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Sightings of Cetaceans during JARE - 56 in the Indian Sector of the Southern Ocean

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Abstract

The cetacean observation was made during the 56th Japanese Antarctic Research Expedition (JARE - 56) cruise on the icebreaker SHIRASE, from 30 November to 15 December 2014 and from 15 February to 9 March 2015, in the Indian Ocean Sector of the Southern Ocean. A total of 28 sightings with 64 individuals of four cetacean species, humpback whale, (*Megaptera novaeangliae*), fin whale (*Balaenoptera physalus*), Antarctic minke whale (*Balaenoptera bonaerensis*), and killer whale (*Orcinus orca*), are reported. The most sighted species was the humpback whale (13 sightings) and the maximum number of individuals in a group was six for the same species. All sightings were made higher than 60 degrees South, close to the Antarctica coast.

Introduction

In recent years, the Southern Ocean and Antarctica are under threat due to various anthropogenic stresses such as plastic pollution (Barnes, 2010; Isobe *et al.,* 2017; Waller *et al.,* 2017), non-indigenous species (Houghton *et al.,* 2016; Chwedorzewska *et al.,* 2020), illegal/unreported/unregulated (IUU) fishing, overfishing (Joyner & Aylesworth, 2008; Baird, 2010; Grant *et al.,* 2012), as well as climate change and changes in sea ice (Aronson *et al.,* 2011; Griffiths, 2010).

Cetaceans, that is, whales and dolphins, are top predators of the marine ecosystem. They have been studied to some extent in the Southern Ocean and Antarctica largely due to whaling, after which their distribution, abundance, and conservation have been discussed for many years in the Southern Ocean and Antarctica (Hoyt, 2005; Zacharias *et al.,* 2006; Shirihai, 2007; Boyd, 2009; Allen *et al.,* 2011).

Historically the Southern Ocean had been one of the main commercial whaling grounds from the early 19th century to the 20th century, which resulted in the depletion of some whale populations. According to Clapham & Baker (2009), Clapham *et al.* (2009), over two million whales were taken in the Antarctic water during that period. The main catch consisted of humpback whales, blue whales, fin whales, minke whales, and sei whales. Beginning in 1994, to protect the endangered populations of whales, the Southern Ocean Whale Sanctuary (SOS) was established by the

International Whaling Commission (IWC) around Antarctica. Later, the Indian Ocean Whale Sanctuary (IOS) was also established in 2002. Recently more requests have been made for establishing marine protected areas for cetaceans in the Southern Ocean and adjacent areas, such as Hoyt (2005) and Whale and Dolphin Conservation Society (WDCS, 2022). Ballard *et al.* (2012) underlined that designation of an effective marine protected area requires substantial knowledge of the spatial use of the region by key species, particularly those of high mobility. In addition, cetaceans in the Southern Ocean either directly or indirectly depend on krill, *Euphausia superba,* which is a key species in the Antarctic and Southern Ocean ecosystem. Krill stocks, however, have been decreasing due to heavy exploitation in recent years (Flores *et al.,* 2012) as well as ice decline and temperature rise (Stammerjohn *et al.,* 2008).

The main objective of this study was to collect information on the occurrence and distribution of the cetacean species during the 56th Japanese Antarctic Research Expedition (JARE - 56) in the Indian sector of the Southern Ocean where there have been few cetacean surveys to contribute to the baseline data to be used for future studies and eventually for the conservation of these animals in the Southern Ocean.

