SC/66b/SH/22

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INTERNATIONAL WHALING COMMISSION

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## Abstract

During a CCAMLR endorsed fishing survey on board the Chilean trawler *Cabo de Hornos* around the South Orkney Islands and Elephant Island, a trained marine mammal observer conducted a distance sampling survey for cetaceans along track. During 10 survey days, 463.1 km were covered on effort. A total of 44 fin whale (*Balaenoptera physalus*) groups comprising 61 individuals were recorded on effort, and a total of 28 humpback whale (*Megaptera novaeangliae*) groups comprising 47 individuals. A single sei whale (*Balaenoptera borealis*) was also recorded. Off effort, e.g. during fishing operations, 35 sightings of mainly mixed-species groups of large whales were observed, comprising of 217 animals. Trawling activity occurred at least twice within a confirmed feeding aggregation of a mixed cetacean group including calves of both humpback and fin whales. Judging from the observed behaviour of the animals, there seemed to be no immediate impact of the fishing activities. However, the risk of displacing or even injuring animals by passing through such a high activity group cannot be assessed adequately without considering events below the surface and the potential effect of a short-term displacement of animals. The preliminary results of the survey show that the areas around the Southern Orkneys and Elephant Island are important feeding grounds for fin-, humpback and, to a lesser extent, sei whales. If any fishing effort is to be undertaken in these areas, no disturbance within these comparably small areas of high animal density should be tolerated. We recommend standardising any future research cruise by incorporating a set of synchronized video cameras to the bow and stern section of the ship to assess any potential behavioural response to allow further insight into interactions with fishing activities and to help quantify any disturbance or nuisance imposed on cetaceans, seals and birds.

## Introduction

A trained marine mammal observer from ITAW (Institute for Terrestrial and Aquatic Wildlife Research in Büsum, Germany) joined a CCAMLR endorsed fishing survey on board the Chilean trawler *Cabo de Hornos* around the South Orkney Islands and Elephant Island in late January / early February 2016. The research focus of the Chilean survey was to update the CCAMLR stock assessment of Antarctic icefish (*Channichthyidae*) around Elephant Island, the South Orkneys and the South Shetland Islands (Arana *et al*., 2016). The ITAW participated in the cruise primarily in order to conduct a dedicated line transect distance sampling survey for cetaceans. In addition, we collected opportunistic sighting data during transit from Chile, during fishing activities, weather conditions unfeasible for dedicated survey work and anchor times along the cruise. Furthermore, the observer helped to assess the potential impact of fishing activities on marine mammals during fishing trawls.

## Materials & Methods

### Line transect distance sampling

We conducted standardised line transect distance sampling from the bridge (at 11.2 m above sea level) on the Chilean fishing vessel *Cabo de Hornos* from the 27$^{th}$ of January until the 7$^{th}$ of February around the Southern Orkneys and Elephant Island, beginning in the south west at Elephant Island. The South Shetland Islands were not covered by the cruise. Data were gathered whenever weather and ship speed were suitable during transit between fishing trawl sites within the designated survey area (see Figure 1 for ship tracks within the target area).

