

MARINE RECORD

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Anthropogenic impact on a pregnant Cuvier's beaked whale (*Ziphius cavirostris*) stranded in Brazil

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Abstract

Background: Because of their usually cryptic behaviour, most knowledge on the biology of beaked whales are from records of stranded animals. Although the Cuvier's beaked whale (*Ziphius cavirostris*) is the best known species of the ziphiidae family, little information on its reproduction is available.

Results: Here we report on the stranding of a dead pregnant female with clear signs of anthropogenic impact, including the presence of a fishing artefact in the stomach.

Conclusions: The region of the stranding (north-eastern coast of Brazil) is an area of increasing interest for oil and gas exploitation. Conservation concerns may arise from findings such as the one presented and discussed here.

Keywords: *Ziphiidae*, Cetacean, Reproduction, Marine debris, Brazil, Toothed whale

Background

Among all living ziphiids, the Cuvier's beaked whale *Ziphius cavirostris* (Cuvier, 1823) is the best known species, with a cosmopolitan distribution (Heyning, 1989; Reeves et al., 2002), having been recorded in offshore waters of all major oceans except in polar regions (Bastida et al., 2007). Although studies on diving and acoustic behaviour with successful tag deployment have significantly improved knowledge on their biology (Baird et al., 2006; Tyack et al., 2006; Schorr et al., 2014; DeRuiter et al., 2013), most information available still comes from the examination of stranded individuals (McLeod et al., 2006). That happens because their oceanic habitat and cryptic surface behaviour (Baird et al., 2006) pose difficulties for the study of the species in the wild (Schorr et al., 2014). In a recent synthesis presented to the International Whaling Commission, Wojtek and Norman (2013) found that *Z. cavirostris* accounted for one third of the beaked whale stranding records

around the world. Although most stranded calves considered in the study occurred along March–September, the majority of records mentioned were for the Northern Hemisphere, and little information on the species' reproduction is currently available in the literature.

In Brazil, both sighting and stranding records of Cuvier's beaked whale have been reported (Carvalho, 1969; Carvalho, 1975; Zanelatto et al., 1995; Pinedo et al., 2001; Batista et al., 2012; Caon et al., 2009; Meirelles et al., 2009; Ott et al., 2009; Mayorga et al., 2010) and its occurrence in the area is not as rare as previously thought (Batista et al., 2012). The presence of foetus was reported only twice for individuals stranded on the Brazilian coast, in São Paulo and Paraíba States (Carvalho, 1975; Pinedo et al., 2001). The present work reports an unusual stranding of a pregnant Cuvier's beaked whale in Brazil, being the first to present clear signs of impact from anthropogenic activities for the north-eastern region of the country.

Methods and results

On 25 January 2010, a dead Cuvier's beaked whale was found stranded at Ipitanga beach (12.9°S, 38.3°W), municipality of Lauro de Freitas. The stranding site is close to the capital city of Bahia state, Salvador, north-eastern

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Brazil (Fig. 1). The fresh carcass of the 5.5 m (total length) female (Fig. 2) was transported to the Instituto Mamíferos Aquáticos (IMA) where a necropsy was conducted.

During the gross examination, unidentified parasite cysts were found in the blubber. Fibrosis associated with encapsulated helminths in the tissue of the lungs was also observed. Stomach chambers (Mead, 2007) contents were examined, which included a considerable piece of fishing net obstructing the passage from the oesophagus to the main stomach. Small amount of hard remains of prey (i.e. cephalopod beaks and fish otoliths) were present mainly in the pyloric chamber, but no signs of recent feeding (i.e. prey flesh) were apparent inside any portion of the digestive tract. The whale was carrying a 221.3 cm foetus (total length) in advanced stage of

development (Fig. 3). Parasites, stomach contents, bones and tissue samples were collected and preserved for future analyses. The adult and foetus are deposited in the IMA's biological collection, under numbers CCPM#0425 and CCPM#0426, respectively. Besides the fibrosis and parasites in the lungs, the piece of fishing net in the stomach and parasite cysts in the blubber, nothing worthy of note was found during the necropsy.

