

**Bahamas Marine Mammal Survey  
2006 FIELD REPORT to  
Bahamas Department of Fisheries  
Permit No. 1 (MAF/FIS/12<sup>A</sup>)**

PRELIMINARY RESULTS

***Background***

The Bahamas Marine Mammal Survey (BMMS) is a long-term study that has been documenting the occurrence, distribution, and abundance of marine mammals around the islands of The Bahamas since 1991. With more than 2100 marine mammal encounters in The Bahamas, we are providing the only comprehensive documentation of the marine mammal fauna in this part of the world. Our research is based on the use of systematic boat-based surveys for describing the distribution and habitat use of different marine mammal species. We employ photo-identification techniques for the recognition of individual whales and dolphins, and we have developed new statistical approaches for using these data to determine abundance estimates and occupancy patterns. This photographic sampling is complemented by the collection of skin and faecal samples for molecular genetic analysis, which are being used to assess levels of genetic diversity and investigate the structuring of marine mammal populations. The use of Geographic Information Systems (GIS) mapping techniques allows us to describe species' distribution within the study area.

***Key Research Objectives:***

Long-term research objectives are:

- To investigate marine mammal species' occurrence, distribution and the abundance around the Bahamas to contribute towards management and conservation directives in the wider Caribbean region.
- To investigate the ecology of coastal Atlantic bottlenose dolphins on Little Bahama Bank, and monitor population trends to contribute towards future management of this population.
- To investigate the ecology of Blainville's beaked whales (dense-beaked whales) to aid in the conservation of beaked whale species in the Bahamas and elsewhere around the world.

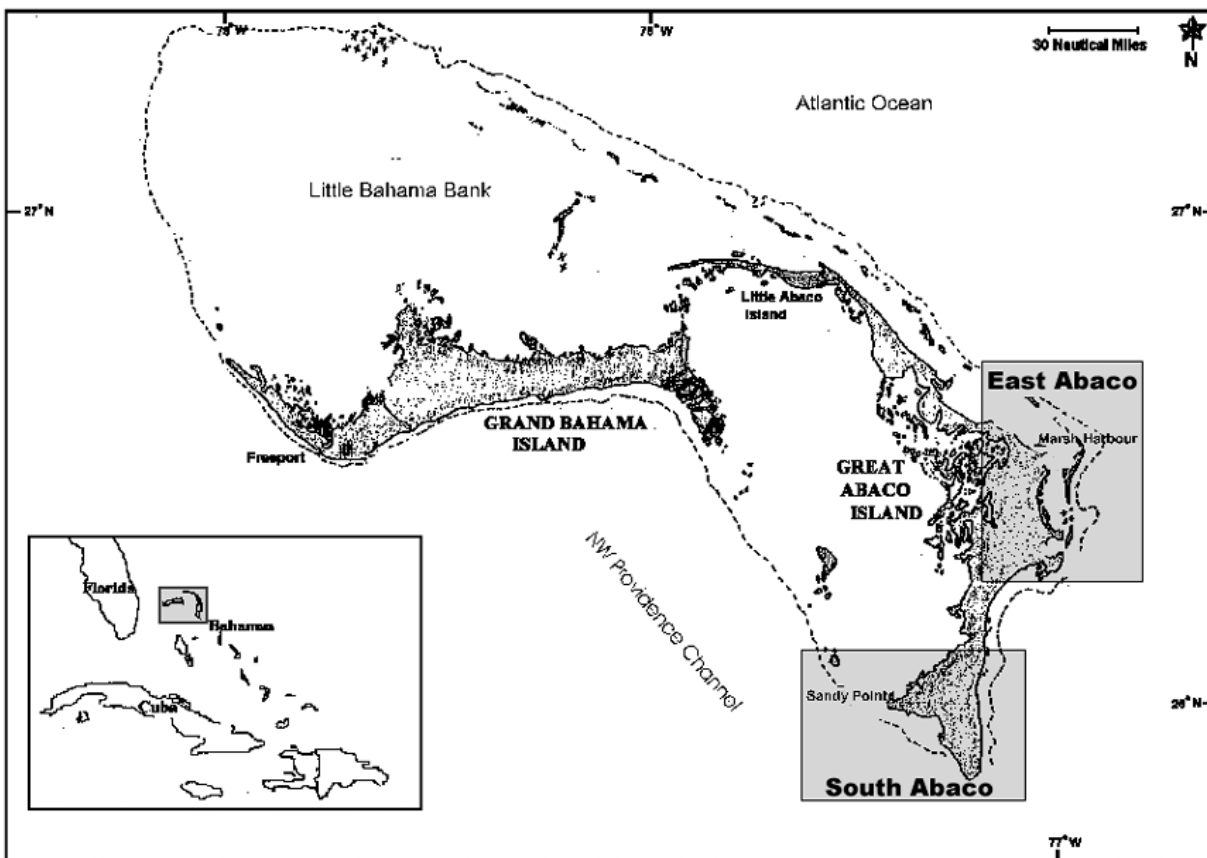
The specific research objectives addressed this field season were:

