der Brutvögel und Säugetiere Deutschlands. – In: BINOT-HAFKE, M.; GRUTTKE, H.; LUDWIG, G. & RIECKEN, U. (Hrsg.): Bundesweite Rote Listen – Bilanzen, Konsequenzen, Perspektiven. - Schriftenreihe für Landschaftspflege und Naturschutz 65: S. 71-88.

BOYE, P.; DIETZ, M. & WEBER, M. (1999): Fledermäuse und Fledermausschutz in Deutschland. - Bonn, 110 S.

BOYE, P.; HAUPT, H. & LUTZ, K. (2000): Perspektiven und Prioritäten für die Umsetzung des AEWA in Deutschland. - In: HAUPT, H.; LUTZ, K. & BOYE, P. [Hrsg.]: Internationale Impulse für den Schutz von Wasservögeln in Deutschland. - Bonn (Landwirtschaftsverlag) S. 211-229.

BOYE, P.; HUTTERER, R. & BENKE, H. (1998): Rote Liste der Säugetiere (Mammalia). – In: BINOT, M.; BLESS, R.; BOYE, P.; GRUTTKE, H. & PRETSCHER, P. [Hrsg.]: Rote Liste gefährdeter Tiere Deutschlands. - Schriftenreihe für Landschaftspflege und Naturschutz 55: 33-39.

BOYE, P.; KUGELSCHAFTER, K.; MEINIG, H. & PELZ, H.-J. (1996): Säugetiere in der Landschaftsplanung. – Schriftenreihe für Landschaftspflege und Naturschutz 46: 186 S.

BRÄGER, S. & LUDWICHOWSKI, I. (1995): Artzusammensetzung, Gelegegröße, Brutverlauf und Schlupferfolg brütender Enten in einer ostholsteinischen Möwenkolonie. - Corax 16: S. 9-16.

BRÄGER, S. & MEISSNER, J. (1990): Bevorzugt die Uferschnepfe (Limosa limosa) zur Fortpflanzungszeit intensiv oder extensiv genutztes Grünland? - Corax 13: S. 387-393.

BRINKMANN, R.; BACH, L.; DENSE, C.; LIMPENS, H. J. G. A.; MÄSCHER, G. & RAHMEL, U. (1996): Fledermäuse in Naturschutz- und Eingriffsplanungen. – Naturschutz und Landschaftsplanung 28 (8): S. 229-236.

BRÜHNE, M.; MOOIJ, J. H.; SCHWÖPPE, M. & WILLE, V. (1999): Projekt zur Minderung von Gänsefraßschäden am Unteren Niederrhein. - NNA Berichte 12: S. 156-162.

BRUNCKHORST, H. & RÖSNER, H.-U. (1998): Das Vorkommen von Pfeifenten (Anas penelope) im schleswig-holsteinischen Wattenmeer. - Corax 17: S. 81-96.

BRUNS, H. A. & BERNDT, R. K. (1999): Ornithologischer Jahresbericht für Schleswig-Holstein 1997. - Corax 17: S. 279-319.

BUNDESAMT FÜR NATURSCHUTZ (1999a): Naturschutzgroßprojekte, Förderung für die Natur. – Bonn, 43 S.

BUNDESAMT FÜR NATURSCHUTZ (1999b): Daten zur Natur 1999.- Münster (Landwirtschaftsverlag) 266 S.

BUNDESAMT FÜR NATURSCHUTZ (2000): Nationaler Bericht zum Fledermausschutz in der Bundesrepublik Deutschland 1998 – 2000. - Bonn (Manuskript).

BUNDESAMT FÜR NATURSCHUTZ (2001a): Erprobungs- und Entwicklungsvorhaben, praktische Beispiele für den Naturschutz. – Bonn, 26 S.

BUNDESAMT FÜR NATURSCHUTZ (2001b): Umweltforschungsplan / Forschungs- und Entwicklungsvorhaben. - http://www.bfn.de/02/0201.htm (27.11.01).

BUNDESDEUTSCHER SELTENHEITENAUSSCHUSS (1992): Seltene Vogelarten in der Bundesrepublik Deutschland 1990. - Limicola 6: S. 153-177.

BURDORF, K.; HECKENROTH, H. & SÜDBECK, P. (1997): Quantitative Kriterien zur Bewertung von Gastvogellebensräumen in Niedersachsen. - Informationsdienst Naturschutz Niedersachen 17: S. 219-224.

BÜRGER, K. & DRÖSCHMEISTER, R. (2001): Naturschutzorientierte Umweltbeobachtung in Deutschland: ein Rückblick. - Natur und Landschaft 76 (2): S. 49-57.

CLEMENS, T. (1996): Der Löffler - eine neue Brutvogelart in Niedersachsen? - Erstnachweis auf der Vogelinsel Mellum. - Seevögel 16: S. 44.

COMMON WADDEN SEA SECRETARIAT (1996): Conservation and management plan for the Wadden Sea seal population. - Wilhelmshaven, Germany.

COMMON WADDEN SEA SECRETARIAT (2001): Trilateraler Wattenmeerplan, Erklärung von Stade 1997. - http://cwss.www.de/tgc/MD-Stade-D/WSP-D/WSP-D-start.html (06.11.01).

CWSS (COMMON WADDEN SEA SECRETARIAT) (2001): TMAP-Manual (Handbuch). - http://cwss.www.de/TMAP/guidelines/Manual.html (26.11.2001).

DAHL, H.-J.; NIEKISCH, M.; RIEDL, U. & SCHERFOSE, V. (2000): Arten-, Biotop- und Landschaftsschutz. - In: BUCHWALD, K. & ENGELAHRDT, W. [Hrsg.]: Umweltschutz - Grundlagen und Praxis. - Heidelberg (Economica) 424 S.

DEGEN, A. et al. (1996): Rastbestände von Höcker-, Zwerg- und Singschwan (Cygnus olor, C. columbianus bewickii, C. cygnus) in Niedersachsen: Ergebnisse landesweiter Synchronzählungen im Januar und März 1995. - Vogelkundliche Berichte Niedersachsen 28 (1): S. 3-18.

DELANY, S.; REYES, C.; HUBERT, E.; PIHL, S.; REENS, E.; HAANSTRA, L. & VAN STRIEN, A. (1999): Results from the International Waterbird Census in the Western Palearctic and Southwest Asia 1995 and 1996. - Wetlands International Publications No. 54. - Wageningen, The Netherlands (Wetlands International) 178 S.

DEUTSCHE SELTENHEITENKOMISSION (Dokumentationsstelle für seltene Vogelarten) (1994): Seltene Vogelarten in Deutschland 1991 und 1992. - Limicola 8: S. 153-209.

DEUTSCHE SELTENHEITENKOMISSION (Dokumentationsstelle für seltene Vogelarten) (1995): Seltene Vogelarten in Deutschland 1993. - Limicola 9: S. 77-110.

DEUTSCHE SELTENHEITENKOMISSION (Dokumentationsstelle für seltene Vogelarten) (1996): Seltene Vogelarten in Deutschland 1994. - Limicola 10: S. 209-257.

DEUTSCHE SELTENHEITENKOMISSION (Dokumentationsstelle für seltene Vogelarten) (1997): Seltene Vogelarten in Deutschland 1995. - Limicola 11: S. 153-208.

DEUTSCHE SELTENHEITENKOMISSION (Dokumentationsstelle für seltene Vogelarten) (1998): Seltene Vogelarten in Deutschland 1996. - Limicola 12: S. 161-227.

DEUTSCHE SELTENHEITENKOMISSION (Dokumentationsstelle für seltene Vogelarten) (2000): Seltene Vogelarten in Deutschland 1997.- Limicola 14: S. 273-340.

DEUTSCHMANN, H. (1997): Der Singschwan Cygnus cygnus als neuer deutscher Brutvogel. - Limicola 11: S. 76-81.

DIERSCHKE, V. (1994): Phänologie und Fluktuationen des Rastvorkommmens der Strandläufer Calidris-Arten auf Helgoland. - Die Vogelwelt 115: S. 59-68.

DIERSCHKE, V. (1997): Das Vorkommen des Sumpfläufers Limicola falcinellus in Deutschland.- Limicola 11: S. 217-229.

DIETRICH, S. & HÖTKER, H. (1991): Wo mausern nordfriesische Säbelschnäbler? - Die Vogelwelt 112: S. 140-147.

DIETZ, M. & SIMON, M. (1999): Fledermausschutz und Fledermausforschung für gebäudebewohnende Fledermausarten – ein neues Erprobungs- und Entwicklungsvorhaben (E & E-) des Bundes. – Nyctalus (N.F.) 7 (1): S. 29-42.

DIETZ, M. & WEBER, M. (2000): Baubuch Fledermäuse. – Gießen, 228 S.

DIETZ, M. & WEBER, M. (2001): Von Fledermäusen und Menschen. Ergebnisse und Erfahrungen aus einem Modellvorhaben zur Öffentlichkeitsarbeit im Fledermausschutz. Bonn (BfN) 212 S.

DIETZ, M.; CASPAR, A. & MARBURGER, S. (2000): Fledermäusen auf der Spur. – Gießen, 202 S.

DITTBERNER, H. & HOYER, E. (1993): Die Vogelwelt der Inseln Rügen und Hiddensee Teil 1 - In: HOYER, E. [Hrsg.]. Galenbeck (Pro Natura MV) 180 S.

DITTBERNER, W. & KÖHLER, R. (1998): Die Europäischen Vogelschutzgebiete Brandenburgs: Unteres Odertal. - Naturschutz und Landschaftspflege in Brandenburg 7: S. 195-196.

DITTBERNER, W. (1996):Erste Bruten von Zwergmöwe Larus minutus, Weißflügel (Chlidonias leucopterus) und Weißbart-Seeschwalbe (C. Hybridus) in Brandenburg. - Limicola 10: S. 258-266.

DITTBERNER, W. (2001): Gibt es eine Chance? Zwergseeschwalben im Binnenland. - Der Falke 48: S. 36-41.

DJV (Deutscher Jagdschutz-Verband e.V.) (2001): DJV-Handbuch 2001 - Jagd aktuell. Mainz (Verlag Dieter Hoffmann) 606 S.

DJV (Deutscher Jagdschutz-Verband e.V.) (2002): DJV-Handbuch 2002 - Jagd aktuell. Mainz (Verlag Dieter Hoffmann)

DO-G (Deutsche Ornithologen Gesellschaft) (1995): Qualitätsstandards für den Gebrauch vogelkundlicher Daten in raumbedeutsamen Planungen. NFN Medienservice Natur 36 S.

