

Report on the status and conservation of the

Leatherback Turtle

Dermochelys coriacea

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Table of contents

1.0 Taxonomy	1
1.1 Scientific name	1
1.2 Common names	1
2.0 Biological data	1
2.1 Distribution (current and historical)	1
2.2 (Current) breeding distribution	5
2.3 Habitat	9
2.4 Population estimates and trends (breeding)	9
2.5 Migratory patterns	17
3.0 Status	18
4.0 Actual and potential threats	18
4.1 Habitat degradation/loss	18
4.2 Exploitation: direct and incidental	19
4.3 Other threats	20
5.0 Legislation	20
5.1 International	20
5.2 National	21
6.0 Conservation Action	38
7.0 Research activities	45
8.0 Needs and recommended actions	47
9.0 References	49

1.0 Taxonomy

1.1 Scientific name

Dermochelys coriacea (Vandelli, 1761)

1.2 Common names

English: Leatherback Turtle; Leathery Turtle; Luth; Trunkback turtle

French: Tortue luth

Spanish: Canal; Tinglada; Tortuga laúd

2.0 Biological data

Dermochelys coriacea is the largest species of turtle. The biggest specimens approach 1.8 m (6 feet) in carapace length and weigh nearly 500 kg (Pritchard, 1971a; Pritchard, 1979; Kemf *et al.*, 2000). Individuals have been recorded weighing as much as 644 kg (G. R. Hughes, *in litt.* to IUCN CMC, 22 February 1982), 700 kg (Treguenza, 1996) with one individual recorded as weighing 916 kg (Kemf *et al.*, 2000) but most mature individuals are much lighter than this. The median carapace length in West Atlantic and Tongaland populations was around 1.5 m (Pritchard, 1971a). Mature East Pacific Leatherbacks are smaller in size, measuring between 1.3 and 1.5 m in length (P. C. H. Pritchard, *in litt.* to IUCN CMC, 2 February 1982). The species is morphologically highly distinctive; notably in lacking cornified epidermal structures (i.e. no scutes on the carapace or plastron, no cornified scales, no claws, and no horny pads in the jaws), and in lacking a properly developed bony carapace and plastron (Pritchard, 1971a; Pritchard, 1979). The carapace has the texture of hard rubber, and is raised up into seven longitudinal ridges.

The large body bulk with its low surface/volume ratio contributes to maintenance of adequately high core temperatures while foraging in cool temperate waters (Frair *et al.*, 1972; Mrosovsky, 1980). The front flippers are exceptionally long and powerful, and may span about 2.5 m when extended (Pritchard, 1979); according to Kemf *et al.* (2000) front flippers are at least half the length of the carapace in adults. The longitudinal flutings on the carapace may be associated with maintaining efficient laminar flow during sustained high-speed swimming (Hendrickson, 1980). A powerful swimmer, inhabiting the open seas, individuals of this species are only rarely sighted away from nesting beaches (with the exception of those encountered in the few known regularly-frequented feeding areas), and ecological observations are correspondingly sparse. The diet of adults is composed mainly of pelagic soft-bodied creatures such as jellyfish and tunicates (Kemf *et al.*, 2000). According to National Marine Fisheries Service and U.S. Fish and Wildlife Service (1992), foraging has most often been reported at the surface but nematocysts from deep water siphonophores have been found in leatherback stomach samples, indicating that foraging may occur in deep water as well.

Although the range of Leatherbacks is greater than that of any other sea turtle, little is known about their basic biology beyond the nesting beach (James and Eckert, 2002). All sea turtles nest in open sandy beaches, however Leatherbacks differ from other species in their low beach fidelity. Nesting is seasonal, occurring, for example, in April-July at most North Atlantic sites and November-January in the East Pacific (P. C. H. Pritchard, *in litt.* to IUCN CMC, 2 February 1982; Treguenza, 1996). The age of sexual maturity is not known. However, in 1976 an experiment was initiated at Trengganu in which the pointed posterior tip of the carapace was excised in 11,502 hatchlings. Fourteen young females with shortened carapaces were observed on the nest beach in 1981. If the assumption is made that these females were indeed among those marked as hatchlings, and do not simply bear a natural mutilation or growth peculiarity, this could be interpreted as suggesting a minimum age at maturity of five years. (K. T. Siow, *in litt.* to IUCN CMC, 8 February 1982). Siow also noted that observations in 1982 and subsequent seasons are necessary before this preliminary indication can be regarded as established (UNEP-WCMC does not have updated information on this issue).

The nesting female emerges from the sea at night and ascends the beach mainly by simultaneous heaving with the powerful fore flippers. The actual nesting process in *Dermochelys* conforms to the stereotyped pattern shared by all sea turtles (Carr, 1982). A shallow body-pit is scooped out by movements of all four limbs, the tail may be thrust into the sand as if to appraise its suitability for nesting (Pritchard, 1971a). The nest cavity is excavated by strictly alternating thrusts of the hind limbs. After the eggs are deposited in the nest cavity, it is refilled with sand by the hind flippers, the nest area is compacted by the hind flippers and the weight of the body, and sand is distributed generally over the area by vigorous backward strokes of the fore flippers. The turtle then returns to the sea. Once egg deposition has started, the female is not readily

disturbed (Pritchard, 1971a). Each egg deposition comprises between 60 to 120 eggs (Kemf, *et al*, 2000). Mean number of fertile eggs ranges from about 66 (Playa Naranjo, Costa Rica) to 104 (Tongaland, South Africa) and typical clutch size is around 85 (Hirth, 1980). Often a variable number of small yolkless eggs are laid towards the end of egg deposition (Hirth, 1980; Pritchard, 1971a). Eggs are white, usually spherical, about 53 mm in diameter (Hirth, 1980). Mean incubation period ranges from 56 days (Trengganu) to around 65 (Suriname) (Hirth, 1980). Hatching success ranged from 63% (Trengganu) (Hirth, 1980) to 76% (Tongaland) (Pritchard, 1971a). Hatchlings are 55-63 mm in length, usually around 58 mm.

Some tagged females have been shown to re-nest on several occasions within a season, and to make nesting re-migrations in different seasons (Hirth, 1980; Pritchard, 1971a). The predominant re-nesting interval appears to be 9-10 days (Pritchard, 1971a). They may lay eggs around four to five times per season (Kemf, *et al*, 2000). In Suriname, there may be six (occasionally nine) nestings per season; and at least four in Tongaland (Pritchard, 1971a). At least some tagged females have been shown to re-migrate to nest at one (rare), two, or three year intervals (Pritchard, 1971a; Hughes, 1982b). However, since most females tagged while first nesting are never seen again, the extent to which re-migration is typical of the whole female population has been questioned (Hughes, 1982b). The available data do not appear to justify the common assumption that re-migration is characteristic of the whole population (Hughes, 1982b). Data from Trengganu indicated an annual productivity per female of 58 hatchlings (with mean clutch size of 83.5) (Hirth, 1980). Leatherbacks are notable in producing fewer but larger eggs and hatchlings in comparison with other sea turtles (except Flatback *Natator depressus*) (Hirth, 1980).

Temperature nest incubation influences the sex of hatchlings. High temperatures result in female individuals and low temperatures in male hatchlings. The pivotal temperature may differ from other sea turtle species, with Leatherbacks requiring a higher temperature for female differentiation (National Marine Fisheries Service and U.S. Fish and Wildlife Service, 1992).

2.1 Distribution (current and historical)

This is a widely distributed species. Nesting occurs on beaches of tropical seas in the Atlantic, Indian and Pacific oceans and occasionally in the subtropics and Mediterranean (Pritchard, 1980). Most sites are located between 30°N and 20°S (Groombridge, 1982). Away from the nesting site, individuals are known to move into temperate waters to feed. Major non-breeding Leatherback areas include, the New England area of north-east U.S.A., including the Gulf of Maine (Lazell, 1980); the eastern Atlantic, notably parts of the Bay of Biscay (Duron and Duron, 1980); the east Pacific between **Peru** and **Ecuador** (G. M. Hurtado, pers. comm. to M. R. Márquez in Groombridge, 1982), and the east coast of **Australia** (Cogger, 1979; Limpus and McLachlan, 1979).

The countries in which the species has been recorded as a non-nesting visitor are listed below (CMS Parties underlined). See section 2.2 for breeding distribution.

Albania: One specimen was caught in the 1960s (Haxhiu, 2002).

Algeria: Recorded (Groombridge, 1990)

Antigua and Barbuda: Listed as a Range State by CMS (2003).

Argentina: Recorded (Chebez, 1987; Richard, 1988)

Belgium: The first record was noted by van Gompel (1990) and it was subsequently recorded by Haelters and Kerckhof (1999).

Belize: Recorded (Stafford, 1998).

Cambodia: One individual was recorded in May 2001 (Stuart *et al.*, 2002).

Canada: Occurs regularly (Goff, 1988; James, 2000a and b)

Cape Verde: Recorded by UNEP/CMS (2000) and Lazar and Holcer (1998). López-Jurado *et al.* (2000) noted that there were isolated sightings by fishermen and some non-confirmed references that it nests on Boavista.

Chile: Recorded frequently in Chilean waters (Chile National Report to CMS, 2002; Brito, 1998). There is no information regarding the size of the population, but it appears to be an abundant species in Chilean seas, because it is frequently caught by fishermen (Pincheira-Donoso, 2002 in the Chile National Report to CMS, 2002).

China

Taiwan: Rarely recorded – one individual was caught in a set-net between 1991-1994 (Cheng and Chen, 1997).

Croatia: Recorded as an occasional visitor (Lazar and Tvrtkovic, 1998).

Cyprus: Several individuals have been recorded off the west coast (Demetropoulos and Hadjichristophorou, 1989).

Djibouti: Listed as a Range State by CMS (2003).

Egypt: Recorded (Frazier and Salas, 1984)

Eritrea: Listed as a Range State by CMS (2003).

France:

France: Recorded frequently (Delaugerre, 1988; Duguy, 1989; Fretey, 1996; Oliver, 1986; Thiebaut and le Milinarie, 1992)

French Polynesia: Recorded (Fretey, 1987; Fretey and Lebeau, 1985)

New Caledonia: Rarely recorded in New Caledonia (IFRECOR, 1998).

Gambia: Only one Leatherback shell has been found on the Gambian coast (UNEP/CMS, 2000).

Greece: Recorded (Margaritoulis, 1986).

Haiti: Recorded (Ottenwalder, 1996).

Iceland: Recorded (Petersen, 1984).

Iran: Recorded (Kinunen and Walczak, 1971).

Ireland: Recorded (Smiddy, 1993, 1996, 1999).

Israel: Listed as a Range State by CMS (2003). Although emergence crawls, or apparent nesting have been recorded no adequately documented instance of *Dermochelys* nesting in the Mediterranean is known (Groombridge, 1990).

Italy: Recorded by Pastorelli (1999). Although emergence crawls, or apparent nesting have been recorded no adequately documented instance of *Dermochelys* nesting in the Mediterranean is known (Groombridge, 1990).

Jordan: The first record was noted by Kinzelbach (1986) and summarised by Disi (1998).

Kenya: Recorded by Wamukoya and Haller (1996), although no indication of numbers was provided. Although occasional nesting was noted by Márquez (1990) there is no evidence of this from other sources. It is found along most areas of the Kenyan coast, with higher concentrations in the northern parts. Seasonal variations in distribution occur (Kenya National Report to CMS, 2002).

Kuwait: First recorded only very recently (Al Mohanna and Meakins, 2000).

Lebanon: Recorded (Groombridge, 1990)

Libya: Recorded (Groombridge, 1990)

Madagascar: Vagrant (Glaw and Vences, 1994).

Malaysia:

Sabah: Leatherbacks are not known to nest in Sabah, but have been occasionally sighted at sea in the area (K. Proud, *in litt.* to IUCN CMC, 12 May 1982; De Silva, 1978).

Maldives: An occasional visitor (Anon., 2003b).

Malta: Reported by Lanfranco (1983). Although emergence crawls, or apparent nesting have been recorded no adequately documented instance of *Dermochelys* nesting in the Mediterranean is known (Groombridge, 1990).

Mauritius: Listed as a Range State by CMS (2003).

Monaco: Listed as a Range State by CMS (2003).

Morocco: Recorded (UNEP/CMS, 2000). Little information is available on the presence of Leatherback turtles along the Moroccan coast, including the Western Sahara (Bons and Geniez, 1996), although two females tagged in French Guiana were found in this area (Fretey, 2001).

Namibia: Leatherback turtles are found along the entire coast of Namibia and are concentrated in West Bay (UNEP/CMS, 2000).

Netherlands:

Aruba: Listed as a Range State by CMS (2003).

New Zealand: Recorded (Gill, 1997).

Nigeria: Recorded (UNEP/CMS, 2000).

Norway: Recorded (Brongersma, 1982; Gulliksen, 1990)

Oman: Although occasional nesting was noted by Márquez (1990) there is no evidence of this from other sources.

Pakistan: One dead animal was recorded in 1988 (Firdous, 1989).

Philippines: Listed as occurring by CMS and by Kadir (2002).

Portugal

Portugal: This is a rare, though regular visitor (Portugal National Report to CMS 2002).

Azores: It is occasionally captured accidentally in the Azores where it is a regular visitor (Portugal National Report to CMS, 2002).

Madeira: It is a regular visitor (Portugal National Report to CMS, 2002).

Russian Federation: Listed as a Range State by CMS (2003).

Saudi Arabia: Listed as a Range State by CMS (2003).

Senegal It is common in central Senegal in the national park of the delta of the Saloum, and reported in the north in the national park of the Barbary coast. No precise information about the size of the population is available (Senegal National Report to CMS, 2002).

Seychelles: Although occasional nesting was noted by Márquez (1990) there is no evidence of this from other sources.

Singapore: Listed as a Range State by CMS (2003).

Slovenia: Listed as a Range State by CMS (2003).

Somalia: Although occasional nesting was noted by Márquez (1990) there is no evidence of this from other sources.

Spain:

Spain: Recorded (Pascual, 1985; Pino, 1996a and b).

Ceuta: Strandings recorded in 1980, 1982 and 1983 (Fernandez and Moreno, 1984).

Sudan: Listed as a Range State by CMS (2003).

Sweden: Recorded (Mathiasson, 1995)

Tanzania, United Republic of:

Listed as a Range State by CMS (2003). Although occasional nesting was noted by Márquez (1990), the Tanzania National Report to CMS (2002) stated that there is no nesting record in Tanzania.

Tunisia: Recorded by Hachaichi (1985) and reported as occurring regularly by Bradai and El Abed (1998).

Turkey: First recorded only very recently (Baran, 1998; Taskavak and Farkas, 1998)

United Arab Emirates: Listed as a Range State by CMS (2003).

United Kingdom:

United Kingdom: Reported by Langton (1999a and b), Morgan (1989). Many reports of its occurrence in UK waters from 1997 to 2003 are described by the British Marine Life Study Society at <http://ourworld.compuserve.com/homepages/BMLSS/turtles.htm>

British Indian Ocean Territory: Vagrant (Oldfield, 1999).

Saint Helena: A single Leatherback was recorded about 1 km off the coast of Ascension Island in December 2001 (White and George, 2002).

United States:

United States: It has been recorded from the west coast in California (Starbird *et al.*, 1993, 1995) to 60°N in Alaska (Hodge, 1979). It has also been recorded on the east coast (Lazell, 1980; Leary, 1957; Lund, 1978; Shoop and Kennedy, 1993).

American Samoa: Recorded (Grant, 1994)

Federated States of Micronesia: Occasional records (Buden and Edward, 2001).

Uruguay: Fairly often recorded as strandings or caught in marine fisheries (Fallabrino *et al.*, 2000).

Vietnam: Was recorded in the 19th century (Stuart *et al.* 2002) but little recent information. Occurrence noted by Kadir (2002).

Yemen: Although occasional nesting was noted by Márquez (1990) there is no evidence of this from other sources. It is listed as a Range State by CMS (2003).

2.2 (Current) breeding distribution

Available data on nesting areas (including probable nesting) are summarised below by country (CMS Parties underlined):

Angola: Nesting recorded (Huntley, 1972).

Anguilla: Reported as occurring by the Anguilla National Trust (2003) and as nesting by Oldfield (1999).

Australia: Nesting recorded at scattered sites in Queensland, New South Wales and the Northern Territory (Australia National Report to CMS, 2002).

Bahamas: Nesting recorded (Anon., 2001).

Bangladesh: Nesting recorded (Islam, 2002).

Barbados: Nesting recorded (Horrocks, 1987, 1992).

Benin: In Benin, this is the second most frequently observed species of marine turtle, after *Lepidochelys olivacea* (Benin National Report to CMS, 2002). Nesting has been confirmed in Benin (Dossou-Bodirenou *et al.*, 1999; Abdoulaye, pers. comm.).

Brazil: Recorded nesting in Espirito Santo (Carr *et al.*, 1982; Sternberg, 1981), Rio Grande do Sul and Santa Catarina (Soto *et al.*, 1997), and Rio de Janeiro (Barata and Fabiano, 2002).

Cameroon: Nesting remains to be confirmed on beaches in northern Cameroon in the area between Kribi and the Nigerian border (Fretey, 2001).

China Reported as nesting in the South China Sea, and occasionally as far north as the Yellow Sea (Huang 1982, Zhou 1983). Márquez (1990) noted that nesting occurred in the provinces of Kuangtung, Fukien, Chekiang, Kiangsu, Shangtung and Liaoning.

Colombia: Madaune (2002) considered Acandi and Playona beaches as the most important nesting sites for the species in Colombia. Pinzon (2000) reported that there is biannual nesting of the species in the north of the Colombian Caribbean between Gauchaca Beach and the Buritaca mouth.

Congo: The Leatherback turtle nests in the 100 km section of the South Atlantic, between Mayumba (Gabon) and Conkouati (Congo). Leatherback turtles have been observed near the beaches of Pointe-Noire and are present in the Conkouati National Park (Congo National Report to CMS, 2002).

Costa Rica: Some nesting occurs along much of the Caribbean coast of the country (Carr *et al.*, 1982). On the Caribbean coast, a moderate size Leatherback rookery is situated at Matina beach (Carr *et al.* 1982) and they have nested in the Parque Nacional Tortuguero (Campbell *et al.*, 1996), on Playa Naranjo, a 6 km beach within Santa Rosa National Park (Groombridge, 1982) and in Las Baulas National Park on the Pacific coast (Steyermark *et al.*, 1996).

Côte d'Ivoire: Nesting recorded (UNEP/CMS, 2000).

Cuba: Nests at Guantanamo Bay (Anon., 2003a) and occasionally in the Peninsula de Guanahacabibes, Cayo Blanco and Cayo Caguama (Moncada and Rodriguez, 1996).

Democratic Republic of the Congo:

Nesting has been recorded (Márquez, 1990). Past literature refers to the Leatherback in the country, and there is a museum specimen of an embryo (UNEP/CMS, 2000).

Dominica: Nesting recorded (National Marine Fisheries Service and U.S. Fish and Wildlife Service, 2001).

Dominican Republic:

Nesting recorded (Ross and Ottenwalder, 1983).

Ecuador: Nesting recorded (Green and Ortiz-Crespo, 1982).

El Salvador: Nesting probably occurs sporadically (Hasbún and Vásquez, 1999).

Equatorial Guinea:

Nesting recorded, both on the continent to the south (Mba *et al.*, 1998a, b) and on Bioko island (Tomás *et al.*, 1999). Nesting has been confirmed on the islands of Corisco Bay, but not on Annobón (Fretey, 2001).

Fiji: Nesting reported by Márquez (1990). Leatherback nestings and sightings have been recorded for Savusavu region, Qoma, Yaro passage, Vatulele and Tailevu (WWF Pacific, 2003).

France:

French Guiana: Eight beaches between the estuaries of the Maroni (Marowijne) River on the Suriname border and the Organabo River in the east provided a major nesting area for Leatherback (J. Fretey, *in litt.* to IUCN CMC, 26 May 1981; Pritchard, 1971a; Pritchard, 1979).

Guadeloupe: Nesting recorded (National Marine Fisheries Service and U.S. Fish and Wildlife Service, 2001).

Martinique: Nesting recorded (National Marine Fisheries Service and U.S. Fish and Wildlife Service, 2001).

Gabon: Gabon holds important nesting areas, from Mayumba to the border with Congo (UNEP/CMS, 2000; Billes *et al.*, 2000). *D. coriacea* frequents all of the beaches in Gabon, from the Pointe-Pongara across from Libreville all the way to the Congo (Fretey and Girardin, 1988, 1989).

Ghana: Márquez (1990) referred to minor and solitary nesting, whereas Carr and Campbell (1995) stated that nesting occurred all along the coast.

Grenada: Nesting recorded (National Marine Fisheries Service and U.S. Fish and Wildlife Service, 2001).

Guatemala: Nesting recorded on the Caribbean coast between Cabo de Tres Puntas and Rio Montagua.

Guinea: Nests and eggs have been recorded (UNEP/CMS, 2000). The Leatherback occurs widely, particularly in the north-west (Guinea National Report to CMS, 2002).

Guinea-Bissau:

Nesting recorded on the Bijagos Islands in the Orango National Park (Barbosa *et al.*, 1998).

Guyana: Nesting recorded at Shell Beach (Groombridge, 1982).

