



CONVENTION ON MIGRATORY SPECIES

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HABITATS IN THE PACIFIC ISLANDS REGION
Noumea, New Caledonia, 8 September 2012
Agenda Item 3.1

BUILDING ON THE LOCAL KNOWLEDGE OF WHALES AND DOLPHINS ALONG THE SOUTHERN COAST OF UPOLU AND THE NORTHWESTERN COAST OF SAVAI'I

**BUILDING ON THE LOCAL KNOWLEDGE OF WHALES AND DOLPHINS ALONG
THE SOUTHERN COAST OF UPOLU AND THE NORTHWESTERN COAST OF
SAVAI'I**

20TH SEPTEMBER – 29TH OCTOBER 2010



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1. INTRODUCTION

Whales and dolphins are a group of marine mammals belonging to the order Cetacea. These extraordinary mammals are known to be an important component of the marine biodiversity and are documented to be highly intelligent animals. Whales are known to teach, learn, cooperate, scheme, and even grieve. Dolphins are among the most intelligent animals and their often friendly appearance and seemingly playful attitude have made them popular in human culture. For many of the people of the Pacific region, whales and dolphins play an integral part in their traditions, featuring in myths, legends and traditional uses.

The vast Pacific Ocean is known to be a vital habitat for more than 40 species of whales and dolphins that are either migratory or resident. Samoa is located in the southern west part of the Pacific and has been identified as a breeding and calving habitat for large whales such as the Humpback whales (*Megaptera novaeangliae*) and for resident species like the Spinner dolphins (*Stenella longirostris*). Humpback whales migrate each year to winter breeding grounds near islands and shallow banks in the tropical waters of the South Pacific after feeding during summer in waters near the Antarctic.

During the 20th century, whales in the South Pacific waters were intensively exploited by factory ships and modern-shore operations, which consequently led to the rapid decline in their populations. However, in recent years the population of whales in certain areas has been slowly recovering with the enforcement of laws prohibiting the hunting of these endangered mammals. In 2002 the Government of Samoa declared its EEZ (Exclusive Economic Zone) as a marine sanctuary in an effort to protect and conserve its marine animals. This effort was further reinforced with the formulation of the Marine Wildlife Protection Regulation 2009 which prohibits the hunting and/or injuring of all marine mammals within Samoa's EEZ.

Many of the whale species found in the region are endangered, like the Humpback whale which is listed as 'Endangered' under the IUCN Red List of Threatened Species. The current status of cetaceans in Samoa is very much unknown although annual surveys are continuing to collect more information to build on and to strengthen the local knowledge on the distribution and abundance of species such as the humpback whales and spinner dolphins. The limited research efforts, along with the large expanse of marine area that hasn't been surveyed, make it plausible that there may still be unreported species that inhabit these waters. Twelve species have been documented to occur within the coastal waters of Samoa with six other species that are known to occur throughout the Pacific and are most likely to be found in Samoa (Miller, 2007).

This report presents the findings of the 2010 survey which was carried out by the Ministry of Natural Resources and Environment, in collaboration with UNEP/CMS, from the 20th September to the 29th October 2010. The survey was conducted along the southern coast of Upolu and the northwestern coast of Savai'i with the primary goal of acquiring more information to expand the local knowledge and understanding on the status, biology, behavior and ecology of whales and dolphins found in Samoa to help increase and conserve their populations.

2. SURVEY OBJECTIVES

The main survey objectives were:

1. To assess and determine the diversity, distribution and abundance of whale and dolphin species along the southern coast of Upolu and the northwestern coast of Savai'i.
2. To collect scientific data through photo-identification and genetic sampling to further build onto the local knowledge of whales and dolphins in Samoa.
3. To obtain information on habitat utilization of whales and dolphins along the southern coast of Upolu and the north western coast of Savai'i.
4. To contribute to the conservation of whales and dolphins by acquiring a better understanding from the collected data on the behavior and biology of all cetaceans found in Samoa.