DORNBUSCH, G. (2000): Der Schwarzstorch: Status: Gefährdung und Schutzziele. - In: HAUPT, K.; LUTZ, K. & BOYE, P. [Hrsg.]: Internationale Impulse für den Schutz von Wasservögeln in Deutschland. - Bonn-Bad Godesberg (Bundesamt für Naturschutz). - Schriftenreihe für Landschaftspflege und Naturschutz 60: 63 S.

DORNBUSCH, M. (1983): Zur Bestandssituation der Großtrappe. - Naturschutzarbeit in Berlin und Brandenburg, Beiheft 6: S. 3-5.

DORNBUSCH, M. (1996): Situation und Schutz der Großtrappe (Otis t. tarda L.; 1758) in Sachsen-Anhalt. - Naturschutz und Landschaftspflege in Brandenburg 5: S. 28-29.

DRESCHER, H. E. (1978): Hautkrankheiten beim Seehund, Phoca vitulina Linné, 1758, in der Nordsee. - Säugetierkundliche Mitteilungen 26: S. 50-59.

DÜRR, T.; MÄDLOW, W.; RYSLAVY, T. & SOHNS, G. (1997): Rote Liste und Liste der Brutvögel des Landes Brandenburg. - Naturschutz und Landschaftspflege in Brandenburg 6: S. 1-31.

DÜTTMANN, H. & EMMERLING, R. (2001): Grünlandversauerung als besonderes Problem des Wiesenvogelschutzes auf entwässerten Moorböden. - Natur und Landschaft 76: S. 262-269.

EUROPÄISCHE KOMMISSION (2001a): Action plans Annex I Bird species considered as „priority for funding under life". - www.europa.eu.int/comm/environment/nature/ directive/birdspriority_intro_en.htm (22.10.01).

EUROPÄISCHE KOMMISSION (2001b): LIFE-Nature Database. www.europa.eu.int/comm/life/ nature/databas.htm (23.10.01).

EUROPARC (2001): Europarc Deutschland e. V.; das Erbe bewahren. - www.europarc-deutschland.de/ (30.10.01.).

EXO, K.M.; P.H. BECKER, HÄLTERLEIN, B.; HÖTKER, H.; SCHEUFLER, H.; STIEFEL, A.; STOCK, M.; SÜDBECK, P. & THORUP, O. (1996): Bruterfolgsmonitoring bei Küstenvögeln. - Die Vogelwelt 117: S. 287-293.

FEYERABEND, F. & SIMON, M. (2000): Use of roosts and roost switching in a summer colony of 45 kHz phonic type pipistrelle bats (Pipistrellus pipistrellus Schreber, 1774). – Myotis 38: S. 51-59.

FLADE, M. (1994): Die Brutvogelgemeinschaften Mittel- und Norddeutschlands - Grundlagen für den Gebrauch vogelkundlicher Daten für die Landschaftsplanung. - Eching (IHW) 879 S.

FLEET, D. M. (1999): Gänseschadensmanagement an der Westküste Schleswig-Holsteins. - NNA Berichte 12: S. 154-156.
FLEET, D.M.; FRIKKE, J.; SÜDBECK, P. & VOGEL, R. J. (1994): Breeding Birds in the Wadden sea 1991. - Wadden Sea Ecosystems 1: S. 1-108.

FLORE, B.-O. (1998): Bestandsentwicklung von Seeregenpfeifer (Charadrius alexandrinus) und Zwergseeschwalbe (Sterna albifrons) im niedersächsischen Wattenmeer 1948-1995. - Seevögel 19 - Sonderheft: 1. Deutsches Seevogelkolloquium: S. 57-63.

FRANZ, D. (1998): Das Blaukehlchen. - Sammlung Vogelkunde. Wiesbaden (Aula) 140 S.

GARTHE, S. & HÜPPOP, O. (2000): Aktuelle Entwicklungen beim Seabirds-at Sea-Programm in Deutschland. - Die Vogelwelt 121: S. 301-306.

GATTER, W. (1997): Waldgeschichte, Buchenprachtkäfer und Rückgang des Waldlaubsängers Phylloscopus b. bonelli. - Die Vogelwelt 118: S. 41-47.

GATTER, W. (2000): Vogelzug und Vogelbestände in Mitteleuropa. - Wiebelsheim (Aula) 656 S.

GEBHARD, B. (2000): EU-Life-Projekt Feuchtlebensraummanagement im „Biosphärenreservat Schaalsee". - Naturschutzarbeit in Mecklenburg-Vorpommern 43: S. 13-21.

GEBHRADT, H.; KINZELBACH, R. & SCHMIDT-FISCHER, S. (1998): Gebietsfremde Tierarten, Auswirkungen auf einheimische Arten, Lebensgemeinschaften und Biotope, Situationsanalyse. - Landsberg (ecomed) 314 S.

GEMMEKE, H. (1998): Schäden durch Wildgänse auf landwirtschaftlich genutzten Flächen -Ergebnisse einer Umfrage. - Nachrichtenbl. Deut. Pflanzenschutz: 50: S. 88-98.

GEORGE, K. (1994): Zur Überwinterung des Rotmilans Milvus milvus im nördlichen Harzvorland (Sachsen-Anhalt). - Die Vogelwelt 115: S. 127-132.

GEORGE, K. (1996): Deutsche Landwirtschaft im Spiegel der Vogelwelt. - Die Vogelwelt 117: S. 187-197.

GEOSCIENCE ONLINE (2001): Natur im Trend. - http://www.g-o.de/geo-bin/frameset.pl?id=00001&frame1=titelgo.htm&frame2=menue04.htm&frame3=kap3/3abb0017.htm (27.11.01).

GERICKE, H.-J. (2001): Bundesweiter Arbeitskreis der staatlich getragenen Bildungsstätten im Natur- und Umweltschutz - BANU. - Natur und Landschaft 76: S. 226-230.

GIENAPP, P. (2001): Nahrungsökologie von Kiebitzküken (Vanellus vanellus) im Grünland der Eider-Treene-Sorge-Niederung. - Corax 18: S. 133-144.

GLIMM, D.; HÖLKER, M. & PRÜNTE, W. (2001): Brutverbreitung und Bestandsentwicklung der Wiesenweihe in Westfalen. - LÖBF-Mitteilungen (2): S. 57-68.

GLUTZ VON BLOTZHEIM, U. N.; BAUER, K. M & BEZZEL, E. (1971): Handbuch der Vögel Mitteleuropas. Band 4, Falconiformes. - Frankfurt/Main (Akademische Verlagsgesellschaft) 934 S.

GLUTZ VON BLOTZHEIM, U. N.; BAUER, K. M. & BEZZEL, E. (1985): Handbuch der Vögel Mitteleuropas. Band 7 Charadriiformes (2. Teil).- Wiesbaden (Aula) 885 S.

GLUTZ VON BLOTZHEIM, U. N.; BAUER, K. M. & BEZZEL, E. (1994): Handbuch der Vögel Mitteleuropas. Band 5 Galliformes und Gruiformes. - Wiesbaden (Aula) 699 S.

GLUTZ VON BLOTZHEIM, U. N.; BAUER, K. M. & BEZZEL, E. (1999): Handbuch der Vögel Mitteleuropas. Band 6 Charadriiformes (1. Teil). 3. durchgesehene Auflage. - Wiesbaden (Aula) 885 S.

GOETHE, F. (1983): Wale und Delphine in niedersächsischen Küstengewässern und Flüssen. - Drosera 83: S. 49-68.

GOODHART, C. B. (1988): Did virus transfer from harp seals to common seals? - Nature 336: S. 21.

GREEN, R.E.; ROCAMORA, G. & SCHÄFFER, N. (1997): Populations, ecology and threats to the corncrake Crex crex in Europe. - Die Vogelwelt 118: S. 117-134.

GRO (Gesellschaft Rheinischer Ornithologen) & WOG (Westfälische Ornithologen-Gesellschaft) (1997): Rote Liste der gefährdeten Vogelarten Nordrhein-Westfalens. - Charadrius 33: S. 69-116.

GRÜNKORN, T. & STRUWE-JUHL, B. (1998): Erste Ergebnisse der Seeadlerberingung. - In: PROJEKTGRUPPE SEEADLERSCHUTZ IN SCHLESWIG-HOLSTEIN E. V. [Hrsg.]: 30 Jahre Seeadlerschutz in Schleswig-Holstein, 107 S.

GÜNTHER, K. & RÖSNER, H.-U. (2000): Bestandsentwicklung der im schleswig-holsteinischen Wattenmeer rastenden Wat- und Wasservögel von 1998 bis 1999. - Die Vogelwelt 121: S. 293-300.

HAASE, P. & RYSLAVY, T. (1997): Aktuelle Beobachtungen balzender Doppelschnepfen Gallinago media und Zwergschnepfen Lymnocryptes minimus in Brandenburg. - Die Vogelwelt 118: S. 71-77.

HAASE, P.; LANGGEMACH, T.; PESTER, H. & SCHRÖTER, H. (1999): Management von wandernden Wasservogelarten (Gänse, Schwäne, Kraniche) zum Schutze landwirtschaftlicher Kulturen in Brandenburg - Möglichkeiten und Grenzen. - Berichte zum Vogelschutz 37: S. 69-84.

HAASE, P. (2000): Ergebnisse und Lösungsmöglichkeiten zum Management von wandernden Wasservogelarten im Naturpark Westhavelland des Landes Brandenburg.- In: HAUPT, H.; LUTZ, K. & BOYE, P. [Hrsg.]: Internationale Impulse für den Schutz von Wasservögeln in Deutschland. - Bonn-Bad Godesberg (Bundesamt für Naturschutz) - Schriftenreihe für Landschaftspflege und Naturschutz 60: S. 159-172.

HABERER, A. (2001): Rabenvögel (Corvidae) auf Amrum und ihre Auswirkungen auf den Kiebitzbestand (Vanellus vanellus) der Insel. - Corax 18: S. 133-144.

HABERMEIER, A. (1997): Zur Situation der weltweit gefährdeten Moorente (Aythya nyroca) in Deutschland und Europa. - Berichte zum Vogelschutz 35: S. 119-126.

