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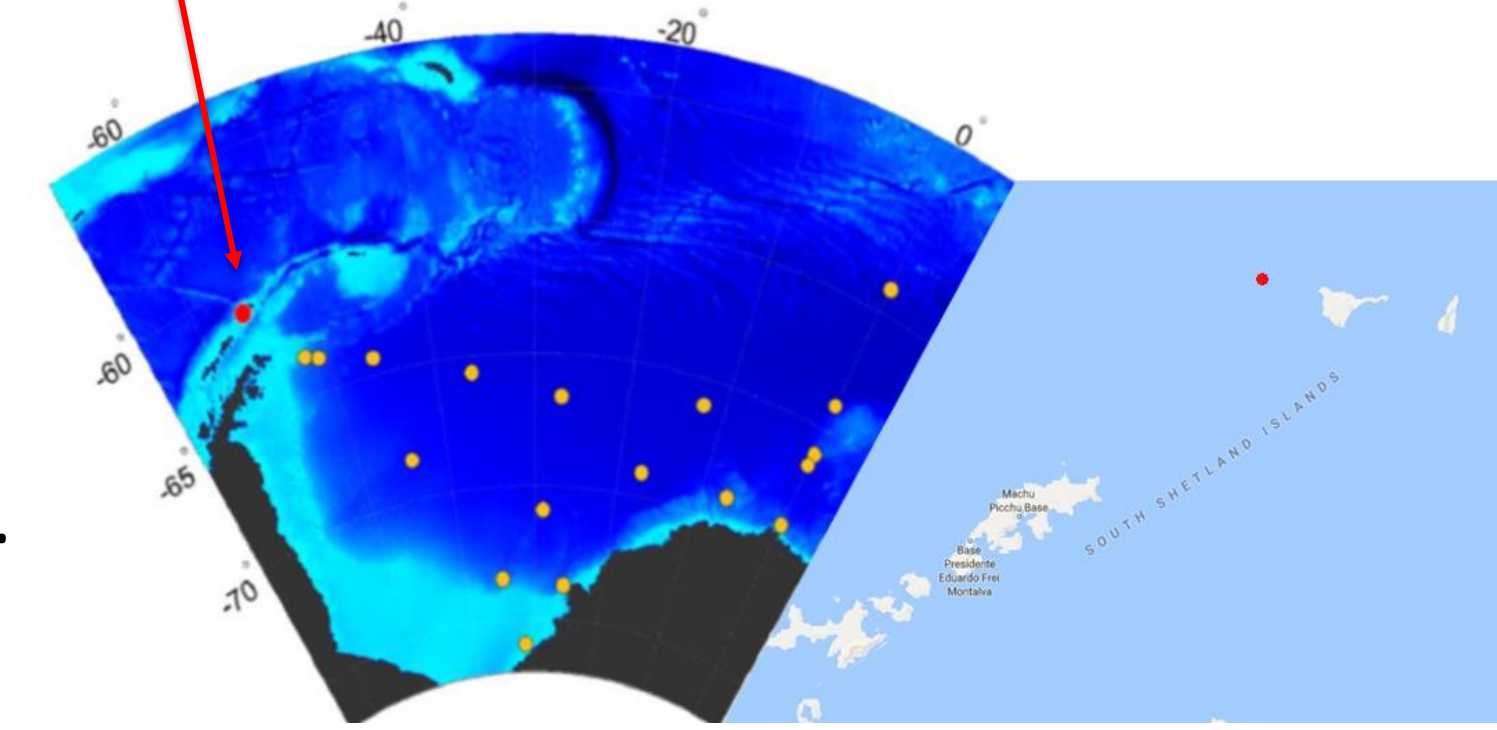
ALFRED-WEGENER-INSTITUT
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UND MEERESFORSCHUNG