- Honduras:** Nesting recorded (National Marine Fisheries Service and U.S. Fish and Wildlife Service, 2001).
- India:** Nesting has been recorded in the Union Territory of the Andaman and Nicobar Islands (Bhaskar, 1979a; Sivasundar, 1996). Isolated Leatherbacks occasionally nest on the mainland, including part of the west coast, south to Kerala, and the central east coast (Bhaskar, 1979b; Frazier, 1982).
- Indonesia:** Recorded nesting at several sites in Indonesia including West Sumatra and Bengkulu Provinces in Sumatra, and on the north coast of the Kepala Burong (Vogelkop) part of Irian Jaya, as well as occasionally on beaches on the south coast of Java (Polunin and Nuijta, 1995; Márquez, 1990).
- Jamaica:** Nesting recorded (National Marine Fisheries Service and U.S. Fish and Wildlife Service, 2001).
- Japan:** The Leatherback Turtle was first recorded nesting in 2001 (Kamezaki *et al.*, 2002).
- Liberia:** Nesting has been reported (Márquez, 1990), however according to UNEP/CMS (2000) nesting is unconfirmed.
- Malaysia:**
- Peninsular Malaysia:** Leatherback nesting is concentrated along a 20 km beach at Rantau Aba-ngm Trengganu State on the east coast of Peninsular Malaysia (Siow and Moll, 1982).
- Sarawak:** Noted as nesting (Tisen and Bali, 2002).
- Mauritania:** Minor and solitary nesting recorded (Márquez 1990) although there is little information (UNEP/CMS, 2000). Leatherbacks have been observed several times in Lévrier Bay (UNEP/CMS, 2000) and numerous sightings at sea or on beaches in Mauritania have been made since the 1970s (Maigret, 1983). If regular nesting in Lévrier Bay is confirmed, then this would be the most northern location for the eastern Atlantic. Females, which nested in northern South America, may have visited these waters (Eckert, 1998).
- Mexico:** Reported nesting on parts of the Pacific coast of Mexico (Groombridge, 1982; Márquez *et al.*, 1981, Márquez, 1978) such as the c.1,000 km of coast from Maruata (Michoacan) south to the Isthmus of Tehuantepec (Oaxaca) (Pritchard and Clifton, 1981). Major nesting beaches were located on the south-east coast of Guerrero between Bahia Dulce and Barra de Teconapa and at Bahia de Chacahua. Other localities included Mexiquillo, Colola, Maruata and Boca de Apiza in Michoacan; Mismaloya in Jalisco; Cuyutlan in Colima; Petacalo and Piedra de Tlacoyunque in Guerrero; La Escobilla and Bahia Blanca in Oaxaca. A secondary nesting beach was discovered on the south-west coast of Baja California (Márquez *et al.*, 1981).
- Mozambique:** Nesting recorded (Frazier, 1982).
- Myanmar:** One nesting attempt reported (Maxwell, 1911) but no recent data are available.
- Netherlands:**
- Aruba:** It possibly nests in Aruba (Anon., 1995).
- Netherlands Antilles:** There is evidence of occasional nesting on Bonaire and St Maarten (Sybesma, 1992)
- Nicaragua:** Nesting recorded (National Marine Fisheries Service and U.S. Fish and Wildlife Service, 2001).
- Panama:** Low density nesting probably occurs sporadically on the Pacific coast (Cornelius, 1982; Meylan, 1985). In 1979 two important nesting localities were discovered on the Caribbean coast, at Playa Chiriqui and Playa Changuinola; in addition, a site was already known at Bahia Aglatomate, in the San Blas Islands (Carr *et al.*, 1982).
- Papua New Guinea:**
- Leatherbacks have nested on many parts of the north coast and on some of the larger islands, including sites in West and East Sepik Provinces, Madang, and Milne Bay Province, and on Manus Island, New Britain, New Ireland and others (Spring, 1982).

Peru: The Leatherback Turtle possibly nests in Peru (Pritchard, 1971a). According to Márquez (1990) scattered nesting occurs. However, the distribution of *D. coriacea* is still unknown in Peru (Peru National Report to CMS, 2002).

Saint Kitts and Nevis:

Nesting recorded (Groombridge, 1982).

Saint Lucia: Nesting recorded (National Marine Fisheries Service and U.S. Fish and Wildlife Service, 2001).

Sao Tomé and Príncipe:

Nesting sites have been recorded on Sao Tome (Graff, 1996) and Principe (UNEP/CMS, 2000; Rosseel in Fretey, 1998). Three juvenile Leatherbacks were accidentally captured on the island of Principe in March (Fretey, 2001).

Sierra Leone: Although there have been no sightings of the species on the continent in Sierra Leone, a small nesting zone has been confirmed on the island of Sherbro (Fretey and Malaussena, 1991).

Solomon Islands:

Leatherbacks have nested on several islands of the group; the most important areas are on Choiseul and New Georgia, and Ysabel (Vaughan, 1981).

South Africa: Nesting recorded along the Kwa Zulu coast (Tongaland) of Natal (Frazier, 1982; Hughes, 1982a).

Spain:

Canary Islands: Sightings of the species in Macaronesia are rare, except perhaps in the Canary Islands where the bodies of turtles caught accidentally in industrial fishing nets wash up on the shore (Brongersma, 1968; Fretey, 2001). There are data of breeding in the eastern Canary Islands.

Sri Lanka: Leatherbacks nest mainly in the south-east on the Yala coast (Frazier, 1982). Widespread nesting was recorded in the south in 1997-1998 (Amarasooriya, 2001; Amarasooriya and Jayathilaka, 2002). The species was noted as nesting on the beaches of Induruwa, Kosgoda, Mavela, Usangoda, Ambalantota, Bundala and Yala (Mutukumara, 1998).

Suriname: Nesting occurs in the Galibi Reserve on the Suriname side of the Marowijne estuary, and further west in the Bigisanti area (Matapica and Krofajapasi beaches) east of Paramaribo (Groombridge, 1982).

Thailand: The Leatherback Turtle is found in the waters of peninsular Thailand. It breeds on the airport beach in Changwat Phuket, in the Laem Phan Wa marine reserve in Phuket, and in coastal Changwan Phangnga (Bain and Humphrey, 1980).

Togo: Nesting recorded (Márquez, 1990).

Trinidad and Tobago:

Some Leatherback nesting has been recorded on both islands, mainly on the north and east coasts of Trinidad (Bacon, 1970; Carr *et al.*, 1982; Chu Cheong, 1990; Ross, 1982a; Sternberg, 1981).

United Kingdom:

Anguilla: Nesting has been recorded from the main island and Scrub Island (Oldfield, 1999)

British Virgin Islands: Nesting recorded (Eckert *et al.*, 1992).

Cayman Islands: Nesting was recorded during a survey between 1971 and 1991 (Wood and Wood, 1994) but none was found in 1998 and 1999 (Aiken *et al.*, 2001).

Montserrat: Nesting has been recorded rarely (Oldfield, 1999).

Saint Vincent and the Grenadines: Occasional to sporadic nesting occurs (National Marine Fisheries Service and U.S. Fish and Wildlife Service, 2001).

United States

United States: On the Atlantic coast small scale nesting is recorded from Georgia (Pete and Winn, 1998a and b; Richardson and Richardson; 1995; Frick *et al.*, 2002), and Florida (mainly in Martin and Palm Beach counties) (Lund, 1978), with isolated records from North Carolina (Anon., 1980; Rabon *et al.*, 2003). There are no nesting sites in the US continental Pacific coast, according to the action plan produced by the National Marine Fisheries Service and US Fish and Wildlife Service (1998); however, it seems that there are important feeding areas there.

Puerto Rico: Nesting recorded on islands adjacent to Puerto Rico, including Culebra, Mona and Vieques (Carr *et al.*, 1982).

U.S. Virgin Islands: Recorded as nesting at Sandy Point on St Croix (Anon., 1981a).

Vanuatu: Nesting reported by Márquez (1990).

Venezuela:

Nesting recorded (National Marine Fisheries Service and U.S. Fish and Wildlife Service, 2001), particularly on the Paria Peninsula (Hedelvy *et al.*, 2000).

2.3 Habitat

The Leatherback is ecologically unique among sea turtles in its truly pelagic mode of life, although sharing with all sea turtles the necessity to nest on land.

The diet of *Dermochelys* is also unique among sea turtles; it consists almost entirely of jellyfish (Scyphozoa) including *Cyanea capillata*, *Rhizostoma cuvieri*, *R. pulmo* and Cabbage Head Jellyfish *Stomolophus meleagris* (Brongersma, 1969; James, 2001), *Catostylus mosaicus* and the Portuguese Man o' War *Physalia utriculus* (Hydrozoa) (Cogger, 1979), and also planktonic tunicates such as *Salpa*, *Pyrosoma* (Thaliacea) and ascidians. Other items found in the gut of Leatherbacks are mainly animals such as amphipods or fishes that live associated with the primary prey (Brongersma, 1969; G. H. Balazs, *in litt.* to IUCN CMC, 20 February 1982). Possibly linked with this diet are the pair of short pointed projections at the tip of the upper jaw, and the pointed posteriorly-directed papillae scattered over the lining of the mouth and oesophagus (restricted to the latter site in other sea turtles); both structures may aid in ingestion of gelatinous prey items. However, it appears that feeding Leatherbacks may often not differentiate between jellyfish and floating plastic debris. Nearly 50% of non-breeding Leatherbacks examined had plastic (e.g. bags) or cellophane in the stomach. This may contribute to mortality (Mrosovsky, 1981a).

In general, it appears that most *Dermochelys* nesting occurs on relatively undisturbed beaches, with a stable beach platform, deep water approaches extending close to the shoreline, and heavy surf (Pritchard, 1971a). Such conditions were found at the major Trengganu rookery (Hendrickson and Balasingam, 1966), in the Guianas (Schulz, 1975), and similarly on the best of the Dominican Republic and Mexican nesting beaches (Márquez *et al.*, 1981). Of 22 nest beaches in the Solomon Islands, all were near river mouths and all had deepwater approaches (Vaughan, 1981). Leatherbacks almost never nest on beaches with a fringing reef (Pritchard, 1971a). The presence of deep water close inshore may ease the approach of this mainly pelagic species to the beach.

Eggs and hatchlings are taken by ghost crabs *Ocypode* (although the relatively deep nest reduces egg loss), pigs and monitor lizards (where present); hatchlings are eaten by crabs, occasionally birds, small mammals, and sharks (Pritchard, 1971a; R. Petocz, *in litt.* to IUCN CMC, 9 February 1982). Adults may fall prey to sharks, or to large felids while nesting (Pritchard, 1971a). A significant proportion of nests is laid below the high tide mark and thus lost to flooding (Pritchard, 1971a). Much mortality has been caused among nesting females in French Guiana by the turtles becoming entangled in masses of dead mangrove roots found along many beaches (Fretey and Lescure, 1979).

2.4 Population estimates and trends (breeding)

Population estimates for sea turtles can only be based on an estimate of the total number of mature nesting females. Nesting females, or rather their nests or nesting tracks, can be counted more readily than other classes (although still with considerable difficulty). In contrast, males do not leave the water and are rarely identified at sea and are thus impossible to count. Immature animals are similarly impossible to count at sea. The nesting track of Leatherbacks is distinctive in that it is usually wider than that of other sea turtles, often

sinuous and with a distinct orientation circle; this aids in estimation of nesting density, particularly from the air (Groombridge, 1982).

The Leatherback turtle was widely considered to be on the brink of extinction in the mid 20th century. However, surveys in 1971 estimated the minimum world population of breeding females to be around 29,000 (Pritchard, 1971a), with a maximum of 40,000 allowing for undiscovered or uninvestigated nest beaches.

Surveys carried out in the 1970s confirmed and extended earlier reports (Márquez *et al.*, 1981; Márquez, 1978) of major nesting along the Pacific coast of Mexico in Michoacan, Guerrero and Oaxaca (Pritchard and Clifton, 1981). On one 40 km beach at Tierra Colorada it was estimated that 500 turtles nested each night of the season (Penaflares, pers. comm. cited in Pritchard and Clifton, 1981) from October to January (Márquez *et al.*, 1981; Márquez, 1978). This was conservatively estimated at about one third of the nightly nesting in the entire Michoacan-Guerrero-Oaxaca area; allowing for other nest beaches in the area, and re-nesting of each turtle after about 10 days; this led to an estimate of the total number nesting per season of 30,000. Multiplying by 2.5 to allow for a two or three year nesting cycle, the total breeding female population using this tri-state area was estimated to be around 75,000 (Pritchard and Clifton, 1981). This figure alone more than doubled the previous minimum world estimate of 29,000 and, after allowing for nesting in non- or partly surveyed areas of Mexico and Melanesia, an estimate of 104,000 was given for the world total of breeding female Leatherbacks (Pritchard and Clifton, 1981). Even this may have been a significant underestimate since an aerial survey along the north coast of the Kepala Burung (Vogelkop) region of Irian Jaya, Indonesia disclosed one 30 km stretch of beach with evidence of around 3,500 sea turtle nests, many of which were considered to be Leatherback nests (R. Petocz, *in litt.* to IUCN CMC, 6 October 1981; Salm, 1981).

In the early 1980s, although the total population of Leatherbacks was found to be much larger than had previously been thought, and no evidence for an overall decline in the species was found, breeding populations were mostly of relatively small size (with only a few hundred, or fewer, females nesting annually), were widely scattered through the tropics, and were often subject to heavy exploitation for food (Pritchard and Clifton, 1981; Ross, 1982a). Perhaps half a dozen sites appeared to hold a few hundred females per year, and many held only a few individuals.

Leatherback populations in the Pacific and Indian Oceans underwent dramatic declines from the 1970s onwards (Spotila *et al.*, 1996). For example, there was a calamitous collapse of the colony at Trengganu, **Peninsular Malaysia**, from more than 3,000 females in 1968, to 20 in 1993, and just two in 1995. Similar scenarios occurred elsewhere in **Indonesia**, **Sri Lanka**, **Thailand** and **Mexico**. Numbers recorded at the four major Pacific rookeries declined to about 250 in **Mexico**, 117 in **Costa Rica**, two in **Malaysia** and fewer than 550 in **Indonesia**. The Pacific population may have then contained as few as 2,300 adult females, making Pacific Leatherbacks the world's most endangered sea turtle. However, not all *D. coriacea* populations exhibited declines: in **South Africa**, three decades of strong protection increased the small annual nesting population more than fourfold, and it was thought that this may be representative of a larger population in **Mozambique**. There were also significant increases in nesting in **Trinidad**, **Guyana**, **Suriname** and St. Croix, **US Virgin Islands**. But, globally, declines in Leatherback numbers were precipitous. In 1982, the world population was estimated to be 115,000 adult females, and endangered. By 1994 this had been revised down to about 34,000. Between 1996 and 2000, numbers of female Leatherbacks in the eastern Pacific population dropped from 4,638 to 1,690 (Spotila *et al.*, 2000). Pritchard (1996) disputed some of the conclusions arrived at by Spotila *et al.* (1996), noting that the Leatherback was a vigorous and dynamic species able to show quite rapid response to protection. Nevertheless, the Leatherback was reclassified as Critically Endangered in 2000 (IUCN, 2002). Demographic models, based on these population estimates and available data on the mortality of different life stages, age at sexual maturity, and fecundity, have been used to predict the fate of Leatherbacks under different levels of human exploitation. The conclusion is that populations of *D. coriacea* in the Indian and Pacific Oceans cannot tolerate even moderate levels of adult mortality, and are now facing imminent extinction (Reina *et al.*, 2002b). The Malaysian population, which collapsed ten years ago, still shows no sign of recovery. Even the larger Atlantic populations are being killed as bycatch at unsustainable rates. Global extinction is only a matter of time unless adult mortality can be reduced and survival of eggs and hatchlings increased (WCMC and WWF International, 2001).

Regional population estimates for nesting adult Leatherback turtles

Region	Estimated number of nesting females	Low estimate	High estimate
Western Atlantic ¹	18,800	13,300	24,300
Caribbean ¹	4,021	3,592	4,450
Eastern Atlantic ¹	4,787	3,190	6,383
Indian Ocean ¹	445	445	445
Western Pacific ¹	1,838	1,775	1,900
Eastern Pacific ²	1,690	1,690	1,690

(¹ data taken from: Spotila *et al.*, 1996; ² data taken from Spotila *et al.*, 2000)

It must be recognised that estimates of this kind are based on several unproven assumptions (Pritchard and Clifton, 1981), notably about re-nesting and re-migration frequency. Some individual Leatherbacks have been shown to re-nest between four and seven times during a season, and similarly, some have been shown to re-migrate at two or three year intervals (Hirth, 1980; Pritchard, 1971a; Pritchard and Clifton, 1981). These figures are used as the basis for extrapolating from numbers nesting per night, or per season, to an estimate of the total breeding female population. It should be stressed that there were no data to indicate how typical these re-nesting and re-migrating intervals are for the female population as a whole (G. R. Hughes, *in litt.* to IUCN CMC, 22 February 1982; J. P. Ross, *in litt.* to IUCN CMC, 20 February 1982). It cannot be assumed that re-migration occurs in the entire female population. For example, in the Tongaland population, some marked females have re-migrated after a one (rare), two or three year interval; occasional females have even returned in four and five different years. However, 70% of the 321 nesting females tagged have never been seen again (Pritchard, 1980). If a similar proportion of single-season breeders occurs in other populations, then estimates of total mature female numbers – derived by multiplying the number of females nesting in one season by a factor expressing assumed multiple breeding – will be excessively high.

Recently, there have been only four major Leatherback nesting areas where over 1,000 females have been recorded nesting annually: the Pacific coast of **Mexico**, **French Guiana** (with a population that is apparently partly shared with **Suriname**), Trengganu (**Peninsular Malaysia**) (which has experienced huge declines), and the Kepala Burung (Vogelkop) region of Irian Jaya, **Indonesia**. A nesting population on the coast of **Gabon** would appear to be a fifth nesting population of global significance.

Mexico:

Leatherbacks have been reported to nest in good numbers on parts of the Pacific coast (Márquez *et al.*, 1981; Márquez, 1978). Mexico had c.30,000 females annually, and a total female population of between 50,000 (M. R. Márquez, *in litt.* to IUCN CMC, 26 February 1982) and 75,000 (Pritchard and Clifton, 1981). This latter figure was more than twice the estimate for the previous world population. Extensive aerial surveys on 31st October and 1st November, 1980, along approximately 1,000 km of coast from Maruata (Michoacan) south to the Isthmus of Tehuantepec (Oaxaca) revealed significant to high density Leatherback nesting along much of the coast. Hundreds of kilometres of Leatherback nesting beaches were surveyed on which nesting density was about one nest per 50 m at maximum (Pritchard and Clifton, 1981). Major nesting beaches were located on the south-east coast of Guerrero between Bahia Dulce and Barra de Teconapa (an estimate of 5,000 females nesting per season) and at Bahia de Chacahua. Other localities included Mexiquillo, Colola, Maruata and Boca de Apiza in Michoacan; Mismaloya in Jalisco; Cuyutlan in Colima; Petacalo and Piedra de Tlacoyunque in Guerrero; La Escobilla and Bahia Blanca in Oaxaca. A secondary nesting beach was discovered on the south-west coast of Baja California (Márquez *et al.*, 1981). Sarti *et al.* (1996, 1998) estimated that fewer than 1,000 females nested on the Pacific coast during the 1995-1996 nesting season, based on counts of 5,222 nests and an average annual frequency of 5.3 nests per female. Kempf *et al.* (2000) report that the number of females reported as nesting on the Pacific beaches of Mexico has declined tenfold in less than a decade.

French Guiana:

About c 4,500-6,500 nesting females have been recorded annually, although this number only represents a fraction of the total population as not all females breed in every season (Fretey and Lescure, 1979). This

population is apparently partly shared with Suriname. The annual number of nesting females was estimated at 15,000 in 1971 (Pritchard, 1971a). This very large population was thought to be by far the most important Leatherback nest area in the world prior to the discovery of major nesting in Pacific Mexico. Due to marine action, the major Organabo beach moved westwards during the 1970s, and by 1979 was reduced to a sandspit washed over at high tide. Nesting may have decreased to some extent during this period (Schulz, 1979). However, at least some of the French Guiana Leatherbacks have shifted their nest sites westward toward the Suriname border, and most nesting subsequently occurred at Les Hattes – Awara (at the junction of the Maroni and Mana Rivers), with some nesting occurring on beaches that did not exist in 1960-1970 (Fretey and Lescure, 1979; P. C. H. Pritchard, *in litt.* to IUCN CMC, 2 February 1982). The 1979 population was of approximately the same size as that reported in 1971, with an estimated total mature female population of 19,596, or 16,330, or 13,996 (the estimates vary according to whether a given female nests 5, 6 or 7 times a season) (J. Fretey, *in litt.* to IUCN CMC, 26 May 1981; Fretey and Lescure, 1979). Only a fraction of the total population will nest in a given year (P. C. H. Pritchard, *in litt.* to IUCN CMC, 2 February 1982); between 4,500-6,500 females in a season (Fretey and Lescure, 1979). It was reported (Schulz, 1979) that the nest sites were so crowded that a considerable number of nests were destroyed by later-nesting females, also there was massive disturbance of nesting turtles since cars could be driven right onto the beach (Schulz, 1979) (more accessible than the old Organabo sites (P. C. H. Pritchard, *in litt.* to IUCN CMC, 2 February 1982). Girondot and Fretey (1996) summarised the nesting records for the period 1978-1995. More than 50,000 nestings were recorded annually in 1988 and 1992, but only 10,000 to 15,000 annually in 1978-1986, 1993, and 1995, with intermediate numbers of 20,000 to 30,000 annually in 1987, 1989, 1991 and 1994. In 1998, 7,800 nestings were counted on the Hattes beach (Talvy *et al.*, 2002). Girondot *et al.* (2002) examined density-dependent nest destruction of Leatherbacks in French Guiana and Suriname. They found that the proportion of successful nests was very low (10%) on the Yalimapo-Awala (= Hattes) beach, compared with Costa Rica (57%), Puerto Rico (75%) and the US Virgin Islands (67%), but the reasons for this were not clear.

