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Combined acoustic and visual survey for sperm and beaked whales in off-shore waters around the Canary Islands

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Sperm whales (*Physeter macrocephalus*) and Cuvier´s and Blainville´s beaked whales (*Ziphius cavirostris* and *Mesoplodon densirostris*) are present year-round in the Canary Islands (André 1997;Aguilar de Soto 2006). Here we present the first results of a combined acoustic and visual line-transect survey conducted in autumn and winter 2009 to study the distribution and abundance of these species in the deep off-shore oceanic waters around the Archipelago.

Methods

A randomized set of boat transects summing 2463,5 nm was designed with the software *Distance 6.0* (Thomas *et al.* 2010) to cover the edge of the insular shelf and 30 km off-shore from it. This included the abyssal plain and two sets of seamounts (Concepción and Amanay) currently proposed for protection as Nature 2000 areas. Survey lines and additional transit lines are shown in Figure1.

Cetaceans were detected using both acoustic and visual methods. Survey was interrupted in some cases to get photo-ID data and confirm group size and species. A 200m long twin-element broadband hydrophone towed array (Ecologic, J. Gordon) was used for acoustic detection. Signals were digitalised at a sampling rate of 96 kHz using a digital ADC (*E-MU Tracker Pre)* and monitored continuously in real time using *Logger* and *Rainbow Click* detection software (IFAW). The visual survey was conducted from two independent observation platforms, monitoring the area by naked eye and using 7x50 binoculars with reticle and compass.

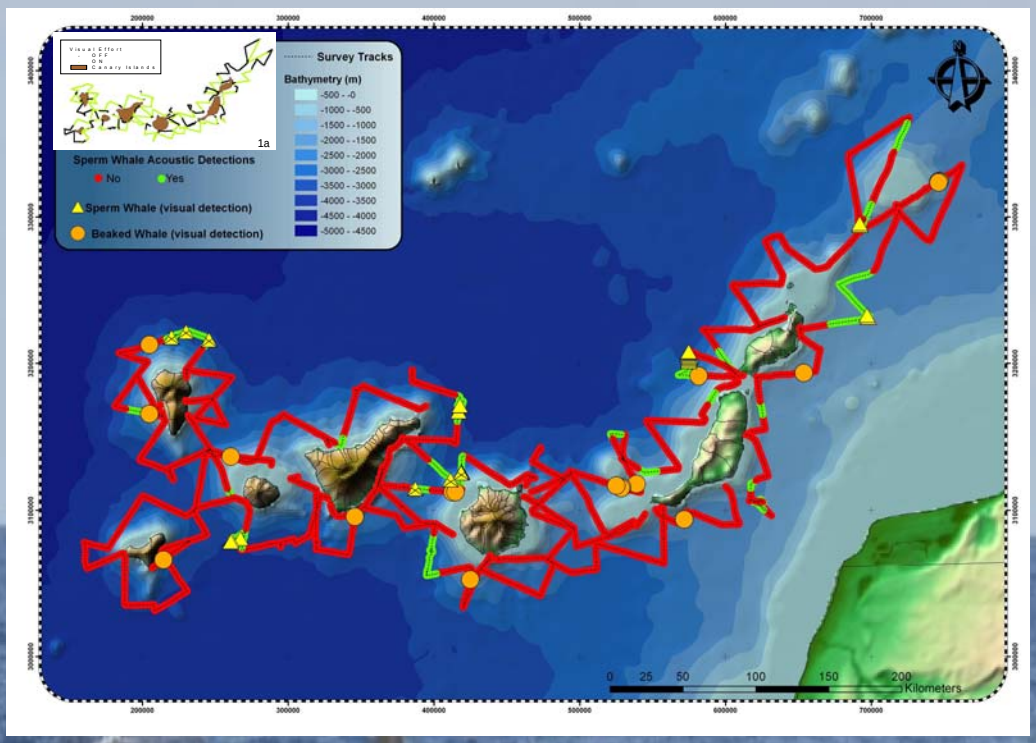

Figure 1:
Distribution of visual effort on (green) and off (black) along the transect lines (1a). Survey tracks around the Canary Islands with acoustic and visual sperm whale detections and beaked whales sightings. All but 10 visual encounters with sperm whales (triangle with cross) were off-transect, following acoustic detections to gather photoID Data.

Results

Total acoustic effort came to 2062,5 nm of trackline. Due to weather, daylight and operational constraints the visual coverage was lower, 1464,4 nm in Beaufort sea state < 4 (shown as Visual On in Figure1). The survey gathered 219 sightings of groups of at least ten different cetacean species comprising 32 sightings of sperm whales (*Physeter macrocephalus*), two of Blainville´s beaked whales (*Mesoplodon densirostris*), three of Cuvier´s beaked whales (*Ziphius cavirostris*), 13 of unidentified beaked whales (Ziphiidae), one record of Kogia sp., 32 sightings of short finned pilot whales (*Globicephala macrorhynchus*), six of striped dolphins (*Stenella coeruleoalba*), 34 of spotted dolphins (*Stenella frontalis*), 14 of bottlenose dolphins (*Tursiops truncatus*), nine of common dolphins (*Delphinus delphis*), seven of Risso´s dolphins (*Grampus griseus*), 32 of unidentified dolphins, 24 sightings of rorqual whales (Balaenpteridae) and 10 of unidentified medium/large whales .

Acoustically, three suspected hot-spot areas for sperm whales (André 1997) were confirmed; the north of La Palma, the channel between Tenerife and Gran Canaria and an area to the northeast of Lanzarote. In addition, abundant detections were made west of Fuerteventura, north of Lanzarote and over the Concepción seamount. The Concepción bank also showed a high relative abundance of beaked whale sightings as well as seabirds and sea turtles.

Data analysis is being carried out to derive absolute and relative abundance estimations of the study species, and to model habitat usage. These analysis aim to incorporate corrections for the limited detection probability of deep divers (Barlow 1999).

Conclusions

1) Some detected sperm whale hot-spots overlap with fast-ferry inter-insular routes. Sperm whales are the most abundant cetacean species found stranded with signs of boat collisions in the Archipelago, indicating that adaptations in the fast-ferry routes should be considered.

2) Beaked whale visual and acoustic detections were abundant over the Concepción seamount. This suggests that the existing moratoria to the use of naval sonar within 50 nm off the coast of the Canary Islands should be extended to include a further area around the Concepción seamount.

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