Preliminary results of aerial surveys around Elephant Island and the South Shetland Islands

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Abstract

From 19 December 2006 to 6 January 2007 Germany carried out a CCAMLR – dedicated fish programme from board RV 'Polarstern' (Polarstern ANT 23-8) in the Elephant Island, the South Shetland Islands and Joinville – D'Urville Islands region. This allowed for the opportunity to conduct a helicopter based cetacean survey in the same area parallel to the fish work. A total of 2570nm were covered on survey effort with the helicopter. During this time a total of 39 sightings with 91 animals were recorded. The sightings included four different baleen whale species: humpback whale (*Megeptera novaeangliae*), fin whale (*Balaenoptera physalus*), sei whale (*Balaenoptera borealis)* and Antarctic minke whale (*Balaenoptera bonaerensis*). Using the helicopter in addition with digital photography allowed the identification of three different beaked whale species: southern bottlenose whale (*Hyperoodon planifrons*), strap-toothed whale (*Mesoplodon layardii*) and Gray's beaked whale (*Mesoplodon grayi*). The different cetacean species showed a clear spatial segregation in the study area. Humpback whales occurred in a mean water depth of 254m, whereas fin whales occurred on the outer shelf and on the slope at a mean depth of 1106. Beaked whales were sighted in much deeper waters with a mean depth of 3198m.

Introduction

Since the late 1990's, the Antarctic Peninsula region has become one of the focal points in investigating the abundance of cetaceans (Reilly *et al.*, 2004; Sirovic *et al.*, 2004; Thiele *et al.*, 2004) in relation to spatio – temporal variations in the abundance of their diet krill (e.g. Daly, 2004; Hewitt *et al.*, 2004; Murphy *et al.* 2004; Reid *et al.*, 2004; Ross *et al.*, 2004; Zhou and Dorland, 2004) and changes in environmental conditions (e.g. Klinck *et al.*, 2004; Howard *et al.*, 2004). Such investigations have been fostered through and have benefited considerably from a close collaboration between the Scientific Committees of the International Whaling Commission (IWC, whales) and the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR, krill, predators other than whales) (e.g. Reilly *et al.*, 2004) and large international programmes, such as GLOBEC (Thiele *et al*., 2005a, b).

Germany carried out a CCAMLR – dedicated fish programme from board RV 'Polarstern' (Polarstern ANT 23-8) in the Elephant Island, the South Shetland Islands and Joinville – D'Urville Islands region from 19 December 2006 to 6 January 2007. We used the opportunity

to conduct a helicopter based cetacean survey in the same area parallel to the fish work. We report here on first results from this survey.

Method

Aerial surveys following standard line-transect distance sampling methodology were conducted by helicopter from board RV 'Polarstern' from 19st December 2006 to 6th January 2007. Tracklines were designed for the area around Elephant Island and north of the South Shetland Islands in a way that they formed a representative samples of the study area (Figure 1). In addition, "ad hoc" surveys were flown whenever feasible.

Flying altitude was 600 feet and helicopter speed was 80 knots. The first observer was sitting on the port front seat of the helicopter and observed the area to the front, focusing on the transect line. The second observer was positioned behind him in the back of the helicopter and was observing the area to the port side of the helicopter. The program VOR was used to continuously store the GPS positions, environmental conditions and information on sightings. A digital tape recorder was used as an audio backup for later reference. Environmental information on sea state, cloud cover, glare, ice coverage in percent and overall sighting conditions was stored at the beginning of each track line and/or when conditions changed.

The following information was collected with respect to each sighting of a cetacean: species, group size, group composition, behavior, cue, swimming direction, and possible reaction to the helicopter. When a sighting was abeam an inclinometer was used to take the vertical angle. If species or the group size could not be identified during the sighting, the survey was interrupted and the helicopter approached the sighting and stopped for observation (closing mode). Once the missing information was obtained the helicopter returned to the transect and the survey was continued.