Suriname:

Nesting has been reported in the Galibi Reserve on the Suriname side of the Marowijne estuary, and further west in the Bigisanti area (Matapica and Krofajapasi beaches) east of Paramaribo (Groombridge, 1982). The total number of nests, probably representing virtually all Leatherback nesting in Suriname, rose fairly steadily from 95 in 1964 to 1,625 in 1975 (Schulz, 1975) and to 3,900 in 1979 (Schulz, 1982). This rise in numbers was thought to be due at least in part to nesting females shifting from the French Guiana sites (Schulz, 1982). Assuming a two-year nesting cycle and three nests per female each year, about 650 females nested in 1975 at Bigisanti and 200 at Galibi (Schulz, 1975). In 1999, 4,200 nests were counted and it was estimated that the total number was over 10,000 (Hilterman *et al.*, 2002). Estimates from the Galibi National Park population indicated 1,635 in 1970, which increased to 8,812 in 1980 and the last report from 1985 stated that there were 12,401 individuals.

Peninsular Malaysia:

Leatherback nesting was noted as concentrated along a 20 km beach at Rantau Abang Trengganu State on the east coast, where c.1,500 females nested annually. However, this population was found to be declining (Siow and Moll, 1982). The yield of *Dermochelys* eggs in Trengganu declined by 66% from 1956 to 1982 (because the number of eggs collected was not the same as the number laid, and because of different sampling techniques, this figure can only be an approximation of population decline). Between 1,000-2,000 females nested annually (1974 data quoted in Ross, 1982a). By 1995 the population was severely depleted, with nestings representing less than 1% of levels recorded in the 1950s (Chan and Liew, 1995, 1996). In 2002 no eggs were laid although three landings were detected (Anon., 2003d).

Indonesia:

Leatherbacks have been recorded as nesting at several sites, including West Sumatra and Bengkulu Provinces in Sumatra, and on the north coast of the Kepala Burong (Vogelkop) part of Irian Jaya, as well as occasionally on beaches on the south coast of Java (Polunin and Nuijta, 1995; Márquez, 1990). The major nest site reported was on the northern coast of the Kepala Burong (Vogelkop) region of Irian Jaya (R. V. Salm, *in litt.* to IUCN CMC, 1 October 1981; Salm, 1981). In addition, about one female a year might have nested on Citerem and Cibuniaga Beaches in south-east Java, less than five a year nest in south-east Sulawesi, less than 20 on Sukamade Beach in south-east Java and at Inggresau (on P. Yapen, Irian Jaya), with possibly similar numbers at several sites near Bengkulu in west Sumatra (R. V. Salm, *in litt.* to IUCN CMC, 27 January 1982). Some nesting was recorded at the northern tip of P. Morotai (near Halmahera)

(Groombridge, 1982). At Sukamade Beach in south-east Java (regarded as the most important sea turtle nesting area in Java (Blouch *et al.*, 1981) 16 nests were recorded between June-August 1980, after an absence of four years, and 21 nests were found in 1981 (Anon., 1982a). Suárez *et al.* (2000) reported that there were 3,000-5,000 nests annually along the north Vogelkop coast of Irian Jaya, and Putrawidjaja (2000) reported a total of 2,983 nestings on Jamursba-Medi beach in 1999.

Gabon:

During the 1999/2000 nesting season, monitoring of a site stretching between Mayumba and the border resulted in the counting of nearly 30,000 nests, representing the coming to shore of between 4,222 and 7,096 females (Billes *et al.*, 2000). These new data place Gabon and the Conkouati region in a position of primary importance, along with French Guiana, for the worldwide conservation of *D. coriacea* (Fretey, 2001).

Leatherback population estimates and trends in other countries in which the species has been recorded nesting are described below:

Angola:

At least 30 Leatherback nests were reported on one beach in the Parque Nacional da Quicama in December 1971 (Huntley, 1972).

Australia:

Only one or two females were recorded nesting annually along 100 km of Queensland coast from Mon Repos beach at Bundaberg north to Round Hill Head (Limpus, 1982, 1984, 1994a; Limpus and McLachlan, 1979). Leatherbacks were also recorded as nesting in northern New South Wales by Tarvey (1993). While a small number of females nest in scattered sites in Queensland, New South Wales and the Northern Territory, there have only been a small number of sightings off the mid-west coast of Australia, and very rarely there have been sightings off Victoria and Tasmania (Australia National Report to CMS, 2002).

Bahamas:

Small numbers nest (Anon., 2001).

Bangladesh:

One confirmed nest was observed in Shill Banyar Gula in May 2001 (Islam, 2002).

Barbados:

Only a few nestings recorded each year (Horrocks, 1987, 1992).

Cameroon:

Leatherbacks used to nest in Cameroon in greater numbers according to local sources (Fretey, 1999).

China:

The Leatherback Turtle is listed as Critically Endangered in the Chinese Red Data Book and as Category II in the State Protected Wildlife (Zoological Division of Chinese Biodiversity Information Center, 2001).

Colombia:

About 100 (Ross, 1982a) or 200-250 (Anon., 1981a) females were reported as nesting annually along the Gulf of Uraba, but in 1997 a survey in the Caribbean found only 8 nesting Leatherbacks (Amorocho *et al.*, 1999).

Congo:

An average of 1,000 Leatherbacks nests have been found each year (UNEP/CMS, 2000).

Costa Rica:

On the Caribbean coast, a moderate size Leatherback rookery, comprising around 500 females per year, was reported from Matina beach and some nesting was reported along much of the Caribbean coast of the country (Carr *et al.*, 1982). In the Parque Nacional Tortuguero on the Caribbean coast an estimated 150-368 females nested in 1990-1991 (Leslie *et al.*, 1996), and monitoring in 1995 showed that Leatherbacks deposited an estimated 70 clutches along 35 km of beach; however, comparison with previous studies indicated a probable

decline in numbers (Campbell *et al.*, 1996). S. E. Cornelius (*in litt.* to IUCN CMC, 31 December 1981) indicated that several beaches along the Pacific coast had many Leatherbacks nesting. The species appeared to have undergone an increase in abundance on Playa Naranjo, a 6 km beach within Santa Rosa National Park. During September-November 1971, 18 females were tagged and 106 nesting emergences were recorded over 50 days. In November 1981, during only two nights, 22 and 10 females were tagged in 8.5 and 2.0 hours, respectively. During the first night 44 Leatherbacks emerged and tracks of 118 that had emerged over the previous 3-4 nights were counted. The apparent increase in Leatherback nesting occurred in parallel with a decrease in nesting by Green Turtle *Chelonia mydas* (S. E. Cornelius, *in litt.* to IUCN CMC, 31 December 1981). In 1989-1990, 466 tracks of this species were registered, in 1990-1991 there were 1,212 tracks, and in a short period in 1993-1994 there were 152 tracks (Araúz-Almengor and Morera-Avila, 1994). In Las Baulas National Park on the Pacific coast numbers nesting at Playa Grande reached a peak of 1,600 in 1988 and 1989 but declined to 469 in 1994-1995, perhaps due to the recent increase in development in the area surrounding nesting beaches, as well as incidental catch of Leatherbacks in offshore fisheries (Steyermark *et al.*, 1996). In 1991-1992 a total of 229 Leatherbacks were tagged at the nearby Playa Langosta beach (Chaves *et al.*, 1996).

Democratic Republic of the Congo:

Minor and solitary nesting has been recorded (Márquez, 1990).

Dominica:

Occasional to sporadic nesting recorded (National Marine Fisheries Service and U.S. Fish and Wildlife Service, 2001).

Dominican Republic:

Although reported uncommon by local informants, the species was thought to nest occasionally in very low densities on suitable beaches anywhere in the Republic, but four areas of more concentrated Leatherback nesting were identified on information from locals: Playa del Muerto, Playa Macao (both in Altigracia Province), Playa San Luis and Playa des Aguilas (Pedernales Prov.). Based on interviews with local informants, and assuming that each turtle nests three times during a 60 day season, it was tentatively estimated that 300 *Dermochelys* nested annually in the Dominican Republic (Ross and Ottenwalder, 1983). An estimate of 500 nests per year was given by Márquez (1990).

Ecuador:

Recorded nesting in small numbers along most of the mainland coast (Green and Ortiz-Crespo, 1982).

El Salvador:

Low density nesting probably occurs sporadically (Hasbún and Vásquez, 1999).

Equatorial Guinea:

The species nests regularly and in significant numbers in Equatorial Guinea, both on the continent (Mba *et al.*, 1998a, b) and on Bioko island (Tomás *et al.*, 1999).

Fiji:

The number of Leatherbacks is likely to be around 20-30 individuals (WWF Pacific, 2003). According to WWF Pacific (2003) this species is not common in Fiji but there have been recorded sightings and four nesting attempts in Fiji. Although the numbers are low in Fiji, the significance of the population is likely to be high, due to the very low numbers in the region. It has been suggested that most Leatherbacks are merely passing through Fiji on westerly moving ocean currents, and may represent the remains of a relic population.

France:

Guadeloupe: Occasional to sporadic nesting occurs (National Marine Fisheries Service and U.S. Fish and Wildlife Service, 2001).

Martinique: Occasional to sporadic nesting occurs (National Marine Fisheries Service and U.S. Fish and Wildlife Service, 2001).

Grenada:

Occasional to sporadic nesting occurs (National Marine Fisheries Service and U.S. Fish and Wildlife Service, 2001).

Guatemala:

Sparse or occasional nesting has been recorded on the Caribbean coast between Cabo de Tres Puntas and Rio Montagua.

Guinea-Bissau:

Leatherback turtles seemed to be very rare in the Orango National Park on the Bijagos Islands and only a few individuals/nests were recorded during two years of surveying (Barbosa *et al.*, 1998). An estimated 10 or so Leatherbacks were reported as nesting in the Bijagos Islands (UNEP/CMS, 2000).

Guyana:

Small numbers were found nesting at Shell Beach (Groombridge, 1982) although, according to Márquez (1990), up to 500 nests per year have been recorded.

Honduras:

Occasional to sporadic nesting occurs (National Marine Fisheries Service and U.S. Fish and Wildlife Service, 2001).

India:

Moderate-scale nesting has been recorded in the Union Territory of the Andaman and Nicobar Islands (Bhaskar, 1979a; Sivasundar, 1996). In April 1979 about 80 Leatherback excavations were found on Great Nicobar Island and about 70 in January 1979 on Little Andaman (Bhaskar, 1979a). Isolated Leatherbacks occasionally nested on the mainland, including part of the west coast, south to Kerala, and the central east coast (Bhaskar, 1979b; Frazier, 1982). Mainland nesting reportedly occurred more frequently around the turn of the century, for example around Quilon in southern Kerala (Bhaskar, 1979b). Granite blocks and embankments, designed as defences against sea erosion, prevent turtles approaching beaches on much of the Kerala coast (Anon., 1981b). *Dermochelys* has been recorded nesting in small numbers in Lakshadweep (Bhaskar, 1979b).

Jamaica:

Occasional to sporadic nesting occurs (National Marine Fisheries Service and U.S. Fish and Wildlife Service, 2001).

Liberia:

Minor and solitary nesting has been recorded (Márquez, 1990) although UNEP/CMS (2000) reported that nesting remained to be confirmed.

Mozambique:

Fewer than 50 Leatherbacks were thought to nest annually (Frazier, 1982).

Myanmar:

Leatherbacks are very rare; a female attempted to nest near the mouth of the Ye River in Tenasserim in 1862, and the species was apparently familiar to inhabitants of the Arakan coast at the turn of the century (Maxwell, 1911).

Nicaragua:

Occasional to sporadic nesting occurs (National Marine Fisheries Service and U.S. Fish and Wildlife Service, 2001).

Panama:

Low density nesting has probably occurred sporadically on the Pacific coast (Cornelius, 1982; Meylan, 1985). In 1979 two important nesting localities were discovered on the Caribbean coast, at Playa Chiriqui and Playa Changuinola; in addition, a site was already known at Bahia Aglatomate, in the San Blas Islands (Carr *et al.*, 1982). Ordoñez *et al.* (2002) recorded 735 Leatherback tracks on Chiriqui Beach, Bocas del Toro province in 1999.

Papua New Guinea:

Leatherbacks have nested regularly, but in small numbers, on many parts of the north coast and on some of the larger islands, including sites in West and East Sepik Provinces, Madang, and Milne Bay Province, and

on Manus Island, New Britain, New Ireland and others. Although sea turtle populations in general were reported to be slowly declining in most areas of P.N.G., there appear to be no specific data on Leatherbacks (Spring, 1982). In 1989 a minimum of 76 clutches were laid on a beach near Piguwa (Hirth *et al.*, 1993).

Saint Kitts and Nevis:

Small-scale nesting has been reported (Groombridge, 1982), with 120 nesting events (crawls and pits) recorded in 1999 (Butler, 2002).

Saint Lucia:

Occasional to sporadic nesting occurs (National Marine Fisheries Service and U.S. Fish and Wildlife Service, 2001).

Solomon Islands:

Leatherbacks have nested on several islands of the group; the most important areas are on Choiseul and New Georgia, each with 50-100 nests annually, and Ysabel, with over 100 nests (Vaughan, 1981).

South Africa:

Medium density nesting has been reported, notably along the Kwa Zulu coast (Tongaland) of Natal (Frazier, 1982; Hughes, 1982a). Numbers of nesting females increased from five in 1966 to 70 in 1977/78 (Hughes, 1982a). Further increases to over 100 per season were observed in 1995 (Hughes, 1996).

Sri Lanka:

Historically, Sri Lanka was the major breeding ground for the Leatherback in the Indian Ocean (Deraniyagala, 1953). More recently they have been reported as nesting mainly in the south-east on the Yala coast, with probably less than 100 females nesting annually (Frazier, 1982). The population was reported to be declining (T. W. Hoffmann, *in litt.* to IUCN CMC, 5 March 1981). Widespread nesting was recorded in the south in 1997-1998 (Amarasooriya, 2001; Amarasooriya and Jayathilaka, 2002). The species was noted in 1998 as nesting on the beaches of Induruwa, Kosgoda, Mavela, Usangoda, Ambalantota, Bundala and Yala (Mutukumara, 1998).

Thailand:

It was found in waters of peninsular Thailand, and breeds on the airport beach in Changwat Phuket, in the Laem Phan Wa marine reserve in Phuket, and in coastal Changwan Phangnga (Bain and Humphrey, 1980). In 1992-1993 at least 28 nests were recorded on the Phuket and Phangnga coastline (Settle, 1995). In 1997-1998 a survey found nine nests at Phra Thong island in the south (Aureggi *et al.*, 1999). The Andaman Sea population was decimated by near-total, long-term egg harvest (Limpus, 1995).

Togo:

Minor and solitary nesting recorded (Márquez, 1990) and neonates have been recorded (UNEP/CMS 2000). In addition, there are three Leatherback eggs in a museum collection, but no recent data on this species exist (UNEP/CMS, 2000).

Trinidad and Tobago:

Some Leatherback nesting has been recorded, mainly on the north and east coasts of Trinidad, where the nesting population was estimated at 400-500 females in 1971 (Bacon, 1970; Carr *et al.*, 1982; Chu Cheong, 1990; Ross, 1982a; Sternberg, 1981). There may be 1,000 nests per year (Márquez, 1990). In 1991 a minimum of 300 nests were laid in Trinidad and at least 50 nests in Tobago (Godley *et al.*, 1993).

United Kingdom:

Anguilla: Nesting has been recorded from the main island and Scrub Island but in 1999 its status was unknown (Oldfield, 1999).

British Virgin Islands: Declines in the numbers nesting were reported from 1987 to 1989 (Cambers and Lima, 1990). Only small numbers were nesting in the early 1990s, with fewer than 10 per year on Tortola (Cambers and Lima, 1990; Eckert *et al.*, 1992) This species only nests between late March and June and the annual nesting population consists of approximately 10-15 individuals with 39 nests in 1998, 33 nests in 1999 and 63 nests in 2000 (UK National Report to CMS, 2002). In 2001 the figure increased to an all time high of 63 verified nesting activities (Hastings, 2003).

Saint Vincent and the Grenadines: Occasional to sporadic nesting has been reported (National Marine Fisheries Service and U.S. Fish and Wildlife Service, 2001).

United States:

USA: According to the National Marine Fisheries Service and US Fish and Wildlife Service (1992) nesting trends appeared to be stable, but populations faced significant threats in the marine environments; it reported its main nesting occurrence was in south-western Florida. Bagley *et al.* (1998) reported finding 12 nests in the Archie Carr National Wildlife Refuge, Florida in 1996. Calleson *et al.* (1998) recorded the species nesting in north-west Florida.

Puerto Rico: Small to moderate numbers of Leatherbacks have nested on islands adjacent to Puerto Rico, including Culebra, Mona and Vieques (Carr *et al.*, 1982). A study in 1981 recorded 26 Leatherback nests during the entire season on Vieques (P. C. H. Pritchard, *in litt.* to IUCN CMC, 2 February 1982).

US Virgin Islands: Annual emigration rates averaged 34.1% and the migration interval was 2 years according to Boulon *et al.* (1996). Fifty to 70 Leatherbacks were recorded as nesting at Sandy Point on St Croix (Anon., 1981a).

Venezuela:

Occasional to sporadic nesting reported (National Marine Fisheries Service and U.S. Fish and Wildlife Service, 2001). The most important nesting beaches are on the Paria Peninsula (Hedelvy *et al.*, 2000) and in 2000 a total of 37 gravid females were tagged (Guada *et al.*, 2002).

No further information, other than that in the Distribution section 2.2, is available on the population status, estimates and trends in **Benin, Brazil, Côte d'Ivoire, Cuba, Ecuador, Ghana, Japan, Mauritania, Netherlands (Aruba, Netherlands Antilles), Sierra Leone, Spain, United Kingdom (Cayman Islands, Montserrat)**.

2.5 Migratory patterns

While *Dermochelys coriacea* is mainly a pelagic species, at least four areas in temperate zones are known where concentrations may occur seasonally on or near the continental shelf; the eastern Bay of Biscay, especially the Pertuis Charentais off La Rochelle (Duron and Duron, 1980), the New England region of the north-east **United States** (coastal Massachusetts, New Hampshire and Maine) (Lazell, 1980), the east Pacific between **Peru** and **Ecuador** (G. M. Hurtado, pers. comm. to M. R. Marquez), and the eastern seaboard of **Australia** where large adults may be seen all year in larger bays, estuaries and rivers, notably off New South Wales (Cogger, 1979). Dense concentrations of food items are also recorded in these areas, *Cyanea capillata* in New England (Lazell, 1980) and *Rhizostoma pulmo* in the Pertuis Charentais (Duron and Duron, 1980); the seasonal appearance of Leatherbacks in these temperate waters may be correlated with this. The Gulf of Maine, for example, is reported to be highly productive in medusans (Lazell, 1980). A concentration of about 100 Leatherbacks, between 1-2 m in length, was recorded in December 1956 in a 50 km stretch of sea north from Port Aransas, Texas (Leary, 1957). These were feeding among a dense aggregation of Cabbage Head jellyfish *Stomolophus meleagris*, such as occur annually with the onset of winter (Hildebrand, 1982). It has been noted (Brongersma, 1982) that Leatherbacks may travel in small groups. Limited data (Frair *et al.*, 1972; Mrosovsky, 1980) indicate that Leatherbacks can maintain a deep body temperature up to 18°C above that of the surrounding water (in an experimental tank of cold water) for an unknown period. This ability presumably facilitates foraging in cool temperate waters, and may be due to the large size, thick layer of oily tissue around the body, and the counter-current heat exchange system in the flippers (Mrosovsky, 1980).

There are few long-distance recaptures of tagged Leatherbacks, but these document some of the longest migrations recorded for any reptile (Meylan, 1982). Five Leatherbacks tagged in the **Guianas** had travelled over 5000 km (Pritchard, 1976) to recapture sites in **Ghana, Mexico** (Campeche area) and **USA**. About 35 individuals tagged at Trengganu, **Peninsular Malaysia** have been recaptured, in the **Philippines, Japan, Kalimantan (Indonesia), Hainan Island (China) and Taiwan** (Meylan, 1982), indicating a wide dispersal through south-east Asia and the South China Sea. This dispersal of Trengganu turtles is thought (K. T. Siow, *in litt.* to IUCN CMC, 8 February 1982) to be due to prevailing currents and not purposeful movement to feeding grounds. Several females that were either tagged or equipped with satellite transmitters at South American nesting sites (French Guiana, Surinam) have been found in [Macaronesian] waters (Fretey and Sequeria, *in Fretey*, 1998).

3.0 Status

The information in this section deals mainly with the status of the Leatherback in range states for which there is no evidence of breeding. Relevant information on the status of the Leatherback within its breeding distribution are provided in section 2.4 on population estimates and trends. For the sake of brevity such information is not repeated again here.

Some information on the occurrence (regularly recorded, rarely recorded *etc*) of the Leatherback is provided in section 2.1. and some additional information is provided below. However, additional information on the status of the Leatherback in non-breeding range states is unavailable for many of the range states, particularly where it does not occur in significant numbers or is considered vagrant. These countries (underlined countries are Party to CMS) include Albania, Algeria, Argentina, Belgium, Cambodia, Canada, Cape Verde, Croatia, Cyprus, Djibouti, Egypt, Eritrea, France, French Polynesia (France), New Caledonia (France), Réunion (France), Gambia, Greece, Guinea, Iceland, Iran, Italy, Jordan, Kuwait, Lebanon, Libya, Madagascar, Maldives, Malta, Mauritius, Monaco, Morocco, Namibia, Netherlands, New Zealand, Nigeria, Norway, Oman, Pakistan, Philippines, Portugal, Azores (Portugal), Madeira (Portugal), Russian Federation, Saudi Arabia, Seychelles, Singapore, Slovenia, Somalia, Canary Islands (Spain), Ceuta (Spain), Sudan, Sweden, Tunisia, Turkey, United Arab Emirates, United Kingdom, British Indian Ocean Territory (United Kingdom), Turks and Caicos Islands (United Kingdom), American Samoa (United States of America), Federated States of Micronesia (United States of America), Uruguay, Viet Nam, Yemen.