Materials and Methods

Visual surveys of cetaceans were conducted onboard the icebreaker SHIRASE, a Japanese Antarctic research ship, that belongs to the Japan Maritime Self - Defence Force. She left Fremantle, Western Australia, on 30 November 2014 and arrived on 15 December 2014 in the water off East Ongul Island where the Japanese Syowa Station is located. The return trip started on 15 February 2015 and arrived on 9 March 2015 in Fremantle. The cruise route was decided regardless of the intention of cetacean observation. All observations were made during daylight hours either from the bridge or the exterior wings of the bridge with naked eyes by the lead author (BÖ). Besides, the captain and other crew at the bridge also helped with sightings. Reticule binoculars (7 × 50 magnification and 50 mm) were used for species identification The observation was stopped when the Beaufort's sea state was higher than 4. When a sighting was made, species, group size, GPS position (Global Positioning System), time, vessel speed, and sea state were recorded. Photographs were taken to assist in the species identification if the weather conditions permitted. The species identification was made according to Shirihai (2007).

Results

Even the research cruise started from Fremantle on 30 November 2014 and the observation effort was made from the beginning, it was only 12 days later, on 12 December 2014, when the first cetacean sighting was recorded. On the return trip which started on 17 February 2015, there were sightings in the first four days and no sighting was recorded after 20 February 2015 until 9 March 2015 when the ship arrived at Fremantle. Cetaceans were observed only in the area south of 60°S, closer to the Antarctica continent.

Details of all cetacean observations are presented in the Table 1, Figures 1 and 2. A total of 28 sightings (64 individuals) of four species were recorded. The number

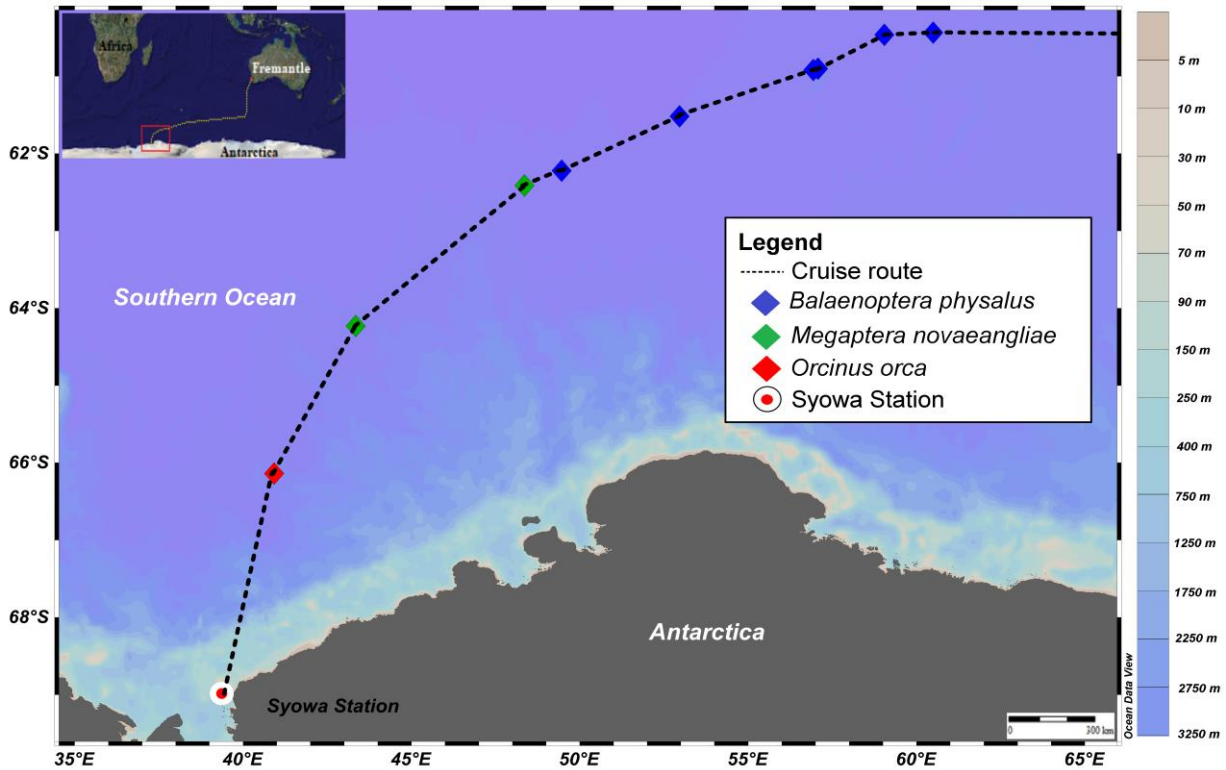

Figure 1. Sighting locations of the observed cetaceans during the departure cruise of JARE - 56.

