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ABSTRACT

In 2012 WWF-Pakistan initiated an observer programme to monitor tuna gillnet operations in the coastal and offshore waters of Pakistan. Among other things, these observers were assigned to report observations of whales encountered during fishing operations. These vessels (with onboard observers) provided a platform of opportunity for recording the spatial and temporal distribution of whales in the Northern Arabian Sea. During 2019 a total of 7 sightings of Arabian Sea humpback whales, 1 sighting each of blue whales and Bryde's whales, 6 sightings of sperm whales, 8 sightings of baleen whales (that could not be identified to species level due to lack of adequate photographic or video evidence) and 3 records of entanglement and mortality of Cuvier's beaked whales.

Fewer whales were recorded through the programme in 2019 than 2018 and 2017 when a total of 35 and 95 sightings of whale were recorded respectively. This decrease in sightings is attributed to many factors, including early closure of the fishing season in early April 2019 because of low catches and unreliable prices of tuna in the market. As such the fishery was closed for four months from mid-April to mid-August instead of the usual two months of June and July.

Extremely high sea surface temperatures during September to October 2019 (possibly an oceanic heat wave) were believed to be the cause of reduced tuna catches. Therefore, only a few tuna boats remained operational during this period. An unprecedented jellyfish bloom of *Crambionella orsini* from September 2019 onward forced fishermen to stop fishing operations during this period. Furthermore, the observer programme was completed on September, 2019, after which only 45 out of 75 observers voluntarily continued to provide information about sightings. The paper also reports on two baleen whale strandings - a Bryde's whale (*Balaenoptera brydei*) stranded on the rocky shore at Gunz, western coast of Pakistan and a blue whale in Pushukan, Gwadar (West Bay).

INTRODUCTION

Pakistan's Arabian Sea coast is known to have a well diversified whale fauna which includes both baleen and toothed whales documented by a number of studies including Gore et al. (2012), Kiani and Siddiqui (2009), Kiani (2014, 2015a, 2015b), Mikhalev (1997; 2000), Minton *et al.* (2015) and Moazzam and Nawaz (2017, 2018, 2019). Among baleen whales, three species including Arabian Sea humpback whales (*Megaptera novaeangliae*), blue whales (*Balaenoptera musculus*) and Bryde's whales (*Balaenoptera brydei*) have been reported from Pakistan, whereas toothed whales include sperm whales (*Physeter macrocephalus*), killer whales (*Orcinus orca*), dwarf sperm whales (*Kogia sima*), Longman's beaked (or tropical bottlenose (*Indopacetus pacificus*) and Cuvier's beaked whales (*Ziphius cavirostris*). Between 2016 and 2018, Moazzam and Nawaz (2017, 2018, 2019) have provided details of the observations made by fisheries crew-based observers of baleen whales and some toothed whales occurring along the Pakistan coast. This paper provides an update on sightings recorded by the WWF-Pakistan's Crew Based Observer Programme during the 2019.

MATERIAL AND METHODS

The data collection of whales was described in detail by Moazzam (2019a) and Moazzam and Nawaz (2017, 2018, 2019). Data was collected by 75 participating captains or crew-members of tuna gillnet fishing vessels. Observers were trained by WWF Pakistan and provided with the necessary materials (GPS, data recording forms) to accurately record their observations. Species identifications were considered positive only if supporting photographic or video evidence was available for the authors to inspect. In all other cases, identifications were considered unconfirmed.

RESULTS

Whale sightings

During 2019 a total of 7 sightings of Arabian Sea humpback whales (ASHW), 1 sighting each of blue whales and Bryde's whales, 6 sightings of sperm whales, and 8 sightings of baleen whales (that could not be identified to species level due to lack of adequate photographic or video evidence) were made. In addition, 3 records of entanglement and mortality of Cuvier's beaked whales were also reported. Fewer whale sightings were recorded for the year 2016 to 2019 when a total of 47, 95 and 35 sightings of whale were recorded respectively. No killer whales (*Orcinus orca*) were reported from the area during 2019.

