

Interactive comment on “Discovering sounds in Patagonia, characterizing sei whale (*Balaenoptera borealis*) downsweeps in the south-eastern Pacific Ocean” by Sonia Español-Jiménez et al.

Sonia Español-Jiménez et al.

sonia.espanoljimenez@gmail.com

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We appreciate the suggestions and comments provided by reviewer one, specifically regarding the concern about the calls are actually from Sei whales. Much work has gone into making a more straightforward and easier to read manuscript. For example we introduces photos of sei whales in the area when we detected acoustically and a better description of the methods and discussion.

Specific comments are given below: Introduction: Line 31: I think you might mean to say “least known” rather than “least unknown”. Either way, there are other species that are arguably at least as poorly studied; Bryde’s whales come to mind. You might

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simply say that they are poorly known. Response: the sentence has been reword as follow: The sei whale (*Balaenoptera borealis*) is one of the least known whale species. Information on sei whale’s distributions and its regional variability in the south-eastern Pacific Ocean are even more scarce than that from other areas. Vocalizations of sei whales from this region are not described yet.

Lines 37-38: A recent study published in Conservation Genetics (Huijser et al 2018) addresses population structure of sei whales between the North Atlantic and North Pacific. Response: : We appreciate the information, the sentence has change to: North Atlantic, North Pacific and Antarctic populations are almost certainly separated and probably subdivided into geographic stocks (Horwood, 1987; Baker et al., 2004; Kanda et al., 2006; Huijser et al., 2018). International Whaling Commission in 1991 divided the global sei whale population in “stocks” (based on the distribution of catches, sightings and mark-recapture data) for management purposes (Donovan, 1991). However, genetic studies provide a different population distribution. For example, at North Atlantic Ocean, the sei whale population from Iceland, the Gulf of Maine and the Azores share the same genetic diversity, showing the wide latitudinal and longitudinal ranges they moved. Furthermore, it is well known the genetic divergence between North Pacific and North Atlantic stocks, but no studies of this genetic structure between hemispheres or within the Southern Ocean have been presented (Huijser et al., 2018).

Line 40: This is a misinterpretation of the data discussed in Donovan 1991. He mentioned that eight “concentrations” of whales had been identified in the North Atlantic, but that these did not necessarily represent different stocks. In fact the IWC recognizes 3 management units in the North Atlantic, though actual stock delineation is unclear. Response: the response above explain better the idea.

Line 49: There is a general inappropriate use of apostrophes throughout the paper. In this example, this sentence should begin with: “Population boundaries” not “Population’s boundaries”. In other instances, for example on line 42, the text should read “sei whale sightings”, not “sei whale’s sightings”. Line 75, there should be no apostrophe in

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“strandings”. Please check for this and correct throughout the manuscript. Response: We appreciate the corrections, changes it as the reviewer suggestion

Methods: Much more detail needs to be included in the methods; in its current form, this section is completely lacking a large body of necessary information. Response: we introduce figures and tables to explain better the methodology and the results, the methodology text was change as follow: Two cruises to the Tres Montes Gulf (46.2-48.0° S, 74.0-75.4° W) aboard the motor sailing vessel Saoirse were carried out in May 2016 and May 2017 during which biological, oceanographic and acoustics studies were carried out (fig 01). Marine mammals were identified visually with binoculars and the naked eye for a team of experienced marine mammal observers in the vessel. Two different hydrophones were used for the recordings: an icListenHF hydrophone (sensitivity -171 dBV re 1 μ Pa with pre-amp; frequency response 10–200kHz from Ocean Sonic, Canada); and a SoundTrap 202 STD hydrophone (sensitivity -205 dBV re 1 μ Pa; frequency response 60000Hz $\pm$ 3 dB from Ocean Instruments, New Zealand). Also, we made stereo recordings on several occasions with an HTI-96-MIN hydrophone (flat frequency response from 0.02 to 30 kHz) connected to a handy recorder (H4nPro from ZOOM). Opportunistic and planned recordings were carried out depending on the weather conditions and the vessel location. In 2017 the hydrophones were deployed for 2 to 5 days in 3 locations. In these cases, hydrophones were deployed at a depth of 5 or 10 meters on rocky bottom with no more than 40 meters depth. Hydrophones were hold on a row with an anchorage in the end and superficial buoys in the opposite side. In both years, during the day or night, hydrophones were deployed at a depth of 5 and 10 meters from the stationary vessel. In the opportunistic recordings, recordings were continuously, but in the night when the vessel was anchorage, the recordings were in intervals between 10-30 minutes each hour for guarantee the capacity of the acoustic personal to study the recording in the next day. During all the recordings, the engine vessel was turn off. All the recordings were stored in the internal card memory of the equipments, and at the end of the day these were download in a portable computer. Audio data were analyzed using Raven Pro 1.5 (Cornell University, Ithaca, NY). Low