- To conduct vessel surveys to search for marine mammals primarily around Great Abaco Island, including random line transects, in order to assess species' distribution and habitat requirements.
- To photo-identify marine mammal species, with particular emphasis on bottlenose dolphins, Blainville's beaked whales and sperm whales, to provide sufficient data for the statistical assessment of occupancy patterns, abundance and social organization.

- To collect skin and faecal samples from marine mammal species, focussing on Blainville's beaked whales and sperm whales, to investigate population and social structuring using molecular genetic techniques, and to identify prey species.

### *Summary of 2006 Field Effort*

During the 2006 field season, the BMMS team covered 3,370 nautical miles (6,240 km) during 107 vessel surveys in The Bahamas. The majority of surveys were conducted in the waters off Great Abaco Island, in the northern Bahamas (see Figure 1). Eighty-five percent of all surveys were run in the South Abaco study site, BMMS main study area, while 4 surveys were run in East Abaco. Additionally, 11 surveys were conducted off North Andros and 1 off Central Andros.



**Figure 1.** Map of the northern Bahamas showing the South Abaco and East Abaco study areas covered by the Bahamas Marine Mammal Survey during 2006 field season. The broken line shows the boundary between the shallow waters of Little Bahama Bank and the surrounding deep oceanic waters.

The majority of surveys were opportunistic vessel surveys allowing us to maximise our encounter rate and photo-identification. In order to gather non-biased data on species'

distribution, we also completed 8 random-line transects in South Abaco during 2006, allowing us to build on our distribution dataset for cetaceans found in Northwest Providence Channel, with 5 different pelagic species found in 12 encounters on transect. Marine mammals were found during 63 of the all vessel surveys, or during 59% of the surveys run.

### ***Marine Mammal Encounters***

During the 2006 field season, there were 126 sightings of marine mammals, including six different species and totaling 685 animals. All of the sightings consisted of toothed whale species in the Order Cetacea, Suborder Odontocete, including one endangered species, the sperm whale. There were also sighting reports from the public which included another endangered species, the humpback whale (*Megaptera novaeangliae*, suborder Mysticete) as well as a group of killer whales (*Orcinus orca*) off Elbow Cay.

The majority of sightings (49%) were of the coastal or inshore ecotype of Atlantic bottlenose dolphins found on the shallow carbonate banks. Other frequently encountered species included Blainville's beaked whales (17%) and dwarf sperm whales (14% of sightings). It is interesting to note that sperm whales were only sighted on 4 occasions during 2006 or only 3% of all sightings, and that there was only one sighting of Cuvier's beaked whales. Two fecal samples and one sloughed skin sample were collected opportunistically during an encounter with sperm whales. Table 1 lists the species sighted and the number of encounters and samples collected from each species.

Eighty-nine hours were spent with marine mammals during encounters allowing substantial observation and habitat use data to be gathered. The mean encounter duration was 52 minutes (standard deviation equals 6 minutes), with a range of 1 to 324 minutes.

**Table 1.** Marine mammal species encountered in the waters around Great Abaco Island and Andros Island during the 2006 field season.

Common name	Scientific name	No. Sightings	No. enc. during transects	No. faecal or sloughed skin samples
Atlantic bottlenose dolphin – coastal ecotype	<i>Tursiops truncatus</i>	62	0	0
Atlantic spotted dolphin	<i>Stenella frontalis</i>	5	2	0
Short-finned pilot whale	<i>Globicephala macrorhynchus</i>	1	0	0
Dwarf sperm whale	<i>Kogia sima</i>	18	4	0
Pygmy sperm whale	<i>Kogia breviceps</i>	3	0	0
Sperm whale	<i>Physeter macrocephalus</i>	4	0	3
Blainville's beaked whale	<i>Mesoplodon densirostris</i>	21	3	0
Cuvier's beaked whale	<i>Ziphius cavirostris</i>	1	1	0
Unknown cetacean Species		11	2	0

### 2006 Strandings

There were six stranding events reported in The Bahamas in 2006. These stranding events were during two time periods: in February and in April, and occurred close together temporally raising concern as to whether or not these strandings were from natural causes.