Belize: This species is rare, found in low densities it is unlikely to be seen, and only known from a few localities (Ministry of Natural Resources' Land Information Centre, 1998).

Chile: Regular non-breeding visitor. Population size unknown. Published work indicates that "this is the most abundant marine turtle species in Chilean seas, as it is the most frequently caught by fishermen". In March and April 1990, 14 adult specimens were recorded, one in Valdivia and 13 in Region VIII.' (Chile National Report to CMS, 2002). Brito (1998) reported on an initiative to collect information on sea turtles and their relationship with the swordfish drift net fishery. A total of 82 new records of this species were obtained for Chilean waters, including four marked individuals from Central America and Mexico, thus indicating the origin of Chilean animals; in addition, the range of the species was extended to 41°S. Frazier (1990) noted an estimate of at least 250 individuals caught annually by the San Antonio swordfish fishery (Brito, 1998).

Ireland: Vagrant (Smiddy, 1993, 1996 and 1999). Migrations of this species along Irish coasts peak in late summer (August – October), but no hard data on numbers are available. Most sightings are off the west and south-west coasts (Ireland National Report to CMS, 2002).

Israel: This species is a rare visitor. In 2001, one female got stranded and injured in a fishing net, and subsequently died at the rehabilitation centre' (Israel National Report to CMS, 2002).

Kenya: This species is a regular visitor in small numbers. It is found along most areas of the Kenyan coast, with higher concentrations in the northern parts.

Tanzania, United Republic of: The population size and trends of the Leatherback in Tanzania are not known. (Tanzania National Report to CMS, 2002).

4.0 Actual and potential threats

The major threats to the Leatherback turtle are ongoing harvesting (hunting/gathering), accidental mortality through fisheries bycatch and pollution (IUCN, 2002). Habitat degradation, egg predation and ingestion of plastic also threaten the Leatherback turtle.

4.1 Habitat degradation/loss

Development was cited as a potential threat to the **U.S. Virgin Islands** population, nesting at Sandy Point on St. Croix (Anon. 1981a). Similarly, in **Sri Lanka** increasing human use of Leatherback nesting beaches, notably for tourism, was considered the main cause of decline in nesting of this and other sea turtles (T. W. Hoffmann, *in litt.* to IUCN CMC, 5 March 1981).

4.2 Exploitation: direct and incidental

The global intensity of exploitation of the Leatherback is certainly less than that directed at the Green Turtle *Chelonia mydas* complex, Olive Ridley *Lepidochelys olivacea* or Hawksbill *Eretmochelys imbricata*. Virtually no international trade in Leatherback parts or derivatives was reported by Pritchard and Clifton (1981) and it is listed on Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Adult Leatherbacks are not consumed by man as widely as some species, notably Green Turtles and Olive Ridley (Pritchard, 1979), since their oily flesh is generally considered unpalatable (Kemf *et al.*, 2000). However, adults were heavily exploited for food in some parts of their range (Ross, 1982a), and eggs were harvested intensively for food in most known nesting areas. Furthermore, it was reported that subsistence use of Leatherbacks – meat as well as eggs – was increasing throughout the range (except possibly **French Guiana** and **Suriname**), and was likely to expand further as shorelines develop (A. Carr, *in litt.* to IUCN CMC, 20 February 1982).

Egg collection was said to constitute the primary threat to Leatherback populations (Ross, 1982a). Almost all eggs laid in **Mexico** were harvested (P. C. H. Pritchard, *in litt.* to IUCN CMC, 2 February 1982), indeed the severe population declines seen in Malaysia have often been attributed to over collection of eggs (IUCN, 2002). At Trengganu (**Peninsular Malaysia**), the nesting beaches were leased to the highest bidder, and nearly 100% of eggs laid were collected; the State Fisheries Department were then able to buy back a proportion, which during the early 1980s was about 10% (K. T. Siow, *in litt.* to IUCN CMC, 8 February 1982). Total egg production declined from 1956 to the early 1980s by around 66% (Siow and Moll, 1982). Prolonged egg collection is one of the main threats to the leatherback turtle and in some areas the egg harvest and illegal poaching have removed more than 95% of the clutches (IUCN, 2002). It was heavy in parts of Pacific **Mexico** (Pritchard and Clifton, 1981; Márquez, 1978). Decline or loss of populations in **India**, **Sri Lanka** and **Thailand** appeared to be due to excessive egg harvest (Ross, 1982a). Heavy take of eggs has also been reported in **Trinidad** (Ross, 1982a) for example where poaching has declined (Godley *et al.*, 1993), and some harvest of eggs has been said to occur throughout the nesting range of *Dermochelys* (Ross and IUCN/SSC Marine Turtle Group, 1978). It is exploited for its eggs in the **Democratic Republic of the Congo** (Democratic Republic of the Congo National Report to CMS, 1997).

In the nesting areas of Pacific **Mexico**, the remains of many adult Leatherbacks were seen in an aerial survey and it was estimated that hundreds may have been slaughtered annually (Pritchard and Clifton, 1981). Remains of 167 adults in total were noted on two beaches in **Peru** in October 1978 (sources in Pritchard and Clifton, 1981). In **Trinidad**, an estimated 20-30% of the breeding population (of 400-500 females) were killed annually (Pritchard, 1971a). In **Papua New Guinea** adults, when found, were usually killed for their meat by coastal villagers, although Leatherback populations here were in low densities (Spring, 1980). About 100 adults may have been killed annually by inhabitants of a single village in the Kai Islands near Irian Jaya (**Indonesia**) and exploitation may have been on a similar level in much of this region (Pritchard and Clifton, 1981; Suarez and Starbird, 1995, 1996). Leatherbacks were only rarely eaten in the **Solomon Islands**, but among groups that do consume this species, it was considered an important cultural event (Vaughan, 1981). Leatherback flesh is used for bait, in Mexico (M. R. Márquez, *in litt.* to IUCN CMC, 26 February 1982) and (for sharks) in **Indonesia** (R. Petocz, *in litt.* to IUCN CMC, 9 February 1982). In some areas Leatherbacks are killed to be rendered into oil for caulking boats, on Larak Island in the Persian Gulf for example (Kinunen and Walczak, 1971), or for oil lamps in **Papua New Guinea** (Spring, 1980), or for medicinal use in the Caribbean (Anon., 1981a; A. Meylan, *in litt.* to IUCN CMC, February 1982) (e.g. **British Virgin Islands**, Grenadines (**Saint Vincent**), **Panama**). The Leatherback Turtle has been exploited for its flesh in the **Democratic Republic of the Congo** (Democratic Republic of the Congo National Report to CMS, 1997).

Longlines for tuna and swordfish are responsible for killing Leatherback turtles which are attracted to the baited hooks (Kemf *et al.*, 2000). In European Atlantic waters some mortality is caused by turtles becoming entangled in lobster-pot lines or in nets, or by being struck by ships' propellers (Brongersma, 1982). Longlines and driftnets also pose a considerable threat to Leatherbacks since juveniles and adults are

captured in their migratory routes (IUCN, 2002; Eckert, 1997). The most serious direct threat to the Trengganu population was the large number of offshore fishermen using large mesh (6-10 cm) drift nets, in which turtles become entangled (Chan, 1988), although egg collection is generally recognised as being a main cause for the subsequent collapse of this population (IUCN, 2002). Similarly, Leatherbacks were trapped in shark nets (M. R. Marquez, *in litt.* to IUCN CMC, 26 February 1982); and nylon monofilament drift nets used in the north-west Pacific by Japanese (and other) fishermen to catch squid were known to cause significant (and previously unsuspected) Leatherback mortality (Balazs, 1982). Opportunistic reports from swordfish fishermen in the Chilean port of San Antonio, indicated that nine and 21 Leatherbacks were taken as bycatch in the years 1988 and 1989 respectively (Frazier and Brito, 1990). One fisherman estimated that the minimum average bycatch by swordfish fishermen was one per vessel (Frazier and Brito, 1990). Of 62 Leatherbacks bycaught in a swordfish driftnet fishery in Chile, at least 53 drowned (Bowen *et al.*, 1998). In the 1990s, about 1,500 female Leatherbacks per year are estimated to have been killed in longline and gillnet fisheries in the Pacific. The pelagic feeding habits of Leatherbacks make them vulnerable to oceanic fishing vessels using longlines for tuna, swordfish and sharks. These fish congregate along oceanic fronts and in areas of upwelling, where jellyfish and other plankton are also most abundant. As a result Leatherbacks are frequently caught as bycatch, either taking the bait directly or through becoming entangled in the lines as they dive for bait. This has been reported in Samoa, the north-eastern Caribbean, the south-eastern Pacific and Hawaii (Grant, 1994). Large numbers of Leatherbacks also get caught in the nets of shrimp trawlers and, if Turtle Excluder Devices (TEDs) are not fitted into the net, most of these animals then drown.

According to the WWF Pacific (2003) the main threats to sea turtle populations in Fiji are from traditional harvesting of adults for ceremonial purposes, subsistence and commercial harvesting of adults, their eggs and shell, and mortality in commercial fishing nets. Unfortunately, the extent and intensity of each of these threats is currently unknown due to a lack of local capacity and financial resources.

4.3 Other threats

Egg predation may be important in some areas, e.g. an estimated 40% of eggs laid on Galibi beaches in Suriname were predated by mole crickets (Girondot *et al.*, 2002). Leatherbacks have been killed by jaguars *Panthera onca* on nesting beaches in **Suriname** (Autar, 1994) and in **Costa Rica** (Troeng, 2000). In **Mexico**, evidence was found of predation by a killer whale *Orcinus orca* on a Leatherback (Sarti *et al.*, 1994). Destruction of nests by wild pigs is the most important source of mortality for Leatherback turtles at Birds Head, Irian Jaya (Stark, 1993).

Adults ingest large quantities of floating plastic, mistaking it for jellyfish. This leads to a long and often very painful death (National Marine Fisheries Service and US Fish and Wildlife Service, 2001). In the summer of 1982, 11 out of 15 turtles stranded on Long Island, New York had ingested plastic bags and died as a result. Leatherback mortality from ingestion of plastics has been seen in many locations around

the world.

Loss of nests by marine erosion was severe in the **Guianas** (P. C. H. Pritchard, *in litt.* to IUCN CMC, 2 February 1982).

5.0 Legislation

5.1 International

Many countries have laws that protect marine turtles, but as with most other migratory animals, conservation of Leatherbacks can only be fully achieved through effective international and regional agreements and conventions. A number of these agreements cover marine turtles; for example, all species of marine turtles are listed on Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), a listing which prohibits trade in the species between party States. However, hunting for international markets outside the CITES framework remains of concern, and over-use for local consumption continues. In addition, all species of sea turtles found in the western hemisphere are listed in both Appendix I and Appendix II of the 1975 Bonn Convention (Convention on Migratory Species). However, none of the range states that contain the main nesting areas for Leatherbacks are Party to CMS, and so concerted actions within the framework of the Convention are difficult to implement.

The 1996 Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC) is a major international treaty dedicated exclusively to sea turtles. It recognizes that these migratory animals are resources shared by the peoples of many nations, and promotes regional conservation plans and accords. Twelve States have signed the Convention, and eight need to ratify it before it can come into force. To date, it has been ratified by seven States. The IAC calls on Parties to avoid bycatch of turtles through the use of Turtle Excluder Devices and other technologies on their shrimp boats. In addition, all six species of Caribbean sea turtles are listed in Annex II of the Protocol concerning Specially Protected Areas and Wildlife (SPA), a Protocol to the Convention for the Protection and Development of the Marine Environment in the Wider Caribbean Region (the Cartagena Convention). The Protocol stipulates that each party shall ensure total protection and recovery of species in Appendix II.

The Co-operative Agreement for the Conservation of Sea Turtles of the Caribbean Coast of Costa Rica, Nicaragua and Panama (1998) has united the three countries in the recognition of the important migratory corridor for the Green, Leatherback, Loggerhead and Hawksbill Turtles in these waters. The aim of this Agreement is: "To implement the international and national conventions and agreements of the Parties for the conservation of sea turtles through the execution of a Regional Management Plan". To date, Nicaragua has failed to sign the Agreement arguing that the needs of its indigenous Miskito peoples have not been addressed.

Other regional instruments to conserve sea turtles include the Memorandum of Understanding on ASEAN (Association of South East Asian Nations) Sea Turtle Conservation and Protection, and two others developed under the auspices of the CMS: the 1999 Understanding Concerning Conservation Measures for Marine Turtles of the Atlantic Coast of Africa, and the Memorandum of Understanding on the Conservation and Management of Marine Turtles and their Habitat of the Indian Ocean and South East Asia (IOSEA).

The significance of the Barcelona Convention (Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean), as far as marine turtles are concerned, is reflected not only in the Protocol concerning Specially Protected Areas (SPAs) and biological diversity in the Mediterranean but also in the elaboration of an Action Plan for the Conservation of the Mediterranean Marine Turtles in 1989 and its recent revision in 1999 (Ouerghi, 2001). The Action Plan for the conservation of Mediterranean Marine Turtles is integral to the Barcelona Convention framework and sets priorities and recommendations for marine turtle conservation in the Mediterranean. Actions specified include management and protection activities, research and monitoring, public awareness and education, and co-operation and co-ordination between parties. The plan was adopted at the 11th Meeting of the Parties in Malta in October 1999. Country members of the SPA and biodiversity protocol are: Albania, Algeria, Cyprus, Croatia, Egypt, France, Greece, Israel, Italy, Libya, Malta, Morocco, Monaco, Spain, Tunisia, Turkey, European Union. In addition, Bosnia and Herzegovina, Slovenia, Lebanon and Syria have also signed the Action Plan (FAOLEX, 2003).

5.2 National

The Leatherback is nominally protected by legislation in most countries where nesting occurs and some others (Anon., 1981a; Honegger, 1979; Hughes, 1982a; Ross, 1982a).

Albania: Albania is Party to the Barcelona Convention, that aims for the protection of biodiversity and for the conservation of wild flora and fauna that are rare, depleted, threatened or endangered as well as their habitats in the area that the convention applies. It has also signed the protocol concerning special protected areas and biodiversity, which lists *Dermochelys coriacea* as an endangered species in Appendix II. This recommended that Albania should grant full legal protection to marine turtles and undertake campaigns to assess the occurrence of nesting on the Albanian coasts (FAOLEX, 2003).

Algeria: Algeria is also part of the Barcelona Convention, signatory of the SPA and biodiversity protocol and the Action Plan for the conservation of marine turtles. The latter includes a proposal for Algeria to speed up the procedures to enact legal text for the protection of the species and establish monitoring programmes to assess by-catches by Algerian fisheries.

Angola: The Leatherback Turtle is protected in Angola (UNEP/CMS, 2000).

- Anguilla:*** The Fisheries Protection Ordinance No. 4 1988 applies to both territorial waters and the contiguous 200 mile fisheries zone. This provides for the appointment of Fisheries Officers and gives them enforcement powers. The Ordinance regulates the taking and killing of certain marine species, and establishes closed seasons for lobsters and turtles. It repeals the Turtles Ordinance No. 6 of 1984. Details of the policing of fisheries are set out in the Fisheries Protection Regulations No. 12 1988 and the Fisheries Protection (Amendment) Regulations No. 4 1990 (Oldfield, 1999).
- Antigua and Barbuda:*** The Marine Areas (Preservation and Enhancement) Act 1972 (Act No. 5) is An Act to create and regulate protected areas, which aims to preserve and enhance natural beauty, protect the flora and fauna, promote the enjoyment of the public and promote scientific study and research. The Minister may designate any portion of the marine areas as a restricted area (FAOLEX, 2003). According to the Marine Areas (Preservation and Enhancement) Regulations, 1973 (No. 25 of 1973) no turtle shall be killed, or can be taken or removed from restricted areas except with the permission of the Minister.
- The Turtle Ordinance 1927 (Date of consolidation/reprint: 1936) renders the taking of turtles or turtle eggs, tortoise or tortoise eggs in the closed season, or taking of turtles under 20 pounds of weight, slaughtering of turtles, or offering for sale of turtles or tortoise during a specified period, as well as attempting to take, sell, slaughter, etc, a declared offence (FAOLEX, 2003).
- Argentina:** In Argentina it is illegal to sell, hunt or fish any marine turtle or its parts. Law 22344/80 approves CITES and 23918/91 CMS. Law 22412 from 1981 establishes the framework for Argentinean wildlife conservation, protection and regulation. Wildlife is also protected by the National Decree 666 from 1997 that regulates wildlife classification and protection. Resolution 1089, from 1998, prohibits hunting, domestic trade and export of endangered wildlife, including *Dermochelys coriacea* and any part of its body or products. (FAOLEX, 2003)
- Australia:** The taking of *Dermochelys coriacea* is prohibited in Australia through various legislation including the Environment Protection and Biodiversity Conservation Act 1999, and the Fisheries Management Act 1991. Marine Protected Areas cover certain critical turtle habitat (Australia National Report to CMS, 2002). The National Parks and Wildlife Regulations 1977 also provides protection to Leatherback turtles although it does not include those in the Great Barrier Reef Marine Park which is covered by separate legislation (ECOLEX, 2003). There are also a number of state laws, which provide protection for the Leatherback turtle.
- Bahamas:*** The Fisheries Resources (Jurisdiction and Conservation) Regulations, 1986 (S.I. No. 10 of 1986) implement the Fisheries Resources (Jurisdiction and Conservation) Act, 1977 (Act No. 13 of 1977). - 16 June 1977. These regulations concern the conservation and management of the fishery resources of the Bahamas and the jurisdiction of the Bahamas over such resources (FAOLEX, 2003). They declare a closed season for turtles between 1st April and 31st July, during which time the possession of any live or freshly killed turtle is prohibited without the permission of the Minister, unless the turtle has been bought by the permit holder. In addition, turtles cannot be captured on any beach, and turtle eggs cannot be possessed, bought or sold.
- Bangladesh:*** The Bangladesh Wildlife (Preservation) Order, 1973 (Order of the President No. 23 of 1973) protects some species and regulates hunting of others (FAOLEX, 2003). Although Leatherback turtles are not fully protected under this Order, all immature reptiles are.
- Barbados:*** The Coastal Zone Management Act (No. 39 of 1998) (an Act which provides for more effective management of the coastal resources of Barbados, for the conservation and enhancement of those resources and for matters related thereto) makes provisions for the preservation and enhancement of designated marine areas

in Barbados as well as providing for the protection of beaches in Barbados (FAOLEX, 2003).

Belgium: The ‘Arrêté royal relatif à la protection des espèces de faune et de flore sauvages par le contrôle de leur commerce’ implements CITES (FAOLEX, 2003).

Belize: Under the Wildlife Protection Act 1981 (No.4/1981), *Dermochelys coriacea* receives total protection whereby possession, transport, and/or national trade is prohibited or regulated (ECOLEX, 2003).

Benin: The Leatherback Turtle is protected in Benin (UNEP/CMS 2000).
Sea turtles are fully protected by Law no. 87-014 of 21 September 1987 on nature protection and hunting. Implementation of CITES is achieved through Decree no. 83-204 of 31 May, 1983. No beach in Benin is currently legally protected (Doussou-Bodjrenou and Tehou, 2000). Due to extreme poverty, lack of awareness and inadequate enforcement of regulations, sea turtles are continually captured, and their eggs and hatchlings collected (Doussou-Bodjrenou and Tehou, 2002).

Brazil: In Brazil the taking of *Dermochelys coriacea* is prohibited by the Statutory Instrument: ‘Portaria. Manter proibida a captura de tartarugas marinhas das espécies *Caretta caretta*, *Dermochelys coriacea*, *Eretmochelys imbricata* e *Lepidochelys olivacea* No.27/1982’ (Regulations on the taking of marine turtles). The Statutory Instrument ‘Portaria. Atividades desportivas amadoristas da pesca No.109/1969 (Sports fishing) regulates sport fishing; prohibits the use of certain fishing gear; provides for the requirement of licences and establishes conditions for the issuance of such licences; regulates, in particular, underwater fishing, provides a list of species the taking of which by underwater sport fishermen is authorized; the taking of all other species is prohibited (ECOLEX, 2003).

Cambodia: The Prakas Declaration on the protection of natural areas (No. 1033) prohibits ‘the hunting or the placement of hunting traps, the fishing of mammals, amphibians, reptiles and aquatic animals for tusks, bones, feathers, horns, leathers and blood’ (FAOLEX, 2003). In addition, the Regulations on the Creation and Designation of Protected Areas of 1993 designates national parks, wildlife sanctuaries, protected landscapes and multiple-use management areas (FAOLEX, 2003).

Cameroon: The Leatherback Turtle is protected in Cameroon (UNEP/CMS, 2000).

Canada: The Species at Risk Act, 2002, c. 29 aims for the protection of wildlife species, and includes this species in its appendix of endangered species. The Act regulates the measures for conserving wildlife in Canada and sets general strategies for conservation, protection and recuperation of endangered species and habitat protection (FAOLEX, 2003).

Cape Verde: The ‘Act No. 79/III/90 creating the natural reserve of Santa Luzia’ creates the natural reserves of Santa Luzia and its surrounding isles: Branco, Raso, Santa Maria, Seco ou Rombo, Cima, Grande, Curral Velho and Baluarte (FAOLEX, 2003).