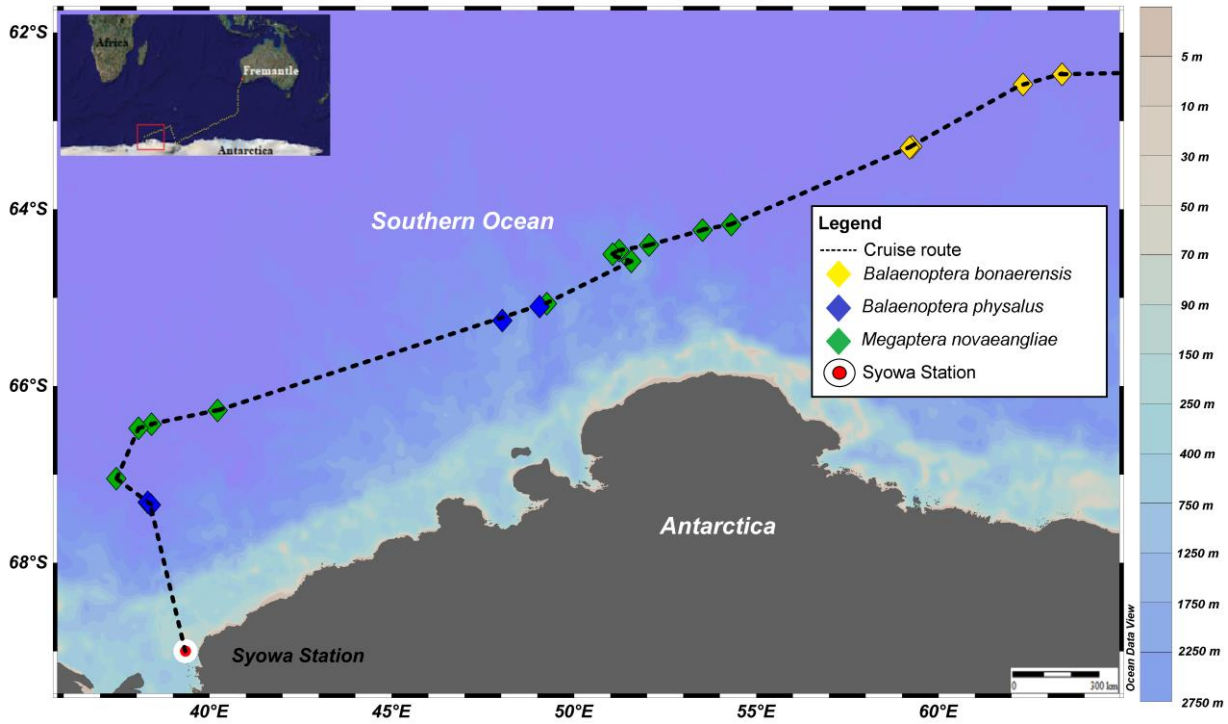

Figure 2. Sighting locations of the observed cetaceans during the return cruise of JARE - 56.

of sightings was 13 for humpback whale (*Megaptera novaeangliae*) (Figure 3), 10 for fin whale (*Balaenoptera physalus*), 4 for Antarctic minke whale (*Balaenoptera bonaerensi*), and 1 for killer whale (*Orcinus orca*). Ship speed varied between 6 and 14 knots during the study period.