3. METHODOLOGY

a. Study Area

The first part of the survey was conducted along the southern coast of Upolu Island from the 20th September 2010 to the 1st October 2010. The second part was conducted along the northwestern coast of Savai'i Island from the 25th – 29th October 2010. The reef along the south southeastern coast is mainly fringing and approximately 4 km from the coastline. The reef drops to depths ranging from 100 – 2000m. The reef along the south-southwestern coast is more barrier in nature and provides a wider shelf compared to the south-southeastern coast. Around 10 km from the coastline the reef reaches the same depth range as the south-southeastern coast. For the island of Savai'i, there is a narrow shelf which runs along the northern and southern coast, terminating at a shelf break in approximately 150m water depths. The seafloor is relatively featureless with a few bathymetry highs at the south western corner (Figure 1).

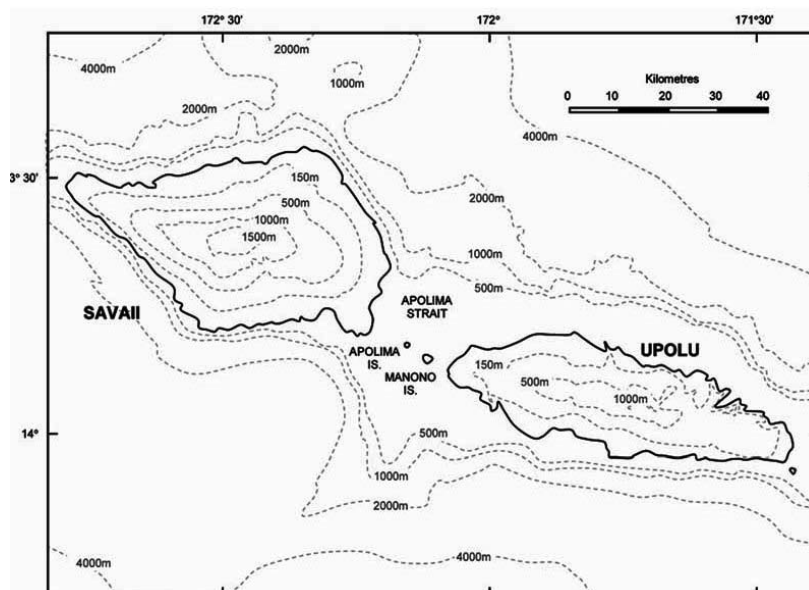


Figure 1: Bathymetry map of Samoa. The dotted line outlines the depths in meters. (Source: Noad *et al.* 2002)

b. Data Collection

A 7 - 8m aluminium boat (*alia*) was used as our research platform for Upolu and a smaller 5- 6m alia boat for Savaii. For both Upolu and Savai'i, the vessel was launched from a location that was central to the whole survey area. Vessel based observations were conducted as visual line transects. All four persons on board observed for cetaceans while survey was underway. When a cetacean was spotted, the transect would be broken and the vessel would approach the animal(s) in an attempt for identification of species and group composition, the recording of GPS position and for the collection of genetic and photographic samples. In addition, the behavior of the animal would also be recorded, especially before and after a genetic sample is taken.

c. Photo-identification

Photographs of encountered whales and dolphins were taken using a digital Canon EOS20D camera equipped with a 70 – 300mm USM lens. When dolphins were encountered, photographs were attempted of the animal's whole body, particularly the dorsal fin which would have distinctive scarring or marks that would be used to identify each dolphin. When a whale was encountered, the dorsal fin and the underside of its tail (fluke) which would have unique markings are photographed for individual identification purposes.

The images are integrated into a photo-identification catalogue for each species by the Marine Conservation Section. These catalogues allow the composition of different cetacean groups sighted around the islands to determine their distribution, migration and habitat utilization. For Humpback whales, the catalogued images are used and compared between groups and study sites from other regions at the South Pacific Whale Research Consortium (SPWRC).

d. Genetic Sampling

Genetic samples were obtained using a PAXARM biopsy system, which is a modified .22 rifle designed to propel floating darts with a stainless steel tip modified to retain a small sample (~2.5cm) of skin and blubber. Biopsy sampling is mainly dependent on the weather conditions and is only attempted when the conditions of the sea is at a Beaufort scale between zero to three. During sampling, the targeted animal is approached at a slow and steady speed and a sampling attempt is made on the target area between the dorsal fin and the tail. The animal's behavior before and after sampling is recorded. Samples that were successfully obtained were noted as a 'hit with sample' and attempts where the dart was fired but failed to collect any tissue sample were classified as a 'miss'. Tissue samples that are collected are preserved in 70 % ethanol for subsequent analysis at the University of Auckland.