The Leatherback Turtle is protected under the Act No. 86/IV/93 of 26 June 1993 defining environmental policy. This is implemented by Decree-Law No. 3/2003 establishing the legal regime for the management of protected areas (FAOLEX, 2003).

The Leatherback Turtle is protected in Cape Verde (UNEP/CMS, 2000).

Chile: The ‘Decreto supremo No. 868’ of 14 October 1981 implements the CMS. The ‘Ley No. 19.473’ Hunting law, regulates conservation and sustainable use of wildlife (all CMS Appendix I species are protected) and the ‘Decreto Supremo No. 255’ of 1995 prohibits hunting of cetaceans, marine reptiles and Humboldt Penguin listed by CMS, for a period of 30 years (Ministerio de Relaciones Exteriores, Dirección de Medio Ambiente (DIMA), 1999).

Chile implements CITES through the Minister of Foreign Relations' Supreme decree No. 141 (25 May 1975) (Brito, 1995). The 'Diario Oficial de Republica de Chile', of 9 May 1993: 7-10 under the 'Ley de Caza' protects Leatherback Turtles by imposing a ban on hunting, although the capture (taking or seizure of animals that does not constitute hunting) of sea turtles may be authorised by The National Fisheries Service (Brito, 1995).

China:

The leather back turtle is listed as Vulnerable on the Chinese List of Nationally Protected Wild Animals. This lists species benefiting from 'national key protection' under the Law on the Protection of Wild Animals of 1988. Species are listed in two categories, category I comprises endangered species and category II includes rare or vulnerable species. Rare or vulnerable species may only be taken under a permit from the competent provincial authority; the export of specimens or species belonging to any of these two categories requires a permit from the central government (ECOLEX, 2003). The Law on the Protection of Wild Animals of 1988 is implemented by a number of Regulations: the Regulations of the People's Republic of China for the implementation of wild aquatic animal protection (5 October 1993), the Wildlife Protection Law implementing Regulations (8 September 1993), the Implementation Measures of Gansu Province of PRC on the Law of Wildlife Protection (2 September 1999) and the Wild Land Life Protection Regulations (1 March 1992) (FAOLEX, 2003).

The Regulations of the People's Republic of China for the implementation of wild aquatic animal protection aim at the management and conservation of wild aquatic animal resources and lay down provisions to, *inter alia*, regulate hunting and export of aquatic animals (FAOLEX, 2003).

The Circular Decree of the State Council concerning strict protection of precious and rare wild animals aims to strengthen the commitment of public authorities on national and local level to a policy of strict control over hunting and trade in rare wild animals. Hunting of these animals must be monitored and the trade in rare wild animals is forbidden (FAOLEX, 2003). It is unclear whether this refers to the Leatherback Turtle.

There are a number of regional laws, which also deal with species protection and conservation.

Taiwan:

No information on legislation protecting turtles in Taiwan was available.

Colombia:

The Ministry of Environment established the Special Management Area of the Darién along the entire border with Panama through Resolution 1427 in December 1996. This area is to be protected and managed under sustainability principles. Through National Law 388 from 1997, every municipality in the country must take all factors of sustainability into consideration for future developments. Community participation should be encouraged to enable the development of sustainable production activities around the sea turtle protection programme (Madaune, 2002). The Ministry of Environment Resolution 107, from 1996, establishes the use of turtle excluding devices in all the shrimp vessels in the Pacific Ocean. In the Caribbean Sea the use of these devices was established by Resolution 157, 1993. Resolution 108, from 1992, prohibits the use of marine turtles caught as bycatch (FAOLEX, 2003).

Congo:

The Leatherback Turtle is not protected in the Congo (UNEP/CMS, 2000). The Congo is in the process of finalising national legislation on the protection of marine turtles including the Leatherback (Congo National Report to CMS, 2001).

There are a number of relevant items of legislation listed in the Congo National Report to CMS (2001) although it is unclear which, if any, relate specifically to Leatherback Turtles. These include

-loi n°34/82 du 7 juillet 1982 autorisant la ratification de la Convention sur le Commerce international des espèces de faune et de flore sauvages menacées

d'extinction ;

- loi n°48/83 du 21 avril 1983 définissant les conditions d'exploitation et de conservation de la faune sauvage ;
- loi n°21/85 du 19 décembre 1985 portant sur la ratification de la Convention relative à la coopération en matière de mise en valeur du milieu marin et des zones côtières de la région de l'Afrique de l'Ouest et du Centre, et du Protocole relatif à la coopération en matière de lutte contre la pollution en cas de situation critique;
- loi n°02/2000 du 1er février 2000 portant sur l'organisation de la pêche maritime au Congo ;
- loi n°28-96 du 25 juin 1996 autorisant la ratification de la Convention de RAMSAR sur les zones humides d'importance internationale, particulièrement comme habitats de la sauvagine;
- loi n°14-99 du 3 mars 1999 autorisant la ratification de la convention sur la conservation des espèces migratrices appartenant à la faune sauvage ;
- Déclaration n°486/MAEC/SG/DSG/DAJ du 17 avril 1998 relative à l'applicabilité de la Convention de RAMSAR sur les zones humides d'importance internationale, particulièrement comme habitat de la sauvagine.

Costa Rica:

The nesting beaches on Playa Naranjo in Santa Rosa N.P. are protected. The 'Decreto se establece el Parque Nacional de Tortuguero No.5680/1975' (Decree Establishing the Tortuguero National Park) provides for the prohibition of the taking of marine turtles and their eggs in the Tortuguero National Park. Decree 29.068/2000 established the Tamarindo Wildlife National Refuge as an assigned area for *Derموchelys coriacea* observation, declaring restricted access during the spawning season. Costa Rica ratified the Inter-American Convention for Marine Turtles Protection and Conservation in 1999 through Law 7.906 (FAOLEX, 2003). The 'Ley de Pesca y Casa Maritimas' (1949) and the 'Decreto Ejectivo No. 9 del 24 Mayo de 1963' also deal with sea turtles (Navid,1982).

Côte d'Ivoire:

The Leatherback Turtle is protected in the Côte d'Ivoire (UNEP/CMS, 2000). The 'Loi no. 65-255 du août 1965, relative à la protection de la Faune et à l'exercice de la chasse' also deals with sea turtles (Navid, 1982).

Croatia:

The taking of Leatherback Turtles is prohibited under national legislation. The Law on Nature Protection of 1994 states that "individual plant and animal species enjoying special protection of the State includes rare or endangered species". In addition "Any action that would disturb or interfere with the natural life cycle and growth of a plant or an animal is prohibited. Other prohibited actions include: the hiding, sale, purchase and stealing, or any other kind of acquisition of a protected plant or animal, and the stuffing and mounting of a protected animal." Protection is also given to the native plants and wildlife within national parks, strict reserves or special reserves, and to cave animals, regardless of whether or not they are a protected plant or animal species. Other relevant legislation includes the Law on Ratification of the Bonn Convention (Official Gazette – International Treaties, No 6/2000), and the Act on Hunting (OG No 29/99) (Ministry of Environmental Protection and Physical Planning, 2002).

Cuba:

The Statutory Instrument 'Resolución para establecer un período de veda de los quelonios marinos (No.79/1991)' prohibits the taking of sea turtles from 30th April to 31st July 1991 and from 30th August to 30th November 1991 in certain areas of the country. In addition, the damaging or destruction of turtle nests is permanently prohibited and the taking of turtles for scientific purposes during the closed season is authorised by certain research institutions (ECOLEX, 2003).

Cyprus:

Leatherback Turtles are protected by the Fisheries Regulations, 1991 (FAOLEX, 2003).

Democratic Republic of the Congo:

Leatherback Turtles are protected in the Democratic Republic of Congo (UNEP/CMS 2000). The 'Loi portant sur la réglementation de la chasse' (Hunting

Act) of 1982 (No.82-2 (No. 2)) gives total protection to the Leatherback Turtle and possession, transport, and/or national trade is prohibited or regulated (ECOLEX, 2003).

- Djibouti:*** According to Decree 85-103/PR/AG (1985) of the Ministry of Agriculture, hunting, commerce and export of marine mammals and marine turtles or their eggs is prohibited in the entire territory and national waters. Carapace trade will only be allowed if the animal was sourced in another country and has a proper permit certificate from the country of export (FAOLEX, 2003).
- Dominica:*** The Forestry and Wildlife Act, 1976 (Act No. 12 of 1976) provides for the protection, conservation, and management of wild mammals, freshwater fishes, amphibians, crustaceans and reptiles, and for purposes connected therewith (FAOLEX, 2003). It prohibits the taking of turtles between 1st June and 30th September inclusive. In addition it specifies that no person shall “catch or take or attempt to catch or take any turtle which is under twenty pounds in weight”, or “disturb any turtle nest or eggs, or take any turtle eggs or take or attempt to take any turtle laying eggs or on the shore engaging in nesting activities”.
- Dominican Republic:*** Decree No. 34/96 prohibits any activity that leads to the capture or death of marine turtles of the Cheloniidae and Dermochelyidae families. It also prohibits egg collection and trade of any part of the specimens. Turtles are also protected by the Decree No. 55/92 that prohibits any activities that lead to capture, death or mutilation of any wild animal or its products (FAOLEX, 2003).
- Ecuador:*** The Statutory Instrument ‘Acuerdo - Considerese protegidas por el Estado a todas las especies de tortugas marinas existentes en aguas territoriales ecuatorianas’ No.212/1990 prohibits the taking and processing of, and domestic and international trade in all species of sea turtles, including *Dermochelys coriacea* (ECOLEX, 2003). Ecuador ratified the Inter-American Convention for Marine Turtles Protection and Conservation in 2000 through Decree 719 (FAOLEX, 2003).
- Egypt:*** The Law No. 102/1983 concerning natural protected areas prohibits catching, transporting, killing and disturbing wildlife in protected areas (FAOLEX, 2003). According to the Egypt National Report to CMS (2002), marine turtles are protected in Egypt by the following decrees: Decree 472/1982 from the Minister of Agriculture concerning the ban on hunting of wildlife in protected areas, Decree 1403/1990 concerning the ban of hunting, killing, capturing, transporting and selling of marine turtles, Prime Ministerial Decree 264/1994 concerning the regulation of activities in protected areas. Public awareness campaigns are being conducted, commercial fisheries controlled in turtle distribution zones and specific nesting habitats are protected within marine protected areas (Egypt National Report to CMS, 2002).
- El Salvador:*** Decree 844 of 1994 established the legal framework for wildlife management and protection and refers specifically to the creation of national regulation aiming to protect threatened species (FAOLEX, 2003). The Leatherback turtle would appear to be protected under this legislation.
- Equatorial Guinea:*** The Leatherback Turtle is protected in Equatorial Guinea (UNEP/CMS, 2000). It is not included in the list of species, which it is permitted to hunt, and which is annexed to Law 8/1988 that regulates protected areas, wildlife and hunting. This law also regulates the creation of protected areas, including the Isla de Bioko an important site for turtle nesting, where the Leatherback has been reported to occur. (FAOLEX, 2003)
- Eritrea:*** No information on legislation protecting turtles in Eritrea was available.
- Fiji:*** The taking of turtles and their eggs during the breeding season, December to March, is prohibited in Fiji. Since 1990, some changes have been made to legislation in Fiji to address the conservation of turtles nationally. “A ban on the export of turtle shell was imposed in 1990, though a number of exemptions have been granted. A five-year moratorium was imposed on the killing of turtles, the taking or destroying of

eggs, and the trade of turtle meat and eggs from 1995 to December 2000. The Department of Fisheries is hoping to extend this moratorium for a further period” (WWF Pacific, 2003).

France:

Metropolitan France: The Leatherback is protected in France. The Statutory Instrument ‘Arrêté du 17 juillet 1991 fixant la liste des tortues marines protégées sur le territoire métropolitain’ (Order of 17 July 1991 listing the species of sea turtles protected in the metropolitan territory of France) lists species of sea turtles protected in the metropolitan territory of France; prohibits the destruction, collection or removal of the eggs or nests of such turtles and the destruction, capture, collection, damaging, taxidermic treatment, transport, utilization, offer for sale, sale or purchase of specimens of the species, whether live or dead (ECOLEX, 2003).

- The French 1976 Nature Protection Act institutes measures on flora and fauna protection, hunting, freshwater fishing and protected areas (national parks and nature reserves).
- The 1986 Coast Act recognises that coastlines form entities, which require specific planning, protection and development policies. Some of the main policy concerns are to protect outstanding natural areas and those that are essential in preserving the balance of ecological and biological systems, to control urban growth and introduce the concept of urban growth buffer zones, and to ensure unrestricted access to shorelines.
- The 1992 Water Act recognises that water is part of the national heritage and shared by all, and that water resources must be protected and usable water resources enhanced and developed, as a matter of public interest. The provisions of the Act aim to institute balanced systems of water resource management which must, in particular, ensure protection against pollution.

<http://www.environnement.gouv.fr/ifrecor/domtom/legislaa.htm>

French Guiana: The Statutory Instrument ‘Arrêté du 17 juillet fixant la liste des tortues marines protégées dans le département de la Guyane’ (Ministerial Order of 17 July 1991 listing the species of sea turtles protected in the ‘département’ of Guyana) provides total protection to *Dermochelys coriacea* and prohibits the destruction or removal of the eggs and nests, the damaging, destruction, capture, removal, taxidermic treatment of listed sea turtles, including *Dermochelys coriacea*, as well as the transport, utilization, offer for sale, sale and purchase of live or dead specimens of these species (ECOLEX, 2003).

Guadeloupe: Total protection is conferred to the Leatherback turtles through the Statutory Instrument ‘Arrêté fixant la liste des tortues marines protégées dans le département de la Guadeloupe’ of 1991 (Ministerial Order Listing Protected Species of Sea Turtles in the ‘département’ of Guadeloupe) which prohibits the destruction or removal of the eggs and nests, the damaging, destruction, capture, removal, taxidermic treatment of listed sea turtles, including *Dermochelys coriacea*, as well as the transport, utilization, offer for sale, sale and purchase of live or dead specimens of these species (ECOLEX, 2003).

Martinique: The Statutory Instrument of 1993 ‘Arrêté fixant la liste des tortues marines dans le département de la Martinique’ prohibits the destruction or removal of the eggs and nests, the damaging, destruction, capture, removal, taxidermic treatment of listed sea turtles, including *Dermochelys coriacea*, as well as the transport, utilization, offer for sale, sale and purchase of live or dead specimens of these species (ECOLEX, 2003).

New Caledonia: Regulations apply to the use of turtles in New Caledonia, and trade in turtles is banned (IFRECOR, 1998).

Gabon:

The Leatherback Turtle is protected in Gabon (UNEP/CMS 2000). The Statutory Instrument ‘Décret relatif à la protection de la Faune’ provides partial protection to

Dermochelys coriacea in that the hunting, capture, trade and transport of partially protected species is regulated (ECOLEX, 2003).

Gambia:

The Leatherback Turtle is protected in Gambia (UNEP/CMS, 2000). The Wildlife Conservation Act, 1977 (Act No. 1 of 1977) protects species within national parks or national reserves and sets out the conditions for hunting in Gambia, as well as for sale, import or export of animals (FAOLEX, 2003). The Wildlife Conservation Regulations, 1978 (L.N. No. 36 of 1978) provide for certain matters relating to nature reserves and for hunting in general and the hunting of specified birds (FAOLEX, 2003), although turtles are not specifically referred to.

Ghana:

Under the Wildlife Conservation Regulations 1971 (L.I. 685/1971), the hunting, capture, possession and destruction of the Leatherback are prohibited all year throughout Ghana. No CITES export permits can be issued for this species or its derivatives (Ghana National Report to CMS, 1991).

Greece:

Presidential Decree on the protection of sea turtles (No.617/1980) prohibits the taking of sea turtles, their young and their eggs (ECOLEX, 2003). In addition, the Presidential Decree relating to the protection of vegetation and wildlife, as well as the establishment of the procedure, coordination and control of related research (No.67/1980) prohibits the taking, collection, destruction, sale, transport and export of protected species, including *Dermochelys coriacea*, with some exceptions with permits (ECOLEX, 2003).

Grenada:

Under the Birds and Other Wildlife (Protection of) Ordinance (No. 26 of 1956) the taking or destroying or possessing of any turtles or turtle eggs on land is prohibited, and it is an offence to take, kill, sell, purchase or possess any turtle weighing less than 25 pounds. The closed season for turtles is 1st June to 30th September during which it is prohibited to wound, kill or take any turtles or eggs.

Guatemala:

The Wild Animals and Bird Protection Act aims to protect all marine and fresh water turtles, the giant land tortoise, and wild terrestrial birds and sea birds.

Guinea:

The Leatherback Turtle is protected in Guinea (UNEP/CMS, 2000). Ordonnance portant sur le code de la protection de la faune sauvage et réglementation de la chasse (No.90-7PRG/SGG) (Ordinance issuing the Protection of Wildlife Code and Hunting Regulations) provides for the establishment of protected areas; lists fully and partially protected animal species; prohibits the hunting or capturing of fully protected species and the collection of their eggs except under a scientific permit; and prohibits the possession of live specimens of such animals and the import or export of any specimens of these animals or trophies thereof, except under a scientific permit. *Dermochelys coriacea* is fully protected under this legislation.

Guinea-Bissau:

The Leatherback Turtle is protected in Guinea Bissau (UNEP/CMS, 2000). The Decree No. 21/80 approving the Hunting Regulation consists of 56 articles listing endangered species, animals permitted to be caught, hunting areas, authorized methods etc. It also specifies the authorized hunting seasons (from 1 November to 30 April) (FAOLEX, 2003). The Legal Framework on Protected Areas of 1996 establishes the basic legislation on protected areas and specifies the requirements to be satisfied in order to preserve flora and wildlife ecosystems and to manage forestry resources (FAOLEX, 2003).

Guyana:

Order 23 / 1994 mandates that owners or charterers of fishing vessels shall not fish in the fishery zone or territorial sea with trawl nets, unless the nets have been fitted with a turtle excluder device (FAOLEX, 2003). The Wildlife Regulations, 1987 deal with miscellaneous matters relating to the capture of wild animals and wild animals held in captivity, licenses (granted by the Guyana CITES Management Authority) and restrictions on the export of animals. The Fisheries (Aquatic Wild Life Control) Regulations (1966) also deals with sea turtles (Navid, 1982).

Haiti:

No information on legislation protecting turtles in Haiti was available.

- Honduras:*** Honduras ratified the Inter-American Convention for Marine Turtles Protection and Conservation in 1999 through Decree 101. Resolution 83 from 1984 permanently bans the capture and/or trade of marine turtles, their eggs or any parts of their body (FAOLEX, 2003).
- Iceland:*** No information on legislation protecting turtles in Iceland was available.
- India:*** The Leatherback is included on Schedule I, Part II of the Wildlife (Protection) Act, 1972 (Entry No. 11) (An Act to provide for the protection of wild animals, birds and plants and for matters connected there with or auxiliary or incidental thereto) updated by Wild Life (Protection)Amendment Act, 2002, No. 16 of 2003). This deals with hunting of wild animals, sanctuaries, national parks and closed areas, and prohibition of trade or commerce in trophies, animal articles, etc (FAOLEX, 2003). All hunting, capturing and trade (import/export) is banned (India National Report to CMS, 1991 and 1994).
- Indonesia:*** Sukamade Beach lies within Meru Betiri Nature Reserve (Java) and important nesting beaches in the Kepala Burung (Vogelkop) area of Irian Jaya and on Japen Island (Yapen) are within a projected Reserve network. Order No.301/1991 listing protected wild animals in Indonesia lists protected species. Pursuant to the Act of 10 August 1990 on the Conservation of Living Resources and Their Ecosystems, it is prohibited to kill, capture, possess, transport, trade in or export protected animals whether alive or dead, or parts of such animals. The taking, destruction, trade or possession of the eggs or nests of protected animals is also prohibited (ECOLEX, 2003).
- Iran:*** No information on legislation protecting turtles in Iran was available.
- Ireland:*** The Wildlife Act 1976 (No.39/1976) provides for the protection of listed wild birds, animals and flora, enables the Minister to proclaim wildlife and nature sanctuaries and regulates and controls wildlife trade and the transport, import and export of wildlife. This was subsequently amended by the Irish Wildlife (Amendment) Act 2000. *Dermochelys coriacea* is fully protected (ECOLEX, 2003).
- Israel:*** Israel is Party to the Barcelona Convention, signatory of the SPA and Biodiversity Protocol and the Action Plan for the conservation of marine turtles. Proposed actions for Israel in the latter include: to ensure long term protection for nesting-beaches, promote legal declaration of marine/coastal protected areas and eliminate destructive activities on nesting beaches. The Wildlife Protection Regulation of 1976 establishes conditions for the licensing, hunting, capturing, reporting, marking and trading of wildlife animals. The Nature Reserves Regulations (Order and Behavior) – 1979 prohibits the taking or causing of any type of damage to plants, animals or land within the boundaries of a Nature Reserve (FAOLEX, 2003).
- Italy:*** The regional law of ‘Liguria, Legge Regionale - Tutela de la Fauna Minore No.4/1992’ (Regional law - minor fauna protection) implements articles 4 and 6 of the Berne Convention in respect of amphibians and reptiles in Liguria; lists protected species; prohibits the intentional killing or damaging of animals of such species and their disturbance, capture, possession and trade; provides that possession and trade prohibitions apply to live or dead specimens or parts thereof (ECOLEX, 2003). In Lazio, the ‘Legge Regionale - Tutela di alcune specie della fauna minore No.18/1988’ (Regional Act - Protection of certain species of lower fauna) lists protected species; prohibits the killing, capturing and possession of animals of these species as well as their transport, taxidermic treatment and trade; provides that these prohibitions also apply to the eggs of these animals and to their easily identifiable parts and products; prohibits the damaging or destruction of the breeding and nesting sites of these animals; and provides for enforcement measures and penalties (ECOLEX, 2003).
- Jamaica:*** Leatherback Turtles are protected under the Wildlife Protection Act of 1945 which, *inter alia*, lists protected animals and prohibits the taking or possession of protected animals; prohibits the taking, selling or possession for the purpose of sale of turtle

eggs; and regulates fishing (ECOLEX, 2003). The Endangered Species (Protection, Conservation and Regulation of Trade) Act, 2000 (No. 6 of 2000) implements the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in Jamaica, and protects, conserves and manages endangered species by regulating the importation and exportation of such species (FAOLEX, 2003).

