Playing hide and seek underwater: Evidence of orcas (*Orcinus orca)* presence in offshore Icelandic waters through acoustic analysis

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Objective: Investigate whether orcas are present across Icelandic waters, in regions or seasons where there is no visual observation effort by whale-watching operators or marine researchers.

Focus: Acoustic analysis of PAM recordings retrieved from moored hydrophones to answer the following **questions**:

1) Are pulsed calls of orcas present in the recordings from different inshore (Northeast and South) and offshore locations (Northeast, East, and West) in Iceland?

2) Based on a comparison with the known repertoires of the Icelandic and Norwegian orca populations, what is the provenance of these pulsed calls for each region?

Introduction

Understanding orca (*Orcinus orca)* movement patterns in relation to prey is important for conservation management. In the North Atlantic, orcas are known to have a close relationship with herring, being regularly sighted feeding in coastal herring grounds. However, their distribution in offshore waters is less monitored and therefore poorly understood.

The acoustic presence of orcas across four regions of Iceland is investigated to gain knowledge on their seasonal distribution and population origin based on their calls. Calls were compared to catalogues from Iceland and Norway.

Results and Discussion

Most calls were detected in E and NE Iceland during the summer months, suggesting individuals are feeding on the Norwegian spring-spawning herring, which in recent years has returned to this area during the summer and fall.

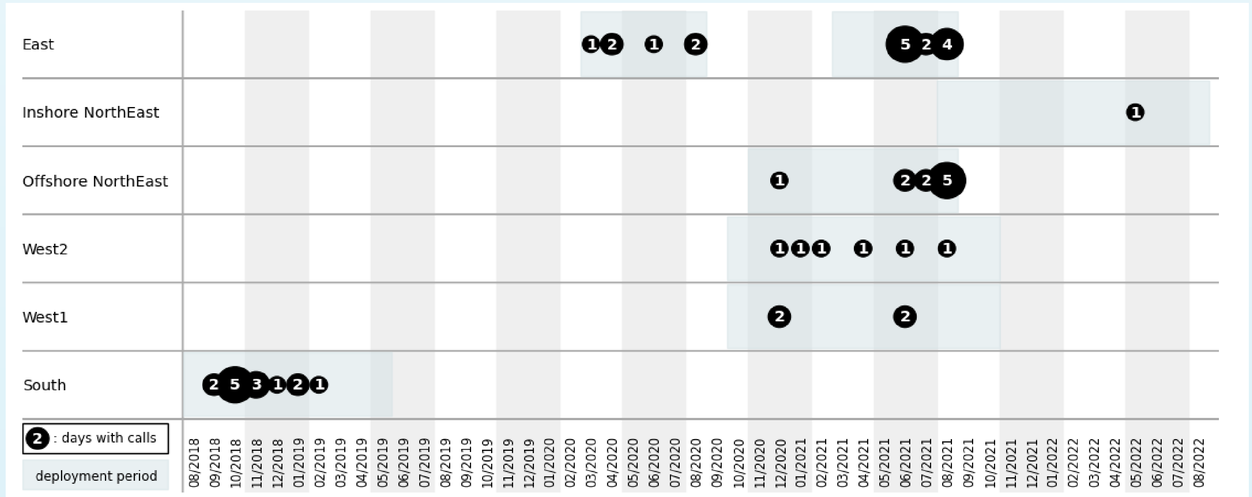

Figure 2 Orca's acoustic occurrence for each of the monitoring locations. Numbers inside the black circles represent the days per month during which orca sounds were confirmed. Grey shading is used to indicate the seasons (Winter and Summer) and light green to indicate monitoring effort.

760 matches to 29 Icelandic call types, including I36 the 'herding call'

2,558 hours
3,876 classifiable detections
766 matched calls

6 matches to 2 Norwegian call types

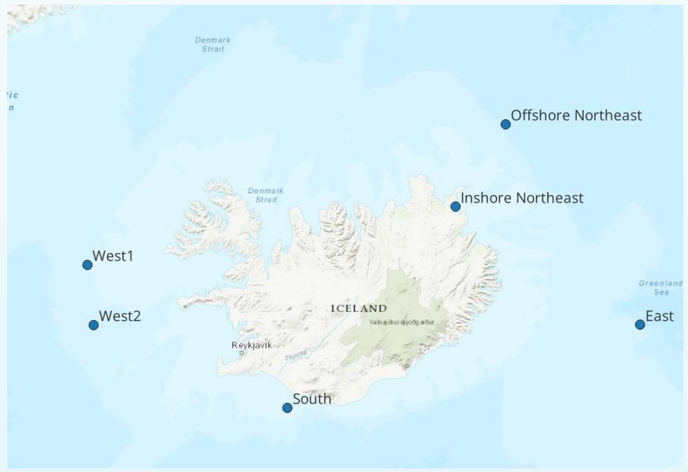

Figure 1 Locations of moored hydrophone devices around Iceland for which data was analysed

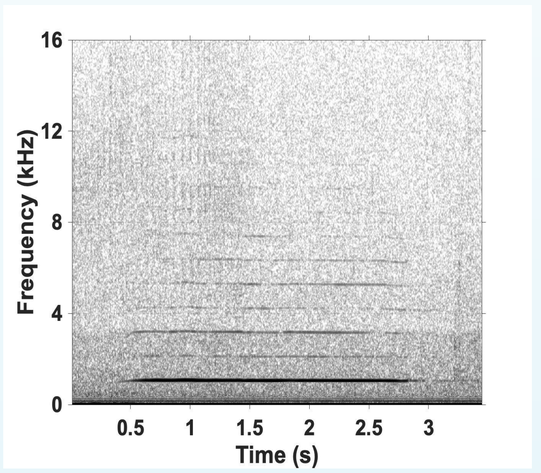

Figure 3 Call type I36, 'the herding call' (sampling rate: 96kHz; window: Hann; FFT size: 4,096)

Conclusion

- This study extends the known orca habitat in Iceland to all regions monitored.
- The herding call, a feeding-specific call, detected in the South during winter, suggests orcas feed in the region throughout the year and not just in summer, as previously thought[3].
- While most individuals are likely to be part of the Icelandic population, the detection of a few Norwegian calls suggests connectivity between Northeast Atlantic populations that requires further study.

Future research

- More hydrophones needed →Where to deploy them to maximise effort?
  - Possible interaction between Icelandic and Norwegian populations

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