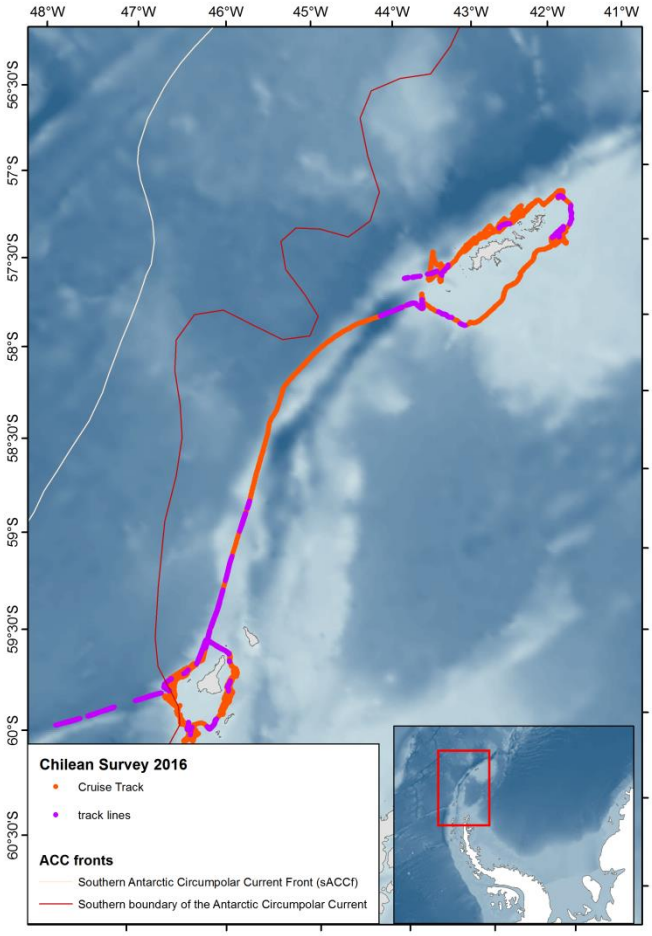


**Figure 1: Overview of cruise track in designated survey area; purple line indicates on effort stretches (track lines).**

A single observer was stationed on the bridge at a central location, allowing an unobstructed 60° field of view (FOV) to each side of the ship. Using binoculars (Fujinon MTRC-SX with a 7°30' field of view and a 7x50mm magnification) and a standardized computer setup connected to a GPS device to record survey parameters and detections, the observer recorded all cetacean sightings within his FOV, focussing on the 90° sector around the transect line (45° to each side of the transect). The binoculars were only used after initial naked eye detection to measure the distance to the sighting and, if necessary, to confirm the species ID. Observer shifts were limited to 1 1/2 hour stretches of continuous effort, followed by 1/2 hour break to prevent observer fatigue. Total effort time within any 24 hour period was limited to 8 hours.

## Opportunistic sightings during off effort times

Whenever weather conditions were unfeasible for dedicated line transect work, we gathered opportunistic sighting data on cetaceans.

# Results

## Line transect distance sampling survey

A total of 463 km were covered on effort over 10 survey days. Sea states 2 and 4 on the Beaufort scale were most common during the survey (Table 1). A total of 44 fin whale groups comprising 61 individuals were recorded on effort, resulting in an average group size of 1.3 individuals per group. A total of 28 humpback whale groups comprising 39 individuals were recorded on effort, resulting in an average group size of 1.39 individuals per group. One humpback whale calf was seen on the 27th of January (see **Error! Reference source not found.**). A single adult sei whale was recorded on effort on the 5th of February. All on effort sighting positions are shown in Figure 2.

**Table 1: Summary of sea states encountered during the survey. Sea state denotes the perceived strength of wind force measured in Beaufort.**

| Sea state | Effort [km] | Percentile |
|---|---|---|
| **1** | 80.6 | 17.41% |
| **2** | 158.7 | 34.26% |
| **3** | 83.9 | 18.11% |
| **4** | 124.2 | 26.81% |
| **5** | 15.8 | 3.40% |

**Table 2: Summary of cetacean records on effort between the 27th of January and the 7th of February 2016. Area: subset of survey area; G: Number of cetacean groups recorded on effort. I: Total number of cetaceans recorded (asterisk indicate calf sighting); ŝ: average group size of encounters; table gives detections for fin and humpback whales, respectively.**

| | | Fin whales | | | | Humpback whales | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Area* | Effort [km] | G | I | C | ŝ | G | I | C | ŝ |
| *Elephant Island* | 299 | 27 | 29 | 0 | 1.07 | 16 | 18 | 1 | 1.13 |
| *South Orkney Islands* | 164 | 17 | 32 | 0 | 1.88 | 12 | 21 | 0 | 1.75 |
| ***Total*** | **463** | **44** | **61** | **0** | **1.39** | **28** | **39** | **1** | **1.39** |