4. RESULTS

a. Survey effort

Over a period of 12 days, a total of 88 hours and 56 minutes (average: 7 hours 38 mins per day) were spent surveying the southern coasts of Upolu and the northwestern coasts of Savaii islands. A total of 17 hours and 37 minutes were spent working with the encountered whales and dolphins. The total distance covered during the entire survey was 869.69 km where the concentration of the field efforts were spent in near-shore waters during the early mornings (approximately 1 km) and further offshore (approximately 7 km) in search of deep water cetacean species (Table 1).

In general weather conditions during the survey were unfavourable. The overall Beaufort scale ranged from 3 – 5 with the wind speed picking up during the afternoon which limited the surveys in the early mornings to late afternoons. The mean overall boat speed was 10 – 15 km/hour.

Table 1: Summary of the whales and dolphins encountered during the survey

DATE	TOTAL TIME	DISTANCE COVERED (km)	# OF ENCOUNTERS	# OF SPECIES	SPECIES	# OF BIOSPY SAMPLES
20/09	7hrs 6mins	50.02	3	2	Humpback whale Spinner dolphin	0
21/09	6hrs 30mins	52.11	4	3	Humpback whale Spinner dolphin Blainville's beaked whale	0
22/09	7hrs 35mins	58.79	2	2	Humpback whale Spinner dolphin	0
23/09	6hrs 5mins	58.43	1	1	Spinner dolphin	0
28/09	8hrs 25mins	84.94	3	3	Humpback whale Spinner dolphin Unidentified delphinid	4
29/09	6hrs 30mins	71.34	2	1	Humpback whale	1
30/09	6hrs 40mins	91.80	3	2	Humpback whale Spinner dolphin	0
1/10	8hrs 15mins	92.30	3	2	Humpback whale Spinner dolphin	2
25/10	8hrs 10mins	82.15	4	2	Humpback whale Spinner dolphin	0
26/10	8hrs 35mins	93.47	5	2	Spinner dolphin Unidentified whale	4
27/10	9hrs 35mins	83.34	1	1	Rough-toothed dolphin	0
29/10	5hrs 30mins	51	-	-	-	-

b. Cetacean encounters

During the 12 days survey, a total of 31 sightings of cetaceans were recorded (Table 1; Figure 2). Species that were positively identified from these encounters included Humpback whales (*Megaptera novaeangliae*), Spinner dolphins (*Stenella longirostris*), Rough-toothed dolphins (*Steno bredanensis*) and Blainville's beaked whales (*Mesoplodon densirostris*). An unidentified whale and delphinids were also recorded and could not be positively identified during the survey.

Humpback whales (45%, $n = 14$) and spinner dolphins (42%, $n = 13$) were the main species observed throughout the survey period except for the last day where no whales and dolphins were recorded. The majority of humpback whales were sighted on the southern coast of Upolu island (~2.13 whales per day) compared to Savaii (~0.75 whales per day) where only 1 pod comprising of 3 animals was recorded. The average rate of humpback whale sightings was 1.2 encounters per day with an average of 1.7 whales per day. Pod compositions were mainly of single animals (53%), adult pairs (5%), mother-calf pairs (20%) and mother-calf escort (5%).

Spinner dolphins were found close to the reef and were observed on both islands on all days except the last day. The daily detection rate ranged from 0 to 30 animals per day with an estimated maximum of 30 individuals in a pod. Spinner dolphins were observed in larger numbers in Savaii compared to Upolu and were found mainly along Falealupo to Falelima (Figure 2).

Rough-toothed dolphins were only observed in Savaii and an estimated maximum of 30 animals were in a pod. Rough-toothed dolphins are found in deep water offshore and are generally found in 500 meters > depths. The northwestern coast of Savaii reaches deep water (200m depths) within 1km from the reef where as for Upolu the same depth is approximately 3km suggesting shallower areas along the southern area of Upolu. Rough-toothed dolphins were sighted 5 km offshore in water depths of approximately 800 meters.

