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Communication of killer whales engaging in carousel feeding recorded with a large baseline hydrophone array

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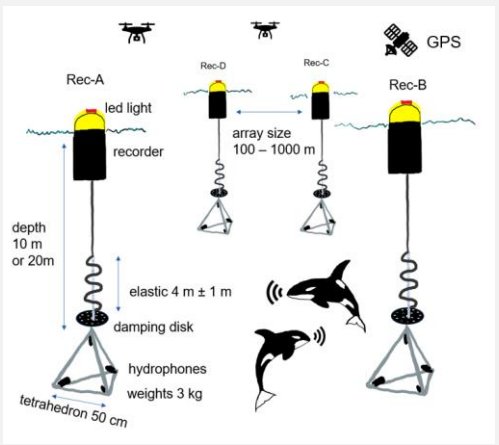
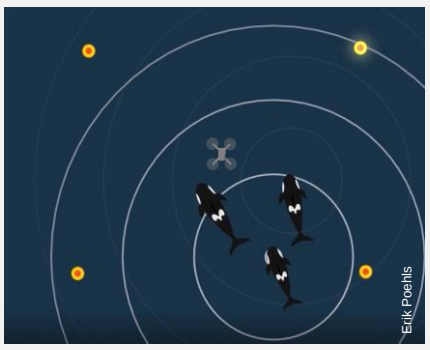
1 Introduction

To study the communication within a group of animals, the individual calls need to be separated. Receiver arrays provide a non-invasive alternative to on animal tags. Norwegian killer whales that engage in cooperative carousel feeding, are well suited to study group communication with arrays, because the animals vocalize very actively, and stay quite stationary and close to the surface.

2 Instrumentation

Special built recorder buoys with GPS synchronization



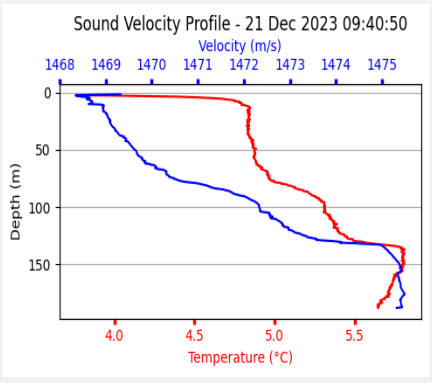


- Hydrophones: HTI-96 -165 dB re V / µPa
- ADC: 24 bit, 102.8 kS/s
- GPS synchronization ~ 100 ns
- Battery: LiFePo, 100 Wh, 10 h runtime

Synchronized video drones
2x DJI Mini 3 Pro, 1x DJI Air 3

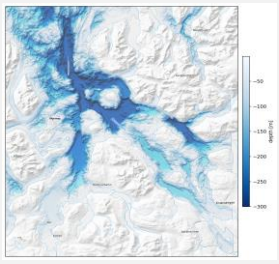
Clock shot at start and end of flight for synchronization. Flying with camera facing down allows to match position and time of animals with acoustics.

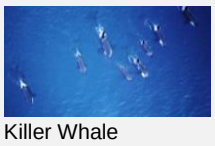
Sound velocity profiler
Valeport SwiFT SVP



3 Expedition WhaleSonic

November 2023 – January 2024, 6 weeks with day and night excursions, 15 participants, 60 excursions with the boat, 85 buoy deployments, ca. 130 hours of acoustic recording, 108 sound velocity profiles.





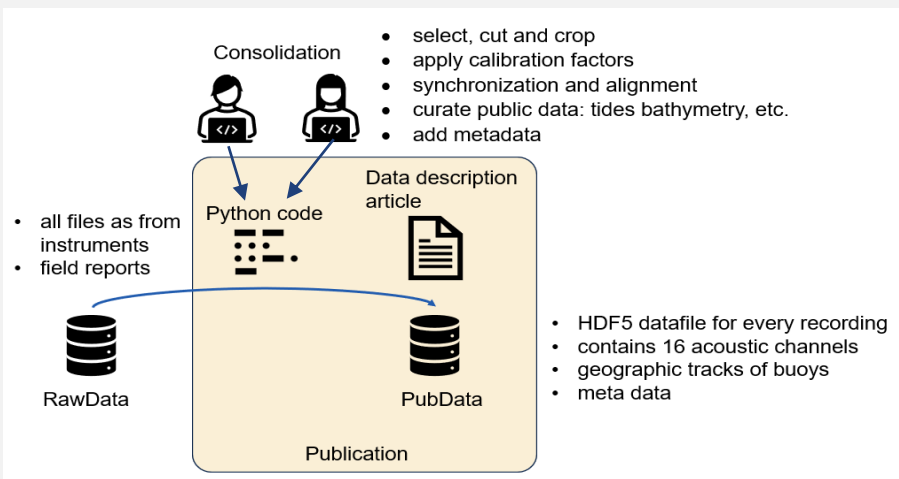
Killer Whale

Humpback Whale

Fin Whale

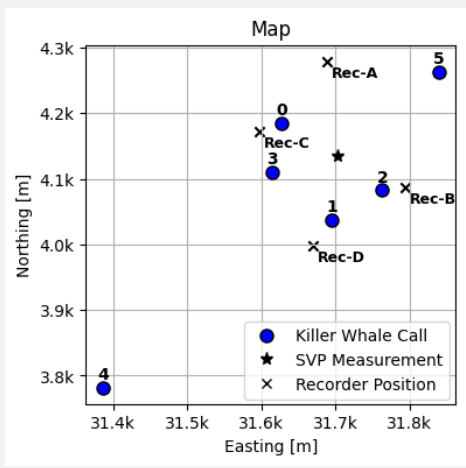
Sperm Whale

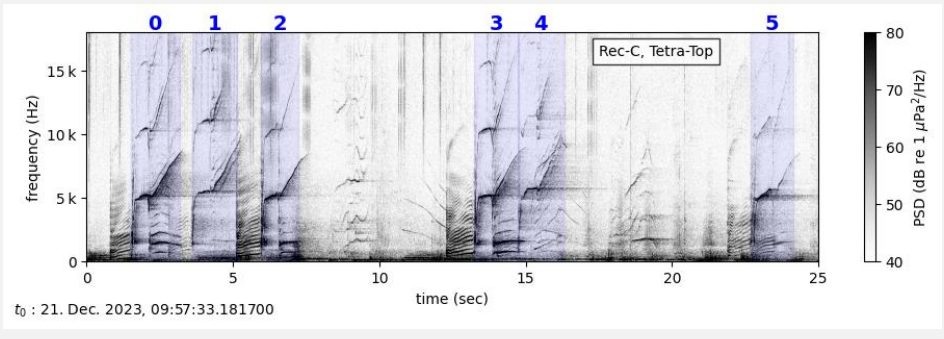
4 Data Management



5 Example for Communication Analysis

Long baseline localization of calls in 2D. Time difference of arrivals was obtained by spectrogram correlation. The same call type is used by several different animals.





5 Summary & Outlook

- An extensive dataset has been acquired with synchronized acoustic recordings from 16 hydrophones. Some recordings are complemented by top view videos from drones. The dataset addresses the behavior of four cetacean species.
- The dataset will be published with open access with FAIR principles.

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