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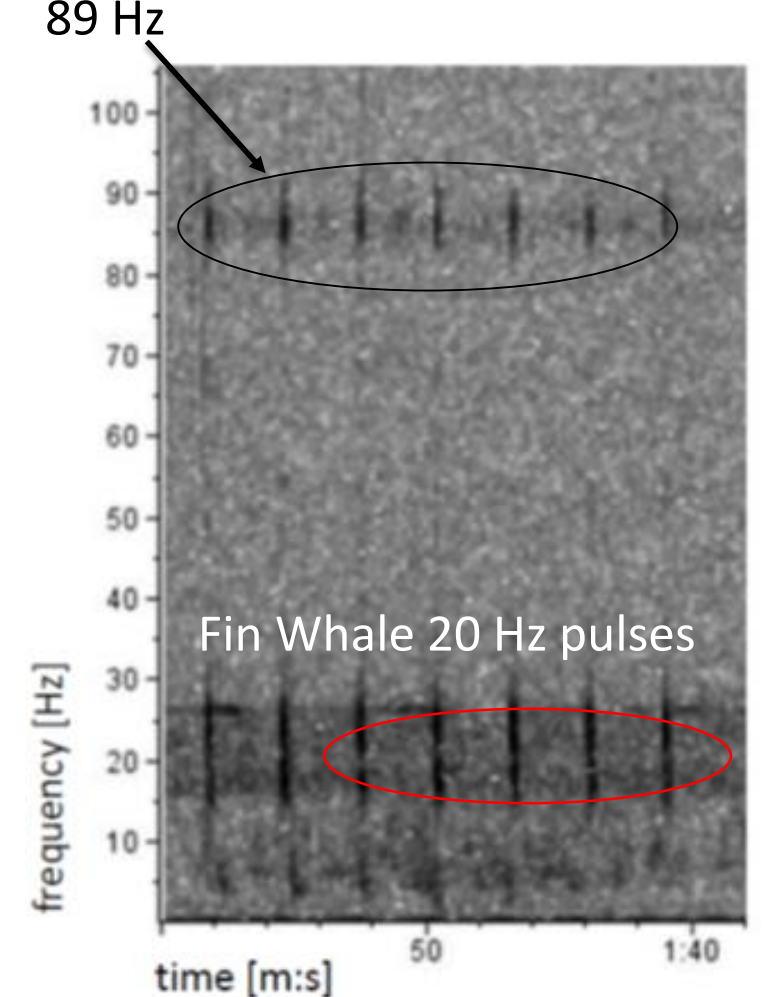
Fin whale (*Balaenoptera physalus*) acoustic presence off Elephant Island, Antarctica



Acoustic mooring off Elephant Island (61° 0.88'S, 55° 58.53'W, water depth 320m)