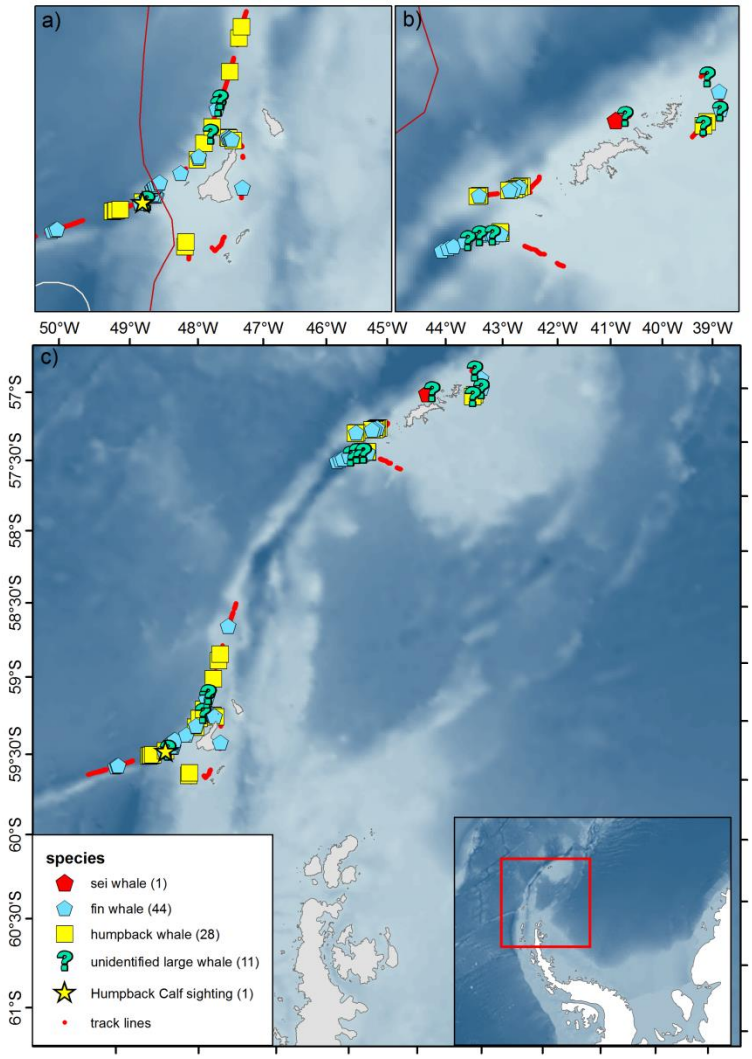


**Figure 2: Overview of all sightings recorded on effort around Elephant Island (a), Southern Orkney Islands (b) and along the full cruise (c) (27th of January – 7th of February 2016).**

Analysis of these data including model based abundance and density estimates for fin whales are currently in preparation (Viquerat & Herr, *in prep*.).

## Opportunistic sightings during off effort times

A total of 35 groups of large whales were observed off effort, comprising a total of 217 animals. Many groups encountered were mixed species groups. The average group size of large whale encounters (including mixed species groups) was estimated to be at 6.2 (Table 3).

Table 3: Summary of opportunistic large cetacean (fin, humpback, sei and unidentified large whales) sightings recorded during off effort stretches; Note: unidentified blows were a group of 7 whales that were clearly large.

| Species | sightings | individuals | gs |
|---|---|---|---|
| ***Balaenoptera borealis*** | 2 | 4 | 2 |
| ***Balaenoptera borealis / unknown*** | 2 | 7 | 3.5 |
| ***Balaenoptera physalus*** | 7 | 57 | 8.14 |
| ***Balaenoptera physalus / Balaenoptera borealis*** | 3 | 6 | 2 |
| ***Balaenoptera physalus / Megaptera novaeangliae*** | 7 | 104 | 14.86 |
| ***Megaptera novaeangliae*** | 11 | 29 | 2.64 |
| ***unidentified blows*** | 1 | 7 | 7 |
| ***unidentified large whale*** | 2 | 3 | 1.5 |
| **Large whales** | **35** | **217** | **6.2** |


Figure 3: DSLR image of unidentified blows taken on the 3rd of February 2016. The Image has been cropped and colours have been modified to increase contrast of the blows to the background. At least 7 large blows are clearly visible. While the iceberg makes accurate distance estimation difficult (obscuring the horizon), the distance to the event was estimated at about 2-3 km.

Similar to large whales, we grouped all small cetacean sightings. It consists solely of Peale's dolphin (*Lagenorhynchus australis*) and dusky dolphins (*L. obscurus*). A total of 7 small cetacean groups were encountered off effort, comprising of 42 animals with an average group size of 6 animals / small cetacean group (Table 4).

