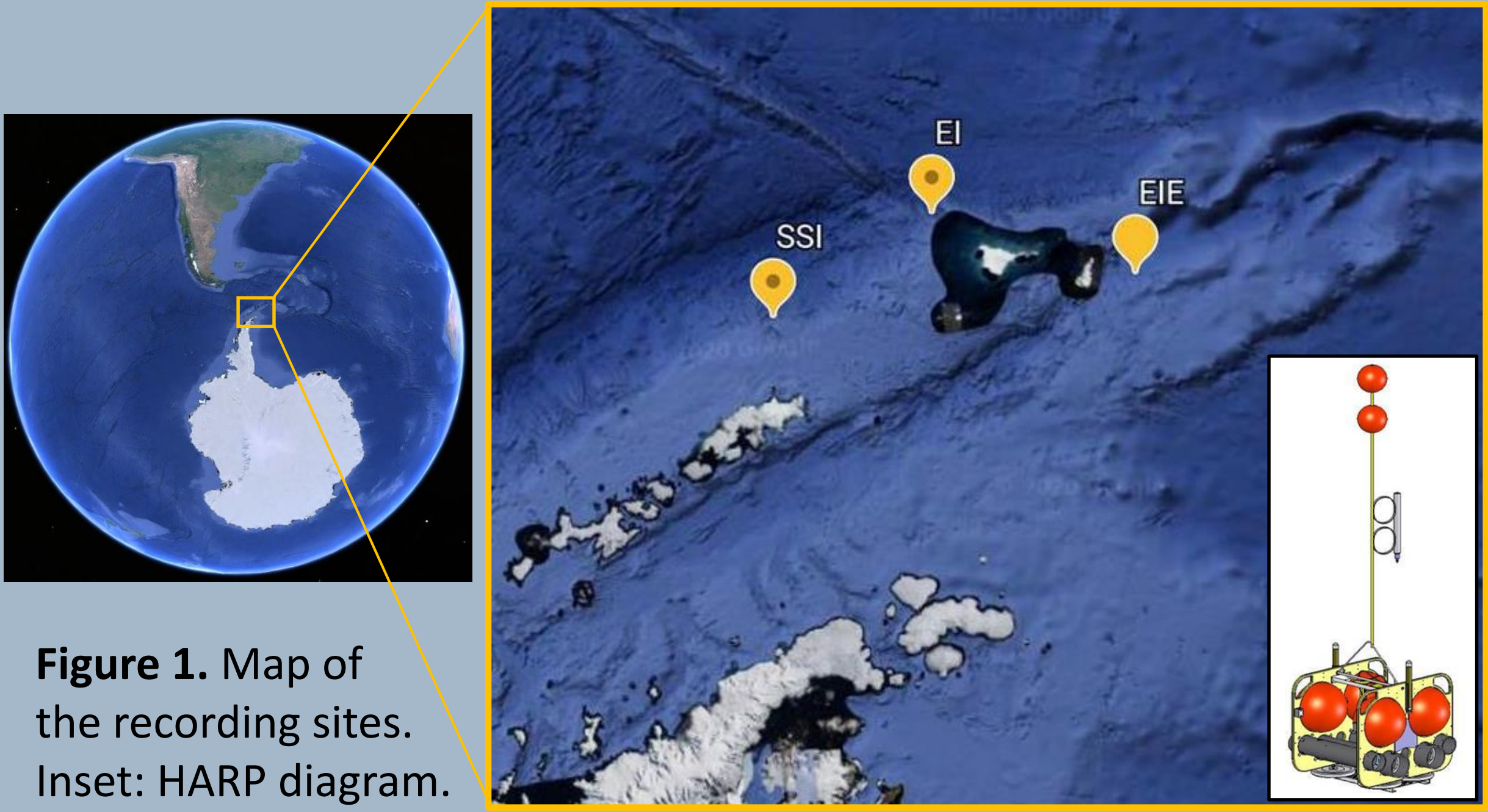


Cetacean occurrence near the South Shetland Islands based on long-term passive acoustic monitoring

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Summary



- A High-frequency Acoustic Recording Package (HARP) was deployed at three sites around Elephant Island (Figure 1), collecting long-term broadband recordings from 2014 – 2016.
- Relative abundance of the detected cetaceans varied across sites, and sea ice dynamics are a likely driver for some of the observed seasonality (Figure 2).
- Three different beaked whale echolocation signal types were detected (Figure 3).
- Long-finned pilot whale echolocation clicks indicated a nocturnal foraging pattern (Figure 4A).
- Sperm whale acoustic encounters contained both regular echolocation clicks as well as slow clicks, all produced by large males (Figure 4B).