A pod comprising of 2 blainville's beaked whale were observed only once during the survey on the southern coast of Upolu island. These whales are rarely seen, deep water and were encountered 6 km offshore. During the 2003 survey, beaked whales were sighted although species could not be confirmed. The sighting of these blainville's beaked whale has now confirmed the presence of this species in Samoa.

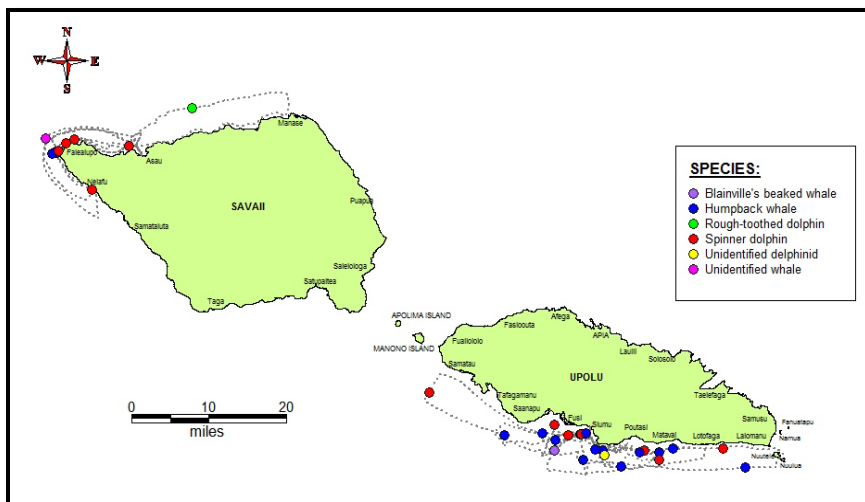


Figure 2: Sightings of whale and dolphins species over the 12 days of survey. The dotted lines represent the vessel tracks.

c. Photo-identification

A total of 20 humpback whales were sighted during the survey, 12 of which can be identified by dorsal fins and 5 by their unique flukes (tails) (Figure 3). None of the whales that were sighted were seen in previous years and within season.



Figure 3: Dorsal fins and flukes (tails) are photographed to identify individual animals

Photographs of the dorsal fins of spinner dolphins, rough-toothed dolphins and blainville's beaked whale were taken (Figure 4). Distinctive scarring, marks or deformations along the edges of the dorsal fin can distinguish individual animals. These images are catalogued and are used to determine re-sights, migration and interchange with dolphins photographed in Savaii.