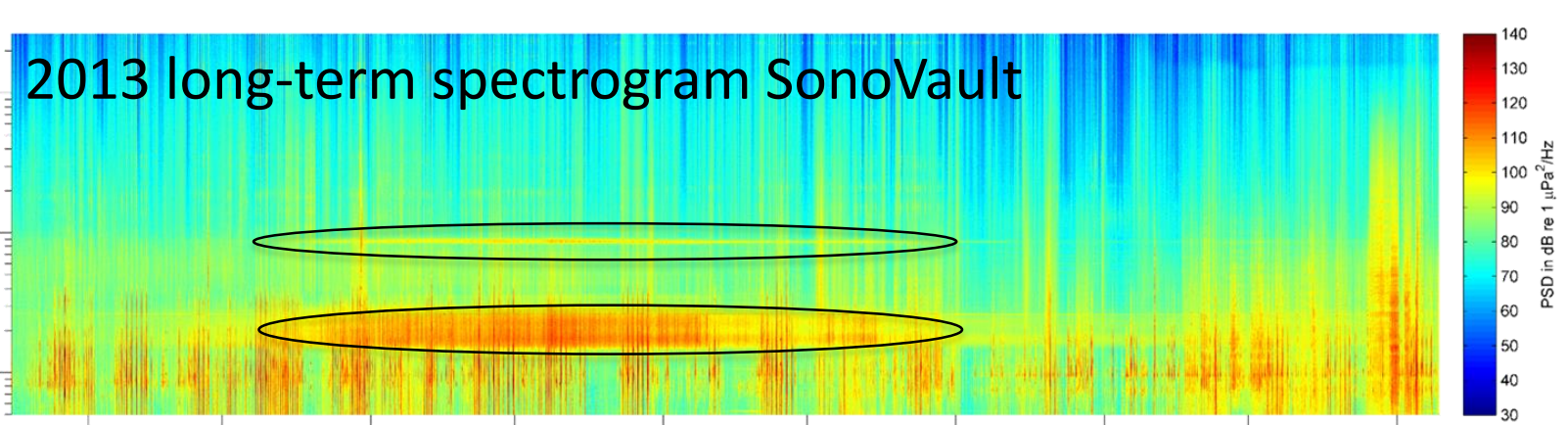


Fin whale upper call component



In a nutshell:

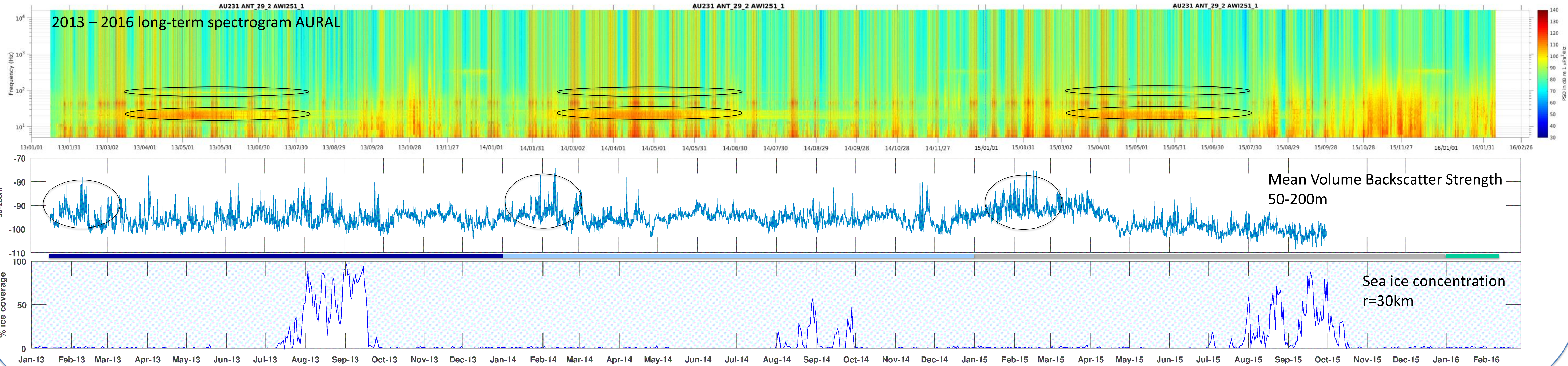
- Visual sightings of large fin whale groups suggest Elephant Island may serve as an important feeding spot.
- PAM used to gather year round information of fin whale acoustic presence between Jan 2013 - Feb 2016.
- Data exhibit autumn increase in fin whale 20 Hz calls preceded by volume backscatter peaks in February.
- Lack of discernable diel cycle during peak call period (May-June).



Methods:

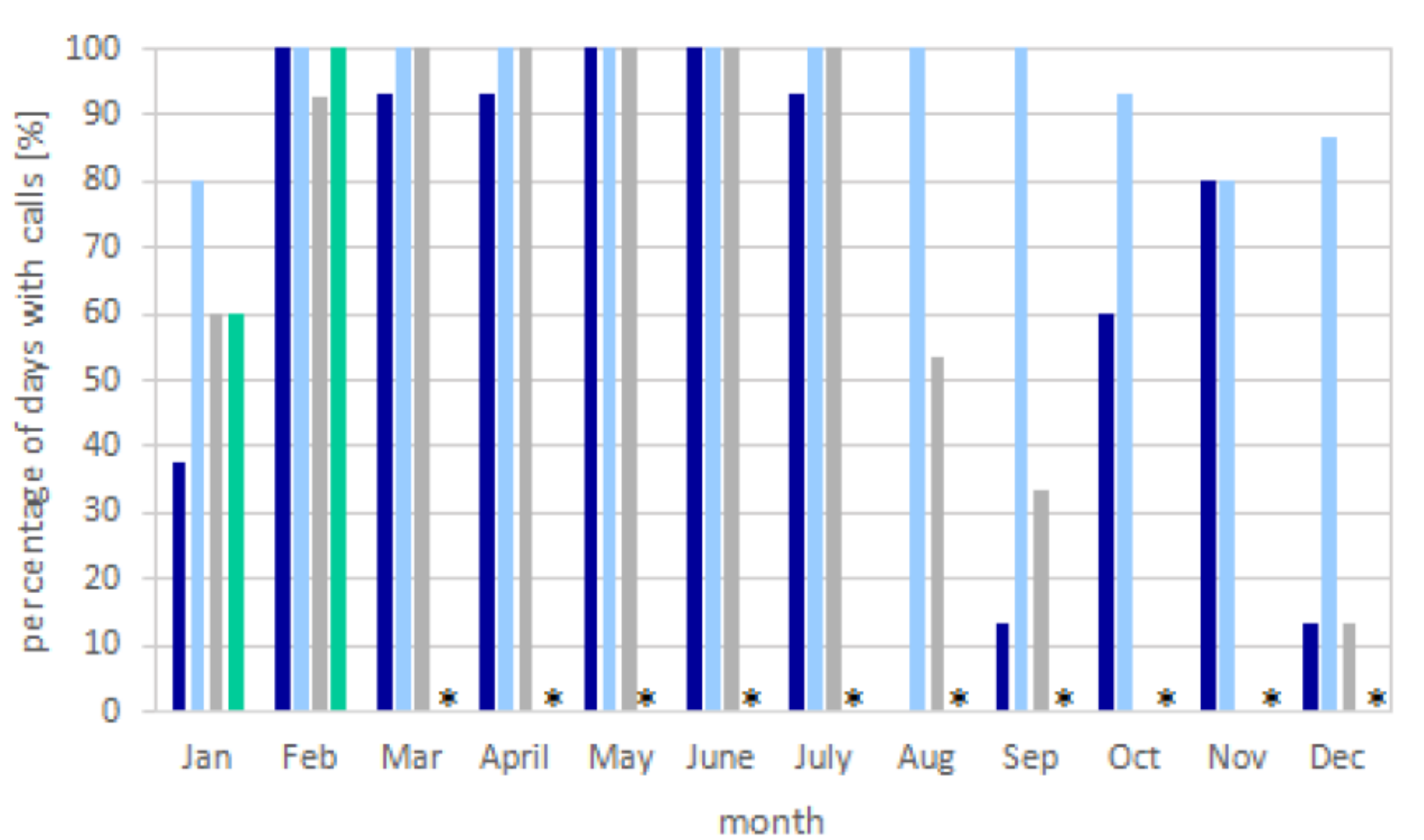
- AURAL: 210m depth, 32kHz 16bit, duty cycle 8% (5 min every hour)
- SonoVault: 212m depth, 5.3kHz 24 bit, continuous sampling, duty cycle 100%
- Upward looking ADCP for backscattering strength, 314m depth, averaged 50-200m
- Sea ice data: Spreen, G., L. Kaleschke, and G. Heygster (2008), Sea ice remote sensing using AMSR-E 89 GHz channels *J. Geophys. Res.*, vol. 113, C02S03, doi:10.1029/2005JC003384.