From 11 to 15 December 2014, five days in total, nine sightings were made on two baleen whale species, namely fin whale and humpback whale, and one toothed whale species, a killer whale. During the return trip, in four days between 17 and 20 February 2015, 19 sightings were made on three baleen whale species, namely fin whale, humpback whale, and Antarctic minke whale. The most common species was the fin whale during the trip to Antarctica and the humpback whale during the return trip to Australia. Group size (min - max) was 2 - 5 for fin whales, 4 - 6 for humpback whales, and 2 - 4 for Antarctic minke whales (Table 1, Figures 1 and 2).

Discussion

This study provides new information on the cetacean occurrence in the Indian sector of the Southern Ocean, which may contribute to the effort of conservation and management of the cetaceans around Antarctica in the future. The number of sightings was limited mainly due to two reasons. One is that only visual observation was made during daytime. The other reason is bad sea conditions which did not permit observation of cetaceans. It is also known that the water between 40 and 60 latitudes is known as roaring 40s, furious 50s, and screaming 60s, which is not suitable for sighting cetaceans in general.

Among observed species, the humpback whale was one of the target species for whalers for many years but protected from commercial whaling in Southern Hemisphere by the IWC since 1963. This species makes long - distance seasonal migration, spending winters in low latitude breeding grounds and summers in high latitude feeding grounds (Dawbin, 1966; Öztürk *et al.,* 2017). Shirihai (2007) reported that the humpback whale takes small schooling fish and krill as its diet. Therefore, krill abundance has vital importance for the humpback whale. According to Bastida & Rodriguez (2009), the main threats for this whale species are accidental entanglement in fishing gears, collision with marine vessels, and acoustic disturbance due to the exploration of marine resources. This species has recovered from whaling impact on a global scale and is recently assessed as Least Concern in the International Union for Conservation of Nature (IUCN) Red List (Cooke, 2018a).

Southern fin whales migrate from the breeding grounds to the Antarctic Sea in spring, traveling over some 2400 miles in a month (Laws, 1961). This species had been caught for many years during the whaling period and its stocks were depleted. The fin whales are also recovering from the whaling but are currently still listed as Vulnerable at a global scale in IUCN Red List in 2018 (Cooke, 2018b).

Antarctic minke whales are abundant from 60°S to the ice edge during summer and they migrate to breeding grounds at middle - latitudes. In summer, they are found in the waters surrounding Antarctica, from the edge of the great ice fields to areas far from land in the open ocean (Bastida & Rodriguez, 2009). However, some authors recorded them as overwintering in the

Table 1. Sightings of cetaceans during the cruise of JARE - 56 in 2014 and 2015.

