

First record of Blainville's Beaked Whale *Mesoplodon densirostris* in Fiji

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Little is known about the conservation status and geographic range of beaked whales. This note provides the first record of a Blainville's Beaked Whale *Mesoplodon densirostris* in Fijian waters, and contributes to the available knowledge of a species poorly known in the South Pacific region. On 11 November 2003, a female beaked whale stranded near Viti Levu, Fiji. A lack of suitable references and unfamiliarity with diagnostic morphological characters inhibited species identification at the time of stranding. However, we were able to identify this specimen by using molecular genetic information and applying a diagnostic character approach. DNA sequences from the unknown specimen exhibited nucleotide character states that unambiguously identified it as a Blainville's Beaked Whale. Unfortunately, a lack of associated data collected in this particular event emphasizes a common situation around the world: untrained or poorly equipped personnel (municipalities, governmental agencies or local residents) must manage stranded marine mammals out of necessity. However, information from these events or opportunistic beach surveys assists in furthering research of conservation status and management needs.

Key words: Blainville's Beaked Whale, *Mesoplodon densirostris*, Beaked whale, Fiji, Stranding event, Population Aggregation Analysis.

THE beaked whale family Ziphiidae is diverse and poorly understood. Comprised of 21 species and six genera (Dalebout *et al.* 2002), it is the second largest cetacean family. However, relatively few data exist describing these organisms (see Brownell *et al.* 2004). Of the 21 species currently known, 19 are listed on the IUCN Red List (IUCN 2004). The two omitted species, *Mesoplodon traversii* and *M. perrini*, were recently reclassified following extensive (morphometric and genetic) taxonomic review (Dalebout *et al.* 2002; van Helden *et al.* 2002). All 12 species of *Mesoplodon* are categorized as *Data Deficient* and it is likely that *M. traversii* and *M. perrini* will be similarly assessed. Blainville's Beaked Whale *Mesoplodon densirostris*, was first described almost two centuries ago (Blainville 1817), but is only known from about 110 specimens (Mead 1989; Pastene *et al.* 1990; Findlay *et al.* 1992; Dalebout *et al.* 2004). It is considered to be cosmopolitan in tropical and temperate waters, and has the widest distribution of any species in the genus *Mesoplodon*. Blainville's Beaked Whales are typically found near, but not exclusive to, oceanic islands (Mead 1989). Stomach contents indicate that *M. densirostris* is capable of deep-dives to prey on species of mid- and deep-water oceanic squid and fish. Several records exist from the Western Pacific Ocean. These include Lord Howe Island (Krefft 1870), the Philippines (Leatherwood *et al.* 1994), Cook Islands (see Brownell *et al.* 2004), Society Islands (Gannier

2000), Easter Island (Aguayo *et al.* 1998) Hawaiian Islands (Shallenberger 1981; Barlow 2003), Midway Islands (Galbreath 1963), Taiwan (Yang 1976), Ryukyu Islands (see Brownell *et al.* 2004), New Zealand (Baker and van Helden 2002) and Australia (Longman 1926). Blainville's Beaked Whale has not previously been documented in Fiji; our finding represents the first record.

On 10 November 2003, a female beaked whale was sighted near Naviti Resort, on the Coral Coast, south-west Viti Levu, Fiji (18°12.3'S, 177°41.7'E). The animal was observed within the shallow lagoon of the fringing reef. Observers noted that the animal was swimming laboriously and listing to one side. Superficial injuries to the whale's abdomen were also noted, and probably sustained by contact with the fringing reef during low tide. The animal beached alive on the evening of the 10th and died the following afternoon.

The length was 3.03 m. This measurement was taken as a straight-line (not along the curve of the body) distance from the tip of the mandibles to a line between the fluke-tips. The weight was 897 kg. The body was grey, with a pattern of lighter mottling, and the beak was grayish-white. Limited tooth-rake scarring was noted on both sides of the body, particularly on the dorsum posterior to the head. No external parasites were observed. The animal exhibited no visible signs

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of fresh or healed wounds resulting from anthropogenic factors (e.g., ship strike or entanglement). No necropsy was performed and the cause of death was undetermined. Photographs¹ and a skin sample were collected prior to burial. The body was buried intact south-west of Sigatoka Town, on the Public Works compound.