Beaked whale signal types

Based on relative abundance and distribution, as well as similarity to known signals, possible candidates for producing the Antarctic signal types BW29, BW37, and BW58 are southern bottlenose whale (*Hyperoodon planifrons*), Gray's beaked whale (*Mesoplodon grayi*), and strap-toothed whale (*M. layardii*), respectively.

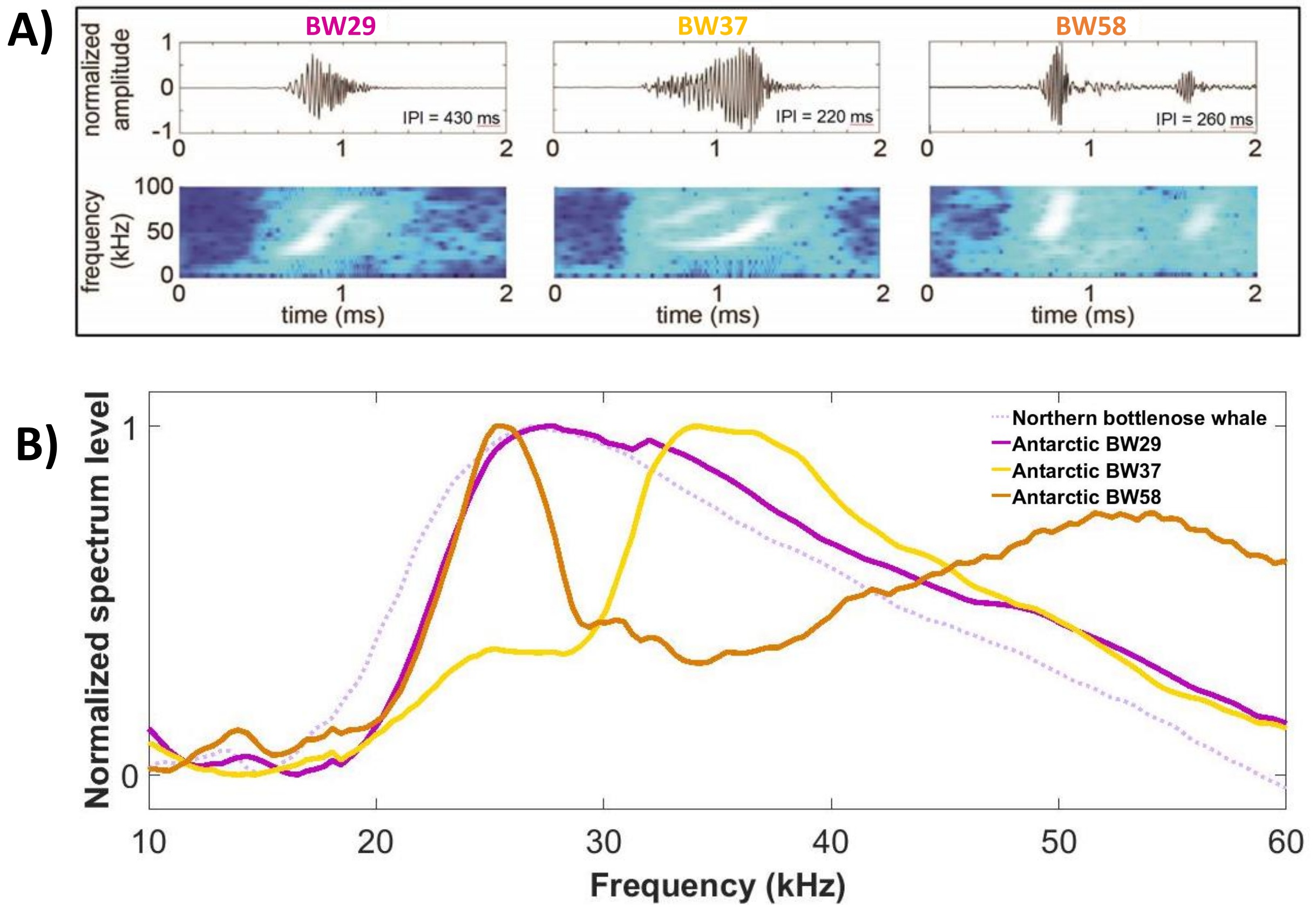


Figure 3. A) Features of the three beaked whale signal types, named after their peak frequencies, are shown as timeseries (top) and spectrograms (bottom). IPI = inter-pulse interval. B) Mean spectra of the Antarctic beaked whale signal types and northern bottlenose whale (*H. ampullatus*).