The first of the February strandings was a 12.1 m sperm whale found dead at Behring Point, Andros on February 24<sup>th</sup>. The carcass was later examined and specimens collected by Dr. Ruth Ewing from US NOAA Fisheries. On February 27<sup>th</sup> a subadult pilot whale was found floating dead off Grand Cay, Abaco. Photographs were taken by local residents, but no specimens were collected. Its length was estimated to be 2.1 m and the whale seemed to have recently died.

On April 5<sup>th</sup> an unknown subadult *Mesoplodon* beaked whale measuring 4.6 m in length was found dead on Big Wood Cay, Andros. On April 14<sup>th</sup>, another unknown subadult male beaked whale was found on Big Wood Cay. This whale was larger and reportedly measured 5.2 m in length. Photographs were taken by Margo Blackwell, but both animals but the species identification could not be confirmed, and both animals were buried.

On April 11<sup>th</sup>, a sperm whale was found dead at Carlton Point, Abaco. It was in an advanced state of decomposition and had been attacked by sharks. It was later examined by Monica Arso, a

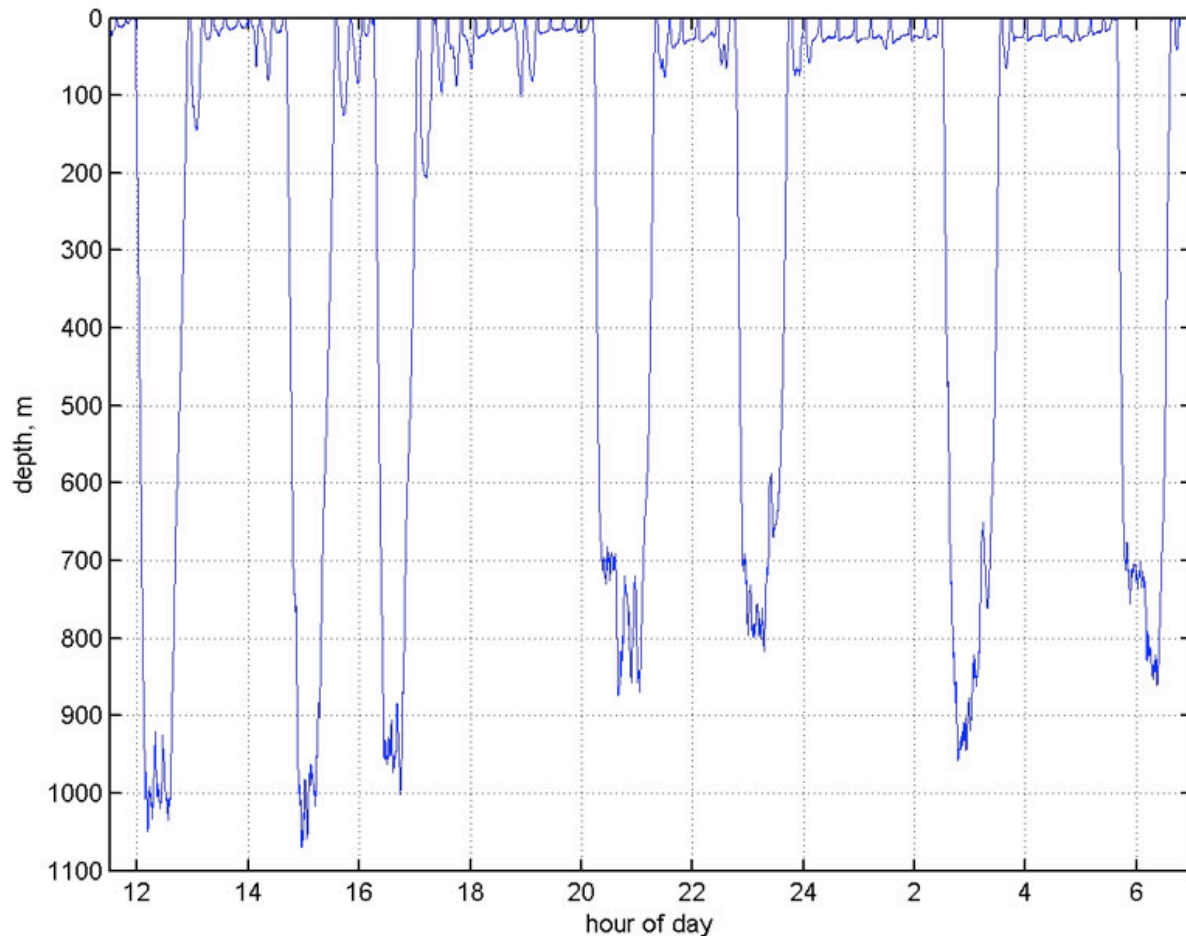
BMMS research assistant and Carol Laing, Fisheries Officer. Photographs were taken but no specimens were collected.