HAFERLAND, H.-J. (1999): Die Entwicklung des Kranichbestandes am Sammel- und Rastplatz „Unteres Odertal" in den letzten 25 Jahren. - Die Vogelwelt 120: S. 291-294.

HAGEMEIJER, W. J. M. & BLAIR, M. J. (1997): The EBCC Atlas of european breeding birds, their distribution and abundance. - London (T & AD Poyser) 903 S.

HALL, A. J.; LAW, R. J.; WELLS, D. E.; HARWOOD, J.; ROSS, H. M.; KENNEDY, S.; ALLCHIUN, C. R.; CAMPBELL, L. A. & POMEROY, P. P. (1992): Organochlorine levels in common seals (Phoca vitulina) which were victims and survivors of the 1988 phocine distemperepizootic. - Science of the Total Environment 115: S. 145-162.

HÄLTERLEIN, B.; FLEET, D. M.; HENNEBERG, H. R.; MENNEBÄCK, T.; RASMUSSEN, L. M.; SÜDBECK, P.; THORUP, O. & VOGEL, R. (1995): Anleitung zur Brutbestandserfassung von Küstenvögeln im Wattenmeerbereich. - Seevögel 16: S. 3-24.

HÄLTERLEIN, B.; SÜDBECK, P.; KNIEF, W. & KÖPPEN, U. (2000): Brutbestandsentwicklung der Küstenvögel an Nord- und Ostsee unter besonderer Berücksichtigung der 1990er Jahre. - Die Vogelwelt 121: S. 241-268.

HAMMOND, P. S.; BENKE, H.; BERGREN, P.; BORCHERS, D. L.; BUCKLAND,S. T.; COLLET, A.; HEIDE-JØRGENSEN, M.-P.; HEIMLICH-BORAN, S.; HIBY, A. R.; LEOPOLD, M. F. & ØIEN, N. (1995): Distribution and abundance of the harbour porpoise and other small cetaceans in the North Sea and adjacent waters. - Final report to the European Commission, Life 92-2/UK/027.

HASSELMEIER, I. (2000): Morphometrische, anatomische und ökologische Untersuchungen an Schweinswalen aus der Nord- und Ostsee. Examensarbeit, Universität Kiel.

HAUFF, P. & ILLMANN, P. (1999): Langfristige Bestandsentwicklung der Graugans Anser anser im Naturschutzgebiet „Kuhlrader Moor und Röggeliner See", Mecklenburg-Vorpommern. - Die Vogelwelt 120: S. 231-235.

HAUFF, P. (1993): Seeadler in Mecklenburg-Vorpommern. - In: DER UMWELTMINISTER DES LANDES MECKLENBURG-VORPOMMERN [Hrsg.], 11 S.

HAUFF, P. (1996): Gedanken zur Störungsbiologie am Beispiel des Seeadlers Haliaeetus albicilla.- In: MEYBURG, B. U. & CHANCELLOR, R. D. [Hrsg.]: Eagle Studies. - Berlin (Weltarbeitsgruppe für Greifvögel und Eulen e. V.) S. 39-46.

HAUFF, P. (1998): Bestandsentwicklung des Seeadlers Haliaeetus albicilla in Deutschland seit 1980 mit einem Rückblick auf die vergangenen 100 Jahre. - Die Vogelwelt 119: S. 47-63.

HAUFF, P. (1999): Seeadler Haliaeetus albicilla in Mecklenburg-Vorpommern. - In: Schriftenreihe des Landesamtes für Umwelt, Naturschutz und Geologie [Hrsg.]: Großvogelschutz im Wald. - Güstrow, 73 S.

HAUPT, H.; LUTZ, K. & BOYE, P. [Bearb.] (2000): Internationale Impulse für den Schutz von Wasservögeln in Deutschland. - Bonn-Bad Godesberg (Bundesamt für Naturschutz) -Schriftenreihe für Landschaftspflege und Naturschutz: 305 S.

HECKER, N. (1994): Ferruginous Duck (Aythya nyroca).- In: IWRB [Hrsg.]: Actions to prevent avoidable mortality for threatened waterbirds in the European Community. - Bericht für die Europäische Union. - Slimbridge / UK.

HEINE, G.; JACOBY, H.; LEUZINGER, H. & STARK, H. (1999): Die Vögel des Bodenseegebietes. - Ornithologische Jahreshefte für Baden-Württemberg 14/15: S. 1-847.

HEINICKE, T. (2000): Die Bedeutung der Karrendorfer Wiesen für Wasser- und Watvögel. - Seevögel 21: S. 21-26.

HENNICKE, F. (1994): Das Peenehaff-/Peenetalmoor-Projekt. - Naturschutzarbeit in Mecklenburg-Vorpommern 37: S. 9-14.

HEYDEMANN, F. (1998): Arten- und Biotopschutz in Seeadlerrevieren. - In: PROJEKTGRUPPE SEEADLERSCHUTZ IN SCHLESWIG-HOLSTEIN E.V. [Hrsg.]: 30 Jahre Seeadlerschutz in Schleswig-Holstein. - Kiel 107 S.

HOLZ, R.; HERMANN, C. & MÜLLER-MOTZFELD, G. (1996): Vom Polder zum Ausdeichungsgebiet: Das Projekt Karrendorfer Wiesen und die Zukunft der Küstenüberflutungsgebiete in Mecklenburg-Vorpommern. - Natur und Naturschutz in Mecklenburg-Vorpommern 32: S. 9-27.

HÖTKER, H. & KÖLSCH, G. (1993): Die Vogelwelt des Beltringharder Kooges - ökologische Veränderungen in der eingedeichten Nordstrander Bucht. - Corax 15: S. 1-145.

HÖTKER, H.; BLEW, J.; BRUNS, H. A.; GRUBER, S.; HÄLTERLEIN, B. & PETERSEN-ANDRESEN, W. (2001): Die Bedeutung der „Naturschutzköge" an der Westküste Schleswig-Holsteins für brütende Wiesenlimikolen. - Corax 18: S. 39-46.

HUGGENBERGER, S.; BENKE, H. & KINZE, C. (1999): Geographical variations of the harbour porpoise (Phocoena phocoena, L.) populations of the North and Baltic Seas using morphometric comparisons. - European Research in Cetaceans 13: S. 362-366.

IKEMEYER, D. & KRÜGER, B. (1999): Bestandsmonitoring bei „Wiesenvögeln" in Feuchtwiesenschutzgebieten. - LÖBF Mitteilungen (3): S. 42-46.

IUCN (2000): Policy Statement on Sustainable Use of Wild Living Resources. - 2.

IUCN World Conservation Congress. Amman. IUCN (2001): IUCN/ SSC Guidlines for re-introductions.- www.iucn-org.ac.psi-web.com/themes/ssc/pubs/policy/reinte.htm (03.12.01).

JANKE, K. (2000): 10 Jahre Nationalpark Hamburgisches Wattenmeer: Hamburgs größtes Schutzgebiet feiert Jubiläum. - Seevögel 21: S. 41-46.

JARMATZ, K. & MÖNKE, R. (1994): Projekt: Schaalsee-Landschaft, Schleswig-Holstein und Mecklenburg-Vorpommern. - Naturschutz und Landschaftsplanung 69: S. 315-322.

JODL, O. (1991): Teichwirtschaft und Naturschutz. Lösungsansätze und Perspektiven aus der Sicht der Naturschutzbehörde. - Berichte der Bayerischen Akademie für Naturschutz und Landschaftspflege (ANL) 15: S. 169-172.

JÜDES, U. (1988): Zur Organisation von Öffentlichkeitsarbeit sowie Aus- und Fortbildung im Fledermausschutz. – Schr.R. Bayer. Landesamt für Umweltschutz 81: S. 53-58.

KAATZ, C. (1999): Die Bestandssituation des Weißstorchs (Ciconia ciconia) in Deutschland, unter besonderer Berücksichtigung der Jahre 1994 und 1995. - In: SCHULZ, H. [Hrsg.]: Weißstorch im Aufwind? White Stork on the up? - Proceedings, Int. Symp. on the White Stork, Hamburg 1996.- Bonn (Naturschutzbund Deutschland e.V.) S. 137-155.

KAISER , A. (1996): Zugdisposition mitteleuropäischer Kleinvögel: Mauser, Körpermasse, Fettdeposition und Verweildauer. - Journal für Ornithologie 137: S. 141-180.

KALCHREUTER, H. (1996): Waterfowl and population dynamics: an overview. In: Proceedings of The Anatidae 2000 Conference, Straßburg, 05.-09.12.1994. Gibier Fauna Sauvage 13: S. 991-1008.

KALCHREUTER, H. (2000): Das Wasserwild. Verbreitung und Lebensweise - Jagdliche Nutzung und Erhaltung. - Stuttgart (Franckh-Kosmos) 299 S.

KIEFER, A. & HUTTERER, R. (i.Dr.): Fledermausmarkierung in der Bundesrepublik Deutschland: Beispiele für die Auswertung von Beringungsdaten mit Hilfe der Datenbank BatRing. – Schriftenreihe für Landschaftspflege und Naturschutz.

KISSLING, D. (2001): Siedlungsdichte des Waldwasserläufers (Tringa ochropus) und GIS-gestützte Bestandsabschätzung im Biosphärenreservat Schorfheide-Chorin. - Die Vogelwelt 122: S. 1-14.

KLAFS, G. & STÜBS, J. (1987): Die Vogelwelt Mecklenburgs. - Jena (VEB Fischer).

KLAFS, G. (1965): Historisches zur Verbreitung und Ökologie der Großtrappe (Otis tarda L.). - Hercynia N.F. 2: S. 191-202.

KNIEF, W.; BERNDT, R. K. & S CHWENNESEN, W. (1997): Entwicklung der Küstenvogelbrutbestände in den Naturschutzgebieten an der schleswig-holsteinischen Ostseeküste von 1984 bis 1995. - Seevögel 18: S. 82-93.

KNIEF, W.; OTTO, M. & BERNDT, R. K. (2001): Ergebnisse der Brutbestandserfassung in den Naturschutzgebieten an der schleswig-holsteinischen Ostseeküste 1999. - Seevögel 22: S. 39-40.

KNIEF, W.; SCHWENNESEN, W. & BERNDT, R. K. (2000): Ergebnisse der Brutbestandserfassung in den Naturschutzgebieten an der schleswig-holsteinischen Ostseeküste 1998. - Seevögel 21: S. 71-73.