Subtle morphological characters differentiating species of beaked whales can inhibit accurate species diagnosis, even for experienced cetologists. A lack of suitable references and unfamiliarity with diagnostic morphologic characters hampered species identification at the time of this stranding. Using genetic data, an increasingly valuable resource to provide species identity in such cases (Henshaw *et al.* 1997; Dalabout *et al.* 1998; Dizon *et al.* 2000; Dalabout *et al.* 2002; Dalebout *et al.* 2004), and employing a diagnostic character approach (Davis and Nixon 1992, Population Aggregation Analysis [PAA]) we were able to positively identify the species. PAA allows for the definition of Operational Taxonomic Units using unambiguous character states. The presence of fixed nucleotide characters defines a group (e.g., species) to the exclusion of other groups, as opposed to traits shared among populations that are indicative of population-level frequency differences.

Whole genomic DNA was extracted (QIAGEN DNeasy Tissue kit) from the collected dermal tissue. Using PCR techniques, we amplified two mitochondrial loci known to be diagnostic for species determination (Dalebout *et al.* 2004): cytochrome *b* (*cyt-b*) and the mitochondrial control region (mtDNA-CR). The subsequent products were cleaned (Beckman-Coulter Biomek robot outfitted with an Array-it PCR clean-up kit) and analysed on an ABI 3730xl Automated Sequencer using Big Dye Terminator (v1.1). We compared 208 base pairs of *cyt-b* and 387 base pairs of the mtDNA-CR with reference sequences from GenBank (42 *cyt-b* and 41 mtDNA-CR sequences) representing all 21 beaked whale taxa (Dalebout *et al.* 2004). The computer program McClade v4.07 (Maddison and Maddison 2000) was used to manage sequence data and compare diagnostic sites. Several suites of diagnostic sites were uniquely shared between the mtDNA-CR of this unknown specimen and sequences from known Blainville's Beaked Whales (Genbank Nos AY579513, AY57914) to the exclusion of all other ziphiid whales. Three sites within the *cyt-b* region were fixed and diagnostic character states among all samples of Blainville's Beaked Whale (Genbank Nos AY579540, AY57941) to the exclusion of all other ziphiid species. The unknown specimen exhibited these three character states.

The limited amount of associated field data collected from this stranding event is unfortunate, but not uncommon. In areas without a formal stranding network or response protocol, it is often the case that untrained or poorly equipped personnel must employ available methods and materials to manage stranded marine mammals out of necessity. This stranding was investigated by Fijian fisheries experts who did not have access to the most relevant cetacean taxonomic information. In such instances where researchers are unfamiliar with or do not have access to the most recent morphological findings or where decomposition inhibits species diagnosis, molecular techniques can be used to provide certain identification.

Systematic or opportunistic collection of stranding data via beach surveys can also provide information about species inhabiting areas where little knowledge exists (IWC 1999), such as Fiji. These surveys and resulting data aid in documenting local species diversity, estimating baseline stranding levels, and identifying threats, including fisheries interactions and other human-related threats (Parsons and Jefferson 2000). The knowledge gained from these surveys can guide subsequent research and the evaluation of management needs. Other strandings of Blainville's Beaked Whales in the region have raised concerns over cetacean interactions with fisheries (Kasuya and Nishiwaki 1971; Pastene *et al.* 1990; Dolar *et al.* 1994). An outstanding concern in Fiji is the interaction of cetaceans with longline fisheries (SPREP 2002). In 2003, a Sperm Whale *Physeter macrocephalus* beached on Yadua Island (central Fiji) died from ingesting tackle from this fishery. Given the paucity of self-reporting by fishermen and lack of observer programmes in this region, strandings may offer the best available source of data for monitoring longline impacts on cetaceans. Fisheries authorities across the Pacific region should systematically record strandings (see Geraci and Lounsbury 1998) and communicate mortalities resulting from interactions with fishing equipment and boats. Mass strandings of beaked whale species may also be related to production of anthropogenic noise (Evans and England 2001; Brownell *et al.* 2004). Both of these threats to beaked whales deserve increased research and prioritization as conservation issues in the region.