Sea ice and cetacean acoustic presence

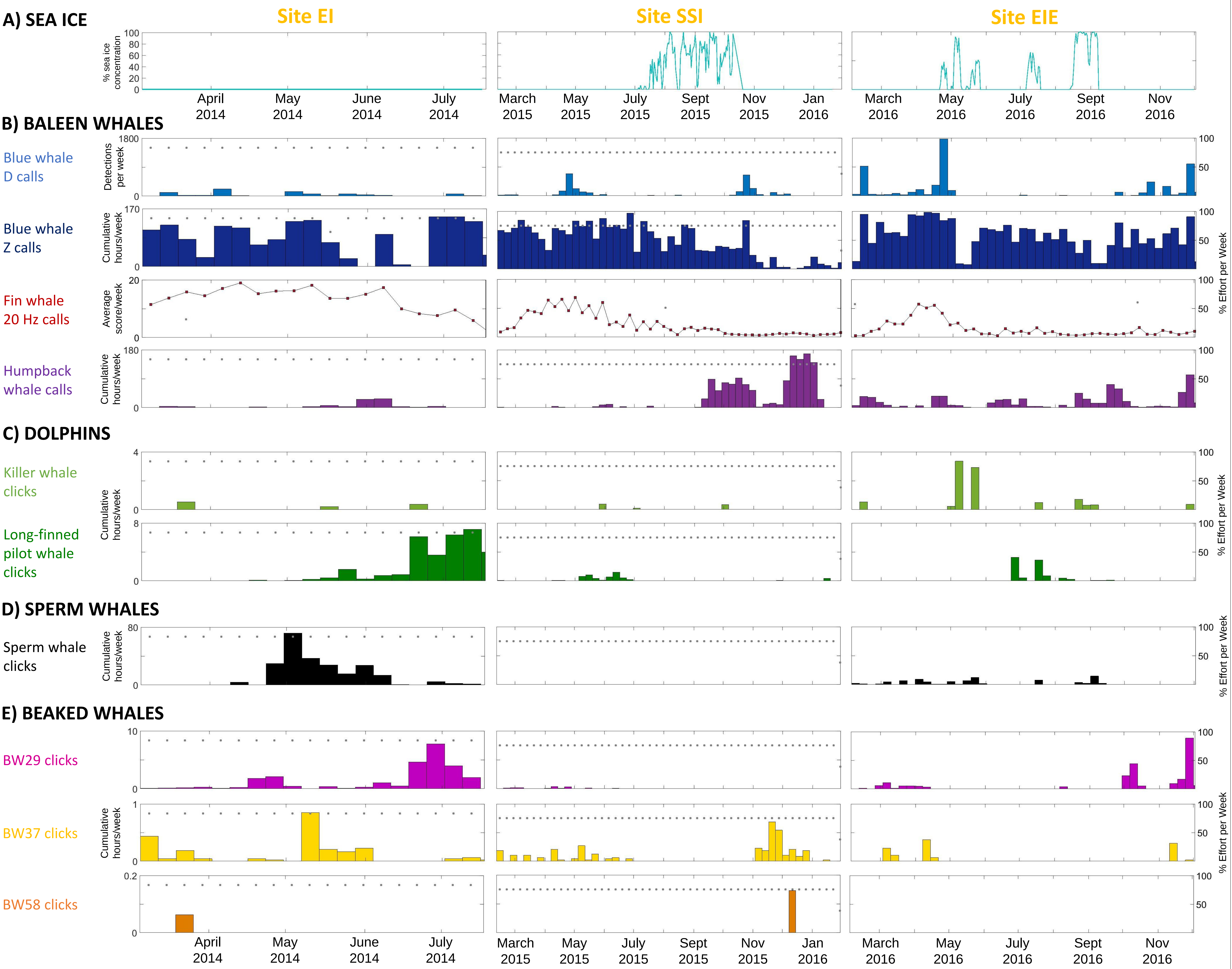


Figure 2. Cetacean acoustic detections plotted against sea ice cover at recording sites EI, SSI, and EIE. A) Mean daily percent sea ice cover (AMSR2, 3.125 km grid resolution). B-E) Weekly presence of cetacean call types. Gray dots represent percent of effort in weeks with less than 100% recording effort (data from sites EI and SSI were duty-cycled).