KOOP, B. (1998): Die Brutansiedlung und Bestandsentwicklung der Weißwangengans Branta leucopsis in Schleswig-Holstein. - Limicola 12: S. 72-76.

KÖPPEN, U. (1998): Küstenvogelschutz in Mecklenburg-Vorpommern heute - Organisation, Probleme und Konzepte. - Seevögel 19- Sonderheft: 1. Deutsches Seevogelkolloquium: S. 31-40.

KÖPPEN, U. (2000): Brutbestände der Küstenvögel in Schutzgebieten Mecklenburg-Vorpommerns 1998. - Seevögel 21: S. 54-57.

KÖPPEN, U. (2001): Brutbestände der Küstenvögel in Schutzgebieten Mecklenburg-Vorpommerns in den Jahren 1999 und 2000. - Seevögel 22: S. 104-105.

KÖPPEN, U. (2001): Ringing and colourmarking of White-Tailed Eagles in eastern Germany - results, experiences and future tasks. - In: HELANDER, B. [Hrsg.]: Proceedings of the international conference Sea-Eagle. - Björkö/Schweden.

KÖRNER, S. & MÄDEL, R. (1999): Life-Natur Projektantrag: Förderung der Rohrdommel im SPA Schorfheide-Chorin. - unveröff.

KÖSTER, H.; NEHLS, G. & THOMSEN, K.-M. (2001): Hat der Kiebitz noch eine Chance? Untersuchungen zu den Rückgangsursachen des Kiebitzes (Vanellus vanellus) in Schleswig-Holstein. - Corax 18: S. 121-132.

KOSTRZEWA, A. & SPEER, G. (2001): Greifvögel in Deutschland. - Wiesbaden (Aula) 142 S.

KOZULIN, A. & GRITSCHIK, W. (1996): Isolierte Brutpopulation des Zwergsägers Mergus albellus im Süden Weißrusslands (Republik Belarus). - Die Vogelwelt 117: S. 87-88.

KREMER, H. (1990): Zur Situation der Kleinwale in der Nordsee unter besonderer Berücksichtigung des Schweinswales (Phocoena phocoena). In: LOZÁN, J. L.; LENZ, W.; RACHOR, E.;WATERMANN, B. & WESTERNHAGEN, H. v. [Hrsg.]: Warnsignale aus der Nordsee. - Berlin (Paul Parey) S. 330-342.

KRONE, O.; LANGGEMACH, T.; SÖMMER, P. & KENNTNER, N. (i. Dr.): Causes of mortality in white-tailed sea eagles from Germany. - Proceedings of the International Conference Sea eagle 2000. - Björko, Sweden.

KRÜGER, S. (1987): Die Enten der Oberlausitz. - Abhandlungen und Berichte des Naturkundemuseums Görlitz 61: S. 1-16.

KUBE, J. & GRAUMANN, G. (1994): Der Mauserzug des Säbelschnäblers (Recurvirostra avosetta) im Ostseeraum. - Corax 15: S. 93-101.

KUSCHERT, H. (1983): Wiesenvögel in Schleswig-Holstein. - Husum (Husum Druck- und Verlagsgesellschaft) S. 5-120.

LANDESAMT SCHLESWIG-HOLSTEINISCHES WATTENMEER (2001): Nationalparkgesetz. - www.wattenmeer-nationalpark.de/main.htm (02.11.01).

LANDMANN, A. (1996): Der Hausrotschwanz. - Sammlung Vogelkunde. - Wiesbaden (Aula) 144 S.

LANGE, C. (2000): Life Projekt: Wiederherstellung der Flusslandschaft Schaale-Sude. - Naturschutzarbeit in Mecklenburg-Vorpommern 43: S. 6-12.

LANGGEMACH, T. (1999): Management von wandernden Wasservogelarten (Gänse, Schwäne, Kraniche) in Brandenburg. - NNA Berichte 12: S. 162-163.

LANGGEMACH, T.; LIPPERT, J. & SÖMMER, P. (1998): Illegale Verfolgung geschützter Vögel in Brandenburg und Berlin, Situationsbericht. - Berichte zum Vogelschutz 36: S. 45-59.

LANZ, U. (2000): Bestandsförderung von Botaurus stellaris in Teichgebieten Bayerns, Life Vorhaben B4-3200/97/239. - 3. Zwischenbericht: Mai 1999 - Juni 2000. - unveröff.

LAUBEK, B.; NILSSON, L.; WIELOCH, M.; KOFFIJBERG, K.; SUDFELDT, C. & FOLLESTAD, A. (1999): Distribution, numbers and habitat choice of the NW European Whooper Swan Cygnus cygnus population: results of an international census in January 1995. - Die Vogelwelt 120: S. 141-154.

LIMPENS, H.J.G.A. & ROSCHEN, A. (1996): Bausteine einer systematischen Fledermauserfassung. Teil I – Grundlagen. – Nyctalus (N.F.) 6 (1): S. 52-60.

LIMPENS, H.J.G.A. & SCHULTE, R. (2000): Biologie und Schutz gefährdeter wandernder mitteleuropäischer Fledermausarten am Beispiel von Rauhhautfledermäusen (Pipistrellus nathusii) und Teichfledermäusen (Myotis dasycneme). – Nyctalus (N.F.) 7 (3): S. 317-327.

LITZBARSKI, B. & LITZBARSKI, H. (1996): Zur Bestandssituation der Großtrappe Otis tarda in Deutschland. - Die Vogelwelt 117: S. 213-224.

LOHMUS, A. (2001): Fischadler Pandion haliaetus in Estland: Ein historischer Überblick. - Die Vogelwelt 122: S. 167-172.

LOOFT, V. & BUSCHE, G. (1990): Greifvögel.- In: LOOFT, V. & BUSCHE, G. [Hrsg.]: Vogelwelt Schleswig-Holstein. - Neumünster (Wachholtz) 199 S.

LUTZ, K. (2000): Bedeutung der deutschen Küstengewässer für Vogelarten des afrikanisch-eurasischen Wasservogelabkommens. - In: HAUPT, H.; LUTZ, K. & BOYE, P. [Hrsg.]: Internationale Impulse für den Schutz von Wasservögeln in Deutschland. - Bonn-Bad Godesberg (Bundesamt für Naturschutz) - Schriftenreihe für Landschaftspflege und Naturschutz 60: S. 191-198.

MÄDLOW, W. & MODEL, N. (2000): Vorkommen und Bestand seltener Brutvogelarten in Deutschland 1995/ 1996. - Die Vogelwelt 121: S. 189-206.

MADSEN, J.; CRACKNELL, G. & FOX, T. (1999): Goose Populations of the Western Palearctic. A review of status and distribution. - Wetlands International Publications No. 48. - Wageningen, The Netherlands (Wetlands International) 343 S.

MAMMEN, U. & REICH, J. (2001): Bericht zur bundesweiten Wachtelkönigkartierung 1999/2000. - Hilpoltstein (Landesbund für Vogelschutz in Bayern) 34 S.

MAMMEN, U. & STUBBE, M. (2000): Zur Lage der Greifvögel in Deutschland von 1995 bis 1998. - Die Vogelwelt 121: S. 207-215.

MAMMEN, U.; BAHNER, T.; BELLEBAUM, J.; EIKHORST, W.; FISCHER, S.; GEIERSBERGER, I.; HELMECKE, A.; HOFFMANN, J.; KEMPF, G.; KÜNAST, O.; PFÜTZKE, S. & SCHOPPENHORST, A. (in Vorb.): Grundlagen und Maßnahmen für die Erhaltung des Wachtelkönigs und anderer Wiesenvögel in Feuchtgrünlandgebieten. - Münster (Landwirtschaftsverlag) - Angewandte Landschaftsökologie.

MARENCIC, H.; BAKKER, J.; FARKE, H.; GÄTJE, C.; DE JONG, F.; KELLERMANN, A.; LAURSEN, K.; PEDERSEN, T.F. & DE VLAS, J. (1996): The Trilateral Monitoring and Assessment Programm (TMAP). Expert Workshops 1995/1996. - Wadden Sea Ecosystem - Wilhelmshaven.

MAYER, F.; PETIT, E. & VON HELVERSEN, O. (i.Dr.): Populationsgenetische Untersuchungen zur Strukturierung von Fledermauspopulationen am Beispiel des Abendseglers (Nyctalus noctula). - Schriftenreihe für Landschaftspflege und Naturschutz.

MEERGANS, M. (2000): Renaturierung des Flusstalmoores der Recknitz (EU-Vogelschutzgebiet). - Naturschutzarbeit in Mecklenburg-Vorpommern 43 (1): S. 32-39.

MEININGER, P. L.; BERREVOETS, C. M.; FLAMANT, R. & HOOGENDOORN, W. T. (1999): Migration and wintering of Mediterranean Gulls Larus melanocephalus ringed in the Netherlands and Belgium: a progress report. In: MEININGER, P. L.; HOOGEDORN, W.; FLAMANT, R. & RAEVEL. P. [Hrsg.]: Proceedings of the 1st International Mediterranean Gull Meeting, Le Portel, 4.-7. September 1998. - Bailleul (EcoNum) S. 69-84.

MELTER, J. & WELTZ, A. (2001): Eingebrochen und ausgedünnt: Bestandsentwicklung von Wiesenlimikolen im westlichen Niedersachsen von 1987-1997. - Corax 18: S. 47-54.

MELTOFTE, H.; BLEW, J.; FRIKKE, J.; RÖSNER, H.-U. & SMIT, C.-J. (1994): Numbers and distribution of waterbirds in the Wadden Sea. - (Special Issue IWRB Publication 34 / Wader Study Group Bulletin 74) 192 S.

MESCHEDE, A. (2000): Fledermäuse im Wald. - Ansbach und Bonn - Schriftenreihe Landschaft als Lebensraum 4.

MESCHEDE, A. & HELLER, K.-G. (2000): Ökologie und Schutz von Fledermäusen in Wäldern unter besonderer Berücksichtigung wandernder Arten. - Bonn-Bad Godesberg - Schriftenreihe für Landschaftspflege und Naturschutz 66: 374 S.

MESCHEDE, A.; HELLER, K.-G. & BOYE, P. (2001): Ökologie, Wanderungen und Genetik von Fledermäusen in Wäldern – Untersuchungen als Grundlage für den Fledermausschutz. -Bonn - Bad Godesberg - Schriftenreihe für Landschaftspflege und Naturschutz 71.