On April 24<sup>th</sup>, an unknown *Kogia* species was found floating offshore off Elbow Cay. It was reportedly freshly dead and thought to be a juvenile animal with an estimated length of only 1.5 m.

### ***AUTEC Beaked Whale Tagging Experiment***

From October 17<sup>th</sup> – November 6<sup>th</sup>, researchers from Bahamas Marine Mammal Survey joined scientists from Woods Hole Oceanographic Institute (WHOI) to tag beaked whales at the Atlantic Undersea Test & Evaluation Center (AUTEC) range in the Tongue of the Ocean (TOTO), with the support of the Naval Undersea Warfare Center (NUWC). The primary goal was to collect baseline data on the diving behaviour of beaked whales, using a combined acoustic and movement recording tag called the DTag, with a suction cup attachment and deployed using a hand held pole from a small tag boat.

On October 23rd, beaked whales were localized on the range by the NUWC team using the bottom-mounted hydrophone array and we were vectored to the animals' location where a group of 5 Blainville's beaked whales were sighted. The groups' composition was a male, an adult female, a mother-calf pair, and a juvenile. A D-Tag was successfully attached to the adult female of this group. The tag remained on the animal for 19.4 hours, resulting in a dive profile of that contained 7 deep foraging dives to depths in excess of 1000 metres, as shown in the dive profile in Figure 2. The data is being analysed to learn about dive behaviour, foraging ecology, prey size, and buzz and click characterisation.



**Figure 2.** Dive profile for Blainville's beaked whale tagged in Tongue of the Ocean on October 23<sup>rd</sup>, 2006.

### ***Worldwide Population Genetic Structure of Cuvier's beaked whales***

Dr. Merel Dalebout at University of New South Wales, Australia visited the Bahamas Marine Mammal Survey in August to collect samples from Cuvier's beaked whales to contribute towards a global study of their population structure. Cuvier's beaked whale, *Ziphius cavirostris*, is the most cosmopolitan member of the little known family of whales, the Ziphiidae. Found in most of the world's oceans, this species has recently become the focus of widespread concern due to its susceptibility to the adverse effects of sound generated by navy sonar and seismic surveys. *Ziphius* is difficult to study at sea due to its preference for deep offshore waters and elusive habits. Most information has come from dead, stranded animals; hence, many aspects of *Ziphius* biology remain unknown. By analysing mitochondrial DNA sequence data Dr. Dalebout aims to identify appropriate units for conservation for this species worldwide. Most of the samples for this project will be obtained from stranded specimens, including soft tissue samples and bone/tooth powder.

The Bahamas appear to be a hotspot area for *Ziphius* and several other species of beaked whales. Twenty samples were obtained from stranded beaked whales collected in the Bahamas for inclusion in this project. DNA was extracted from bone/tooth powder and soft tissue samples back in the laboratory at the University of New South Wales, Sydney, Australia. For specimens represented only by skulls and other bones, an electric drill with 2 - 3 mm drill bit was used to generate sufficient bone powder (< 0.1 gm) for DNA extraction. Mitochondrial DNA analysis of these samples will enable Dr. Dalebout to determine how *Ziphius* in the Bahamas are related to other populations in the North Atlantic and elsewhere in the world.

### ***Proposed Rocky Point development***

A proposal for a large-scale development at Rocky Point, Abaco is currently being reviewed by the Bahamas Government. The development includes the construction of a 80-slip marina, 100-room hotel, 40 condominiums and 50 homes. This location is adjacent to a sandy bar which extends west from Rocky Point for 1 mile and provides an important feeding area for a resident population of bottlenose dolphins (Parsons *et al.*, 2006). Data gathered from 2002-2006 shows that bottlenose dolphins are sighted at Rocky Point during 51% of the times the site was surveyed. We have concerns about habitat alteration during construction, increased vessel traffic and touristic activities off Rocky Point, and the potential effects on this local population. Rocky Point is one of the most beautiful places in the world to observe bottlenose dolphins and is of high value as a natural resource for the community of Sandy Point for eco-tourism, documentary filming, and scientific study and educational purposes. All of these activities are sustainable and contribute to the local economy. Furthermore, the high frequency of sightings allows scientists to monitor the population because so many different individuals are seen there throughout the year (Durban *et al.*, 2005).