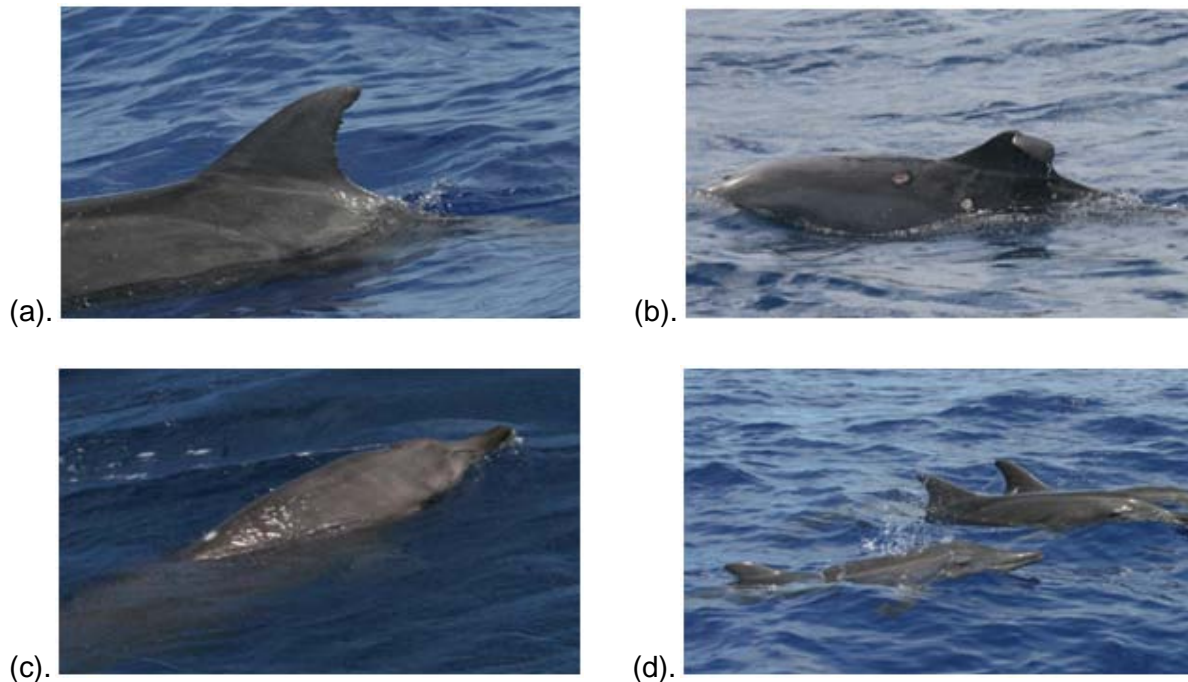


Figure 4: Images of dolphin and whale species encountered. (a). Dorsal fin of a rough-toothed dolphin (b). Dorsal fin of a spinner dolphin (c). Blainville's beaked whale (d). Rough-toothed dolphin.

d. Genetic sampling

A total of 28 biopsy attempts were made whereby 43% were successful in obtaining tissue samples and 57% were unsuccessful. Of the 43%, 5 tissue samples were obtained from humpback whales (42%) and 7 from spinner dolphins (56%). Observing the behaviour of whales and dolphins before and after sampling was noted. The overall behavioural responses or reaction to the impact of the dart is categorized according to Krützen et al. (2002), Brown et al. (1994) and Weinrich et al. (1992).

Spinner dolphins that approached the vessel to bow ride were generally the animals that were sampled. No sampling attempts of animals that were near the vessel with calves were done. The most common reaction of the dolphins after sampling were described by Krützen et al. (2002) as reaction one being a “startle” response whereby the animal flinches but stays within the vicinity of the boat thus continuing to bow ride.

Humpback whales were sampled when they prepare to dive. When collecting tissue samples, the behaviours of the whales are observed prior to sampling. Any reaction from the impact of the dart is recorded. Whales that were sampled would dive, resurface and continue to normal behaviour before sampling. Weinrich et al (1992) describe no reaction as the whale continuing its biopsy behaviour with no detectable change.

The tissue samples collected for this period are yet to be analyzed.

e. Interchange of Humpback whales between Samoa and the Oceania

Over the years, photographs of flukes from individual whales were taken and compiled into a catalogue which now holds 25 images of unique flukes. Samoa's catalogue is incorporated into the Oceania catalogue and includes those from American Samoa, Cook island, Fiji, French Polynesia, New Caledonia, New Zealand and Niue.

Currently a total of 10 fluke matches have been made between Samoa, American Samoa and Tonga. In 2001, a whale photographed in Samoa was later seen in 2004 in Tonga. In 2007, 2009 and 2010, whales sighted in Samoa during the season are later seen in American Samoa or those previously sighted in American Samoa were seen later in Samoa. In 2007, a whale photographed in Samoa was sighted in American Samoa of the same year and in 2009 for Tonga.

f. Occurrence of cetacean species over the surveyed years

Extensive surveys were conducted in 2001 around both islands of Upolu and Savaii. This survey documented the presence of whale and dolphin species in Samoa and noted certain areas of Upolu and Savaii as having high densities of cetacean. Over the years, studies have been focused along these areas and work has been done to collect information to better understand occurrence, distribution and providing an inventory of species present in Samoa.

Figure 5 shows sighting and distribution of whale and dolphin species over the years with most of the efforts concentrated along the northwestern coasts of Savaii and southern coasts of Upolu. Very limited work has been conducted around other parts of the islands and surveys needs to be conducted along these areas. In 2010, the northern coasts of Upolu was surveyed and spinner dolphins were mainly sighted.

Surveys are mainly conducted during the humpback whale season and further work needs to be done outside of the humpback whale season to determine the presence of other species.