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¹Contact Mr. Batibasaga for details on obtaining photographs of this animal.

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REFERENCES

- Aguayo, A., Bernal, R., Olavarria, C., Vallejos, V. and Hucke, R., 1998. Cetacean observations carried out between Valparaiso and Easter Island, Chile, in the winters of 1993, 1994, and 1995. *Rev. Biol. Mar. Oceanogr.* **33**: 103–23.
- Barlow, J., 2003. Cetacean abundance in Hawaiian waters during summer/fall of 2002. Administrative Report LJ-03-03, available from Southwest Fisheries Science Center, 8604 La Jolla Shores Dr., La Jolla, CA 92037. 31 Pp.
- Baker, A. N. and van Helden, A. L., 2002. New records of beaked whales, Genus *Mesoplodon*, from New Zealand (Cetacea: Ziphiidae). *J. R. Soc. N.Z.* **29**(3): 235–44.
- de Blainville, H., 1817. Dauphins. Pp. 178 in *Nouveau Dictionnaire d'Histoire Naturelle V 9*. Deterville, Paris.
- Brownell, R. L. Jr., Mead, J. G. and Yamada, T. K., 2004. Beaked Whales of the World: Systematics, Distribution and Conservation Issues. Unpublished document submitted to Science Committee of the International Whaling Commission. (SC/56/SM30).
- Dalebout, M. L., van Helden, A. L., van Waerebeek, K. and Baker, C. S., 1998. Molecular identification of beaked whales (Cetacea: Ziphiidae). *Mol. Ecol.* **7**: 687–94.
- Dalebout, M. L., Baker, C. S., Mead, J. G., Cockcroft, V. G. and Yamada, T. K., 2004. A comprehensive and validated molecular taxonomy of beaked whales, family Ziphiidae. *J. Hered.* **95**: 459–73.
- Dalebout, M. L., Mead, J. G., Baker, C. S., Baker, A. N. and van Helden, A. L., 2002. A new species of beaked whale *Mesoplodon perrini* SP. N. (Cetacea: Ziphiidae) discovered through phylogenetic analyses of mitochondrial DNA sequences. *Mar. Mamm. Sci.* **18**(3): 577–608.
- Davis, J. and Nixon, K., 1992. Populations, genetic variation, and the delimitation of phylogenetic species. *Syst. Biol.* **41**: 421–35.
- Dizon, A., Baker, C. S., Cipriano, F., Lento, G., Palsbøll, P. and Reeves, R., (eds.), 2000. Molecular Genetic Identification of Whales, Dolphins and Porpoises: Proceedings of a Workshop on the Forensic Use of Molecular Techniques to Identify Wildlife Products in the Marketplace. La Jolla, CA, USA, 14–16 June 1999. U.S. Department of Commerce, NOAA Technical Memorandum, NOAA-TM-NMFS-SWFSC-286. 52 Pp. + xi.
- Dolar, M. L., Leatherwood, S. J., Wood, C. J., Alava, M. N. R., Hill, C. L. and Aragones, L. V., 1994. Directed fisheries for cetaceans in the Philippines. *Rep. Int. Whal. Comm.* **44**: 439–49.
- Evans, D. L. and England, G. R. (eds.), 2001. Joint Interim Report Bahamas Marine Mammal Stranding Event of 14–16 March 2000. Unpublished report to US Department of Interior. 61 Pp. Available from: www.nmfs.noaa.gov/prot_res/overview/Interim_Bahamas_Report.pdf.
- Findlay, K. P., Best, P. B., Ross, G. J. B. and Cockcroft, V. G., 1992. The distribution of small odontocete cetaceans off the coasts of South Africa and Namibia. *S. Afr. J. Marine. Sci.* **12**: 237–70.