Date	Time	Duration (mins)	Coordinates	Species*	Min	Max	Sea State	Ship speed
Australia - Antarctica								
11.12.2014	12 h 00 – 12 h 15	15	60 ° 45.45 S 60 ° 26.260 E	*Bp*	2	-	3	12
12.12.2014	15 h 00 – 15 h 10	10	60 ° 47.38 S 59 ° 25.330 E	*Bp*	3	-	3	12
12.12.2014	16 h 00 – 16 h 10	10	61 ° 02.370 S 57 ° 57.770 E	*Bp*	2	-	3	12
12.12.2014	16 h 30 – 16 h 42	12	61 ° 03.020 S 57 ° 54.170 E	*Bp*	3	-	3	12
13.12.2014	17 h 00 – 17 h 10	10	61 ° 50.924 S 53 ° 05.777 E	*Bp*	2	-	2	12
13.12.2014	18 h 20 – 18 h 24	4	62 ° 22.300 S 49 ° 55.550 E	*Bp*	3	5	2	12
13.12.2014	18 h 50 – 19 h 00	10	62 ° 35.720 S 48 ° 42.180 E	*Mn*	2	-	2	10
14.12.2014	19 h 00 – 19 h 35	35	64 ° 40.0 S 43 ° 32.0 E	*Mn*	2	-	3	10
15.12.2014	12 h 14 – 12 h 25	11	66 ° 06.1 S 41 ° 18.4 E	*Oo*	1	-	2	10
17.02.2015	11 h 30 – 11 h 33	3	67 ° 34.570 S 38 ° 39.700 E	*Bp*	3	-	3	6
17.02.2015	14 h 00 – 14 h 05	5	67 ° 31.580 S 38 ° 30.770 E	*Bp*	2	-	4	6
17.02.2015	18 h 00 – 18 h 03	3	67 ° 05.000 S 37 ° 44.800 E	*Mn*	2	-	3	7
18.02.2015	15 h 45 – 16 h 00	15	66 ° 27.68 S 40 ° 22.75 E	*Mn*	4	6	3	13
19.02.2015	6 h 00 – 6 h 30	30	65 ° 16.97 S 48 ° 10.89 E	*Bp*	3	5	2	13
19.02.2015	7 h 30 – 7 h 45	15	65 ° 08.84 S 49 ° 03.04 E	*Bp*	2	-	4	13
19.02.2015	8 h 00 – 9 h 10	70	65 ° 05.620 S 49 ° 25.830 E	*Mn*	3	5	4	14
19.02.2015	10 h 15 – 10 h 30	15	64 ° 50.980 S 51 ° 06.180 E	*Mn*	3	5	4	13
19.02.2015	11 h 50 – 12 h 00	10	64 ° 46.930 S 51 ° 23.920 E	*Mn*	4	6	4	13
19.02.2015	12 h 25 – 13 h 00	35	64 ° 40.600 S 52 ° 06.220 E	*Mn*	3	5	3	12
19.02.2015	16 h 00 – 16 h 15	15	64 ° 23.630 S 53 ° 52.930 E	*Mn*	3	5	3	12
19.02.2015	16 h 00 – 16 h 15	15	64 ° 17.2 S 54 ° 31.5 E	*Mn*	4	6	4	12
19.02.2015	17 h 20 – 17 h 54	34	64 ° 17.2 S 54 ° 31.5 E	*Mn*	4	6	2	13
20.02.2015	7 h 50 – 8 h 00	10	63 ° 30.450 S 59 ° 21.530 E	*Bb*	2	-	3	12
20.02.2015	10 h 10 – 10 h 50	40	63 ° 29.370 S 59 ° 27.900 E	*Bb*	2	4	4	10
20.02.2015	15 h 45 – 15 h 50	5	62 ° 58.720 S 62 ° 31.730 E	*Bb*	2	-	3	11
20.02.2015	18 h 20 – 18 h 25	5	62 ° 47.200 S 63 ° 39.28 E	*Bb*	2	-	2	8

*Species, *Mn: Megaptera novaeangliae, Bp: Balaenoptera physalus, Bb: Balaenoptera bonaerensis, Oo*: *Orcinus orca*. Symbol (-) was used when the exact count of individuals was determined.

Antarctic (Perrin & Brownell, 2009). The Antarctic minke whale is the most abundant baleen whale species in the Southern Ocean (Tamura & Konishi, 2009) and had been subjected to Japanese scientific whaling until recently. This species is Near Threatened on a global scale according to the IUCN Red List (Cooke *et al*., 2018).

One killer whale was observed where pack ice started off the coast of Antarctica. According to the IUCN Red List, killer whales on a global level are listed as Data Deficient although there are regional populations that can be recognized as endangered (Reeves *et al*., 2017).

Cetacean surveys in the Indaian sector of the Southern Ocean where the present study was carried out have been scarce. Ensor *et al.* (2009) investigated temporal changes in the spatial distribution of cetacean species in the Southern Ocean, including the surveyed area of present study. A total of 1440.5 nautical miles were covered during the 4 surveys and they sighted minke whales, humpback whales, killer whales, Antarctic blue whales, and fin whales. Difference may be due to seasonal variation of the distribution of these species as well as the fact that present surveyed area was at higher latitude, closer to the Antarctic coast, than Ensor *et al.* (2009). Scheidat *et al.* (2011) studied the cetaceans in the Southern Ocean using a ship-based helicopter and 13 cetacean species were identified, but their survey area was different from present study.

