

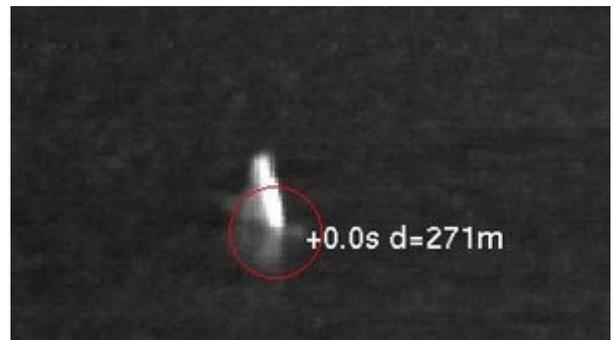
MAPS: Marine Mammal Automated Perimeter Surveillance

Scientific background: Ship based detection of marine mammals has a broad range of applications. On the one hand, population ecologists with focus on whale distributions and migratory patterns are interested in effective methods for conducting a census of marine mammals. On the other hand, users of hydroacoustic instruments are interested to most effectively implement reliable mitigation methods if adverse reactions of marine mammals to the ship's presence may be apprehended.

Scientific objectives: Several methods for the detection, identification and localization of marine mammals and will be evaluated. Because whales and seals spend considerable periods of time both at the surface as well as submerged, multiple methods need to be employed in parallel to ensure detection regardless of their location. Under water, vocalizing mammals can be detected by passive acoustic streamer. Its usefulness, however, is currently compromised by intrinsic vessels noise, which will mask particularly low- to mid-frequency vocalizations of the mammals. We will attempt to develop modern signal processing methods to optimally separate the sounds and provide the optimal sensitivity for the bioacoustic signals. Near the surface, whales will be recognized by their warm blow, which stands out against the cold Antarctic environment. For this purpose we are using infrared technology. Here, research will focus on establishing pattern recognition software, to automatically and reliably detect whale blows under varying environmental conditions.

Infrared based automatic whale detection (MAPS-IR)

Both, non-governmental organizations and governmental agencies increasingly criticize the use of air-guns for marine geophysical research due to the enhanced noise levels these instruments introduce to the aquatic environment. To remedy possible detrimental effects to the marine fauna, mitigation measures are commonly requested by regulatory agencies, requiring in most cases visual observation of the ship's perimeter and shut down of seismic operations when cetaceans are sighted within a predefined exclusion zone around the airguns. To facilitate such observations, the MAPS-IR project aims at developing an automatic whale blow detection system on the basis of a 360° thermal imaging sensor, FIRST-Navy provided by Rheinmetall Defense Electronics, Bremen.



Modelling of cetacean distribution using opportunistic whale sightings (MAPS-vis)

Data on cetacean distribution in the Antarctic is limited for many species due to their mobility and elusiveness, as well as logistic constraints of data collection (such as the region's remoteness and limited seasonal accessibility). However, a better understanding of the environmental factors driving cetacean distribution in the Southern Ocean is important to improve our general understanding of cetacean habitat usage and to limit possible detrimental effects of anthropogenic activities.

To improve data availability, opportunistic whale sightings have been systematically recorded on a presence-only basis by the nautical officers of the research icebreaker RV Polarstern during the past years.

To extract suitable habitats of cetaceans in the Southern Ocean, sighting data are being related to bathymetric and various oceanographic variables (incl. their derivatives) taken from remote sensing data using state-of-the art habitat models.