Arabian Sea humpback whales

During 2019, only 3 sightings of Arabian Sea humpback whales (Fig. 1) were recorded from the continental shelf and slope area mainly along Sindh coast (eastern coast of Pakistan) whereas there were four sightings from Malan and Sapat along Balochistan coast (Fig. 2). Moazzam and Nawaz (2017) reported feeding on planktonic shrimp and sardinellas in waters along the coastline. It may be added that some of the unidentified baleen whales reported here may also include Arabian humpback whales. There were no sightings of Arabian Sea humpback whales from the central part of the Arabian Sea in 2019 whereas, 4 ASHW were reported that area during 2018 season.



Fig.1. Arabian Sea humpback whale sighted along Ghorabari, Sindh on April 26, 2019

Blue whales

There was only one sighting of a blue whale during 2019 from the offshore waters of Balochistan (Fig. 3). In addition, some of the baleen whale sightings in this study that could not be assigned to species level may include blue whales.

Bryde's Whales

There was only one record of Bryde's whale during 2019 from Sindh coast near Karachi (Fig. 2). Some of the baleen whales that could not be assigned to species level may include Bryde's whales.



Fig. 3. Sperm whales sighted from (a) off Ormara on March 17, 2019 and (b) off Gunz on February 4, 2019

Strandings

In addition to the sightings reported by the crew-based observers, a Bryde's whale specimen was found stranded on an isolated beach at Chill near Gunz (Jiwani area), Balochistan on November 29, 2019 (Fig. 8). It was 9.45 m long. Interestingly, a baleen whale was reported to be entangled in the gillnet deployed by the fishermen on November 26, 2019 offshore from Gwadar. Because of the aggressive behaviour of the whale, the fishermen could not safely attempt a disentanglement. It is believed that the same whale died and stranded near Gunz. Tissue samples were preserved for later for genetic analysis. The skeleton could not be retrieved because of inaccessibility of the rocky shore and intensive wave action in the area. The measurements and other details about the stranded whale are being prepared for a separate publication.

A stranding of a juvenile blue whale was documented in Pushukan, Gwadar (West Bay) on 2nd April, 2019 (Fig. 7). It was 10.36 m long. The cause of death of the juvenile blue whale could not be ascertained. The whale is buried at Pushukan with the intention of later recovering its skeleton. Tissue samples from the specimen were obtained for later genetic analysis.



Fig. 4. Cuvier's beaked whale entangled in gillnet in off Ormara waters in January, 2019

DISCUSSION

Whale sightings reported from 2016 to 2019 were generally higher than those reported in 2019: 47 sightings of baleen whales in 2016 (Moazzam and Nawaz, 2017), 95 in 2017 (Moazzam and Nawaz, 2018), and 35 in 2018 (Moazzam and Nawaz, 2019), compared to a total of 26 in 2019 (see Table 1 below).

Table 1. Summary of Sightings of whales recorded from Pakistan Coast (Arabian Sea) recorded by Crew-Based Observers.

Year	AHBW	Blue Whale	Bryde's Whale	Unidentified Baleen Whale	Sperm Whale	Killer Whale	Cuvier's Beaked whale
2016	12	0	3	32	0	0	0
2017	42	13	5	30	4	1	0
2018	13	2	1	15	4	0	0
2019	7	1	1	8	6	0	3

A number of factors were likely to have contributed to the lower number of whale sightings from the crew-based observer programme in 2019. These include:

- Operation Period of Tuna Vessels:** In 2018 the majority of the fishermen shut down their annual operations in late April because of low catches and unreliable prices of tuna in the market (Moazzam and Nawaz, 2019). A similar situation prevailed in 2019 due to which fishermen closed their operation in early April, 2019. Usually a voluntary two month closed season is observed between June and July, however, in 2019, tuna fishing was stopped by fishermen about one and half months earlier than usual. The new fishing season was started in late August 2019. As such no whale observations were recorded during the four-month summer closure.
- High Seas Surface Temperature (SST):** During the summer months in 2019, sea surface temperature (SST) was observed to be unusually high, with a possible oceanic heat wave in the Arabian Sea (Fig.5). The phenomenon is separately being studied. However, fishermen reported very poor catches in late August to October, 2019. A number of tuna vessels that started their operation in late August, 2019 stopped fishing after their first trip of the new season due to this reason. The impact of high sea surface temperature during the summer of 2019 on distribution and abundance of whales in the Arabian Sea is not known.
- Jellyfish bloom:** An unprecedented bloom of the jellyfish (*Crambionella orsini*) appeared in the southern part of Arabian Sea (between 17°N and 19°N) in September which spread to almost the entire Arabian Sea by the end of October, 2019 (Gul, 2020; Moazzam, 2020). This species previously formed large blooms in the entire Gulf of Oman and Arabian Sea during 2002 and 2003 (Daryanabard and Dawson, 2006). The dense bloom in 2019 (which is still continuing in April 2020) has prevented many fishermen from normal operations because of net fouling and time that will be wasted to remove the jellyfish from the net (Fig.6). Fishermen also reported poor catches of tuna species due to the jellyfish bloom. Impacts of jellyfish blooms on tuna and whale distribution and abundance are also under investigation.
- Closure of Crew-based Observer Programme:** WWF-Pakistan initiated an observer programme in October 2012 with support of the Indo-Pacific Cetacean Research and Conversation Foundation and the Australian Marine Mammal Centre (AMMC). Initially there were four crew-based observers under this project. The programme continued after June 2013 through Area Beyond National Jurisdiction (ABNJ) Project funded by GEF/Common Oceans/FAO. The number of observers gradually increased to 75, and became main source of information about Arabian Sea humpback whales and other cetaceans from northern Arabian Sea along the coast of Pakistan. This GEF/Common Oceans funded project was completed on September 30, 2019. Without continuing funding, the Crew-Based Observer Programme is now officially closed. At least 45 of the 75 observers are continuing to provide information about tuna fisheries, bycatch and sighting of cetaceans on voluntary basis. While this has ensured the temporary continuation of reports of whale

sightings from coastal and offshore waters of Pakistan, it is uncertain how many of these volunteers will continue to make the effort to collect data without compensation for their efforts. Discontinuation of the Crew-Based Observer Programme is a major setback as no other platform of opportunity for recording whale sightings is available in Pakistan. Fewer records from October to December can be attributed to reduction in the number of observers reporting whale sightings. WWF-Pakistan is endeavouring to ensure continuation of the Crew-Based Observer Programme, may be with limited number of observers.