MEWES, W. (1996): Bestandsentwicklung, Verbreitung und Siedlungsdichte des Kranichs in Deutschland. - Die Vogelwelt 117: S. 103-110.

MEYBURG, B.-U.; HAUFF, P. & SCHELLER, W. (2001): Seeadler. - In: KOSTRZEWA, A. & SPEER, G. [Hrsg.]: Greifvögel in Deutschland. - Wiebelsheim (Aula) S. 25-30.

MINISTERIUM FÜR UMWELT, NATURSCHUTZ UND RAUMORDNUNG DES LANDES BRANDENBURG (1997): Empfehlungen zur Vermeidung von Vogelschäden auf landwirtschaftlichen Kulturen. - Naturschutz und Landschaftspflege in Brandenburg 6: S. 125-126.

MITLACHER, G. (1997): Ramsar - Bericht Deutschland. - Münster (Landwirtschaftsverlag) - Schriftenreihe für Landschaftspflege und Naturschutz 51: 190 S.

MITLACHER, G. (2000a): Geprüfte/r Natur- und Landschaftspfleger/in - Ein neuer Naturschutzberuf. - Bundesverband Beruflicher Naturschutz e.V. [Hrsg.].- Meckenheim (Druck Center Meckenheim) 16 S.

MITLACHER, G. (2000b): Die Fortbildung zum/zur „Geprüften Natur- und Landschaftspfleger/in" in den Bundesländern. - Natur und Landschaft 75: S. 256-259.

MITSCHKE, A. & BAUMUNG, S. (2001): Brutvogel-Atlas Hamburg. - Hamburger Avifaunistische Beiträge 31: S. 1-344.

MITSCHKE, A.; GARTHE, S. & HÜPPOP, O. (2001): Erfassung der Verbreitung, Häufigkeiten und Wanderungen von See- und Wasservögeln in der deutschen Nordsee - Ergebnisse eines Forschungs- und Entwicklungsvorhabens. - Bundesamt für Naturschutz [Hrsg.]: BfN-Skripten 34 - Bonn (Bundesamt für Naturschutz).

MOHR, E. (1935): Historisch-zoologische Walfischstudien. - Nordelbingen 11: S. 335-393.

MOOIJ, J. H. (1988): Ökotourismus und Naturschutz.- LÖLF (3): S. 24-27.

MOOIJ, J. H. (1992): National Report of the Federal Republic of Germany. - In: VAN ROOMEN, M. & MADSEN, J. [Hrsg.]: Waterfowl and Agriculture: Review and future perspective of the crop damage conflict in Europe. - (IWRB Spec. Publ.) S. 137-142.

MOOIJ, J. H. (1997): The status of White-fronted Goose (Anser a. albifrons) in the Western Palearctic. - Die Vogelwarte 39: S. 61-81.

MOOIJ, J. H. (1999): Gänsejagd und Gänseschadensmanagement in Deutschland. - Berichte zum Vogelschutz 37: S. 51-67.

MOOIJ, J. H. (2000): Ergebnisse des Gänsemonitorings in Deutschland und der westlichen Paläarktis von 1950 bis 1995. - Die Vogelwelt 121: S. 319-330.

MOOIJ, J. H. & SÜDBECK, P. (2001): Wasservögel und Schäden an landwirtschaftlichen Kulturen. - In: RICHARZ, K.; BEZZEL, E. & HORMANN, M. [Hrsg.]: Taschenbuch für Vogelschutz. - Wiebelsheim (Aula) S. 440-461.

MU NIEDERSACHSEN (2001): Steckbrief: Ein Nationalpark stellt sich vor. - http://www.mu.niedersachsen.de/Nationalparke/vorstellung.htm (02.11.01).

MULTIMAR WATTFORUM (2001): Internetseite des Multimar Wattforum in Tönning. - http://www.multimar-wattforum.de/ (27.11.2001).

NATIONALPARKAMT (2001): Seehundjagd ist Stammtischthema fürs Sommerloch. Pressemitteilung des Nationalparkamtes für den Nationalpark Schleswig-Holsteinisches Wattenmeer vom 13.08.2001. - http://www.wattenmeernationalpark.de/archiv/ mitteilungen/ 01/13_08_01.htm (29.10.2001).

NEHLS, G. (1996): Der Kiebitz in der Agrarlandschaft - Perspektiven für den Erhalt des Vogel des Jahres 1996. - Berichte zum Vogelschutz 34: S. 123-132.

NEHLS, G. (1998): Bestand und Verbreitung der Trauerente Melanitta nigra im Bereich des schleswig-holsteinischen Wattenmeeres. - Seevögel 19: S. 19-22.

NEHLS, G. (2001a): Bestandserfassung von Wiesenvögeln in der Eider-Treene-Sorge-Niederung und auf Eiderstedt 1997. - Corax 18, Sonderheft 2: S. 27-38.

NEHLS, G. (2001b): Entwicklung der Wiesenvogelbestände im Naturschutzgebiet Alte-Sorge-Schleife, Schleswig-Holstein. - Corax 18, Sonderheft 2: S. 81-101.

NEHLS, G.; BECKERS, B.; BELTING, H.; BLEW, J.; RODE, M. & SUDFELDT, C. (2001): Situation und Perspektive des Wiesenvogelschutzes im Nordwestdeutschen Tiefland. - Corax 18, Sonderheft 2: Wiesenvögel in Nordwestdeutschland: S. 1-26.

NEHLS, G.; KEMPF, N. & THIEL, M. (1992): Bestand und Verteilung mausernder Brandenten (Tadorna tadorna) im deutschen Wattenmeer. - Die Vogelwarte 36: S. 221-232.

NEHLS, H. W. (1969): Die gegenwärtige Situation des Seevogelschutzes an der mecklenburgischen Ostseeküste. - Naturschutzarbeit in Mecklenburg 12: S. 3-14.

NICOLAI, B. [Hrsg.] (1993): Atlas der Brutvögel Ostdeutschlands. - Jena, Stuttgart (Gustav Fischer) 314 S.

NIEHUES, F.-J. & SCHWÖPPE, M. (2001): Die Trauerseeschwalbe: eine vom Aussterben bedrohte Art. - LÖBF-Mitteilungen (2): S. 28-35.

NOWAK, E. (1982): Wiedereinbürgerung gefährdeter Tierarten: Wissenschaftliche Grundlagen, Erfahrungen und Bewertung. - Bonn-Bad Godesberg (Bundesforschungsanstalt für Naturschutz und Landschaftsökologie) – Schriftenreihe für Landschaftspflege und Naturschutz 23: 153 S.

NOWAK, E. (1993): Information über das Abkommen zur Erhaltung der Fledermäuse in Europa. – Z. Säugetierkunde 58, Sonderheft: S. 46-47.

NUA (Natur- und Umweltschutzakademie NRW) (2000): Veranstaltungskalender 2001. - LÖBF-Mitteilungen (3).

OAG MÜNSTER (1996): Internationale Limikolen-Zählungen (1979-1994). - Die Vogelwelt 117: S. 295-302.

ODSJÖ, T & SONDELL, J. (2001): Bestand und Bruterfolg des Fischadlers Pandion haliaetus in Schweden 1971-1998. - Die Vogelwelt 122: S. 155-166.

OEHME, G. (1961): Die Bestandsentwicklung des Seeadlers - Haliaeetus albicilla (L.) - in Deutschland mit Untersuchungen zur Wahl der Brutbiotope. - In: SCHILDMACHER, H. [Hrsg.]: Beiträge zur Kenntnis deutscher Vögel. - Jena (Gustav Fischer) S. 1-61.
OEHME, G. (1987a): Seeadler Haliaeetus albicilla. - In: KLAFS, G. & STÜBS, A. J. [Hrsg.]: Die Vogelwelt Mecklenburgs. - Jena (Fischer) S. 148-150.

OEHME, G. (1987b): Zum Phänomen der Eidünnschaligkeit am Beispiel des Seeadlers, Haliaeetus albicilla (L.), in der DDR. - Populationsökologie von Greifvogel- und Eulenarten 1: S. 159-170.

OEHME, G. (1990): Population status of the White-tailed Eagle, Haliaeetus albicilla (L.) and their trends in the German Democratic Republic (GDR). - Baltic Birds 5: S. 59-64.

PETERSEN, B. (1956): Zum Brutvorkommen des Seggenrohrsängers, Acrocephalus paludicola (Vieillot), in Nordwestdeutschland. - Journal für Ornithologie 97: S. 249-257.

POOT, M.; RASSMUSSEN, L. M.; VAN ROOMEN, M.; RÖSNER, H.-U. & SÜDBECK, P. (1996): Migratory Waterbirds in the Wadden Sea 1993/94. - Wadden Sea Ecosystems 5: S. 1-79.

POTEL, P.; SÜDBECK, P. & HÄLTERLEIN, B. (1998): Wie kommen wir zu einem verbesserten Schutz der Strandvögel im Wattenmeer? - Seevögel 19 - Sonderband: 1. Deutsches Seevogelkolloquium: S. 75-80.

PRANGE, H. (1996): Entwicklung der Kranichrast in Deutschland von 1960 bis 1995. - Die Vogelwelt 117: S. 125-138.

PRANGE, H. (1999): Der Zug des Kranichs Grus grus in Europa. - Die Vogelwelt 120: S. 301-315.

PRIMACK, R.B. (2001): Publish again in another language. – Conservation Biology 15 (1): S. 290-291.

RANFTL, H. & DORNBERGER, W. (1998): Erster mitteleuropäischer Brutnachweis des Grünschenkels Tringa nebularia in Bayern. - Limicola 12: S. 258-263.

RASMUSSEN, L.M.; DIJKSEN, L.; HÄLTERLEIN, B.; KOKS, B.; POTEL, P. & SÜDBECK, P. (2001): The Breeding Bird Season in the Wadden Sea in 2000. - Wadden Sea Newsletter: S. 7-9.

RASMUSSEN, L.M.; FLEET, D. M.; HÄLTERLEIN, B.; KOKS, B.J.; POTEL, P. & SÜDBECK, P. (2000): Breeding Birds in the Wadden Sea in 1996 - Results of a total survey in 1996 and numbers of colony breeding species between 1991 and 1996. - Trilateral Monitoring and Assessment Group of Breeding Birds in the Common Wadden Sea Secretariat [Hrsg.]: Wadden Sea Ecosystem No. 10. - Wilhelmshaven.