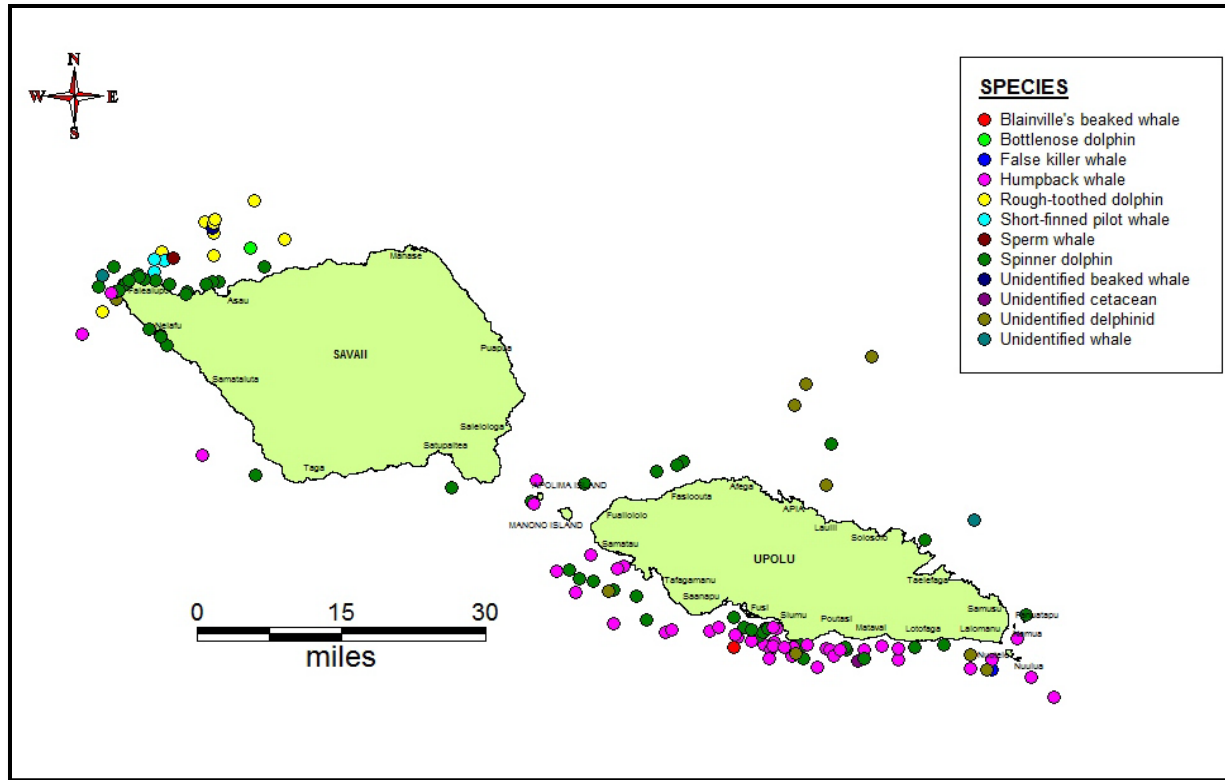


Figure 5: Sightings of species over the surveyed years. Survey efforts were mainly concentrated along the southern coasts of Upolu and western coasts of Savaii.

5. DISCUSSIONS

This survey focused within two areas that were identified in 2001 as having high densities and diversity of cetacean species. Although, there were limitations such as bad weather conditions which restricted the surveys on some days to early mornings and afternoons as well as the low vessel platform, valuable information were still obtained.

Humpback whales and spinner dolphins were the most frequently observed species during the survey. For the southern coasts of Upolu, it was noted that humpback whales were observed on most of the days as compared to the northwestern coasts of Savaii where humpback whales were observed only on one occasion. Although, only one pod of whales were encountered, they displayed a more resting and social behaviour compared to the whales observed in Upolu where they were mainly travelling. There has been limited work conducted in Savaii during the humpback whale season and it is important that further work is needed in Savaii during the season to understand the habitat use and occurrence of humpback whales. Throughout the years in which the southern coasts of Upolu have been surveyed, humpback whales have been documented on most days. This is shown by the number of encounters that have increased since the initial survey in 2001 whereby only 3 whales were seen over a period of 24 days

compared to the 20 individuals that were sighted for this season. The increase in the number of whales sighted does not suggest an increase in the population of these whales for Samoa. The abundance and population status of humpback whales in Samoa is still unknown and further research efforts is required to fill these gaps.

