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# What's that you sei? Confirmed sei whale vocalisations recorded off the Azores


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Vocalisations of sei whales (*Balaenoptera borealis*) are still poorly understood and have only been described on five occasions and for three different geographic areas (Thompson *et al*., 1979; Knowlton *et al*., 1991; McDonald *et al*., 2005; Rankin and Barlow 2007; Baumgartner *et al*., 2008 ). Here we describe sei whale calls recorded during an encounter with two sei whales off the Azores archipelago. The area is regularly visited by this species during their migration to northern latitudes in spring and early summer (Prieto *et al*., 2012). The use of non-invasive techniques including passive acoustics can help identify baleen whale populations and combined with other datasets (e.g. genetics and stable isotopes) can be used to infer distribution and migration patterns.

**Fig. 1.** Sei whale (*Balaenoptera borealis*)

## METHODS

Data were collected from the R/V *Song of the Whale* south of Pico Island, Azores Archipelago, on the 22nd of April 2012. Acoustic recordings were made using a wide-aperture stereo array consisting of a calibrated RESON hydrophone (Fig. 2) and a Non-Anchored Underwater Tracking Instrumentation buoy (NAUTI-buoy) (Fig.3). Calls were identified and characterised post-survey and received Sound Pressure Levels (SPL) for every vocalisation were calculated. The same sei whale calls were identified in both hydrophones by finding call sequences with matching inter-call intervals. Bearings to every vocalisation were obtained using the time difference of arrival of the sound on the two devices and symmetrical hyperbolas were calculated. Surface behaviour of the whales was recorded using Video Range Tracking (VRT) techniques (Fig. 4) and contrasted with bearings to vocalisations.

**Fig. 4.** Video tracking

**Fig. 2.** RESON hydrophone

**Fig. 3.** NAUTI-buoy

## RESULTS

- All vocalisations recorded (n=53) consisted of low frequency downsweep calls with average maximum frequencies of 100 Hz (SD=14 Hz) down to 37 Hz (SD=8 Hz) over 1.2 s (SD=0.3 s) (Fig. 5).
- Average calculated source levels for these calls were 184 dB (SD=5 dB) rms re 1 µPa @ 1 m.
- Bearings to vocalisations coincide with the whales' positions although some of the call bearings don't exactly match with the sightings time series (Fig. 6). This could be explained by the fact that only one of the whales was tracked and some calls could come from the other whale. Also, whale movements between blows are unknown and not necessarily linear, especially during long dives such as the one between the first two sightings.

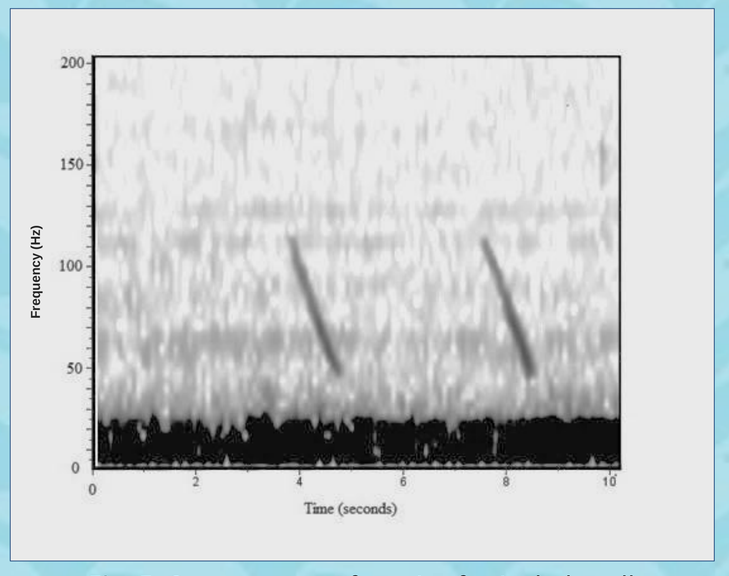
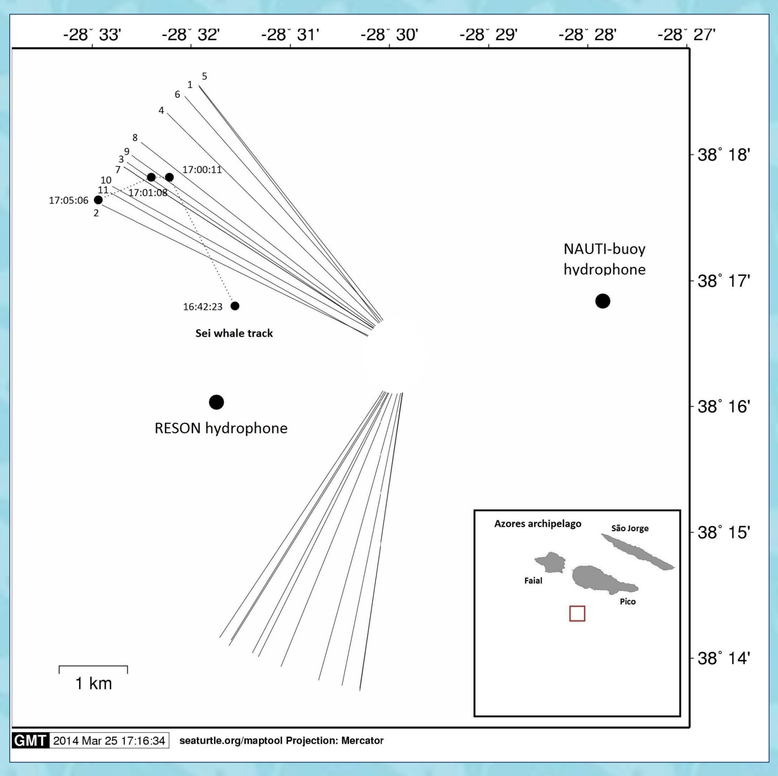



**Fig. 5.** Spectrogram of a pair of sei whale calls




| Call | Time |
|---|---|
| 1 | 16:49:59 |
| 2 | 16:50:03 |
| 3 | 16:51:12 |
| 4 | 16:56:09 |
| 5 | 16:56:30 |
| 6 | 16:56:54 |
| 7 | 16:57:24 |
| 8 | 16:58:27 |
| 9 | 17:00:37 |
| 10 | 17:01:30 |
| 11 | 17:03:37 |

**Fig. 6.** Positions and times of the tracked sei whales and hyperbolic localizations for the 11 calls with timeline

## DISCUSSION

- This is the first time that sei whale calls have been described and positively attributed to this species in the Azores archipelago. These findings add knowledge to a poorly understood and endangered baleen whale species with very few accounts of their vocalisations described worldwide.
- These calls have identical characteristics to those described off New England (Baumgartner et al.,2008) and Hawaii (Rankin and Barlow, 2007) but are different to calls recorded in Antarctica (McDonald et al., 2005) and Nova Scotia (Thompson et al., 1979; Knowlton et al., 1991).
- Source levels calculated here are higher than the ones previously estimated in the Antarctic for a different type of call (McDonald *et al.* 2005).
- The similarity between the North Atlantic and Pacific sei whale calls recorded in different seasons (feeding and breeding) in addition to the high source levels described here suggest this could be a stereotyped contact call for this species.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