Odontocete echolocation behavior

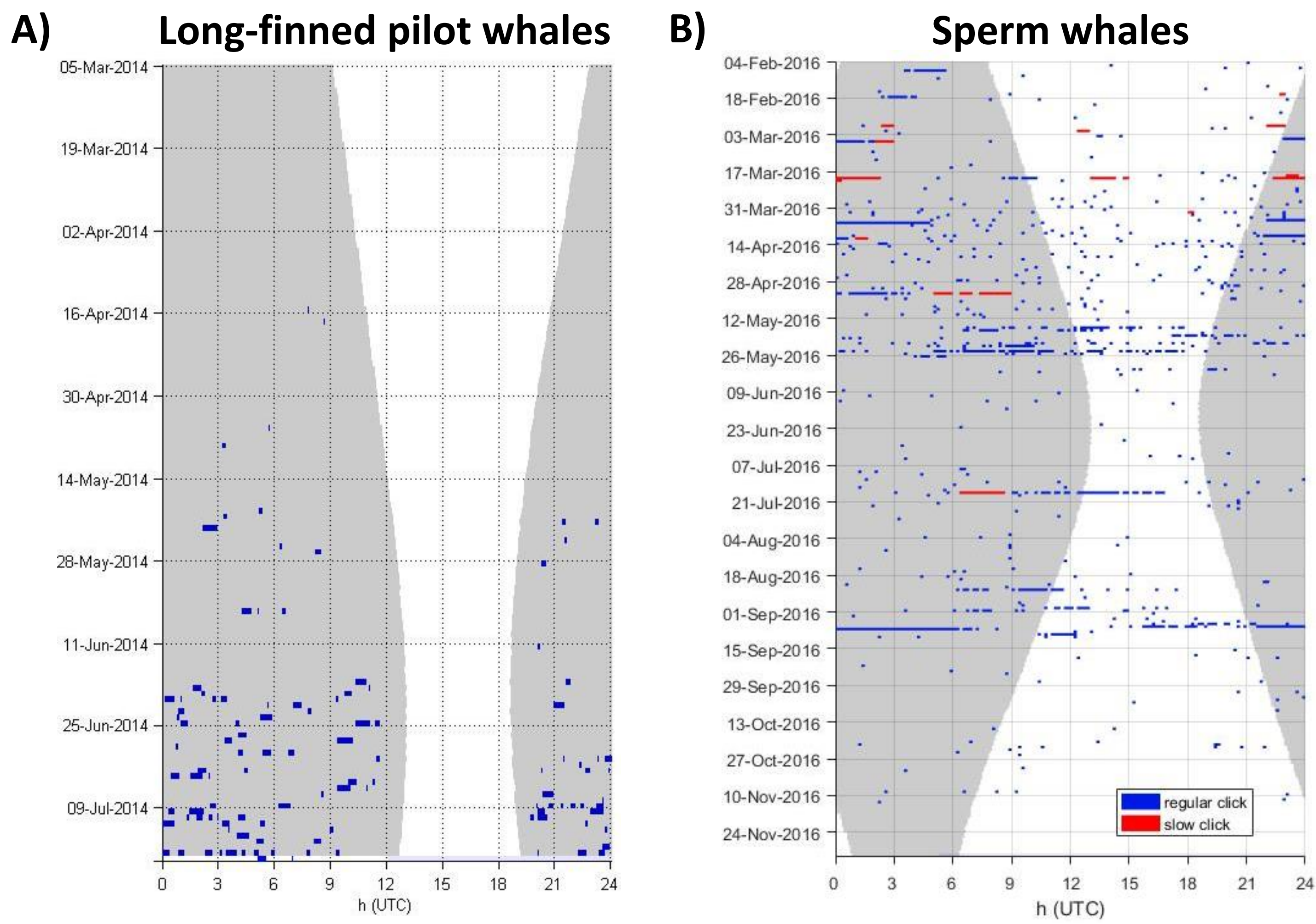


Figure 4. Diel presence of acoustic detections in one-minute bins. Gray shading denotes nighttime.

A) Long-finned pilot whale echolocation clicks, indicated by blue dots, detected at site EI. A similar nocturnal pattern was also observed at sites SSI and EIE.

B) Sperm whale regular echolocation clicks and slow clicks, indicated by blue and red dots, respectively, detected at site EIE. Both click types were also recorded at site EI, while there were no sperm whales detected at site SSI. Slow clicks showed a possible nocturnal pattern, with most of these events occurring at night.

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The northern bottlenose whale spectral template in Figure 5B was provided by Joy Stanistreet (Bedford Institute of Oceanography, Canada).

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