Near real-time passive acoustic monitoring of baleen whales from autonomous platforms in the Gulf of Maine

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Introduction

- Recent advances in technology have made near real-time call detection, classification, and reporting from autonomous platforms feasible.
- WHOI has developed a hardware/ software system (DMON/LFDCS) capable of detecting the calls of baleen whales (Fig. 1) from autonomous platforms [1].

Fig. 1. Target Species: Sei (*Balaenoptera borealis*), fin (*Balaenoptera physalus*), right (*Eubalaena glacialis*), and humpback (*Megaptera novaeangilae*) whales.

- This portion of a larger-scale project seeks to demonstrate that autonomous acoustic detection technology is at a stage where it can be used in Naval monitoring projects, via collaboration with the Naval Oceanographic Office.

Methods

- Autonomous platforms (Fig. 2) equipped with the DMON / LFDCS [1] classify and report vocalizations within 2 hours of detection via Iridium satellite (Figs. 3 and 4).

Fig. 2. Autonomous platforms: Gliders from NAVO (top) and WHOI (bottom) prepared for deployment. Note that the DMON hardware is integrated in the WHOI glider, while the NAVO glider uses an older DMON deployment strategy.

- The LFDCS contains a call library to which detected vocalizations are compared for classification.

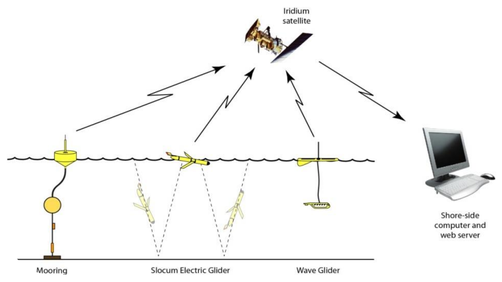
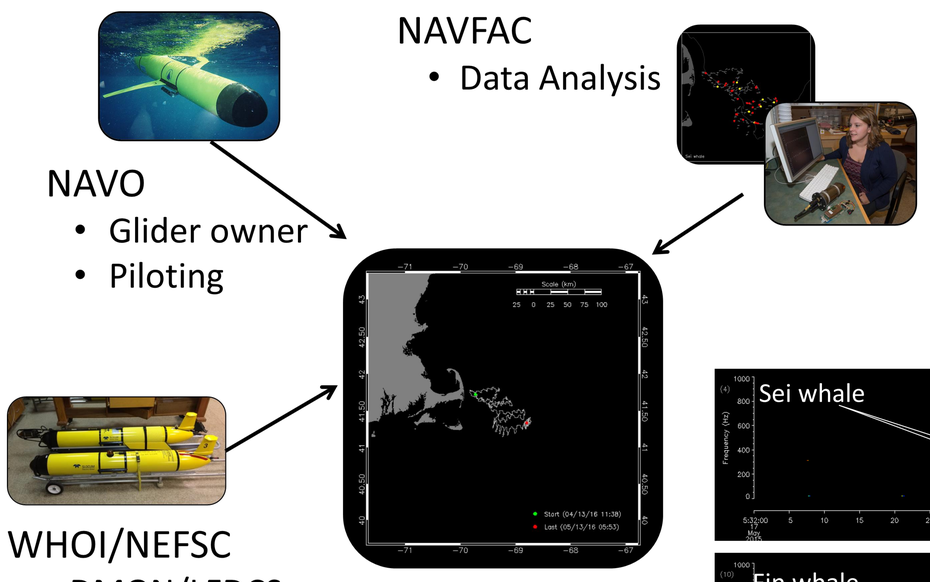


Fig. 3. Data from autonomous platforms are relayed to shoreside analysts via Iridium satellite links.

Collaborative Deployment - Naval Oceanographic Office



- Successful deployment 13 April – 13 May 2016
- Mirrored data analysis to compare analyst accuracy at NAVFAC and WHOI/NEFSC
- 3 of 4 species detected by all analysts (Figs. 4 & 5)

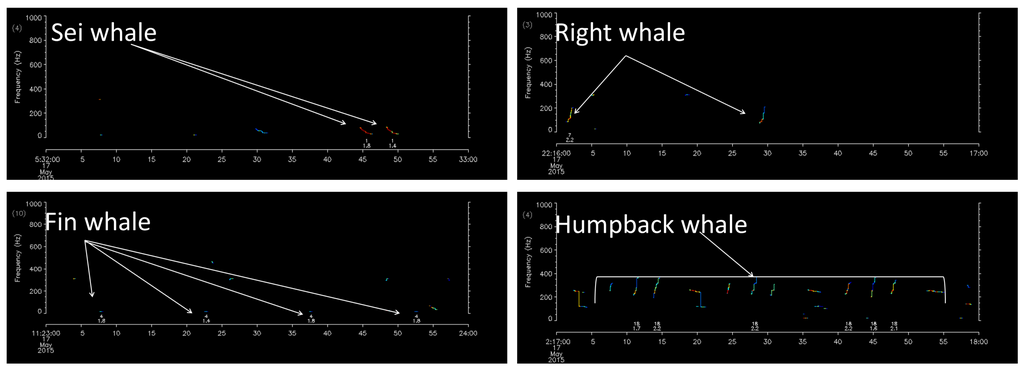


Fig. 4. Example pitch tracks from spring 2015 Slocum glider, detected by LFDCS. Calls classified to species have a number beneath the pitch track.