- Japan:*** No information on legislation protecting turtles in Japan was available.
- Jordan:*** No information on legislation protecting turtles in Jordan was available.
- Kenya:*** Sea turtles are fully and officially protected by several local and international laws, such as The Fisheries Amendment Act (1989), the Wildlife Conservation and Management Act (1989) and CITES (Wamukoya and Haller, 1996).
- Kuwait:*** No information on legislation protecting turtles in Kuwait was available.
- Lebanon:*** Resolution No. 125/1 of the Minister of Agriculture, prohibiting the fishing of whales, seals and turtles, decrees the categorical prohibition to fish whales, seals and turtles along the Lebanese coasts. In addition, to sell, buy, use and trade in the products of the aforementioned animals is prohibited (FAOLEX, 2003).
- Liberia:*** The Leatherback Turtle is not protected in Liberia (UNEP/CMS, 2000)
- Libya:*** Libya is a Party to the Barcelona Convention, signatory of the SPA and Biodiversity Protocol and the Action Plan for the conservation of marine turtles. Proposed actions for Libya in the latter include the promotion of further studies on nesting populations and nesting distributions along the coast; the identification of the most valuable nesting beaches, the development of an adequate management plan and the assessment of the impact of marine fisheries on marine turtles (UNEPMAP, 2003; FAOLEX, 2003).
- Madagascar:*** The ‘Ordonnance no. 62-079 établissant un droit de sortie sur les animaux sauvages (1962)’ deals with sea turtles (Navid, 1982). No further or more recent information on legislation protecting turtles in Madagascar was available.
- Malaysia:***
- Peninsular Malaysia:*** The nesting beach at Rantau Abang in Trengganu State is protected. By the end of 1994, the surrounding marine waters off 38 offshore islands in Peninsular Malaysia and Labuan had been gazetted as marine parks. In addition, one national park in Sarawak, three in Sabah and one state park in Trengganu protect coastal and marine ecosystems (Malaysia National Biodiversity Policy, 1998).
- Sabah:*** The Leatherback Turtle is not listed as a totally protected or partially protected species in the Wildlife Conservation Enactment (No. 6 of 1997), which aims to provide for the conservation and management of wildlife and its habitats in the State of Sabah for the benefit and enjoyment of the present and future generations of the people of the State of Sabah).
- Sarawak:*** Leatherback Turtles have been fully protected since 1958 and there are a number of laws relevant to turtle conservation in Sarawak, namely: The Turtle Trust Ordinance 1957; Land Code 1958; Turtle Protection Rules 1962, Fisheries Prohibited Areas under section 61 of the Fisheries act 1985; and the Wildlife Protection Ordinance 1998 (Tisen and Bali, 2002). Under the Wildlife Protection Ordinance 1998, all marine turtles are totally protected from hunting, killing, capture, sale, import, export, possession of any animal, recognizable part or derivative or any nest, except in accordance with the permission in writing of the Controller of Wildlife for scientific or educational purposes or for the protection or conservation of a species (Tisen and Bali, 2002).
- Maldives:*** No information on legislation protecting turtles in the Maldives was available.
- Malta:*** Malta is a Party to the Barcelona Convention, signatory of the SPA and Biodiversity Protocol and the Action Plan for the conservation of marine turtles. Proposed actions for Libya in the latter include the assessment of the impact of marine fisheries on

marine turtles (UNEP/Map, 2003; FAOLEX, 2003). The Reptiles (Protection) Regulations 1992, LN.No.76/1992 lists protected species of reptiles; prohibits the taking, killing, possession, sale, purchase, exchange, import or export of animals of these species or of any parts or derivatives thereof; requires the registration of marine turtles held in possession before the regulations came into force, and also requires that any marine turtle accidentally caught by fishermen and landed at the fish market be immediately surrendered to the Director responsible for fisheries who shall then dispose of it for scientific purposes only (ECOLEX, 2003).

Mauritania:

It is unclear whether the Leatherback Turtle is protected in Mauritania (UNEP/CMS, 2000).

Mauritius:

The Fisheries and Marine Resources Act (Act No. 22 of 1998) provides for the management, conservation and protection of fisheries and marine resources, and for the protection of the marine ecosystems (FAOLEX, 2003). This specifies that no person shall “land, have in his possession for purposes of sale or supply, or sell or offer for sale any turtle whether dead or alive, or part of a turtle, turtle eggs, stuffed turtle” except with the authorisation for scientific purposes of the Permanent Secretary.

Mexico:

The 1990 Statutory Instrument ‘Acuerdo por el que se establece veda para las especies y subespecies de tortuga marina en aguas de jurisdicción federal del Golfo de México y Mar Caribe, así como las del Océano Pacífico, incluyendo el Golfo de California’ (Order halting the capture of all sea turtle species and subspecies in waters under federal jurisdiction in the Gulf of Mexico, the Caribbean and the Pacific Ocean, including the Gulf of California) provides for a complete and indefinite halt to the capture of all sea turtle species and sub-species living in waters under federal jurisdiction in the Gulf of Mexico and the Caribbean Sea (ECOLEX, 2003). This order aims to protect, conserve and increase the sea turtle population. The ban will only be lifted when scientific research shows that turtle numbers have increased to the point where limited capture will not endanger conservation or population growth (Article 10) (ECOLEX, 2003).

In addition, the ‘Acuerdo por el que se establecen los criterios ecológicos CT-CERN-001-91 que determinan las especies raras, amenazadas, en peligro de extinción o sujetas a protección especial y sus endemismos, de la flora y la fauna terrestres y acuáticas en la República Mexicana’ lists endangered, threatened, and rare animal and plant species and species subject to special protection measures. *Dermochelys coriacea* is listed as a species subject to special protection measures which means that specific regulations to limit their exploitation are required as specified by the Act of 1988 on the Ecological Balance and Protection of the Environment (ECOLEX, 2003). Mexico ratified the Inter-American Convention for Marine Turtles Protection and Conservation in 1999 through Law 7.906 (FAOLEX, 2003).

Monaco:

Monaco is a Party to the Barcelona Convention, and has signed and ratified the SPA and biodiversity protocol and the Action Plan for the conservation of marine turtles. Proposed actions for Monaco in the latter include recommendations to activate the procedure of legal protection for marine turtles (UNEP/Map, 2003; FAOLEX, 2003).

Morocco:

The Leatherback Turtle is not protected in Morocco (UNEP/CMS, 2000). Morocco is a Party to the Barcelona Convention, and has signed and ratified the SPA Protocol. In the Action Plan for the conservation of marine turtles, proposed actions for Morocco include recommendations to activate the procedure of legal protection for marine turtles and to strengthen the monitoring programme on by-catches of marine turtles by Moroccan fisheries (FAOLEX, 2003).

Mozambique:

No information on legislation protecting turtles in Mozambique was available.

Myanmar:

The Burma Wildlife Protection Act 1936 (Act No. VII of 1936) make provisions for licences and special licences to hunt, possess, sell, buy, etc. wild animals and their

products and this Act also makes provisions with respect to closed seasons in which specified animals are protected (FAOLEX, 2003). The Burma Wildlife Protection Rules of 1941 states that the import or export of any reptile (including parts or products) into or from Myanmar is prohibited, with the exception of snakes.

Namibia:

The Marine Resources Act, 2000 (Act No. 27 of 2000) provides for the conservation of the marine ecosystem and the responsible utilisation, conservation, protection and promotion of marine resources on a sustainable basis; for that purpose to provide for the exercise of control over marine resources; and to provide for matters connected therewith (FAOLEX, 2003). This act is implemented by the Marine Resources Regulations (G.N. No. 153 of 2001) which states that “except in terms of a right, an exploratory right or an exemption granted” a person may not harvest any species of marine turtle.

Netherlands:

The Decree concerning the protection of endemic fauna and flora species (Besluit van 3 december 1997, houdende de aanwijzing van beschermende inheemse dier - en plantensoorten) lists protected animal and plant species. According to the Nature Conservation Act of 15 November 1967, it is prohibited to capture or kill any protected animal. Possession of or sale of protected species of animals or plants are prohibited. The Leatherback Turtle is totally protected but its eggs may be collected during a certain period (ECOLEX, 2003). The Flora and Fauna Act (No. 402 of 1998) brings “all provisions relating to the protection of all animals and plants living in the wild together in one text so as to harmonise those provisions, to better respond to international obligations and, in general to make better provision for the protection of flora and fauna” (FAOLEX, 2003).

Aruba:

Marine turtles are fully protected in Aruba and there is considerable interest from tourism developers to collaborate in the conservation of turtles and their nesting sites (Anon., 1995).

Netherlands Antilles: No information on legislation protecting turtles in the Netherlands Antilles was available.

New Zealand:

The Conservation Act 1996 establishes a Department of Conservation and promote the conservation of New Zealand's natural and historic resources (FAOLEX, 2003).

Nicaragua:

Act No.625/1977 partially protects marine turtles by prohibiting egg exportation and regulating personal consumption and internal trade. Decree 204 from 1974 bans temporary capture of any turtle in the Atlantic Ocean from April to June. (FAOLEX, 2003). This Act may have been revised recently, although further information is unavailable.

Nigeria:

The Leatherback Turtle is not protected in Nigeria (UNEP/CMS 2000). The National Park Service Decree, 1999 (No. 46 of 1999) provides for the management of National Parks and lays down restrictions on hunting, fishing, etc. in National Parks (FAOLEX, 2003).

Norway:

No information on legislation protecting turtles in Norway was available.

Oman:

No information on legislation protecting turtles in Oman was available.

Pakistan:

The Baluchistan Wildlife Protection Act 1974 No.19/1974, The Azad Jammu and Kashmir Wildlife Act 1975 No.23/1975 and The Sindh Wildlife Protection Ordinance 1972 No.5/1972 confer total protection on the Leatherback Turtle in Baluchistan, Azad Kashmir and Sind respectively. Possession, transport, and/or national trade are prohibited or regulated (ECOLEX, 2003).

Panama:

The ‘Decreto-Ejecutivo - se dictan medidas de caracter urgente para la protección y conservación de la fauna silvestre No.23/1967’ (Decree prescribing urgent measures for the protection and conservation of wildlife) lists protected species and prohibits the taking of such species. The Decree covers all species of sea turtles, including *Dermochelys coriacea*, and prohibits the collection and sale of eggs between 1st May and 30th September each year, and prohibits the taking of hatchlings at all times (ECOLEX, 2003). In addition, the ‘Resolución por la cual se prohíbe la caza,

captura y venta, y exportación de todos animales silvestres declarar en peligro de extinción' prohibits the taking, capture, selling, purchasing and export of certain species which are declared to be endangered (ECOLEX, 2003).

Papua New Guinea: National legislation in Papua New Guinea applies to the collection, export, research and filming of wildlife and contains a list of protected and restricted species. *Dermochelys coriacea* appeared on this list of protected or restricted species in 1976 (ECOLEX, 2003).

Peru: The capture of Leatherback Turtles measuring less than 80 cm long has been prohibited in Peru since 1976. Decree No. 25977 was enacted in 1995, prohibiting the capture, trade and consumption of marine turtles including the Leatherback Turtle. However, enforcement is poor and sea turtles are still being caught for human consumption in a number of places (Alfaro-Shigueto *et al.*, 2000). The Leatherback Turtle was listed as vulnerable on the Statutory Instrument 'Resolución Ministerial - Categorización de especies de fauna silvestre' and the taking, capturing, transport, trade and export of all listed species except for scientific or cultural purposes is prohibited for an indefinite period of time (ECOLEX, 2003). All marine turtles distributed along the Peruvian coast are protected by Supreme Decree No. 013-99-AG, Ministerial Resolution No 103-95-PE and Supreme Decree No. 026-2001-PE. According to the Supreme Decree No. 026-2001-PE exemptions from this prohibition on the capture of marine turtle are made exclusively for research purposes or cultural promotion, Such cases require an authorisation from the Fisheries Vice-Minister. Furthermore, individual animals can be used exclusively for domestic consumption or can be exchanged without profit. (Peru National Report to CMS, 2002). Peru ratified the Inter-American Convention for Marine Turtles Protection and Conservation in 1999 through Supreme Decree No. 055 -99-RE (FAOLEX, 2003).

Philippines: The MNR Administrative Order 12, 1979 sets the regulations for the conservation of marine turtles in the Philippines and prohibits the capture of animals, eggs or limbs or any use, possession, collection or transport of marine turtles or any of their parts in most of the country (Anon, 2003c). "By virtue of the Executive Order no.542, 1979 the Task Force Pawikan (Marine Turtle Task Force), now referred to as the Pawikan Conservation Project (PCP), became the Philippine government's urgent response to conserve and manage the dwindling marine turtle resources of the country. The PCP is responsible for the development and implementation of conservation and protection policies, management and propagation schemes, and public information and education programs to ensure the survival and growth of the country's remaining marine turtle populations"(Trono, 1991).

In addition "The residents of the province of Tawi-tawi, Philippines, who are largely dependent on turtle eggs for livelihood were exempted from the ban on turtle egg collection issued in 1982. Since then, a regulatory system on the collection of turtle eggs in the province had been administered by the Bureau. This exception still exists to date. However, the new Wildlife Act approved in July 2001 provides for the strict prohibition on the collection of all threatened species in the country. It is yet to be decided if this exception would continue with the passage of the Act"(Philippines National Report to CMS, 2002).

Portugal: The Council of Ministers Resolution No. 49/2001 approving the ordainment plan for the Dunas de S. Jacinto Natural Reserve "determines the elaboration of the Dunas de S. Jacinto Natural Reserve ordainment plan. This fragile dune ecosystem together with the surrounding forest area is one of the best preserved in Europe and essential for avifauna species and acts as a barrier against the sea" (FAOLEX, 2003). There are a number of decrees that establish and define protected marine and coastal areas. These include Decree No. 23/98 establishing the reclassification of the Natural Park of Arrábida to include a marine area in the park and Decree No. 30/98 regulating the classification of the Natural Reserve of 'Berlengas' which defines this marine protected area which aims to protect flora and fauna biodiversity, including endemic

species. Order No. 114/90 enforces the application of the Convention on International Trade in Endangered Fauna and Flora Species (CITES). Decree-Law No. 226/97 implementing Council Directive No. 92/43/CEE concerning wild fauna and flora natural habitat conservation also pertains to species conservation.

Azores: The Leatherback Turtle is protected in the Azores (UNEP/CMS 2000). The Regional Legislative Decree No. 3/90/A establishing the legal regime for hunting activity within the Autonomous Region of Azores deals with hunting regulations in the Azores (FAOLEX, 2003).

Madeira: The Leatherback Turtle is protected in Madeira (UNEP/CMS 2000). Regional Decree No. 11/97/M creating the Natural Reserve of 'Sítio da Rocha do Navio' creates the reserve in order to preserve natural ecosystem and in particular to protect monk seal (*Monachus monachus*). This Regional Decree amends Regional Decree No. 14/90/M creating the Special Protected Area of 'Ilhas Desertas'. Amendments concern: restrictions to be applied for fishing activity (including sport fishing) within this archipelago, geographical limits, and requirements to be met in order to obtain a fishing permit. The Regional Decree No. 9/95/M amending Regional Decree No. 14/90/M creating the Special Protected Area of 'Ilhas Desertas' classifies the reserve as 'Wildlife Reserve', which is administratively integrated within the Natural Park of Madeira (FAOLEX, 2003).

Russian Federation: The Federal Law of the Russian Federation on Wildlife (No. 52-FZ of 1995) deals with the protection of wildlife species and their natural habitat (FAOLEX, 2003), although FAOLEX (2003) does not specify if the turtle is listed. The Ministerial Decree No. 1051 of 1994 regulating the fulfilment of the obligations of Russia originating from the Convention on International Trade in Endangered Species of 3rd March 1973 implements CITES in the Russian Federation. Ministerial Decree No. 158 of 1996 states that "On the Red Book of the Russian Federation it states that wildlife and plant species recorded in the Red Book are under special protection and removal of these wildlife and plant species from their natural habitat is authorised only in exceptional cases in accordance with the modalities established by the Russian Legislation" (FAOLEX, 2003). The Red Book is the state register of endangered species. Order No. 569 of 1997 of the Federal Committee on Environmental Protection regarding the validation of the list of wildlife species recorded in the Red Book and cancelled from the Red Book validates the list of wildlife species recorded in the Red Book (Annex 1) and the list of wildlife species cancelled from the Red Book (Annex 2) (FAOLEX, 2003). The Leatherback Turtle did not appear to be listed in either Annex 1 or 2. However, the Leatherback Turtle may be listed under the Order No.290 of 1998 of the State Committee of Environmental Protection regarding validation of Annexes to the Register of protected species (Red Book) of the Russian Federation.

In the Amur Region, Chapter III of Law No.151-OZ of 1999 "On protected areas." deals with protected animals and protected plants in Articles 20-25. Article 20 covers the status of protected animals and protected plants. Article 21 determines the modalities of classification of animals and plants as protected species. Article 22 regards legal status of regional protected animals and protected plants. Article 23 deals with the Regional Red Book. Article 24 regards the protection and conservation of protected animals and protected plants. Article 25 establishes liability for the damage caused to protected animals and plants (FAOLEX, 2003).

Saint Kitts and Nevis: No information on legislation protecting turtles in Saint Kitts and Nevis was available.

Saint Lucia: The Fisheries (Turtle, Lobster and Fish Protection) Regulations No.67/1987 [Règlement sur les pêches (protection des tortues, langoustes et poissons)] prohibits the disturbance, removal from the waters, possession, sale and purchase of turtle eggs; prohibits interference with turtle nests or nesting turtles; prohibits the taking or

possession of and trade in undersized turtles; prohibits the setting within 100 metres of the shore of nets for the taking of turtles and prohibits the taking or possession of and trade in turtles or parts thereof during the close season (ECOLEX, 2003).

Sao Tomé and Príncipe: The Leatherback Turtle is not protected in Sao Tomé and Príncipe (UNEP/CMS, 2000).

Saudi Arabia: According to the Saudi Arabian Act on fishing, exploitation, and protection of the marine life in the territorial waters, issued by Royal Decree No. M/9 of 27/3/1408, 1987, the transportation of turtle eggs without authorisation is prohibited (FAOLEX 2003).

Senegal: The Leatherback Turtle is protected in Senegal (UNEP/CMS, 2000). The Statutory Instrument 'Décret portant sur le Code de la chasse et de la protection de la faune (Partie réglementaire) No.86-884' regulates hunting, and the Leatherback is totally protected under this (ECOLEX, 2003). The 'Décret no. 67-510 du 30 mai 1967 portant sur le Code de la Chasse et de la protection de la Faune' also deals with sea turtles (Navid, 1982).

Seychelles: The Leatherback Turtle is fully protected under the 'Wild Animals and Bird Protection Act' which aims to protect all marine and fresh water turtles, the giant land tortoise, and wild terrestrial birds and sea birds.

Sierra Leone: No information on legislation protecting turtles in Sierra Leone was available.

Singapore: The Endangered Species (Import and Export) Act 1989 No.4/1989 implements CITES in Singapore and prohibits, except with permits, the import, export, re-export or introduction from the sea of specified specimens of species listed in the schedules to the Act. It also prohibits the possession, sale, offer for sale or display to the public of such specimens where these have been imported or introduced from the sea in contravention of the Act (ECOLEX, 2003).

Slovenia: Slovenia is a Party to the Action Plan for the conservation of marine turtles under the Barcelona Convention (UNEP/Map, 2003; FAOLEX, 2003).

Solomon Islands: Under The Fisheries Regulations 1972 (No.76/1972), Leatherback Turtles receive total protection (ECOLEX, 2003). Possession, transport, and/or national trade is prohibited or regulated.

South Africa: Cape Nature Conservation: there is a total prohibition on taking (South Africa National Report to CMS, 1994).

Gazankulu: the Leatherback is protected and taking is prohibited (South Africa National Report to CMS, 1994).

Natal Parks Board: nesting beaches are conserved and extensively monitored during the breeding season. Activities that may reduce nesting success are restricted (South Africa National Report to CMS, 1994).

Natal: there is a complete prohibition on taking (South Africa National Report to CMS, 1994) and nesting is monitored every season (South Africa National Report to CMS, 1994).

National Parks Board: no harvesting is permitted (South Africa National Report to CMS, 1994).

Kwazulu: a jointly funded research/protection project has been undertaken with the Natal Parks Board (South Africa National Report to CMS, 1994).

KwaZulu: in a jointly funded project with the Natal Parks Board, an annual survey of breeding females of Loggerhead Turtles *Caretta caretta* and Leatherback Turtles was carried out (South Africa National Report to CMS, 1994).

Kwazulu: the Leatherback Turtle is protected under Act 8 of 1975. Taking is permitted only with a special permit, subject to terms and conditions. No permit has been issued (South Africa National Report to CMS, 1994).

Lebowa: the Leatherback Turtle is protected (no further details provided.) (South Africa National Report to CMS, 1994).

Orange Free State: the Leatherback Turtle is fully protected and taking is prohibited (South Africa National Report to CMS, 1994).

Qwaqwa: taking is not permitted and no exceptions have been granted (South Africa National Report to CMS, 1994).