Results

A total of 2570 nm (4759km) were covered on (sighting) effort. In the area around Elephant Island the designed parallel tracklines were covered, in the remaining areas parts of the survey designs were flown (figure 1). A total of 7 cetacean species were identified during the 39 sightings with 91 animals (table 1). The most abundant species in terms of sightings and individuals per sighting was the humpback whale (*Megaptera novaeangliae*). 17 sightings representing 37 animals were made. Mean group size was 2.18. Maximum group size was 4 animals. The species were mostly observed in shallow waters of less than 500m depth, mean depth of sightings was 245m (table 1, figure 2). Fin whales (*Balaenoptera physalus*) were seen in deeper waters (mean depth of sightings was 1106m). A total of 9 sightings representing 25 animals and a maximum group size of 5 was recorded. Mean group size was 2.78. Other baleen whales observed were one minke whale (*Balaenoptera bonaerensis*)

and a group of three sei whales (*Balaenoptera borealis*). Three species of beaked whales were identified. Two sightings of southern bottlenose whale (*Hyperoodon planifrons*), one sighting of Gray's beaked whale (*Mesoplodon grayi*) and one sighting of strap-toothed whale (*Mesoplodon layardii*) (figure 3) were noted. All beaked whale species were identified using digital photographs taken during closing mode. The group of Gray's beaked whale was recorded at a depth of 1622m. The other beaked whales were sighted over depths of more than 3500m (see table 1). Mean depth for all beaked whale sightings was 3198m.

Discussion

Commonly, cetacean surveys in the Southern Ocean are shipborne (Thiele *et al.*, 2000, 2004; Reilly *et al.*, 2004; Ensor *et al.*, 2005, 2006). Shipborne surveys have the disadvantage that they are only able to cover a comparatively small part of the area of investigation per day. Pending reasonable weather conditions, helicopters can cover a much larger area per unit of time. In the case of this cruise several weeks where spent in the area around Elephant Island to conduct a fish survey. This allowed us to use the helicopter to cover pre-designed surveys. Such a systematic and representative coverage of a study area is useful not only to gain more detailed information on density and spatial distribution. The simultaneous collection of data on fish abundance and distribution will also give us the chance to combine these two data sets at a later stage of the analyses.

The seven species showed a clear spatial segregation in the area of investigation. Humpback whales which are frequently observed inshore were the most coastal species. Fin whale and sei whales occurred on the outer shelf and on the slope where their diet krill is most abundant (Siegel, 2005).

Beaked whales typically appeared in deep water on the outer slope or further offshore in oceanic waters. To the extent it is known they feed on deep – water squid (IWC, 1989). Beaked whales are usually difficult to identify given that they remain at the surface for a short period of time. Leaving the survey track and taking digital photos from beaked whales when at the surface proved to be a useful mean to later identifying beaked whales to species level.

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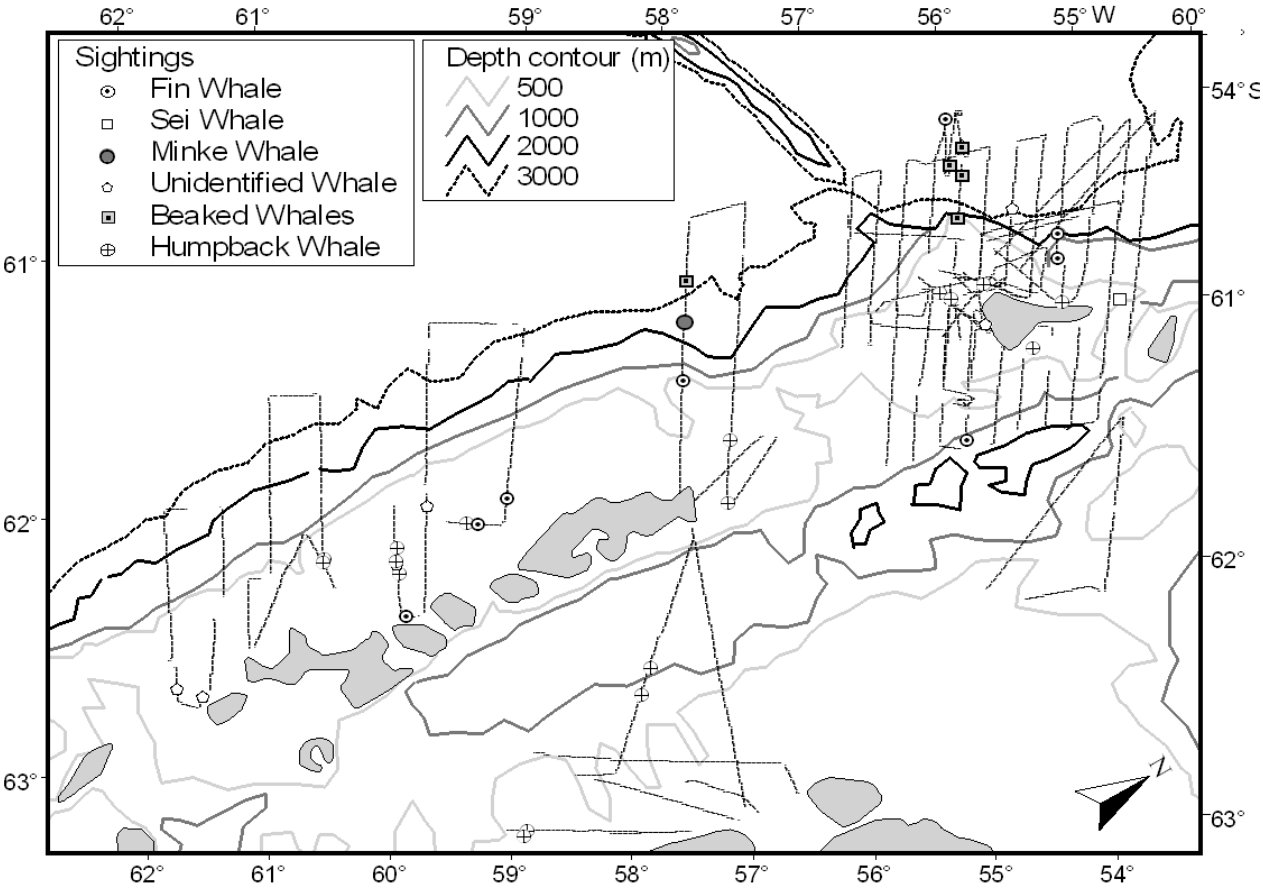