Table 4: summary of opportunistic small cetacean (Peale's and dusky dolphins) sightings recorded during off effort stretches

| Species | sightings | individuals | gs |
|---|---|---|---|
| ***Lagenorhynchus australis*** | 4 | 25 | 6.25 |
| ***L. obscurus*** | 1 | 7 | 7 |
| ***L. obscurus / australis*** | 1 | 8 | 8 |
| ***Lagenorhynchus spec*** | 1 | 2 | 2 |
| **small cetaceans** | **7** | **42** | **6** |

A single Southern bottlenose whale (*Hyperoodon planifrons*) was recorded off effort in the Drake Passage on the 9th of February 2016.

### Marine mammal observations during fishing activities

There was no clear impact of fishing activities on marine mammals as far as was detectable on the surface. However, fishing effort often coincided with sites of high productivity (marked by high numbers of seals, penguins and whales and associated feeding activity near the surface). Trawling activity occurred at least twice within a confirmed feeding aggregation of a mixed cetacean group including calves in both humpback and fin whales (on the 28th of January 2016 and on the 5th of February 2016). The feeding aggregation included various other marine wildlife such as chinstrap penguins (*Pygoscelis antarcticus*), Antarctic fur seals (*Arctocephalus gazella*) and marine bird species, the majority of which were black browed albatrosses (*Thalassarche melanophris*). The group size of these mixed species groups was estimated to be well above 20 per species (*B. physalus* and *M. novaeangliae*), with occasional sei whale (*B. borealis*) sightings in between (see Figure 4 - Figure 7, taken on the 28th of January and the 5th of February 2016, respectively).


**Figure 4: Image taken during a fishing trawl on the 28th of January 2016. Fin whale as part of a feeding aggregation including various others wildlife crossed during the trawl.**


**Figure 5: Image taken during a fishing trawl on the 28th of January 2016. At least 5 Fin whale as part of a feeding aggregation including various other wildlife crossed during the trawl.**


**Figure 6: A humpback whale feeding on krill on the 28th of January 2016, taken during a passage through a mixed feeding aggregation of about 20+ Humpback and Fin whales, including calves. This particular individual was alongside the ship at about 20 meters abeam and was feeding on krill without showing any displacement or disturbance.**


**Figure 7: A fin whale behind the ship on the 5th of February 2016 during a fishing trawl. The particular individual was part of a mixed species aggregation of more than 15 animals feeding on krill at the surface, including Humpback, Fin and some sei whales. The fishing trawl started outside the aggregation and happened to pass through it at constant speed.**

While it was not intended to seek out and trawl through the feeding aggregations and no identifiable displacement occurred, there was also no stoppage once the trawl had entered the aggregation. Judging from the observed behaviour of the animals, there seemed to be no immediate impact of the fishing activities. However, the risk of displacing or even injuring animals by passing through such a high activity group cannot be assessed adequately without considering events below the surface and the potential effect of a short term displacement of animals. The preliminary results of our study show that the area around the southern Orkneys and Elephant Islands are important feeding grounds for fin-, humpback and, to a lesser extent, sei whales, where large feeding groups of more than 20 individuals each occurred regularly at sites of high productivity. If any fishing effort is to be undertaken in these areas, no potential disturbance within these usually small areas of high animal diversity can be tolerated. We recommend standardising any future research cruise by incorporating a set of synchronized video cameras to the bow and stern section of the ship to assess any potential behavioural response in any animal that belongs to a feeding aggregation, including all non-cetacean marine mammals (*i.e.*, seals) within a 360° field of view around the ship for the complete duration of a trawl. In addition, the use of an infrared camera should be considered as some fishing effort happened during night time. That setup would allow further insight into

interactions with fishing activities and help to quantify any disturbance or nuisance imposed on marine mammals.

## Conclusions

This survey has proven that valuable data can be collected and relevant observations can be made as a guest on a fishing survey vessel. This survey provided the database for a small scale humpback and fin whale abundance estimates around Elephant Island and the Southern Orkney Islands (Viquerat & Herr, *in prep*.). The observations made during fishing trawls within feeding aggregations can easily be used to devise study setups that could monitor and quantify the impact of such trawls on marine wildlife, including other marine mammals and marine birds.

## References

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Viquerat, S., Herr, H. (in prep) Mid-summer abundance estimates of fin whales around the South Orkney Islands and Elephant Island