Transvaal: the Leatherback Turtle is fully protected under the Transvaal Ordinance (South Africa National Report to CMS, 1994).

Spain:

The ‘Real Decreto por el que se regula el Catálogo Nacional de Especies Amenazadas No.439/1990’ (Royal Decree providing the national list of Endangered Species) lists endangered species and species of special interest. The Decree prohibits, in addition to the taking prohibitions laid down in the ‘Act of 27 March 1989 on the conservation of natural areas and wild flora and fauna’, the unauthorised possession of live and dead specimens of listed species and of their remains. It also prohibits the intentional disturbance of animals belonging to these species (ECOLEX, 2003). The Leatherback turtle is listed as a species of special interest. The ‘Ley de Protección de los Animales of Catalunya’ also protects the Leatherback Turtle (ECOLEX, 2003).

The National Catalogue of Endangered Species (Royal Decree 439/1990 April 5, 1990) has included the Leatherback Turtle under the category “of special interest”. The Canarias Autonomous Community Regional Catalogue of Endangered Species includes this species under the category “ in danger of extinction” (Decree 151/2001, August 1 2001) (Spain National Report to CMS, 2002).

Canary Islands: The Leatherback Turtle is protected in the Canary Islands (UNEP/CMS 2000). Decree 289/1991 protects all marine turtles in the Islands and Spanish national legislation is also applied to these Islands (FAOLEX, 2003).

Sri Lanka:

The Leatherback Turtle is protected under the Fauna and Flora Protection Ordinance (Sri Lanka National Report to CMS, 1994). The nesting beach in Yala Reserve is protected.

Sudan:

No information on legislation protecting turtles in Sudan was available.

Suriname:

The nesting beaches at Galibi, Matapica and Krofajapasi (formerly within the Wia-Wia Nature Reserve, now protected by special decree) are protected.

Sweden:

No information on legislation protecting turtles in Sweden was available.

Tanzania, United Republic of: No information on legislation protecting turtles in Tanzania was available.

Thailand:

The Leatherback Turtle is protected under the Animals Protection Act B.D 2535 (The Zoological Park Organisation, 2003).

Togo:

The Leatherback Turtle is protected in Togo (UNEP/CMS, 2000).

Trinidad and Tobago:

Legal Notice 65 of 1994 regulates the installation of marine turtle excluders for commercial shrimp trawlers; the returning to sea of captured marine turtles and the participation of shrimp trawlers in marine turtles’ conservation practices specified by the Ministry (FAOLEX, 2003). The Fisheries Ordinance (1916 as amended to 1975) and the protection of turtle and Turtle Eggs Regulations, 1975 also deal with sea turtles (Navid, 1982).

Tunisia:

Tunisia is a Party to the Barcelona Convention, and has signed and ratified the SPA and Biodiversity Protocol and the Action Plan for the conservation of marine turtles. Proposed actions for Tunisia in the latter include recommendations to elaborate special legislation for marine turtle protection, to develop research and monitoring programmes on mortality, fisheries interaction and nesting sites and to establish a marine turtle biology centre in Tunisia. (UNEP/Map, 2003; FAOLEX, 2003).

Turkey:

Turkey is a Party to the Barcelona Convention, and has ratified the SPA and Biodiversity Protocol and the Action Plan for the conservation of marine turtles.

Proposed actions for Turkey in the latter include recommendations to ensure EIA are made an integral part of tourist development projects near nesting beaches; to ensure nesting beaches are legally protected; to regulate tourist activities that could affect turtle nesting; to create and enforce regulations for reduction of by-catch; to set mechanisms to reduce nest predation and to establish awareness campaigns targeted at both the public and decision makers (UNEP/Map, 2003; FAOLEX, 2003).

United Arab Emirates: No information on legislation protecting turtles in the United Arab Emirates was available.

United Kingdom: The Endangered Species (Import and Export) Act 1976 (an Act which restricts the import and export of certain animals, plants and items and which restricts certain transactions regarding these or their derivatives, and which confers on the Secretary of State power to restrict by order the places at which live animals may be imported, to restrict the movement after importation of certain live animals, and for connected purposes) (1976 c.72 (c.72/1976)) lays down restrictions on the import and export of *Dermochelys coriacea* (ECOLEX, 2003). It was amended by the Wildlife and Countryside Act 1981. The Wildlife and Countryside Act 1981 applies to all species of marine turtle (i.e. the families Dermochelyidae and Cheloniidae) when found in British waters. It gives full protection to the Leatherback Turtle and prohibits the intentional killing, injuring or taking (capture, etc); possession; intentional disturbance whilst occupying a 'place used for shelter or protection' and destruction of these places; sale, barter, exchange, transporting for sale and advertising to sell or to buy.

Anguilla: No information on legislation protecting turtles in Anguilla was available.

British Indian Ocean Territory: No information on legislation protecting turtles in British Indian Ocean territory was available.

British Virgin Islands: "Regulated turtle harvesting is currently allowed. All turtles are protected in the British Virgin Islands under the provisions of the Turtles Act 1986 during the closed season (1 April to 30 November) when it is illegal to catch, take or sell any turtles and turtle eggs (eggs are protected all year round)" (UK National Report to CMS, 2002).

Cayman Islands: The Marine Conservation Law, 1978, considers extraction of turtle eggs as an offence. The marine conservation (turtle protection) amendment regulations, 1985, now prohibit the taking, molesting or disturbing of any turtle during the months of May to October in any year. Regulation 5 prohibits the possession of turtles without a valid licence issued by the Marine Conservation Board under regulation 6 of the Endangered Species Protection and Propagation Law, 1978. The Board may grant licences to resident fishermen to take, by traditional methods, turtles within the Cayman Fisheries Zone for consumption within the Islands. The licence shall be valid for one year and will specify the maximum number of turtles that may be taken and the minimum size of turtles. Turtles shall be tagged immediately after catch with tags issued by the Board and inspected by a fisheries officer. Possession of an untagged turtle or slaughter of a turtle that has not been inspected is declared an offence. (FAOLEX, 2003)

Montserrat: The Turtle Ordinance 1951, bans the capture, commerce and transport of any turtle or their eggs between June and September (FAOLEX, 2003).

Saint Vincent and the Grenadines: The possession, trade and capture of turtles outside the turtle season is prohibited (FAOLEX, 2003).

Turks and Caicos Islands: The Fisheries Protection Regulations, 1989, sets restrictions on the extraction of marine resources including marine turtles.

United States: The United States government recently closed a very large area in the northern Pacific to the US longline fishery in order to protect Leatherback Turtles from incidental capture (IUCN, 2002). The Endangered Species Act of 1972 and a number of state legislation also refer to sea turtles (Navid, 1982).

American Samoa: No information on legislation protecting turtles in American Samoa was available.

Puerto Rico: No information on legislation protecting turtles in Puerto Rico was available.

U.S. Virgin Islands: Sandy Point (St. Croix,) and adjacent waters are designated Critical Habitat for the Leatherback Turtles under the 1973 U.S. Endangered Species Act (Anon., 1981a). The Recovery Plan (Anon., 1981a) for the St. Croix population has been approved.

Uruguay: The Presidential Decree 144 prohibits the capture, retention, transport, commerce, transformation or processing of any marine turtle (Karumbé, 2003). Legislation has been developed to reduce incidental capture and prevent habitat alteration, as well as to prevent the removal of individuals from their natural environment (Uruguay National Report to CMS, 1999; FAOLEX, 2003).

Vanuatu: The Prevention of Cruelty to Animals Act, provides for the protection and conservation of turtles in Vanuatu. It bans cruelty to turtles, as well as capture or any damage caused to them or to parts of their body or eggs (FAOLEX, 2003).

Venezuela: The ‘Resolución por la cual téngase como oficial la lista de animales de caza que en ella se indica No.276/1970’ (Resolution containing the Official List of Animals which may be hunted) lists the Leatherback as a game species. Taking is only authorised if an open season has been declared. The Wildlife Protection Act of 1970 applies to all wild mammals, birds, reptiles and amphibians (ECOLEX, 2003).

Vietnam: No information on legislation protecting turtles in Vietnam was available.

Yemen: No information on legislation protecting turtles in Yemen was available.

6.0 Conservation Action

Many sea turtle conservation initiatives, both local and international, have been undertaken by governments, universities, and NGOs *etc* around the world, many of which include conservation and management, research, monitoring and education components. Many of these initiatives also include components that specifically benefit *Dermochelys coriacea*. Examples of international and regional initiatives are described below. Conservation initiatives undertaken in many, but not all, of the range state are then described but, due to the huge number of actions and activities that have been initiated, it is inevitable that some will be omitted.

Argentina, Uruguay and Brazil are working together on understanding the migratory patterns of marine turtles in the **Southwest Atlantic**. Nesting occurs on Brazilian beaches but many individuals are caught in Uruguayan and Argentinean fishing nets and are found stranded on the coast of these countries, although there is no evidence that they nest in the latter two countries.

The **ASEAN** (Association of Southeast Asian Nations) Ministers on Agriculture and Forestry (AMAF), signed a Memorandum of Understanding (MoU) on ASEAN sea turtle conservation in 1999. From this, a Sea Turtle Conservation and Protection Program and Work plan has developed; research and monitoring activities have also been produced regionally (Kadir, 2000).

The countries in the **Western Indian Ocean** drew up a regional strategy for marine turtles’ conservation, the Sodwana Declaration. The meeting, held in November 1995, brought together scientists from Eritrea, Kenya, Tanzania, Mozambique, South Africa, Comoros, Mauritius, Seychelles, and France (including La Reunion and other islands). Actions proposed in the strategy are similar to the IUCN Global Strategy for marine turtles, and include: research and monitoring, integrated management for sustainable marine turtle populations; community participation in conservation; building capacity for conservation, research and management; public awareness, information and education; regional and international co-operation and funding for marine turtle conservation (IUCN, 1996).

In 1998, **West African** countries (Congo, Gabon, Equatorial Guinea, São Tomé and Príncipe and Cameroon) gathered for a workshop on the conservation of marine resources. Marine turtles was one of the special topics covered, and as a result, a network for the Protection of Marine Turtles in Central Africa was created to concentrate efforts on a better knowledge and conservation of marine turtles. One of the activities was the

protection of turtle nesting sites to avoid indiscriminate slaughter along the West African coast, and particularly in the Gulf of Guinea (Vives, 1998).

Twenty one Mediterranean countries (Albania, Algeria, Bosnia and Herzegovina, Croatia, Cyprus, Egypt, France, Greece, Israel, Italy, Lebanon, Libya, Malta, Monaco, Morocco, Serbia and Montenegro, Slovenia, Spain, Syria, Tunisia, Turkey) and the European Union are Parties to the Convention for the Protection of the Marine Environment and the Coastal Region of the **Mediterranean** (Barcelona Convention). Parties to the Barcelona Convention produced an Action Plan for the conservation of Mediterranean Marine Turtles that sets priorities and recommendations for marine turtle conservation in the Mediterranean. Actions specified include management and protection activities, research and monitoring, public awareness and education, and co-operation and co-ordination between parties.

The Inter-American Convention for protection and conservation of marine turtles (see section 5.1) gathers together nine countries in the **Americas** to promote the protection, conservation and recovery of sea turtle populations as well as the habitats on which they depend. The following countries are Parties to the Convention: Brazil, Costa Rica, Ecuador, the United States of America, Netherlands (Netherlands Antilles), Honduras, Peru, Mexico and Venezuela. Belize, Nicaragua and Uruguay have presented instruments for their ratification.

- Albania** The University of Tirana and the Natural Sciences Museum are updating information on marine turtles in Albania, including their status along the Albanian coasts, and are developing awareness programmes among Albanian people and fishermen (Hazhiu, 2002)
- Argentina** The Peyu Project is an NGO that promotes community education and awareness of the issues marine turtles are facing, as well as scientific research on Argentinean coasts. The project also seeks to promote research funding for people and institutions interested in the conservation of marine turtles. The Peyu Project also integrates with other regional projects, such as Kerumbé in Uruguay and Tamar in Brazil (Proyecto Peyu, 2003).
- Barbados** In 1992, the NGO Widecast produced the ‘Sea Turtle Recovery Plan for Barbados’ for the UNEP- Caribbean Environmental Program. The plan was produced in response to the objectives of the Specially Protected Areas and Wildlife Protocol (SPAW protocol), an instrument derived from the Cartagena Convention (a regional convention for the Great Caribbean region), and was part of a series of plans developed in the Caribbean for the protection and conservation of marine turtles. The plan determines the status and distribution of marine turtles in Barbados, identifies threats to marine turtles in the region and proposes solutions for such threats; it also sets out recommendations for governmental and non-governmental organisations (Horrocks, 1992).
- Benin** According to the Benin National Report to CMS (2002), awareness campaigns have been initiated.
- Brazil** The TAMAR project, initiated in the 1980s, aims to produce information for the preservation and conservation of turtles. Currently the project involves research on the behaviour and population genetics of turtles, research on turtle reproduction, incubation, and hatchlings as well as on other aspects of their biology (Projeto Tamar, 2003).
- Cameroon** During 2000, inventories of nesting sites of marine turtles that visit Cameroon’s coasts were undertaken in southern Cameroon; tagging activities have been also developed in the Campo-Ma’an and Douala-Edea reserves (UNEP/CMS, 2000).
- Canada** The Canada Wildlife Service is currently developing a recovery plan for this species in the Atlantic Coast. The Strategy of the plan includes the identification of critical habitats for Pacific population recovery and areas of potential conflict, the development of a database and the reporting all sightings of this species sightings. Other activities involving tagging, telemetry and workshops have also been undertaken (Species at Risk, 2003). On a more local level, the Nova Scotia Leatherback Turtle Working Group is a collaborative conservation and research initiative that involves scientists, fishermen, coastal communities, boat operators and other people interested in the conservation of Leatherbacks. It has operated since 1997 and recuperation and conservation of the species

are its aims. Part of the conservation effort is the involvement of commercial fishermen as partners in the research (LTWG, 2003).

Chile

The National History Museum and the National Fisheries Service are promoting the protection of marine turtles by providing information on the protection and care of turtles to artisanal fisheries organisations and small industries. This does not involve specific legal measures.

Colombia

There are several conservation initiatives ongoing in Columbia, including the initiatives of the Ministry of the Environment that denominated the marine turtle as a species whose conservation is a priority. In Columbia, the most important nesting sites for this species are on the southern parts of the Caribbean coast. A protection program of the Leatherback has been based here since 1993, which focuses on education, research and protection activities, and on increasing awareness in local communities and national authorities (Madaune, 2002). Other initiatives for turtle conservation include technical workshops to update the information produced in the country. Although mostly targeted at Colombian researchers and conservation authorities, these workshops are international (Amorocho, 2002).

Congo

“The Program for the Protection of Marine Turtles in Central Africa (PROTOMAC) included a campaign in 2001 to observe marine turtle nesting sites on the Congolese coastline. It concentrated on three areas: south of Pointe-Noire, the beaches of Pointe-Noire, and North Kouilou. South of Pointe-Noire there was substantial evidence that egg-laying sites had been raided and that the shells of turtles had been taken. On the beaches of Pointe-Noire and north of Pointe-Noire, the PROTOMAC team has observed the landing of netted or live turtles by self-employed fishermen who claim that they have been caught accidentally.” (Congo National report to CMS, 2002).

The ‘Association Congolaise de l’Education pour l’Environnement et la Nature’ (ACEN) [Congolese Association for Education on Nature and the Environment] has monitored and evaluated the violation of turtle nests by poachers in the Conkouati National Park. (Congo National report to CMS, 2002).

Costa Rica

Ecology Project International, established an education and monitoring program in the Pacuare Natural Reserve in 2000, in collaboration with university students from the USA, Costa Rica and other countries of Central and South America, as well as with community participation. The program has trained several students and has created awareness in the community regarding the importance of conserving this species (Ecology Project International, 2003). There are also several NGOs working specifically in marine turtle conservation and education programmes that are focused on both Costa Rica and other Central American countries. These include PRETOMA, the ‘Centro para la Investigacion de Tortugas Marinas Douglas Robinson’, and the Parismina Turtle Commission.

Côte d’Ivoire

A preliminary inventory of nesting sites between Abidjan and the border with Liberia has been undertaken. Nesting sites are monitored and protected in the Azagny National Park (UNEP/CMS 2000)

Equatorial Guinea: Conservation activities developed by CUREF-Cardiff University and ECOFAC include coastal surveys, captures, turtle consumption monitoring, awareness campaigns and park guards training (Formia *et al.*, 2003).

El Salvador:

The Project Ayutzin for the conservation of marine turtles has worked, since 1994, for the protection of the species that visit Playa Toluca –La Libertad Department. The project is a joint effort between the community inhabiting the coast and the NGO, CESTA (CESTA, 2003).

Fiji:

In 1998, the Government, in collaboration with the University of the South Pacific and NGOs, developed “The Fiji Sea Turtle Conservation Strategy” This is being used to manage the species’ conservation efforts although it has not been formally adopted by the government. The strategy identifies a number of actions for turtle conservation, namely institutional capacity building, limitation and regulation of the harvest, education and awareness, marine conservation workshops, protection of nesting sites and nesting turtles,

protection of foraging areas and foraging turtles, captive turtles, pollution, bycatch, and a regional strategy (WWF Pacific, 2003).

French Guiana: According to WWF-Guianas, in French Guiana there are several initiatives being undertaken by universities, NGOs, governmental agencies, research centres and in protected areas that involve marine turtle conservation. Indigenous communities and fishermen are involved in the projects' activities. These activities include: raising of awareness in tourists and school children, tourism management, tagging female turtles, producing surveys of nesting activities, patrolling and assessing turtle and fisheries interactions (WWF-Guianas, 2003)

Gabon: The Smithsonian National Zoological Park conducts health assessments and conservation programmes as part of the FVP's Caribbean/Atlantic Sea Turtle Health Assessment Program (WCS, 2002; Deem, 2003). A tagging programme studying reproductive success, *in situ* protection systems and awareness campaigns have been developed. It has been proposed that the conservation efforts of several agencies, including IUCN, should extend into the Congo in order to protect a greater area. The WCS has also realised conservation activities in Corisco Bay and Pointe Pongara as well as monitoring programmes on the trade of sea turtle meat and eggs in the markets (Formia, 2003)

Gambia: According to UNEP/CMS (2002) four coastal protected areas have been identified as being very important for marine turtles. However, UNEP/CMS (2002) do not report any monitoring activities or research undertaken nor do they mention community or NGO participation in conservation.

Ghana: Community based training programmes have been organised to build national capacity and to set up institutional infrastructure for sea turtle conservation programmes (UNEP/CMS, 2000).

Guatemala: The Wildlife Rescue and Rehabilitation Association is a Guatemalan non-profit organisation created for the preservation of wildlife and wild habitats in the country. Near the village of Hawaii, this Association has developed community-based projects on the conservation of *D. coriacea*, which include the protection of hatcheries against theft and other threats (Juarez and Muccio, 1997).

Guinea: The Guinea National Report to CMS (2002) states that the following actions will be initiated for the conservation of this species: "Restoration of the habitat following the guidelines of the National Strategic Action Plan for Biological Diversity in respect of Marine Turtles; training of administrators of the said habitats; raising the awareness of fishermen and sailors so that they can contribute to the conservation of marine turtles and strengthening of institutional powers".

Guyana: The Guyana Marine Turtle Conservation Society was formed in 2000 with the aim of promoting conservation, management and restoration of marine turtles in Guyana. It develops surveys and protection patrols, education awareness, community empowerment and research. (Guyana Marine Turtle Conservation Society, 2003). WWF-Guianas provides technical assistance to the GMTCS.

Honduras: Projects monitoring the nesting and hatching of *Caretta caretta* and *D. coriacea* have been developed in the Plapaya beach by the NGO Mopawi.

India: The National Sea Turtle Conservation Project in India was launched in 1998 with the aim of protecting *Lepidochelys olivacea*, but it also has conservation and protection strategies for all the other turtle species nesting in the country. A project undertaken by the Indian government includes activities which encompass critical habitats for sea turtles both on-shore and offshore. Its activities include surveys, monitoring programmes, fisheries interactions, community and NGOs participation, awareness raising and education, research support and other support for regional and international co-operation and collaboration for sea turtles conservation (Choudhury *et al.*, 2001).