REIJNDERS, P. J. H. (1981): Threats to the harbour seal population in the Wadden Sea. In: REIJNDERS, P. H. J. & WOLFF, W. J. [Hrsg.]: Marine Mammals of the Wadden Sea. - Final report of the section „Marine Mammals" of the Wadden Sea Working Group, Leiden, S. 38-17.

REIJNDERS, P. J. H. (1986): Reproductive failure in common seals feeding on fish from polluted waters. - Nature 324: S. 456-457.

REIJNDERS, P. J. H. (1992): Retrospective population analysis and related future management perspectives for the harbour seal Phoca vitulina in the wadden sea. - Netherlands Institute for Sea Research Publication Series No. 20: S. 193-197.

REIJNDERS, P. J. H. & REINEKING, B. (1999): 5.12 Mammals. In: JONG, F. DE; BAKKER, J. F.; BERKEL, C. J. M. VAN; DANKERS, N. M. J.A.; DAHL, K.; GÄTJE, C.; MARENCIC, H.; & POTEL, P. [Hrsg.]: 1999 Wadden Sea Quality Status Report. - Common Wadden Sea Secretariat, Trilateral Monitoring and Assessment Group, Quality Status Report Group, Wilhelmshaven - Wadden Sea Ecosystem No. 9: S. 160-164.

REIJNDERS, P. J. H.; DRESCHER, H. E.; HAAFTEN, J. L. VAN, BØGEBJERG, E. & HANSEN, S. (1981): Population dynamics of the harbour seal in the Wadden Sea. - In: REIJNDERS, P. H. J. & WOLFF, W. J. [Hrsg.]: Marine Mammals of the Wadden Sea. Final report of the section `Marine Mammals of the Wadden Sea Working Group, Leiden, S. 19-32.

REUSSE, P.; WALTER, M.; LUX, H. & KNEIS, P. (2001): Bruten der Moorente in zwei Teichgebieten an der Unteren Röder in Südbrandenburg und Nordsachsen in den Jahren 1999 und 2000. - Acta ornithoecologia 4: S. 405-409.

RHEINWALD, G. (1993): Atlas der Verbreitung und Häufigkeit der Brutvögel Deutschlands - Kartierung um 1985. - Schriftenreihe des DDA 12: 264 S.

RICHARZ, K.; BEZZEL, E. & HORMANN, M. (2001): Taschenbuch für Vogelschutz. - Wiebelsheim (Aula) 630 S.

RIEDE, K. (2002, i.Dr.): Global Register of Migratory Species. Database, GIS Maps and Threat Analysis. – Bonn-Bad Godesberg (Bundesamt für Naturschutz).

RIEDEL, W. & LANGE, H. (2001): Landschaftsplanung. - Heidelberg / Berlin (Spektrum Akademischer Verlag) 364 S.

RIES, E. H.; HIBY, L. R. & REIJNDERS, P. J. H. (1998): Maximumlikelihood population size estimation of harbour seals in the Dutch Wadden Sea based on a mark-recapture experiment. - Journal of Applied Ecology 35: S. 332-339.

ROBEL, D. (1991): Die bisher letzte Brut der Blauracke Coracius garrulus in Deutschland gescheitert. - Die Vogelwelt 112.

RÖSNER, H.-U. (2000): Wege zu einem international abgestimmten Beobachtungsprogramm für Wasservogelbestände in Deutschland. - In: HAUPT, H.; LUTZ, K. & BOYE, P. [Hrsg.]: Internationale Impulse für den Schutz von Wasservögeln in Deutschland. - Bonn-Bad Godesberg (Bundesamt für Naturschutz) - Schriftenreihe für Landschaftspflege und Naturschutz 60: S. 97-104.

RÖSNER, H.-U. & GÜNTHER, K. (1996): Monitoring von rastenden Wat- und Wasservögeln im Wattenmeer. - Die Vogelwelt 117: S. 295-302.

RÖSNER, H.-U.; VAN ROOMEN, M.; SÜDBECK, P. & RASMUSSEN, L. M. (1994): Migratory Waterbirds in the Wadden Sea 1992/93.- Wadden Sea Ecosystems No. 2.- Wilhelmshaven (Common Wadden Sea Secretariat & Trilateral Monitoring and Assessment Group) 72 S.

ROSE, P. M. & SCOTT, D. A. (1997): Waterfowl Population Estimates. Second Edition.- Wetlands International Publications 44. - Wageningen, The Netherlands (Wetlands International) 106 S.

ROSENTHAL, G.; HILDEBRANDT, J.; ZÖCKLER, C.; HENGSTENBERG, M.; MOSSAKOWSKI, D.; LAKOMY, W. & BURFEINDT, I. (1998): Feuchtgrünland in Norddeutschland, Ökologie, Zustand, Schutzkonzepte. - Bonn-Bad Godesberg (Bundesamt für Naturschutz) - Angewandte Landschaftsökologie (15): 289 S.

RUDOLPH, B.-U. (2000): Auswahlkriterien für Habitate von Arten des Anhangs II der Fauna-Flora-Habitat-Richtlinie am Beispiel der Fledermausarten Bayerns. – Natur und Landschaft 75 (8): S. 328-338.

RÜGER, A. (1981): Bestandsstützung durch Adoptionsverfahren, Erfahrungen mit Seeadlern in Schleswig-Holstein - Natur und Landschaft 56: S. 133-135.

RUNZE, K. (2000): Life-Projekt: Erhaltung und Wiederherstellung des Trebeltalmoores in Mecklenburg-Vorpommern, einschließlich vorbereitender Untersuchungen für das Recknitztalmoor. - Naturschutzarbeit in Mecklenburg-Vorpommern 43 (1): S. 23-31.

RUTSCHKE, E. (1983): Die Vogelwelt Brandenburgs. - Jena (Fischer) 385 S.

RYSLAVY, T. (2001): Zur Bestandssituation ausgewählter Vogelarten in Brandenburg - Jahresbericht 1999. - Naturschutz und Landschaftspflege in Brandenburg 10: S. 4-16.

SCHÄFFER, N. & SCHÄFFER, A. (1999): Der Seggenrohrsänger - ein Schicksal am seidenen Faden. - Der Falke 46: S. 180-187.

SCHELLER, W.; FRANKE, E.; MATTHES, J.; NEUBAUER, M. & SCHARNWEBER, C. (2001): Verbreitung, Bestandsentwicklung und Lebensraumsituation des Schreiadlers Aquila pomarina in Mecklenburg-Vorpommern. - Die Vogelwelt 122: S. 233-246.

SCHERER, B. (1998): Der Nationalpark Schleswig-Holsteinisches Wattenmeer. - PARK SCHLESWIG-HOLSTEINISCHES WATTENMEER; UMWELTAMTBUND [Hrsg.]: Umweltatlas Wattenmeer Band 1; Nordfriesisches und Dithmarscher Wattenmeer. - Stuttgart (Ulmer) S. 12-13.

SCHERFOSE, V.; BOYE, P.; FORST, R.; HAGIUS, A.; KLÄR, C.; NICLAS, G. & STEER, U. (2001): Naturschutzgroßprojekte des Bundes - Förderprogramm zur Errichtung und Sicherung schutzwürdiger Teile von Natur und Landschaft mit gesamtstaatlich repräsentativer Bedeutung - Naturschutzgroßprojekte und Gewässerrandstreifenprogramm. - Natur und Landschaft 76: S. 389-397.

SCHERNER, E. R. (1981): Die Moorente (Aythya nyroca) in Nordwestdeutschland (Übersicht). - Die Vogelwelt 102: S. 189-192.
SCHILDMACHER, H. (1965): Seevogelschutz an der Ostseeküste der DDR. - Falke 12: S. 45-50.

SCHLUMPRECHT, H. (1999): Die Große Rohrdommel als Zielart, Leitbilder, Ziel und Maßnahmen am Beispiel eines Life-Projektgebietes. - Naturschutz und Landschaftsplanung 31: S. 247-252.

SCHMIDT, D. & ROEPKE, D. (2001): Zugrouten und Überwinterungsgebiete von in Deutschland beringten Fischadlern Pandion haliaetus. - Die Vogelwelt 122: S. 141-146.

SCHMIDT, D. (2001): Bestandsentwicklung des Fischadlers Pandion haliaetus in Deutschland im ausgehenden 20. Jahrhundert. - Die Vogelwelt 122: S. 117-128.

SCHNEIDER, U. (1997): Die Hallig Norderoog. - Seevögel 18: S. 24-25.

SCHNEIDER-JACOBY, M. (1999): Moorente - Aythya nyroca. - In: HEINE, G.; JACOBY, H.; LEUZINGER, H. & STARK, H. [Hrsg.]: Die Vögel des Bodenseegebietes. - (Ornithologische Jahreshefte Baden-Württembergs) S. 285-286.

SCHNEIDER-JACOBY, M. (2000): Freizeit und Entenschutz am Wasser - Sicherung der Brut- und Rastgebiete von Kolbenenten und Moorenten in Deutschland.- In: HAUPT, H.; LUTZ, K. & BOYE, P. [Hrsg.]: Internationale Impulse für den Schutz von Wasservögeln in Deutschland. - Bonn-Bad Godesberg (Bundesamt für Naturschutz) - Schriftenreihe für Landschaftspflege und Naturschutz 60: S. 81-93.

SCHÖPS, A. (2000): Naturschutzfachliche Baubegleitung beim ICE-Trassenbau Hannover - Berlin. - Naturschutz und Landschaftspflege in Brandenburg 9: S. 131-135.

SCHREIBER, H. & RAUCH, M. (1999): Stand und Entwicklung des Kranichsammel- und Rastplatzes bei Nauen, Brandenburg. - Die Vogelwelt 120: S. 317-322.

SCHULZ, H. (1947): Die Welt der Seevögel - Ein Führer durch die Vogelbrutstätten der deutschen Küsten. - Hamburg (Anton Lettenbauer) 260 S.

SCHULZ, H. (1999): Der Weltbestand des Weißstorchs (Ciconia ciconia). - In: SCHULZ, H. [Hrsg.]: Weißstorch im Aufwind? White Stork on the up? Proceedings, Int. Symp. on the White Stork, Hamburg 1996. - Bonn (Naturschutzbund Deutschland e.V.) S. 335-366.

SCHUMACHER, U.; ZAHLER, S.; HORNY, H. P.; HEIDEMANN, G.; SKIRNISSON, K. & WELSCH, U. (1993): Histological investigations an thethyroid glands of marine mammals (Phoca vitulina, Phocoena phocoena) and the possible implications of marine pollution. - Journal of Wildlife Diseases 29: S. 103-108.