Preliminary Results

- Data available in near-real time (dcs.whoi.edu).
- 3 Analysts reviewed pitch-tracks (Fig 4.) in near real-time to determine occurrence of 4 species (Fig. 5). Quantitative analysis is in progress.

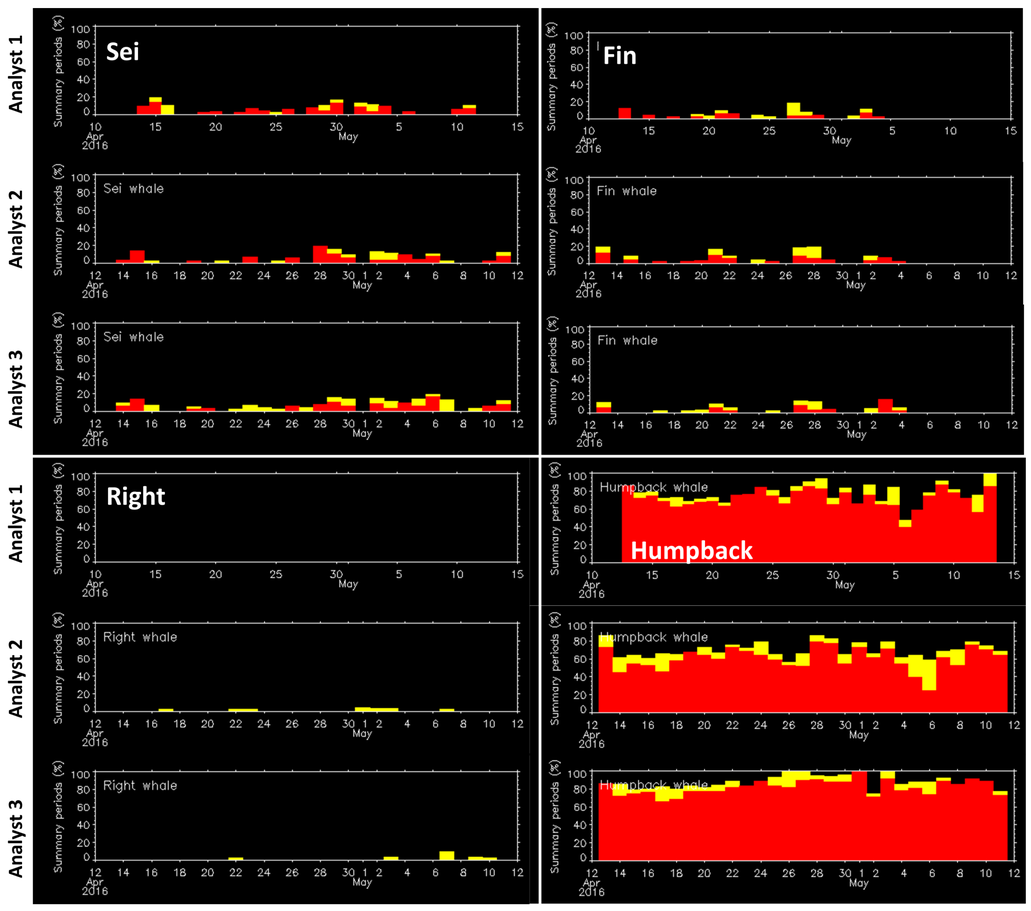


Fig. 5. Analyst results. Example detection plots comparing consistency of detections between the 3 analysts over the course of the deployment.

- Species detection results:
  - Humpback whales detected on all days
  - Limited evidence for right whale presence
  - Sei and fin whale presence regular but sparser than humpbacks.

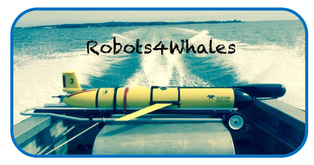
Future Work

- Project funded through 2017 – additional deployment of a DMON/LFDCS-equipped waveglider will proceed in 2016.
- Additional collaborative work with NAVO is proposed – collection of archival acoustic data by a NAVO glider once a few hurdles are jumped.
- Continued refinement of the LFDCS call libraries and platform hardware.

More Information

To view more data from this and related projects, please visit:

Robots 4 Whales (dcs.whoi.edu)
Navy Marine Species Monitoring Portal (http://www.navymarinespeciesmonitoring.us/)



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References

1. Baumgartner, M.F., D.M. Fratantoni, T.P. Hurst, M.W. Brown, T.V.N. Cole, S.M. Van Parijs, and M. Johnson. 2013. Real-time reporting of baleen whale passive acoustic detections from ocean gliders. Journal of the Acoustical Society of America 134:1814-1823.