- Kenya:** Monitoring activities have been undertaken within the framework of coastal zone and biodiversity monitoring. However, habitat protection activities within the framework of coastal zone and marine protected areas management and habitat restoration activities have been conducted only when oil spills and pollution are being addressed (Kenya National Report to CMS, 2002)
- Malaysia:** Sarawak has one of the oldest programmes in the world for sea turtle conservation and management; various government agencies as well as five laws are relevant for turtle conservation; despite this the population has decreased by 90% in the past 50 years. The government has undertaken several major steps to avoid further declines, including extensive scientific studies, total protection of turtle nesting beaches and strengthening of existing laws (Braken and Bali, 2000).
- Maldives:** Recently the Government of the Maldives has imposed a total ban on catching and selling any marine turtle in the Maldives. However, egg collection is still not regulated (Inmaldives, 2003)
- Mauritania:** According to the UNEP/CMS (2000), preliminary inventories of nesting sites have been developed.
- Mexico:** Due to a drastic decline of the nesting population of *D. coriacea* in the Mexican Pacific, the Fishing National Institute, in co-ordination with the National University of Mexico (UNAM), started a research project aimed at understanding the causes of such decline and intensifying protection activities. Protection of females and eggs and monitoring activities are constantly maintained at Llano Grande Beach (the third densest Leatherback nesting site). In the five major rookeries for the Leatherback an intensive tagging programme has been implemented. Other activities in the Pacific Coast consist of aerial surveys of the entire Pacific coast of Mexico, workshops for standardisation of terms, definitions and methods, and training of personnel (Arenas *et al.*, 1998).
- Namibia:** Ninety per cent of the Namibian coast is protected, there does not appear to be any interference between indigenous Namibians and turtles in this country (UNEP/CMS 2000). No conservation actions undertaken by the government or NGOs are reported by UNEP/CMS (2000).
- Netherlands:**
- Netherlands Antilles:** In 1992, the NGO Widecast produced the 'Sea Turtle Recovery Plan for the Netherlands Antilles' for the UNEP-Caribbean Environmental Program. The plan responded to the SPAW protocol objectives and was part of a series of plans developed in the Caribbean for the protection and conservation of marine turtles. The plan's objective is to help marine turtle population recovery in the Antilles and to collect as much information as possible regarding their distribution; the plan also aims to promote public awareness on the species conservation and recovery (Sybesma, 1992).
- Philippines:** Protection of marine turtle habitats and nesting sites is addressed through a much broader programme on the establishment and management of protected areas. Currently, there are about 31 marine areas being managed as protected areas by the Department of Environment and Natural Resources. In the Philippine Biodiversity Conservation Priority –Setting Program, 12 marine areas have been identified as priority areas for conservation to protect marine turtles.
- Regarding law enforcement, PAWB's Wildlife Monitoring Team is closely monitoring trade and apprehending traders of marine turtle by-products. Trade in this species has been greatly reduced thanks to these measures.
- The Philippines have also been active in pursuing international partnership for the conservation of marine turtles through a Memorandum of Understanding with the Malaysian government on the joint management of TIHPA. Field-work for the expansion of the coverage of the TIHPA to include the Berao Islands of Indonesia has been initiated together with Malaysian government. Training and conservation planning with Indonesian groups had been undertaken. These initiatives will lead to the formalisation of

a partnership with the government of Indonesia through a tripartite agreement, which will be done in the near future (Philippines National Report to CMS, 2002).

Saint Kitts and Nevis: In 1992, the NGO Widecast produced the ‘Sea Turtle Recovery Plan for Saint Kitts and Nevis’ for the UNEP-Caribbean Environmental Program. The plan responded to the SPAW protocol objectives and was part of a series of plans developed in the Caribbean for the protection and conservation of marine turtles. The plan determines the status and distribution of marine turtles in Saint Kitts and Nevis, identifies threats to marine turtles in the region and proposes solutions to such threats; the plan enhances information exchange at national and regional levels (Eckert and Honebrink, 1992; Orchard, 1994).

São Tome and Principe: Since 1988, heavy exploitation of sea turtles for meat, eggs, and scutes has been reported. In 1994, a collaborative project between the European programme ECOFAC and the Peace Corps confirmed the non-sustainable exploitation of sea turtles and their by-products on the island of São Tome. Following this survey, ECOFAC initiated regular monitoring efforts, relocation of threatened nests, and public awareness programmes. From 1998 to 2001, a specific project dedicated to the conservation of sea turtles called ‘Projeto Tâtô’ and funded by a national program (PIN) STP/CE took over this study. Projeto Tâtô carried out complete coastline surveys, regular monitoring of significant nesting beaches and of turtle captures at sea, nest relocation in protected hatcheries, as well as awareness campaigns among locals, students, tourists, government officials and tortoiseshell artisans (Formia *et al.*, 2003). It is now known that 4 species lay eggs on the beaches of the archipelago (*C. mydas*, *L. olivacea*, *E. imbricata* and *D. coriacea*) and 5 species have been observed at sea (including *C. caretta*); many age classes (juveniles, subadults, and adults) and males and females are present. Unfortunately, due to lack of funding and a national institution willing to take over the project, ‘Projeto Tâtô’ stopped its activities in May 2001. All the actions concerning sea turtles on the archipelago are now being revised, and the goal is to set up a local organization that can carry out these various activities. A local NGO called “Marapa” has been identified to implement all the turtle work (Fretey *et al.*, 2002). Marapa built two new egg hatcheries at the end of 2002 (Formia *et al.* 2003).

Senegal: According to Fretey *et al.* (2002), there are successful conservation projects in the Joal-Fadiouth and Palmarin region that have stopped the consumption of turtle meat and the sale of carapaces. Local radio stations have contributed broadcasting conservation messages. It has also been proposed that the knowledge of marine turtles in Senegalese waters and their nesting behaviour and the monitoring of beaches should be improved in the near future. Communities should be involved in all processes.

South Africa: As part of the region plan to implement the Sodwana Declaration, The Natal Parks Board initiated a turtle research program at the Turtle Beaches/Coral Reefs of Tongaland, and designated a Ramsar site in October 1986 (Wetlands International, 2003). WWF South Africa has also developed a conservation management project along the coastline of St Lucia Marine Reserve (WWF-ZA, 2003).

Spain: A programme in the Canary Islands is currently being developed for the study and conservation of this species.

Sri Lanka: IUCN, in collaboration with the Department of Wildlife Conservation, has produced a National Marine Turtle Conservation Action Plan for Sri Lanka and declared a marine sanctuary (Sri Lanka National Report to CMS, 2002).

Suriname: Sea turtle activities are co-ordinated by a local Amerindian organisation, Stinasu, which promotes sustainable development and ecotourism. WWF-Guianas technically and financially supports many of the projects; other organisations involved with turtle conservation are the Biotopic Foundation, the Oceanic Society and the University of Suriname. Stinasu, established the first ban on marine turtle eggs harvesting in 1968, since then the organisation, supported by others, has undertaken fieldwork, awareness programmes and international collaboration. Conservation work has been carried out mostly at the Galibi Nature Reserve (WWF, 2003a; Hilterman *et al.*, 2000)

United Kingdom: The Marine Conservation Society in the UK is developing a Jellyfish distribution project around the island, which will contribute to the knowledge of *D. coriacea* foraging distribution (Brown, P. The Guardian, 24 July, 2003). In 1999, the Joint Nature Conservation Committee (JNCC) was commissioned to undertake a project regarding bycatch. According to DEFRA (2001), a total of 154 turtles have been caught since the census began, 94% of which were *D. coriacea*.

A Species Action Plan (SAP) for marine turtles in the UK has been published. The SAP has been developed as part of the UK Biodiversity Action Plan and covers several turtle species (Leatherback Turtle *Dermochelys coriacea*, Loggerhead Turtle *Caretta caretta*, Kemp's Ridley Turtle *Lepidochelys kempii*, Green Turtle *Chelonia mydas*, and Hawksbill Turtle *Eretmochelys imbricata*). Species Action Plans contain targets and their costs, which typically cover both maintenance of the existing resource and more ambitious objectives for the enhancement and re-creation of habitats and the expansion of species populations. Each plan describes a series of actions required to achieve these targets, covering policy and legislation, site safeguard and management, species management and protection, advisory activities, research, monitoring, communications and publicity.

A three year project investigating the exploitation of marine turtles in the UK Overseas Territories is now underway, funded by DEFRA and co-ordinated by the Marine Turtle Research Group and Marine Conservation Society. The study will provide information on the current conservation status, population trends, exploitation patterns and genetics of marine turtles in these territories, as well as providing recommendations for future conservation, monitoring and management efforts (UK National Report to CMS, 2002).

In October 2001, the DEFRA funded project Turtles in the Caribbean Overseas Territories was launched, to assess the status and exploitation of Hawksbill *Eretmochelys imbricata*, Green *Chelonia mydas*, Leatherback *Dermochelys coriacea*, and Loggerhead *Caretta caretta* Turtles in Anguilla, Bermuda, the British Virgin Islands, the Cayman Islands, Montserrat, and the Turks and Caicos Islands. Assessment will include fieldwork and genetic stock analysis at foraging grounds and nesting beaches, and evaluation of legal/illegal turtle harvesting (UK National Report to CMS, 2002).

United States: The National Marine Fisheries Service (NMFS) and US Fish and Wildlife Service produced a recovery plan in 1992 that was aimed at helping the species recover to self-sustainable levels. The major action to achieve this aim focused on: long term habitat protection and ensuring hatching success in the most important nesting beaches; determination of the distribution and seasonal movements for all life stages; reduction of threats from marine pollution and reduction of incidental catches by commercial fisheries. In 1998 the NMFS produced the action plan for the species recovery in the US Pacific coast. Actions proposed were focused on incidental catches by the US and international fisheries; supporting to other countries in their efforts to census and protect nesting beaches in the Pacific; determination of movement patterns; determination of US population size and determination of stock home ranges. The Caribbean Conservation Corporation Sea Turtle Survival League was founded in 1959 and since then it has been undertaking research and education projects in order to protect marine turtles in the Caribbean.

Uruguay: The Karumbé project involves Uruguayan fishing communities in marine turtle conservation projects, by means of education in schools, communication of the status and threats facing marine turtles in Uruguay and worldwide, and teaching local people techniques to release and resuscitate caught turtles. The project is also aiming to achieve that Uruguay ratifies the Inter-American Convention for marine turtles protection and conservation, as it is the only country that has not ratified it yet (Karumbé, 2003).

Venezuela: The Working Group for Marine Turtles from Venezuela and the NGO Widecast have prepared an action plan for marine turtle recuperation in this country. The plan aims to update information, establish guidelines for research and management and contribute to decision-making. Conservation initiatives developed in Venezuela include projects in Miranda, Sucre and Nueva Esparta States, in the Roques Archipelago; and also include

conservation and biology courses and workshops (Tierraviva, 2003). Other initiatives for the species conservation include the creation of a sea turtle centre in Cipara, de Paria Peninsula, as recommended by the Action Plan for the Recovery of Sea Turtles in Venezuela. The main objective of this centre is to protect and monitor nests on the beach. Activities will include turtle tagging, beach surveys, interaction with fisheries, and volunteer training (Guada *et al.*, 2000).

While adults are widely protected by law, collection of eggs has been permitted or controlled in some areas. In Trengganu State (**Peninsular Malaysia**), for example, a *Dermochelys* hatchery, run by the Fisheries Department, was set up in 1961. Adult Leatherbacks were strictly protected on the nest beach, but virtually all eggs laid were gathered by licensed egg-collectors. The Fisheries Department bought back a proportion of the annual egg harvest for transplantation into the hatchery at Rantau Abang. Between 1961-1980, 730,060 eggs were transplanted, from which 360,520 hatchlings were produced for release (K. T. Siow *in litt.* to IUCN CMC, 19 April 1981). Usually more than 10,000 eggs (sometimes several tens of thousands) were incubated each year, with around 50% hatching success (Siow and Moll, 1982). The project was incubating about 10% of the eggs laid on the beach (K. T. Siow *in litt.* to IUCN CMC, 19 April 1981). Fees paid by egg-collectors for their licence have contributed towards the cost of running the scheme. However, it was suspected (Ross *and* IUCN/SSC Marine Turtle Group 1978, Mrosovsky 1979) that the percentage of eggs bought for incubation might be too small to ensure the continued survival of the population. Data on life history parameters were inadequate to objectively define the proportion of eggs that could be taken without adversely affecting the population. More recently this population has collapsed.

7.0 Research activities

There are several research and conservation centres dedicated solely to marine turtle conservation, monitoring and information production; and most of the initiatives described in the previous section also include research components. Much of the research on *D. coriacea* relates to nesting sites, hatching success, tagging, site returning, migration routes and patterns, genetic analysis, nesting behaviour, populations genetic analysis and interaction with fisheries. A number of marine turtle research institutions and organisations operate internationally, and some of these are described below. However, due to the large number of such institutions, the list is by no means complete and is intended as a brief summary of research activities.

The **Archie Carr Centre for Sea Turtle Research - Caribbean Conservation Corporation and Sea Turtle Survival League** have developed projects in Florida, on the western coast of the US and the Greater Caribbean region, including continental Central America and South America (ACCSTR - CCC turtle, 2003).

The **IUCN/Marine Turtle Specialist Group - Mediterranean and North-eastern Atlantic Subgroup**, the first of the marine turtle subgroups was established in 1996. Its activities include the establishment of an internet list server, MedTurtle (IUCN, 2003).

Medasset (Mediterranean Association to Save the Sea Turtles) was established in 1988 to conserve and preserve Mediterranean turtle populations and their marine ecosystems; projects include research programmes, education, policy, publicity campaigns, beach assessments, conferences, and media involvement (Euroturtle, 2003).

The **Smithsonian National Zoological Park (USA) – Science and Conservation** conducts health assessments of sea turtles in several countries world-wide, including Nicaragua, Costa Rica, Central Africa, and the United States. A project on the assessment of the health of Leatherback turtles began in 2002 along the coastline of the Republics of Congo and Gabon. The project includes surveys, monitoring and blood sampling and has involved local NGOs and national protected areas staff (WCS, 2002; Smithsonian National Zoological Park, 2003)

The **Wider Caribbean Sea Turtle Conservation Network** (Widecast) develops conservation, education and research projects in the Caribbean region (Widecast, 2003).

WWF has been working on the conservation and research of Leatherback Turtles in Africa and South and Central America. Projects in Africa include monitoring programmes in nesting beaches in Kenya and Mozambique, in Mozambique migration patterns have been studied for a period of 30 years. In Latin America and the Caribbean, WWF has assisted with the production of a Turtle Action Plan to address loss of habitat, over-exploitation of turtles and their eggs, and incidental catch by fisheries. It has also supported the

implementation of national projects and management plans in Guyana, Ecuador, Costa Rica, Brazil, French Guiana, Honduras and Suriname (WWF, 2003b)

A regional programme in the South East Asian region began a 3-year project on sea turtles conservation and management in 1998. The project included research on: population genetics, sea turtle statistics and tagging programmes in the region (Kadir, 2000).

Examples of research published in the Proceedings of the Annual Symposia on sea turtle biology and conservation held annually by the National Oceanic and Atmospheric Administration for some range states are summarised below.

Canada The Nova Scotia Leatherback Turtle Working Group (LTWG) conducts research in the Canadian Atlantic coast focused in the species' distribution and movement, genetics, necropsy, and histopathology (LTWG, 2003).

Costa Rica In Costa Rica, research has been undertaken on the predation of sea turtle by jaguars, fertility assessment projects, nesting activities, reproduction and emergence success (Mosier *et al.*, 2002), reproductive biology and tagging programmes (Byles and Fernandez, 1998).

Cuba Research has been undertaken on turtle interactions with fisheries and on occasional catches of Leatherback Turtles by Cuban fishermen (Keinath *et al.*, 1996).

El Salvador CESTA and the University of El Salvador have conducted research into the hatching success of marine turtles at the Toluca Beach (CESTA, 2003).

France Girondot (2000) has carried out research on the influence of temperature in sex determination in marine turtles.

French Guiana Research has been carried out on sea turtle nesting activity and behaviour (Mosier *et al.*, 2002), nesting seasons (Kalb and Wibbels, 2000) and density dependence and sex-ratio of hatchlings (Byles, *et al.* 1998).

Guatemala Studies have been carried out on the pivotal temperatures in the production of sexes in Leatherback turtles (Mosier *et al.*, 2002).

Mexico Research undertaken in Mexico includes studies on mortality rates, fibropapillomas case studies (Mosier *et al.*, 2002), nest management (Kalb *et al.* 2000), genetic stock identification, genetic population structure (Abreu-Grobois *et al.* 1998), nesting population size in the Mexican Pacific (Epperly and Braun, 1998), and analysis of egg composition (Byles, *et al.* 1998).

Panama Ordoñez *et al.* (2000) have carried out research into the nesting populations in Bocas the Toro Archipelago where Leatherbacks are the most common species.

Peru Alfaro-Shigueto *et al.* (2000) have studied the mortality of marine turtles in fisheries and results have shown this species to be in 16% of the captures between 1993 and 1994, being mostly caught by gillnets.

Portugal The Portugal National Report to CMS (2002) reported that onboard observation at the Azores fishing fleet as being carried out. According to UNEP-CMS (2000) research projects in the Azores and Madeira Islands include tagging, collection of information on turtle by-catch and its effects, satellite tracking, heavy metal analysis and analysis of stomach contents, autopsies, and growth studies.

South Africa Marine Turtles: The Conservation Management and Monitoring (ZA 204)' is the longest running research project of its kind in southern Africa. It carries out annual surveys, and seeks to determine the size and distribution of nesting populations of Loggerhead and Leatherback Turtles (WWF-ZA. 2003).

Spain The 'Centro Oceanografico de Malaga' has been studying marine turtles for over 20 years. The interactions of *D. coriacea* with fisheries and its migratory patterns have been studied and genetic analysis and tagging programmes have been undertaken (Kasperek, 2001)

- Sri Lanka*** Amarasooriya and Jayathilaka (2000) studied marine turtle nesting in the north-western, western and southern part of the country. Results indicate that Leatherback Turtle nesting occurs on the majority of the beaches surveyed.
- Suriname*** Studies have been undertaken in Suriname on nesting ecology (Mosier *et al.*, 2002), nest paternity and genetic variation (Byles *et al.*, 1998).
- USA*** Research has been carried out into familial relationships among nesting females using genetic techniques; genetic structure and relatedness to nesting populations; satellite tracking; reproductive endocrinology; nesting activities; distribution in the eastern coast and Caribbean islands; ontogeny of diving and feeding behaviour in Leatherback hatchlings (Mosier *et al.*, 2002). Scientists from the USA have also carried out research on the acoustic orientation and sound discrimination of hatchlings, body temperature during inter-nesting intervals, aquatic predation of Leatherback Turtles (Kalb and Wibbels, 2000); Leatherback strandings on the coasts of Georgia; heart rates and diving behaviour (Epperly and Braun, 1998); identification of individual and mating behaviour inferred by means of molecular genetics; hatchling near shore movements (Byles *et al.*, 1998) competition for prey with sunfish, migration patterns (Keinath *et al.*, 1996)
- Venezuela*** Studies on the interaction of marine turtles with artisanal fisheries and turtle monitoring activities have been carried out in Venezuela (Mosier *et al.*, 2002).

8.0 Needs and recommended actions

a) Policy and legislation

Legislation to protect Leatherbacks exists in many parts of the range but is often ineffective (e.g. Polunin and Sumertha Nuijta, 1982; Pritchard and Clifton, 1981; Márquez, 1978); ideally funds and personnel should be made available to enforce these laws. However, meat and especially eggs of this species may provide an important source of nutrients or income to local subsistence peoples, for example, in Pacific **Mexico**. In such cases rational utilization may be the preferred course. It has been pointed out that killing breeding female Leatherbacks is damaging on both economic and biological grounds; the adult female is thought to take a long time to mature, but once mature is potentially able to lay many eggs (Mrosovsky, 1981b). A female only has to nest in two seasons for the monetary value of her eggs to exceed that of her meat (data from Pacific Mexico) (Mrosovsky, 1981b). Thus, if exploitation is to occur, strictly regulated legal harvest of a proportion of Leatherback eggs laid may be appropriate; unregulated illegal killing of adults is unacceptable. However, firm recommendations on the preferable mode of utilization cannot be made. A long-term tagging project in **South Africa** has shown that a large number of adults do not return to breed after the initial tagging. It is therefore possible that the egg cohort of any one year is of comparable importance to the population as are many of the adult egg-layers (G. R. Hughes, *in litt.* to IUCN CMC, 22 February 1982). The feasibility of sustainable egg harvest should be investigated (J. P. Ross, *in litt.* to IUCN CMC, 20 February 1982).

The practice of incubating sea turtle eggs in semi-natural or artificial nests, in the hope of decreasing egg and hatchling mortality, should be reviewed. It is known that the sex of some sea turtle species, and probably all sea turtle species, is determined by temperature during a critical phase of embryonic development. To the extent that temperatures in non-natural nests differ from those in natural nests, the sex ratio among the hatchlings will deviate from the natural ratio. Production of an excess of males, or of intersexes, will clearly be deleterious; an excess of females may be less serious (Morreale *et al.*, 1982). Rearing Leatherback hatchlings is difficult (Jones *et al.*, 2000).

b) Species and habitat protection

A number of actions to enhance species and habitat protection are recommended:

- Protection of critical habitats including nesting beaches, foraging areas and migratory routes.
- Avoiding habitat degradation by contamination (plastic in particular).
- Control of fisheries that capture animals on a large scale.

- Control of the taking of eggs.
- Beach management programmes should be developed, with particular protection conferred on beaches during the nesting season.

c) Monitoring and research

A number of areas where monitoring and research are particularly needed are suggested below:

- Further research on the distribution and status of the Leatherback in many of its range states is needed, particularly in countries where it nests.
- Research into the declines seen in Leatherback numbers should be investigated and possible solutions identified. For example, significant declines in one nesting population in Malaysia may have occurred as a result of over-collecting of eggs. By the time egg collection had been stopped it was too late for this population to recover. Bycatch was also a serious threat to this population.
- Research into sustainable beach management and harvesting such be conducted to ensure that local communities are not deprived of local resources and that turtle conservation is safeguarded.
- The extent and impact of bycatch needs to be investigated. For example, in the offshore waters of the UK, a study on bycatch found that of 154 marine turtle caught incidentally between 1999 and 2001, 94% were Leatherbacks (DEFRA, 2001). Such high level of turtle bycatch in the waters surrounding a country in which the Leatherback is a relatively infrequent visitor indicate the importance of assessing the impacts of the bycatch in areas around breeding grounds.
- Research into fishing methods that reduce bycatch of turtles should be initiated

d) Public awareness and training

A number of areas where public awareness and training could benefit the Leatherback are suggested below:

- Education programmes to highlight the importance of turtle conservation and to encourage sustainable use of natural resources should be developed. Such programmes should be established in local communities and should target individuals such as local egg collectors etc.
- The impacts of bycatch should be highlighted and awareness programmes for fishermen should be developed. Fishing methods that reduce bycatch should be encouraged.

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