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Sperm Whales in the Ross Sea: Seasonal Acoustic Detection Using Moored Sensors

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In 2017 the largest marine protected area on the planet was established in the Ross Sea. This area is one of the most pristine environments on earth, but also the target of a commercial fishery for Antarctic toothfish. The effects of the fisheries on the ecosystem, especially on top predators, is still uncertain. Sperm whales occurrence is believed to be largely outside the protected area so that the effectiveness of the protection measures in protecting this species from the effects of fishing remains to be understood. We started a long term passive acoustical monitoring study of the protected area to describe the seasonal occurrence of sperm whales and understand ecological connectivity between sperm whales and toothfish. The first year of our study has has revealed the presence of sperm whales both at Iselin Bank and the Pacific-Antarctic Ridge area. Sperm whales forage in the area mainly in the summer months when toothfish fisheries catches are higher. Our preliminary results contrast with the recent lack of sightings of sperm whales along the Ross Sea shelf by fishing and research vessels.

Ross Sea Research and Monitoring Programme (RAMP)

Ross Sea Marine Protected Area (MPA)

The Ross Sea Ramp programme is a five year long research project aimed at understanding the effectiveness of the Ross Sea MPA. The MPA was established in 2017 by an international agreement of the 25 member states of the Commission for the Conservation of Marine Living Resources (CCAMLR).

The MPA covers a total of 1.55 million square kilometres of sea (Figure 1), of which 1.12 million square kilometres are fully protected. The MPA establishes “No take” General Protection Zone (GPZ-fully protected area), Krill Research areas (KRS – controlled research on krill permitted), and Special Research Zone (SRZ – limited research permitted).

Specific Objectives:

1) To collect baseline information on the seasonal occurrence of sperm whales in the region (and other marine mammals)

2) To understand ecological connectivity between toothfish and sperm whales to investigate potential effects of commercial toothfish fisheries on sperm whales in the Ross Sea region

Passive acoustics data collection:

Recorders (JASCO AMAR G3 and G4) were deployed in February 2018, 2019, and 2021 (Figure 1). Future deployment planned for 2023.

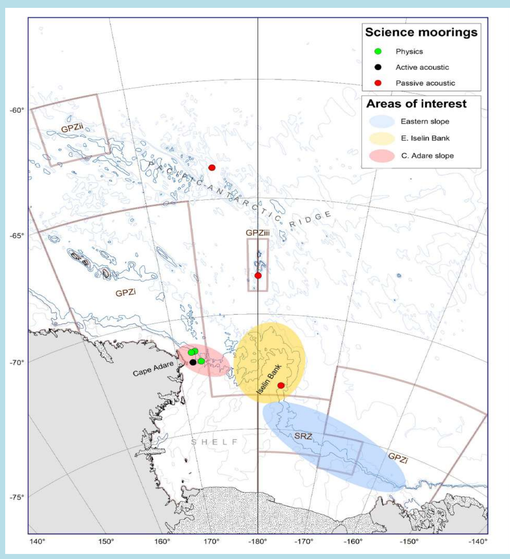
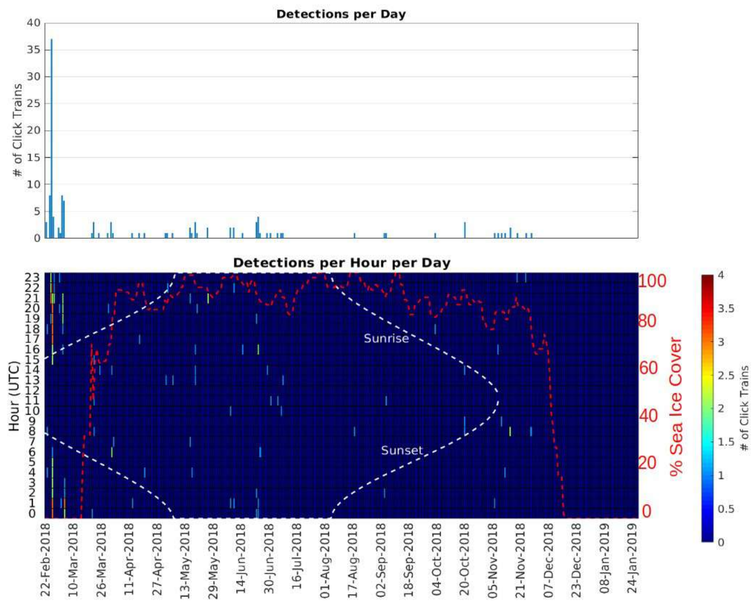