- Galbreath, E. C., 1963. Three beaked whales stranded at Midway Islands, central Pacific Ocean. *J. Mamm.* **44**(3): 422–23.
- Gannier, A., 2000. Distribution of cetaceans off the Society Islands (French Polynesia) as obtained from dedicated surveys. *Aquat. Mamm.* **26**: 111–26.
- Geraci, J. R. and Lounsbury, V. J., 1998. Marine Mammals Ashore: A Field Guide for Strandings [CD-ROM]. National Aquarium in Baltimore, Baltimore, MD. Based in part on Marine Mammals Ashore: A Field Guide for Strandings, 1993 Texas A&M University Sea Grant College Program.
- Henshaw, M. D., LeDuc, R. G., Chivers, S. J. and Dizon, A. E., 1997. Identification of beaked whales (family Ziphiidae) using mtDNA sequences. *Mar. Mamm. Sci.* **13**: 487–95.
- IUCN, 2004. 2004 IUCN Red List of Threatened Species. < <http://www.iucnredlist.org> >. Downloaded on 14 February 2005.
- International Whaling Commission, 1999. Report of the Scientific Committee. Annex I. Report of the Standing Sub-Committee on Small Cetaceans. *J. Cetacean Res. Manage.* **1** (Suppl.): 211–25.
- Kasuya, T. and Nishiwaki, M., 1971. First record of *Mesoplodon densirostris* from Formosa. *Sci. Rep. Whales Res. Inst.* **23**: 129–37.
- Kreff, G., 1870. Notes on the skeleton of a rare whale, probably identical with *Dioplodon sechellensis*. *P. Zool. Soc. London* **1870**: 426–27.
- Leatherwood, S., Dolar, M. L., Wood, C. J. and Hill, C. L., 1994. A sea of jewels: whales and dolphins of the Philippines. *Whalewatcher* [American Cetacean Society] **28**(1): 16–21.
- Maddison, D. R. and Maddison, W. P., 2000. MacClade 4: Analysis of phylogeny and character evolution. Version 4.0. Sinauer Associates, Sunderland, Massachusetts.
- Mead, J. G., 1989. Beaked whales of the genus *Mesoplodon*. Pp. 349–430 in *Handbook of Marine Mammals*. Vol. 4 ed by S. H. Ridgway and R. Harrison. Academic Press, London.
- Parsons, E. C. M. and Jefferson, T. A., 2000. Post-mortem investigations on stranded dolphins and porpoises from Hong Kong waters. *J. Wildl. Dis.* **36**: 342–56.
- Pastene, L. A., Numachi, K., Jofre, M., Acevedo, M. and Joyce, G., 1990. First record of the Blainville's beaked whale, *Mesoplodon densirostris* Blainville, 1817 (Cetacea: Ziphiidae) in the eastern Pacific. *Mar. Mamm. Sci.* **6**: 82–84.
- Shallenberger, E. W., 1981. The status of Hawaiian cetaceans. Marine Mammal Commission report number MMC-77/23 (NTIS PB82-109398).
- South Pacific Region Environment Program, 2002. Cetacean Interactions with Commercial Longline Fisheries in the South Pacific Region: Approaches to Mitigation. *SPREP Technical Workshop*. 11–15 November 2002. Apia, Samoa.
- van Helden, A. L., Baker, A. N., Dalebout, M. L., Reyes, J. C., Van Waerebeek, K. and Baker, C. S., 2002. Resurrection of *Mesoplodon traversii* (Gray 1874), senior synonym of *M. bahamondi* Reyes, Van Waerebeek, Cárdenas and Yáñez, 1995 (Cetacea: Ziphiidae). *Mar. Mamm. Sci.* **18**: 609–21.
- Yang, Hung-Chia, 1976. Studies on the whales, porpoises and dolphins of Taiwan. *Annual Report of Science*, Taiwan Museum (Taipei) **19**: 131–78. [In Chinese; English abstract].