2013 – 2016 long-term spectrogram AURAL



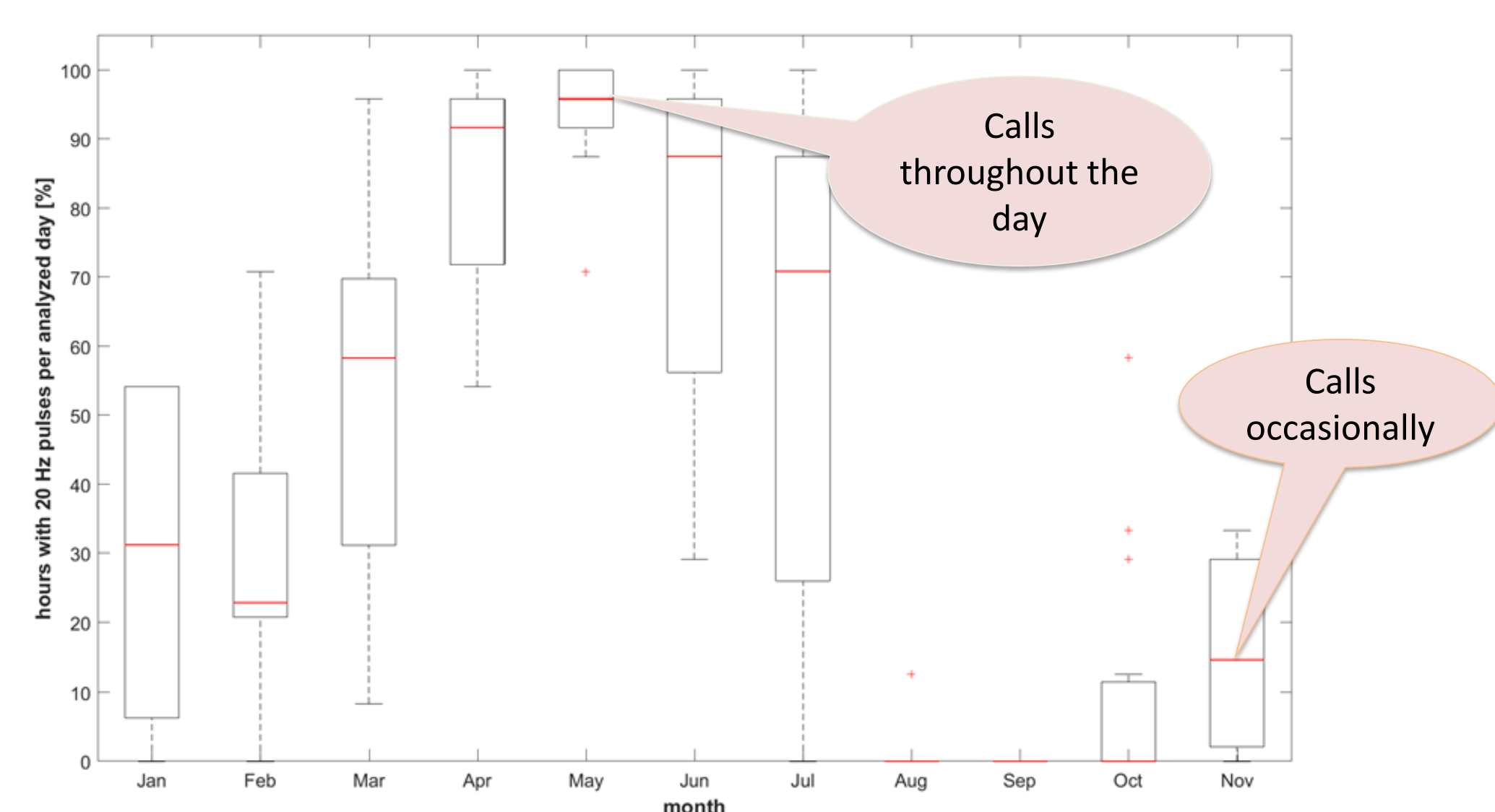
Acoustic Presence Analysis

2013-2016 daily presence per month



Jan 2013-Feb 2016 - 5min/hr, Aural, data screening every second day.