The area is not only important for bottlenose dolphins; we found 7 different cetacean species 59% of the time we surveyed within 1 mile of Rocky Point during the same time period (2002-2006). The deep waters to the south of the proposed development lies along the northern side of the Great Bahama Canyon. This area is unique - the canyon wall on this side has the steepest canyon walls of any canyon worldwide. The importance for scientific study alone should warrant its protection. This canyon provides habitat for deep-diving cetaceans including beaked whales (2 species), dwarf and pygmy sperm whales, and sperm whales (an endangered species), as well as numerous oceanic dolphin species. The edge of the canyon is the most important habitat for mother/calf pairs (Claridge 2006). Most of the cetaceans we find here are year-round residents and are likely to be isolated breeding stocks and thus will be impacted significantly. For example, following a US Navy sonar exercise here in March 2000 one species of beaked whale was absent from the area for 2 years afterwards (Balcomb and Claridge 2001). Furthermore, future potential impacts will be affecting populations which are recovering from previous anthropogenic activities. The use of explosives in the construction of the marina is likely to negatively impact these animals. Because most species found here are deep-diving animals, it will be difficult, and in some cases, impossible to determine if animals are in the area (if they are on a dive) prior to using explosives.

For the reasons stated above, it is recommended that this development as it is currently proposed not be allowed at Rocky Point.

### ***Acknowledgements***

The Bahamas Marine Mammal Survey acknowledges Earthwatch Institute for providing an annual research grant in order to cover field expenses for this study since 1992. This field season, the project was assisted by research assistants Monica Arso, Thomas Brown, Charlotte Dunn, Meagan Dunphy-Daly, Dr. John Durban, Ross Dwyer, Holly Fearnbach, Leigh Hickmott, Olivia Patterson; student interns, Chad Thompson, Jessica Fox and Britney Symonette; and nine teams of Earthwatch volunteers. Field work conducted at AUTECH was funded through an award from the US Office of Naval Research (in March) and under contract with Woods Hole Oceanographic Institute (in September), and in collaboration with Dave Morreti from the Naval Undersea Warfare Center. BMMS is a research project of the Center for Whale Research, WA and acknowledges their continued support.

### ***Publications & Presentations***

#### *Scientific papers:*

Parsons, K.M., J.W. Durban, D.E. Claridge, D.L. Herzing, K.C. Balcomb and L.R. Noble. (2006). Population genetic structure of coastal bottlenose dolphins (*Tursiops truncatus*) in the northern Bahamas”. *Marine Mammal Science* **22**(2): 276-298.

Claridge, D.E. (2006). Fine-scale distribution and habitat selection of beaked whales. Dissertation for Master of Science in Zoology, University of Aberdeen, Scotland, UK. 136 pp.

Johnson, M., L.S. Hickmott and P.T. Madsen. (In prep). Echolocation behaviour adapted to prey in foraging Blainville’s beaked whale, (*Mesoplodon densirostris*).

#### *Management plans and reports:*

Annual Field Report to the Earthwatch Institute, Maynard, Massachusetts, USA.

Contributed marine mammal and sea turtle sightings data and analysis of species occurrence under contract with Geo-Marine for the US Navy’s Marine Resources Assessment Program.

#### *Presentations:*

“Age-class segregation of Blainville’s beaked whale (*Mesoplodon densirostris*) groups in The Bahamas”. Oral presentation by Diane Claridge at the 2<sup>nd</sup> Abaco Science Alliance Conference, January 2006, Marsh Harbour, Abaco, Bahamas.

“Automated categorisation of bottlenose dolphin (*Tursiops truncatus*) whistles”. Poster presentation by Charlotte Dunn at the 2<sup>nd</sup> Abaco Science Alliance Conference, January 2006, Marsh Harbour, Abaco, Bahamas.

“Beaked whale research and conservation in the Bahamas”, presented by Diane Claridge, November 2006, AUTECH, Andros, Bahamas.

#### *Popular articles and films:*

Guide to the most common whales and dolphins of Abaco, in “Cruising Guide to the Abacos”, White Sound Press, New Smyrna Beach, FL., reprinted 2007.

#### *World wide web:*

Bahamas Marine Mammal Survey’s website: <http://bahamaswhales.org/>.

Contribution of Bahamas marine mammal and sea turtle sightings data (1985-2005) to project OBIS-SEAMAP (Ocean Biogeographic Information System - Spatial Ecological Analysis of Megavertebrate Populations) <http://seamap.env.duke.edu/>. On this website marine mammal, seabird and sea turtle data are organized into a spatially referenced database. This project is one of the primary data providers to the Ocean Biogeographic Information System.