Pods of spinner dolphins were observed on both islands on the majority of days and appeared to be the most abundant of the species observed for this season. Larger numbers of dolphins were seen in Savaii compared to Upolu and were mainly found along Falealupo to Falelima. This stretch appears to be an important location in which dolphins were always found every day. It is important that further studies be carried out to understand the habitat use and residency of spinner dolphins along this area. Spinner dolphins were also commonly found in Upolu but were not commonly seen within a certain location compared to Savaii. Distinctive markings on the dorsal fins of the dolphins have been catalogued over the years to identify unique individuals which are used to note migration. Images of the dorsal fins of spinner dolphins did not reveal previously photographed dolphins indicating new individuals.

The northern coasts of Savaii have been the only area so far in which rough-toothed dolphins have been recorded. The 2003 survey documented the first sighting and encountered 7 pods of rough-toothed dolphins, 2007 and 2010 recorded 1 pod. These dolphins have been seen approximately 5 to 13 kilometers offshore and at water depths of 800 meters and more. Little is known about the status of these dolphins in Samoa. During the encounters, photographs of their dorsal fins have been taken and catalogued. Tissue samples have also been collected for genetic analysis. The rough-toothed dolphins photographed for this season has not been previously seen.

In 2003, beaked whales were sighted however; species were not identified at the time. The sighting of the blainville's beaked whales along the southern coast of Upolu is the first record thus building onto the knowledge of species present for Samoa.

The two study areas have shown significance in terms of cetacean diversity as identified in 2001. It is important that work is focused in these areas during the humpback whale season as well as other times to look at the presence of other species.

6. CONCLUSIONS

The findings of this survey have shown that the two study areas are highly important in terms of cetacean diversity. The sighting of the blainville's beaked whales for the first time now brings a total of twelve species of whales and dolphins confirmed to be present in Samoa. These include two baleen whales – humpback whale (*Megaptera novaeangliae*) and minke whale (*Balaenoptera sp.*) and ten toothed whales and dolphins – sperm whale (*Physeter macrocephalus*), short-finned pilot whale (*Globicephala macrorhynchus*), false killer whale (*Pseudorca crassidens*), dwarf sperm whale (*Kogia sima*), cuvier's beaked whale (*Ziphius cavirostris*), blainville's beaked whale (*Mesoplodon densirostris*), melon-headed whale (*Peponocephala electra*), spinner dolphin (*Stenella longirostris*), rough-toothed dolphin (*Steno bredanensis*) and bottlenose dolphin (*Tursiops truncatus*).

The study sites are areas of interest however, areas on both Savaii and Upolu where limited surveys have been conducted are of priority. Surveys outside of the humpback whale season should also be conducted to determine other species that are present and could possibly be found all year round. Although work has been carried out, intensive research is required to

gather data that would provide the necessary information to determine diversity, distribution and abundance of whale and dolphin species thus building onto the knowledge and understanding needed for conservation.

7. RECOMMENDATIONS

- To continue to conduct surveys during the humpback whale season in Samoa
- To carry out surveys outside the whale season to determine other species of whales and dolphins
- To determine important and/or critical habitats of cetaceans and promote marine protected areas for marine mammals
- To continue to collect the necessary information through photo-identification and tissue sampling to identify population structure and migration of species

8. ACKNOWLEDGEMENTS

Our survey this year would have not been possible without the financial assistance from UNEP/CMS and the Government of Samoa.

We would like to extend our thanks to those who have helped us with our surveys especially the boat captain and crew. We would also like to thank Jooke Robbins and David Matilla for sharing and comparing images on an annual basis. Special thanks to Lui Bell of SPREP and the Cetacean Pacific Islands Network which allows us to seek assistance and share with other cetacean experts especially with the identification of the beaked whale. Lastly, we would like to acknowledge the South Pacific Whale Research Consortium (SPWRC) and its members for the constant support.

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Financial Report

Total funds received from CMS (75%) = **ST\$ 8,081.82**

Survey Expenses

Boat hire 2,272.00

Fuel (petrol and oil) 5,644.80

Total 7,916.80

Balance remaining ST\$ 165.02