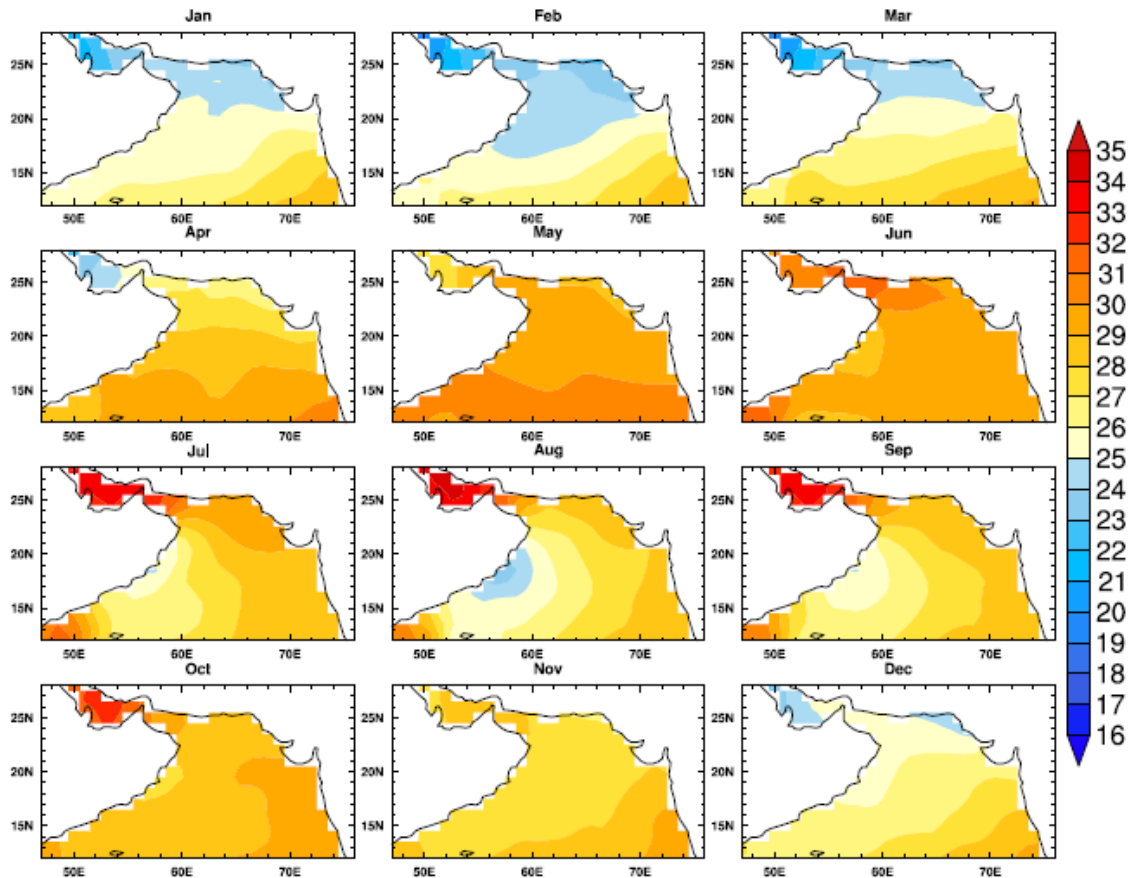


Fig. 5. Sea surface temperature in the Arabian Sea during 2019 (Source: Mr. Rashid Mahmood: Unpublished data)

No major seasonal trend in whale sightings was observed during 2019. , However, the majority of sightings (17 out of 27) were recorded during the Pre-southwest monsoon calm period (February to April). During this period most of the tuna fishing boats shifted their operations to the coastal area of Balochistan mainly in the Sapat and Malan area which is known to one of the major hotspots for cetaceans. The area forms part of the Northeast Arabian Sea Important Marine Mammal Area (IMMA) (see <https://www.marinemammalhabitat.org/immas/imma-eatlas/>). Only 5 sightings were recorded during the Post-southwest monsoon Calm Period (September to November. No sightings were reported in December 2019. No information is available for southwest monsoon (June to July) because of the voluntary closed season observed by the fishermen engaged in tuna gillnetting.



Fig.

6. Bloom forming jellyfish (*Crambionella orsini*) onboard tuna vessel



Fig. 7. Blue whale (*Balaenoptera musculus*) juvenile stranded at Pushukan, Gwadar (West Bay), Balochistan coast on April 2, 2019.



Fig. 8. Bryde's whale (*Balaenoptera brydei*) stranded at Chill, near Jiwani, Balochistan coast on November 29, 2019.

Mapping of the ASHW sightings recorded by the crew-based observer programme over the years provides some valuable insight into the distribution of the species, and areas that may be targeted for future research, such as dedicated cetacean surveys to conduct photo-identification, biopsy sampling, and or use of UAVs to assess body condition and health. The sightings also indicate where it may be useful to position passive acoustic monitoring equipment to more effectively detect and monitor the seasonal presence of humpback whales, especially in periods when fisheries-based observations are not possible due to sea conditions or other constraints.