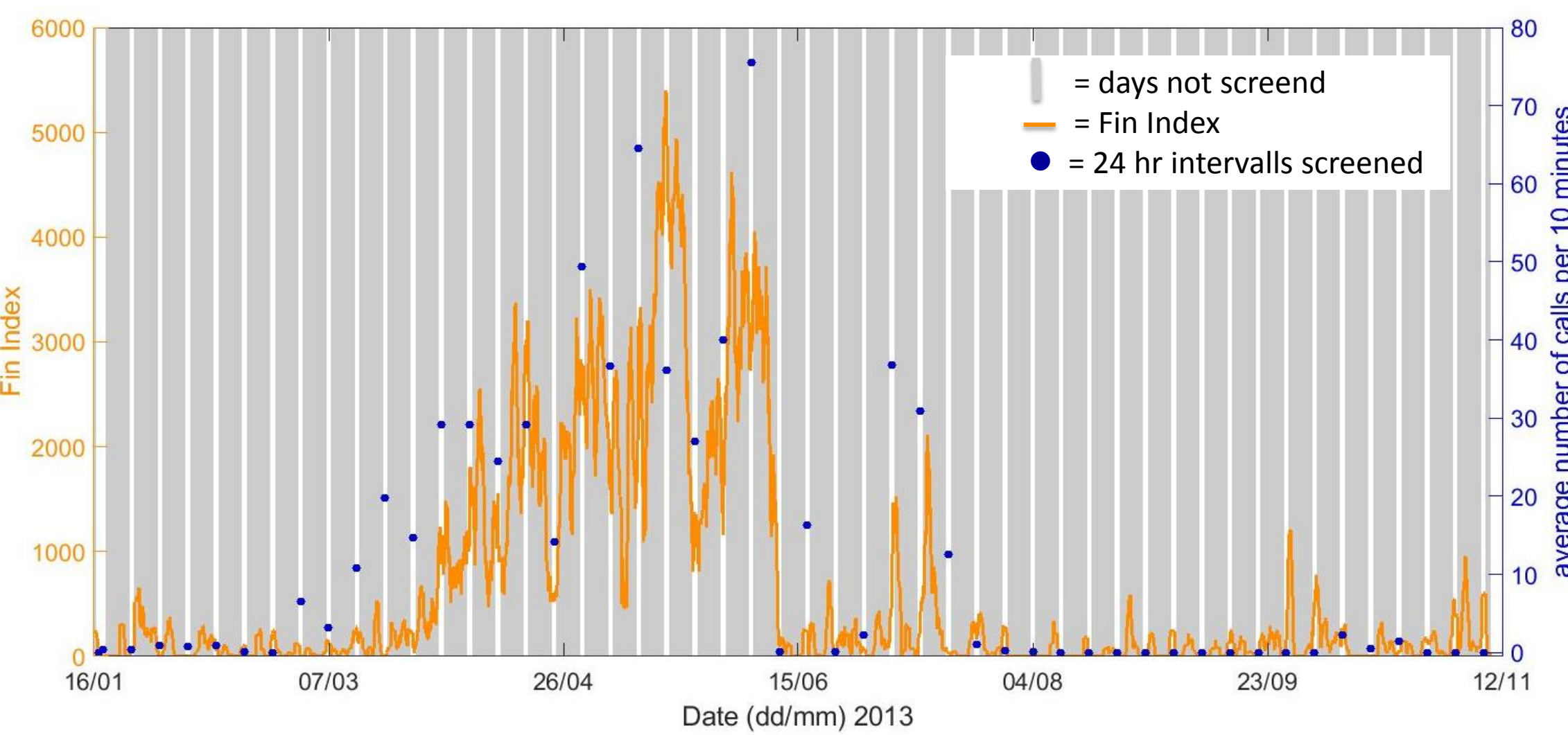
Monthly statistics of hourly presence per day



Jan 2013 – Nov 2013 – continuous SonoVault data, screening every second day.