Figure 1: Location of the passive acoustics recorders in the Ross Sea

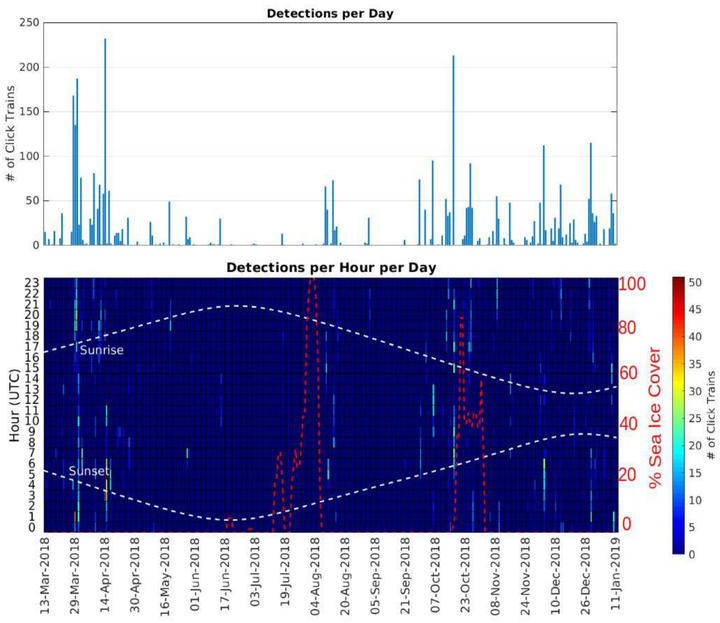
Iselin Banks

The detection rates of sperm whale echolocation signals at Iselin Banks are generally low and concetrated mainly in the summer (February) (Figure 2). With the exception of February 25th, when we detected 37 echolocation click trains, detections are always lower that 5/day. This location is in fact characterised by high concentrations of sea-ice cover (figure 2 red line) for most of the year. The presence of ice surely limits the possibility of breathing at the surface, and it might be a possible cause for the scarse detection of sperm whales at this location



Pacific Antarctic Ridge

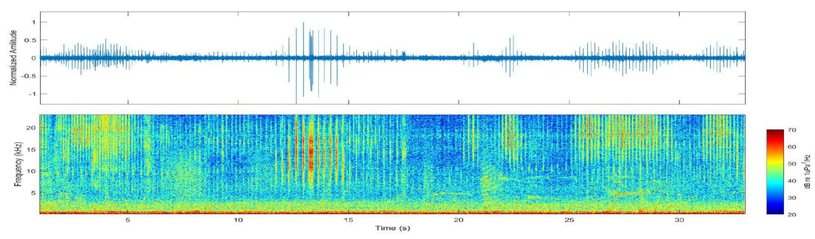
The area of the Pacific Antarctic Ridge had higher detection rates than the Iselin Bank. Here we detected up to 232 click trains on April 15th and 219 click trains on October 11th. Detection were more common between October and April, with lower detection rates during the winter months. It is worth noticing that some sperm whales were foraging in this area also in the month of August.



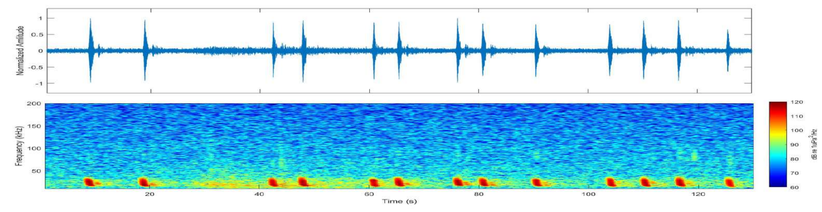
Other Marine Mammal Species Detected

Many other species of marine mammals were detected at both stations. Among them, the most commonly detected include killer whales, fin wha

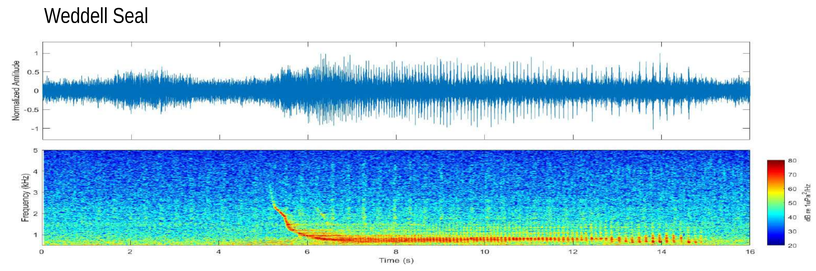
Killer Whale



Fin Whale



Weddell Seal



FUTURE DIRECTIONS

- Quantify temporal & spatial trends of calling marine mammals’ calls

- Understand how climate variability and change affect the soundscape of the region

- Develop National and International Collaborations

ACKNOLEDGMENTS

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