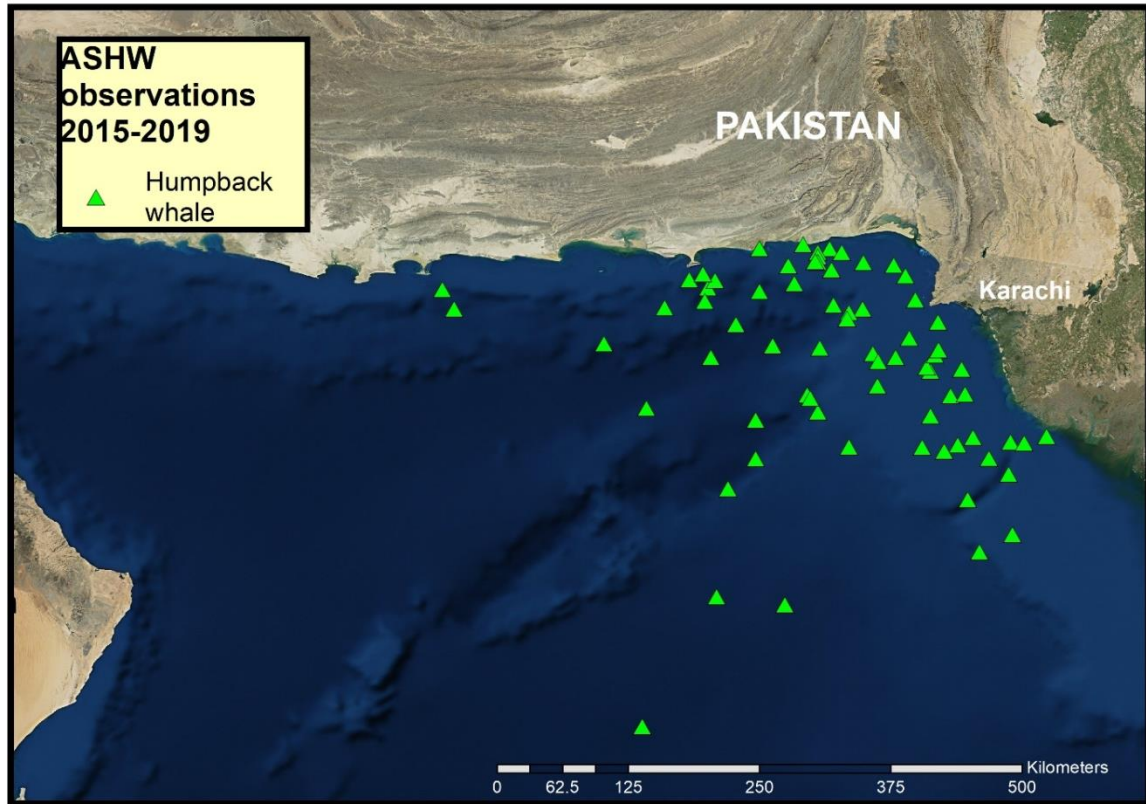


Figure 9: Arabian Sea humpback whale observations recorded through WWF Pakistan’s fisheries crew-based observer programme between 2015 and 2019.

WWF-Pakistan’s Crew Based Observer Programme has provided a platform for collection of information about cetaceans of the northern Arabian Sea along the coast of Pakistan and in the adjacent ABNJ. New sightings of whales especially records of the Arabian Sea humpback whale off the coast of Pakistan are clearly very valuable, as highly limited information about the population of this whale is available. While the programme officially ended on September 30, 2019, however, at least 45 observers sighting of cetaceans on voluntary basis, and WWF-Pakistan is endeavouring to secure funds to ensure the continuation of the Crew-Based Observer Programme, even with limited number of observers.

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