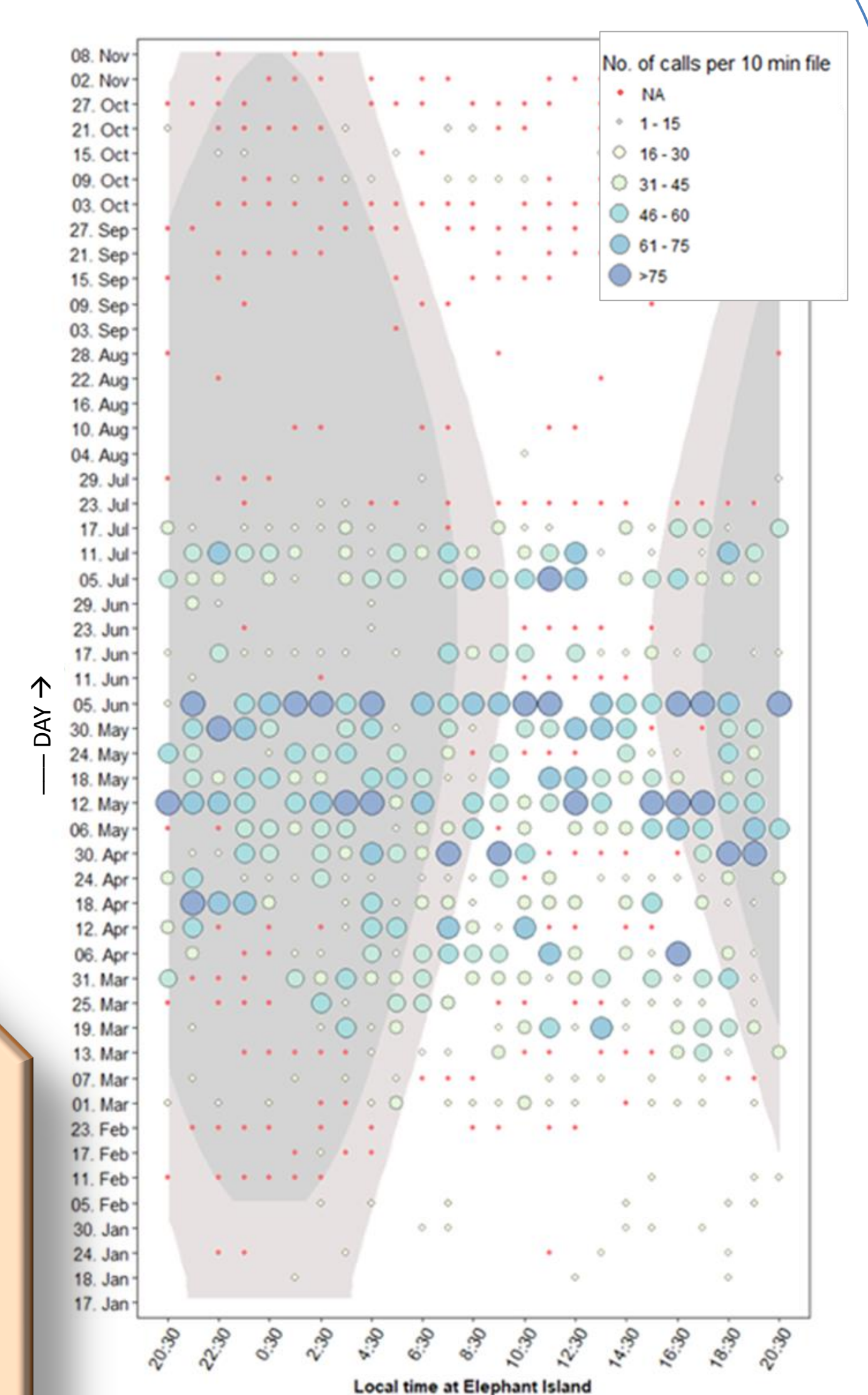
Call rate Analysis

Fin whale index and „calls per 10min“ for 24 hour intervals



Jan 2013 – Nov 2013 – continuous SonoVault data, „Calls/10min“ continuous SonoVault data every 7th file on every 6th day. Fin Index based on combination of SNR_{FL} (13-22/84-89 Hz) and Entropy (13-22 Hz).

2013 diel pattern



Jan 2013 - Nov 2013 - continuous SonoVault data, every 7th file on every 6th day → calls/10 min.

Conclusions:

- Seasonality in acoustic presence, peaking in late autumn/early winter (April-July) for multiple years.
- Near constant high call rates throughout day during peak season.
- Fin whale calls increase subsequent to peaks in ADCP-MVBS (Mean Volume Backscatter Strength as proxy for food).
- Fin whale calls wane concurrent to onset and growth of sea ice → less calls or reduced range?
- 2014 (■) high daily presence related to lesser sea ice?
- Time series of FI resembles manually logged time series of call rates.
- Fin whale index (FI) detects presence of calls even if fin whale calls are numerous and merging into a continuous band rendering reliable manual counting impossible.