SCHUSTER, S.; BLUM, V.; JACOBY, H.; KNÖTZSCH, G.; LEUZINGER, H.; SCHNEIDER, M.; SEITZ, E. & WILLI, P. (1983): Die Vögel des Bodenseegebietes. - Ornithologische Arbeitsgemeinschaft Bodensee. [Hrsg.].- Konstanz.

SCHWARZ, J. & FLADE, M. (2000): Ergebnisse des DDA Monitoringprogramms. Teil I: Bestandsveränderungen von Vogelarten der Siedlungen seit 1989. - Die Vogelwelt 121: S. 87-106.

SCHWARZ, J. & HEIDEMANN, G. (1994): Zum Status der Seehund- und Kegelrobbenbestände im Wattenmeer. In: LOZÁN, J. L.; RACHOR, E.; REISE, K.; WESTERNHAGEN, H. V. & LENZ, W. [Hrsg.]: Warnsignale aus dem Wattenmeer. - Berlin (Blackwell Wissenschaftsverlag) S. 296–303.

SCOTT, D. A. & ROSE, P. M. (1996): Atlas of Anatidae Populations in Africa and Western Eurasia.- Wageningen/ Niederlande (Wetlands International) - Wetlands International Publication No. 41: S. 336

SEITZ, J. (2001): Zur Situation der Wiesenvögel im Bremer Raum. - Corax 18: S. 555-66.

SIEBERT, U.; JOIRIS, C.; HOLSBEEK, L.; BENKE, H.; FAILING, K.; FRESE, K. & PETZINGER, E. (1999): Potential relation between mercury concentrations and necropsy findings in cetaceans from German waters of North and Baltic seas. - Marine Pollution Bulletin 38: S. 285-295.

SIEFKE, A. (1993): Brutbestände der Küstenvögel 1989-1992 in den Schutzgebieten Mecklenburg-Vorpommerns. - Seevögel 14: S. 37-41.

SKOV, H.; DURINCK, J.; LEOPOLD, M. F. & TASKER, M. L. (1995): Important Bird Areas for seabirds in the North Sea including the Channel and the Kattegatt. - Cambridge (BirdLife International).

SKOV, H.; VAITKUS, G.; FLENSTED, K.N.; GRISHANOV, G.; KALAMEES, A.; KONDRATYEV, A.; LEIVO, M.; LUIGUJOE, L.; MAYR, C.; RASMUSSEN, J.F.; RAUDONIKIS, L.; SCHELLER, W.; SIDLO, P.O.; STIPNIECE, A.; STRUWE-JUHL, B. & WELANDER, B. (2000): Inventory of coastal and Marine Important Bird Areas in the Baltic Sea. - Cambridge (BirdLife International) 287 S.

SPICHER, V. (2000): Moore und Große Rohrdommel an der oberen Havel (EU-Life-Natur-Projekt 98Nat/D/50819). - Naturschutzarbeit in Mecklenburg-Vorpommern 43 (1): S. 48-53.

SPILLING, E. (1999): Übersicht über die Weideschäden durch Gänse und andere Vögel in Deutschland und fachliche Anforderungen an die Schadensermittlung. - NNA-Berichte 12 (3): S. 138-143.

SSYMANK, A.; HAUKE, U.; RÜCKRIEM, C. & HÖLZINGER, E. (1998): Das europäische Schutzgebietssystem NATURA 2000. - Schriftenreihe für Naturschutz und Landschaftspflege 53: 560 S.

STEFFENS, R.; SAEMANN, D. & GRÖßLER, K. (1998a): Die Vogelwelt Sachsens. - Jena, Stuttgart, Lübeck, Ulm (Gustav Fischer) 530 S.

STEFFENS, R.; KRETZSCHMAR, R. & RAU, S. (1998b): Atlas der Brutvögel Sachsens. In: SÄCHSISCHES LANDESAMT FÜR UMWELT UND GEOLOGIE [Hrsg.] – Materialien zu Naturschutz und Landschaftspflege, 132 S.

STEGEMANN, M. & HENNICKE, F. (1996): Projekt: Peenetal/Peene-Haff-Moor, Mecklenburg-Vorpommern. - Natur und Landschaft 71: S. 287-294.

STOCK, M.; SCHREY, E.; KELLERMANN, A.; GÄTJE, C.; ESKILDSEN, K.; FEIGE, M.; FISCHER, G.; HARTMANN, F.; KNOKE, V.; MÖLLER, A.; RUTH, M.; THIESSEN, A. & VORBERG, R. (1996): Ökosystem Wattenmeer. Synthesebericht: Grundlagen für einen Nationalparkplan. - Schriftenreihe des Nationalparks Schleswig-Holsteinisches Wattenmeer: 784 S.

STOWE, T. J. & GREEN, R. E. (1997): Threats to the Corncrake Crex crex on migration and in the winter quarters. - Die Vogelwelt 118: S. 175-178.

STREITBERGER, J. (2001): Am Wasser, zu Lande und in der Luft - Blei oder nicht Blei? - Wild und Hund: S. 34-37.

STRIBERNY, W. (2000): Das Seevogelbrutgebiet Listland auf der Insel Sylt und seine Entwicklung. - Seevögel 21: S. 18-26.

STRUWE-JUHL, B. (1995): Habitatwahl und Nahrungsökologie von Uferschnepfen-Familien Limosa limosa am Hohner See, Schleswig-Holstein. - Die Vogelwelt 116: S. 61-72.

STRUWE-JUHL, B. & LATENDORF, V. (1997): Todesursachen von Seeadlern Haliaeetus albicilla. - Die Vogelwelt 118: S. 95-100.

STRUWE-JUHL, B. & LATENDORF, V. (2000): Seeadler. - In: MINISTERIUM FÜR UMWELT, NATUR UND FORSTEN DES LANDES SCHLESWIG-HOLSTEIN [Hrsg.]: Jagd und Artenschutz, Jahresbericht 2000, 117 S.

STRUWE-JUHL, B.; LATENDORF, V. & BÖHLING, J. (1998): Todesursachen von Seeadlern in Schleswig-Holstein. - In: PROJEKTGRUPPE SEEADLERSCHUTZ IN SCHLESWIG-HOLSTEIN E. V. [Hrsg.]: 30 Jahre Seeadlerschutz in Schleswig-Holstein. - Kiel, 107 S.

STUBBE, M.; MAMMEN, U. & GEDEON, K. (1996): Das Monitoring-Programm Greifvögel und Eulen Europas. - Die Vogelwelt 117: S. 261-267.

SÜDBECK, P. & HÄLTERLEIN, B. (2001): Brutvogelbestände an der deutschen Nordseeküste 1998 und 1999: 12. und 13. Erfassung durch die Arbeitsgemeinschaft „Seevogelschutz". - Seevögel 22: S. 41-48.

SÜDBECK, P. & KÖNIGSTEDT, B. (1999): Gänseschadensmanagement in Niedersachsen. - NNA Berichte 12: S. 145-151.

SÜDBECK, P. & OLDEKOP, W. (1999): Zum Brutbestand des Rothalstauchers (Podiceps grisegena) in Niedersachsen 1990-1998. - Vogelkundliche Berichte aus Niedersachsen 31: S. 1-10.

SÜDBECK, P.; HÄLTERLEIN, B.; KNIEF, W. & KÖPPEN, U. (1998): Bestandsentwicklung von Fluß- Sterna hirundo und Küstenseeschwalbe Sterna paradisaea an den deutschen Küsten. - Die Vogelwelt 119: S. 147-163.

SUDFELDT, C.; ANTHES, N. & WAHL, J. (2000): Stand und Perspektiven des Wasservogelmonitorings in Deutschland. - Die Vogelwelt 121: S. 307-317.

SUDFELDT, C.; NAACKE, J.; RUTSCHKE, E. & MOOIJ, J. (1997): Bestandssituation und -entwicklung ziehender und überwinternder Wasservögel in Deutschland, Ramsar - Bericht Deutschland. - In: BUNDESAMT FÜR NATURSCHUTZ [Hrsg.]: Ramsar Bericht Deutschland.- Bonn- Bad Godesberg - Schriftenreihe für Landschaftspflege und Naturschutz (51): S. 89-129.

SUDFELDT, C.; WAHL, J. & BOSCHERT, M. (2002): Brütende und überwinternde Wasservögel in Deutschland. - Gutachten des DDA im Auftrag des Bundesamtes für Naturschutz. Münster, 45 S.

TESSENDORF, F. & WÖLFEL, L. (1999): Gesetzliche Grundlagen des Arten- und Horstschutzes. - In: Schriftenreihe des Landesamtes für Umwelt, Naturschutz und Geologie [Hrsg.]: Großvogelschutz im Wald. - Güstrow, 73 S.

THIEM, A. (1998): Naturschutzgerechte Bewirtschaftung von Fischteichen in Sachsen. - Naturschutzarbeit in Sachsen 40: S. 23-32.

THIESSEN, H. (1986): Zur Bestandsentwicklung und Situation von Möwen Laridae und Seeschwalben Sternidae in Schleswig-Holstein - sowie Gedanken zum „Möwenproblem". - Seevögel 7: S. 1-12.

THYEN, S. & BECKER, P. H. (2000): Aktuelle Ergebnisse des Schadstoffmonitorings mit Küstenvögeln im Wattenmeer. - Die Vogelwelt 121: S. 281-292.

THYEN, S.; BECKER, P. H.; EXO, K.-M.; HÄLTERLEIN, B.; HÖTKER, H. & SÜDBECK, P. (1998): Monitoring Breeding Success of Coastal Birds - Final Report of teh Pilot Study 1996-1997. - Common Wadden Sea Secretariat, Trilateral Monitoring and Assessment Group, Quality Status Report Group. Wilhelmshaven. - Wadden Sea Ecosystem No. 8: S. 7-57.

THYEN, S.; BECKER, P. H.; EXO, K.-M.; HÄLTERLEIN, B.; HÖTKER, H. & SÜDBECK, P. (2000): Bruterfolgsmonitoring bei Küstenvögeln im Wattenmeer 1996 und 1997. - Die Vogelwelt 121: S. 269-280.

TIEDEMANN, R.; HARDER, J.; GMEINER, C. & HAASE, E. (1996): Mitochondrial DNA sequence patterns of harbour porpoise (Phocoena phocoena) from the North and Baltic Sea. - Zeitschrift für Säugetierkunde 61: S. 104-11 l.