Figure 1: Helicopter surveys around Elephant Island. Surveys from 19st December 2006 to 6th January 2007

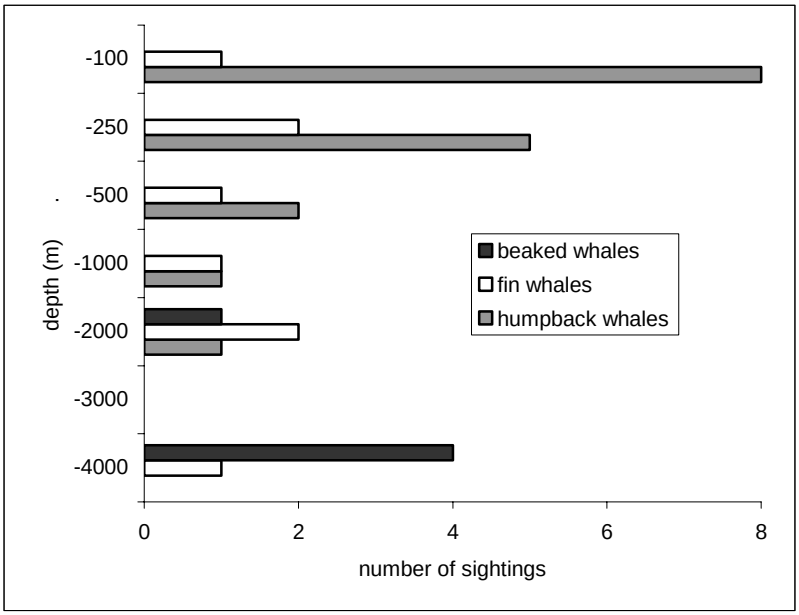

Figure 2: Sightings of humpback, fin and beaked whales in relation to depth

Table 1: Overview of cetacean sightings during the survey

	Sightings	animals	Mean group size	Max group size	Mean depth (m)	Calves
Humpback whale	17	37	2.18	4	245	3
Fin whale	9	25	2.78	5	1106	2
Sei whale	1	3	-	3	120	0
Minke whale	1	1	-	1	2478	0
Unidentified baleen whale	5	11	2.2	3	808	0
Southern bottlenose whale	2	3	1.5	2	3596	0
Grays beaked whale	1	5	-	5	1622	1
Strap-toothed whale	1	3	-	3	3516	0
Unidentified beaked whale	1	2	-	2	3662	0
All beaked whales	*5*	*13*	*2.6*	*5*	*3198*	*1*
Unidentified whale	1	1	-	1	1841	0
total	39	91				

Figure 3: Adult male strap-toothed whale, photographed from the helicopter.