All the baleen whale species sighted during the survey are known to prey upon krill, thus the abundance of whales can be related to that of krill. Krill stocks should be carefully monitored under the Commission for Conservation of Antarctic Marine Living Resources (CCAMLR) which is Regional Fisheries Management Organization (RFMO) for the Southern Sea, and the Commission should set precautionary fishing limits for krill to ensure the sustainability of its predators, such as whales, penguins, fish and other species. The precautionary catch limit set by CCAMLR should be strictly followed.

The Southern Ocean and Antarctica are high seas, which means that they are beyond national jurisdiction. Rochette *et al.* (2014) mentioned that high seas are important as feeding and calving grounds for cetaceans, but the protection of the marine biodiversity beyond national jurisdiction is a complex issue and there is no legally binding instrument for the conservation and sustainable use of marine biodiversity in United Nations Law of the Sea Convention (UNCLOS). Nevertheless, scientific monitoring of cetaceans is important as a part of the holistic approach to the protection of Southern Ocean biodiversity in case of any decision taken on the designation of high sea marine protected areas. It is already known that since 1978 the IWC has conducted several circumpolar cetacean surveys in the Southern Ocean between 60 degrees South and the edge of the pack ice. Besides, IWC - Southern Ocean Whale and Ecosystem Research (IWC - SOWER) cruises were carried out to understand the abundance and distribution of cetaceans in Antarctica and the Southern Ocean (Ensor *et al.,* 2009). Such international cooperation is necessary to monitor migratory species on high seas.

In addition, overexploitation of living resources, climate change, IUU fishing, invasive species, and ocean acidification are major threats to biodiversity in the Southern Ocean (Griffiths, 2010). MARPOL 73 - 78 Convention (International Convention for the Prevention of Pollution from Ships) should be carefully implemented by all ships. According to the MARPOL 73-78 Convention, the Antarctic area is a special area, and discharge of garbage, including plastics, from ships, is prohibited (IMO, 1997).

Figure 3. A humpback whale (*Megaptera novaeangliae*) observed on 19 February 2015.

Finally, Antarctica has been reserved for peace and scientific research as a result of international cooperation enforced by the Antarctic Treaty signed in 1959 by 12 nations in Washington DC. Watanabe (2014) mentioned that the Antarctic Treaty System is a fundamental framework for the Antarctic research expedition and emphasizes the importance of international collaboration through science. The present study is also a good example of international cooperation between Japan and Türkiye under the Antarctic Treaty System as the first author was invited and hosted by the Japanese National Polar Research Institute to carry out the study.

Conclusion

Conservation of cetaceans in the Southern Ocean is one of the priority matters for the sake of marine biodiversity conservation. Besides, designation of large marine protected areas also has crucial importance. Migratory connectivity for the cetaceans in the Southern Ocean is one of the important research topics because all cetacean species reported in the study are migratory and this study contributes to the information needed to understand such connectivity. In addition, as krill is a main prey species for all baleen whale species and its stock assessment and sustainable catch limit need to be determined.

Ethical Statement

The present research paper has been conducted in an ethical and responsible manner. Therefore, it is in full compliance with all relevant codes of experimentation and legislations. The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper. The publication of the current research paper is approved by all authors.

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Author Contribution

Conceptualization, Öztürk B.; methodology, X.; software, X.; validation, X.; formal analysis, X.; resources, writing — review and editing, X. All authors have read and agreed to the published version of the manuscript.

Conflict of Interest

The author(s) declare that they have no known competing financial or non-financial, professional, or personal conflicts that could have appeared to influence the work reported in this paper.

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