Discussion

Ziphius cavirostris are rarely found near the shore except close to submarine canyons, around islands and where the continental shelf is very narrow (Heyning & Mead, 2009). This latter feature is exactly what happens to the region of the present stranding, where the Brazilian





Fig. 2 Necropsy of a female *Ziphius cavirostris*

continental shelf is at its narrowest (Knoppers et al., 1999) with deep waters being relatively close to the shore (Fig. 1). The area is very close to Baía de Todos os Santos (BTS), a bay with calm waters where there is a high level of large ship traffic, entering and leaving several ports every day. Between 2000 and 2014, an average of 1374 ships per year have arrived at the two largest ports in the BTS (CODEBA, 2014). In addition to large ship traffic the BTS also present a high level of tour boats traffic, and a catamaran boat has already been reported to strike an unidentified large whale near Itaparica Island (Talento 2005),

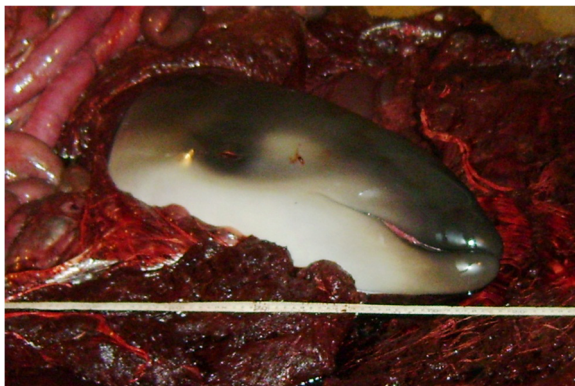


Fig. 3 *Ziphius cavirostris* foetus

along one of the several touristic routes in the bay. Ship strikes causing lethal wounds in whales are recognized as important threats to cetaceans (e.g. Laist et al., 2001; Jensen & Silber, 2004; Dolman et al. 2006; Bezamat et al., 2014), and there are at least 256 documented collisions between whales/dolphins and vessels for the Southern Hemisphere (Waerebeek et al., 2007). Also, the coast of Bahia is a region of great interest to the oil and gas industry and exploration activities are about to expand in the near future (Milani et al., 2000; Suguio & Martin, 2013), which imply in an increase in both large ship traffic and oceanic noise. Whether these pose significant threats to Cuvier's beaked whales in the area, is something yet to be determined.

It was not possible to determine precisely the original use of the present piece of fishing net, but its characteristics point it could had been part of a trawling-net. Marine debris, particularly plastic, have been reported in the stomach contents of *Z. cavirostris* (e.g. Walker & Coe, 1990; Podestà & Meotti 1991; Poncelet et al., 2000; Allen et al. 2011). In the whale reported here, the obstruction caused by the fishing artefact in the digestive tract must have resulted in the inability of this animal to feed. In addition, the bronchial fibrosis probably compromised normal breathing, as respiratory parasites are already known to have affected the health of cetaceans in the North Sea and Eastern Pacific and Atlantic Oceans (Baker, 1992; Cornaglia et al., 2000; Parsons & Jefferson, 2000; Fauquier et al., 2009). Summed to all that, a higher metabolic demand, which mammals present during pregnancy (Schillo, 2009), should have aggravated the pathological condition of the animal. In this sense, it is very reasonable to assume that the ingestion of the piece of fishing net by the animal probably caused its death.

Conclusions

Even though Cuvier's beaked whale is currently considered as a species of "Least Concern" by the International Union for Conservation of Nature (IUCN), it presents "Insufficient Data" status at the national Brazilian evaluation. Therefore all new information for the area, either regarding stranded or sighted animals, is extremely important, so as the pregnancy reported here. However, although the total length of the present foetus represents approximately 80 % of the estimate length at birth for this species (Heyning & Mead, 2009; Reidenberg & Laitman, 2009), more information is needed before we can determine if the area could be a potential breeding/nursing ground. This report highlights the need to adopt regional guidelines to reduce the risk of impact on marine mammals by human activities, like the effective implementation of law 117/96 from the Brazilian Institute of Environment and Renewable Natural Resources

(IBAMA 2014). It is also strongly advisable that educational and informative actions that help preventing the marine pollution are adopted, so threats from marine debris can be minimized.

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Availability of supporting data

The dataset supporting the conclusions of this article is included within the article as photographs.

Authors' contributions

GAB, LRAS and PRBF conducted the necropsy, took photographs and collected samples. GAB, IOBM, MSSR, LRAS and PRBF wrote the manuscript together. All authors have read and approved the final version of the manuscript.

Authors' information

GAB and PRBF have degrees in veterinary medicine.

Competing interests

The authors declare that they have no competing interests.

Ethics approval and consent to participate

This study was part of the routine work of the Instituto Mamíferos Aquáticos (Projeto MAMA). The institution is member of the Aquatic Mammals Stranding Network of North-eastern Brazil (REMANE), implemented by the Brazilian Institute of Environment and Renewable Natural Resources in 2000 (IBAMA; ordinance n. 39, of 28 June 2000).

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