TODTE, I. & BOUDA, K.-H. (1996): Beobachtungen an der ersten Brut des Purpurreihers Ardea purpurea in Sachsen-Anhalt. - Limicola 10: S. 192-195.

TODTE, I.; LUGE, J. & HARTZ, M. (1999): Bestandsentwicklung, Brutbiologie und Ortstreue des Bienenfressers Merops apiaster in Sachsen-Anhalt. - Die Vogelwelt 120: S. 221-229.

TUCKER, G. M. & HEATH, M. F. (1994): Birds in Europe, their conservation status. - Cambridge (BirdLife International) - BirdLife Conservation Series No. 3: 600 S.
UHLIG, R.; MUNDT, J. & KALICIUK, J. (1998): Die Bestandssituation der Zwergseeschwalbe Sterna albifrons an der Unteren Oder. - Limicola 12: S. 136-141.

UMWELTBEHÖRDE HAMBURG (2001): Forschung und Umweltbeobachtung.- http://www.hamburg.de/Behoerden/Umweltbehoerde/wattenmeer/pdf/132-135.pdf (27.11.01).

UMWELTMINISTERIUM DES LANDES MECKLENBURG-VORPOMMERN (2000): Moorschutz, ein Konzept zur Bestandssicherung und Entwicklung der Moore in Mecklenburg-Vorpommern. - In: Umweltministerium des Landes Mecklenburg-Vorpommern [Hrsg.] 20 S.

UNSELT, C.; MAYR, C. & BAUER, H.-G. (2000): Federal Republic of Germany. - In: HEATH, M. F. & EVANS, M. I. [Hrsg.]: Important Bird Areas in Europe: Priority sites for conservation 1: Northern Europe. - Cambridge (BirdLife International) - BirdLife Conservation Series No. 8: S. 263-340.

VERBAND DEUTSCHER NATURPARKE (2001): Verband deutscher Naturparke. - www.naturparke.de (31.11.01).

VEREIN ZUR FÖRDERUNG V. NATURERLEBNISSEN (2001): Verein zur Förderung v. Naturerlebnissen. - http://www.naturerlebnisse.citymap.de/city/print/de/Niedersachsen/Landkreis_Stade/Kunden/Verein_zur_Förderung_v._Naturerlebnissen/1.html (27.11.01).

VERWEY, J. & WOLFF, W. J. (1981): The common or harbour porpoise. - In: REIJNDERS, P. J. H. & WOLFF, W. J. [Hrsg.]: Marine Mammals of the Wadden Sea. Final report of the section „Marine Mammals" of the Wadden Sea Working Group, Leiden, S. 51-58.

VIABONO GMBH (2001): Presse. - http://www.viabono.de/presse/presse.php (27.11.01).

VLUGG, J. J. (2000): Zur Brutbestandsentwicklung und Ökologie des Rothalstauchers (Podiceps grisegena) in Schleswig-Holstein und Hamburg 1969-1998 - mit ergänzenden Bemerkungen zur früheren Situation und zu den Verhältnissen in den Nachbarländern. - Corax 18: S. 160-179.

WASSER- UND SCHIFFFAHRTSVERWALTUNG DES BUNDES (2001): Ablaufdiagramm. - www.wsv.de/Schifffahrt/Bekaempfung_von_Meeresverschmutzungen/Organisation/Ablaufdiagramm/Ablaufdiagramm.html (03.12.01).

WAWRZYNIAK, H. & SOHNS, G. (1977): Der Seggenrohrsänger. - Wittenberg (A. Ziemsen) 100 S.

WEISS, J.; MICHELS, C.; JÖBGES, M. & KETTRUP, M. (1999): Zum Erfolg im Feuchtwiesenschutzprogramm NRW - Das Beispiel Wiesenvögel. - LÖBF Mitteilungen (3): S. 14-26.

WENDT, W. (1997): Empfehlungen für eine bundesweite Bestandsüberwachung von Fledermaus-Populationen als Basis für ein Monitoring-System auf nationaler und internationaler Ebene. – Mitteilungsblatt der BAG Fledermausschutz 1/97: S. 4-6.

WERNER, M. & BAUER, H.-G. (2000): Zur Situation wandernder Vogelarten in Deutschland - Konzeption für einen Zug- und Rastvogelatlas. - Die Vogelwelt 121: S. 223-228.

WETLANDS INTERNATIONAL (1999): Report on the Conservation Status of Migratory Waterbirds in the Agreement Area. - Wageningen, The Netherlands (Wetlands International) 147 S.

WIETFELD, J. (1998): Der Große Knechtsand im Nationalpark Wattenmeer. - Seevögel 19 - Sonderheft: 1. Deutsches See- und Küstenvogelkolloquium: S. 23-26.

WILKENS, S. (1997): 1996 erstmals Löffler (Platalea leucorodia) -Brut auf der Insel Mellum (Nationalpark Niedersächsisches Wattenmeer). - Seevögel 18: S. 45-46.

WILLE, V. (1997): Besucherlenkung der Gänsetouristen. - LÖBF-Mitteilungen (1): S. 56-62.

WINK, M. (1990): Die Vögel des Rheinlandes, Atlas zur Winterverbreitung. - Beiträge zur Avifauna des Rheinlandes 31/32.

WIPPER, E. (1974): Die ökologischen und pathologischen Probleme beim europäischen Seehund (Phoca vitulina Linne 1758) an der niedersächsischen Nordseeküste. - Dissertation, Universität München. 211 S.

WITT, H. (1969): Kleines Sumpfhuhn (Porzana parva) und Seggenrohrsänger (Acrocephalus paludicola) in den Spätingen des Adolfkooges. - Corax 3: S. 37.

WITT, K.; BAUER, H.-G.; BERTHOLD, P.; BOYE, P.; HÜPPOP, O. & KNIEF, W. (1996): Rote Liste der Brutvögel Deutschlands. - Berichte zum Vogelschutz 34: S. 11-35.

WOIKE, M. (2001): Schutz und Entwicklung des Nationalparks Djoudj in der Republik Senegal. Europäisch-afrikanische Kooperation zum Schutz wandernder Vogelarten. - LÖBF Mitteilungen (1): S. 42-51.

WÜST, W (1990): Avifauna Bavariae. - Die Vogelwelt Bayerns im Wandel der Zeit. - München.

WÜSTNEI, C. (1903): Die Adler Mecklenburgs. - Archiv des Vereins der Freunde der Naturgeschichte Mecklenburgs 57: S. 45-104.

ZANDER, R. (1998): Der „Nationalpark Niedersächsisches Wattenmeer": Ziele des Großschutzgebietes und die besondere Bedeutung der Seevogelschutzverbände bei der Erfüllung seiner Aufgabe. - Seevögel 19 - Sonderheft: 1. Deutsches See- und Küstenkolloquium: S. 14-16.

ZANG, H.; GROßKOPF, G. & HECKENROTH, H. (1995): Die Vögel Niedersachsens. Austernfischer bis Schnepfen. - Naturschutz und Landschaftspflege Niedersachsen 8 (2-5) 340 S.

ZEISKE, O. (1992): Die Rastbestände des Sichelstrandläufers in den nördlichen Küstenvorländern des Elbeästuars. - Unveröffentlichte Staatsexamensarbeit am Zoologischen Institut und Zoologischen Museum der Universität Hamburg (Hamburg) 59 S.

ZIESEMER, F. (1986): Die Situation von Uferschnepfe (Limosa limosa), Rotschenkel (Tringa totanus), Bekassine (Gallinago gallinago), Kampfläufer (Philomachus pugnax) und anderen Wiesenvögeln in Schleswig-Holstein. - Corax 11: S. 249-261.

ZINTL, H (1998): Bestandsentwicklung der Flußseeschwalbe Sterna hirundo in Bayern. - Die Vogelwelt 119: S. 123-132.

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are an irreplaceable part of the earth`s natural
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the good of mankind."

Extract from the
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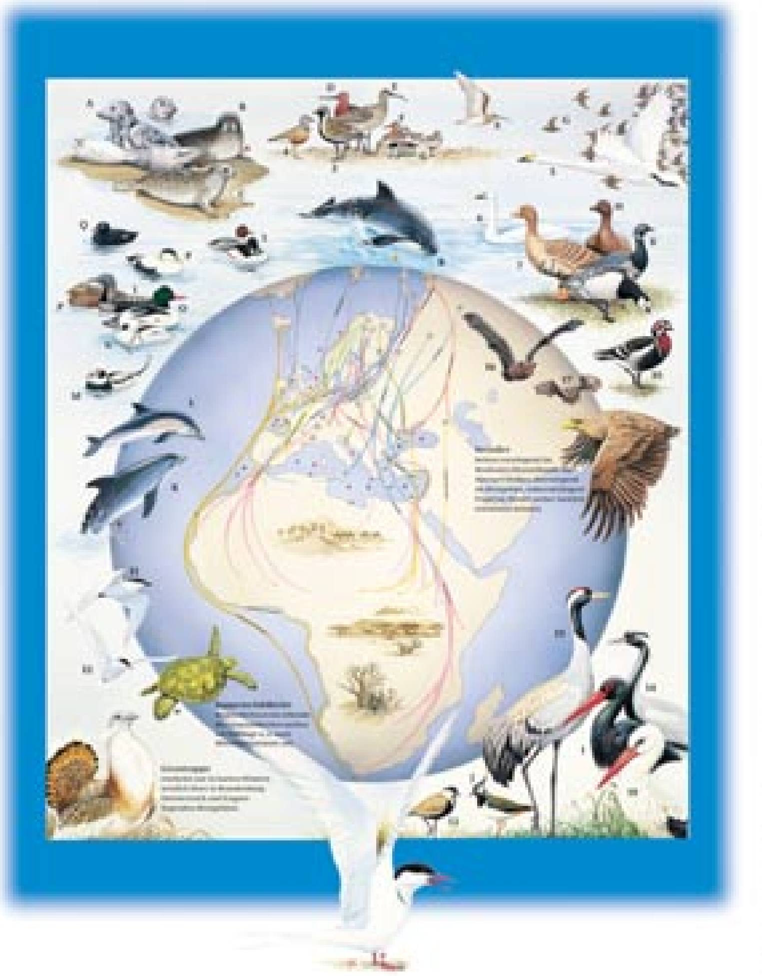

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