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and high frequency (Hz), frequency range (Hz), peak frequencies (the frequency at which the maximum power occurred within a call) and duration (s) for all calls found and attributed to sei whales were analysed from spectrograms and waveform plots created in Raven Pro 1.5 (Hann window; 50% overlap; window size 14563 samples; DFT 16384 samples).

Line 109: what is an “HF 200kHz hydrophone”? Is this a hydrophone model? Response: this hydrophone is icistenHF.

Line 114: The hydrophone deployment method is a little unclear. Was the hydrophone suspended for up to 5 days over the side of the vessel? How many recording stations were conducted? What were the positions (lat/longs)? What was the sampling rate? How were the data recorded? Are these archival recorders, or were you using a computer, a recording deck, etc, and if so, what equipment was included? Response: the methodology was change as follow: Opportunistic and planned recordings were carried out depending on the weather conditions and the vessel location. In 2017 the hydrophones were deployed for 2 to 5 days in 3 locations. In these cases, hydrophones were deployed at a depth of 5 or 10 meters on rocky bottom with no more than 40 meters depth. Hydrophones were hold on a row with an anchorage in the end and superficial buoys in the opposite side. In both years, during the day or night, hydrophones were deployed at a depth of 5 and 10 meters from the stationary vessel. In the opportunistic recordings, recordings were continuously, but in the night when the vessel was anchorage, the recordings were in intervals between 10-30 minutes each hour for guarantee the capacity of the acoustic personal to study the recording in the next day.

Lines 119-123: This section is completely lacking in any detail on the analyses. How were the sounds reviewed? Using spectrograms? What page size, what FFT? How were signals from sei whales distinguished from other species, such as blue whales (which also produce similar low-frequency downsweeps)? How were measurements conducted? Issues with measurements such as low and high frequency that are

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strongly affected by spectrogram parameters and SNR have been recognized in the literature; Raven and other software packages (i.e. Ishmael) offer a set of more “robust” analyses; these need to be used as well. It appears that two software packages were used (Audacity and Raven). What was each one used for? Response: the methodology was change as follow: Audio data were analyzed using Raven Pro 1.5 (Cornell University, Ithaca, NY). Low and high frequency (Hz), frequency range (Hz), peak frequencies (the frequency at which the maximum power occurred within a call) and duration (s) for all calls found and attributed to sei whales were analysed from spectrograms and waveform plots created in Raven Pro 1.5 (Hann window; 50% overlap; window size 14563 samples; DFT 16384 samples).

Results: Line 128: It is difficult to understand the recording scheme; the math as currently presented does not add up. 16 days of recording would be 384 hours, not 136. Response: the recordings were not continuous. The results was change as follow: Sound was recorded during 16 days in 2016 and during 19 days in 2017. A total of 363 hours was recorded between both expeditions, because the recordings were not continuous during every day, 136 hours in 2016 and 227 hours in 2017. Sei whale calls were found in 8 archives for 3 days, on 7 May 2016 and 10-11 May 2017, at 2 different locations (one in 2016 and other in 2017) (Table 1). In acoustic data from 2016, sei whale calls were detected when sei whales were sighted closer the vessel (fig 02). In 2017, between May 8th and 10th, sei whales were sighted in the area were after sei whale calls had been recorded (fig 02). Sei whale calls from 2016 were only recorded around midday, while in 2017 they were recorded in the late afternoon or at night (Table 1).

Were the recordings duty cycled? In the methods, you describe that the hydrophones were deployed from 2-5 days at a time, so it would seem that you'd have many more hours of recording over 16 days and 19 days. Please clarify this both in the methods section and here. Response: the response above explain better the idea.

Line 133: What SNR was used to determine quality? Response: the methodology was

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change as follow: only sei whale sounds were detected without associated calls. Only calls with high-visual quality were measured.

Figure 1: Which whale tail corresponds to which year? Also, the area where putative sei whales were detected appear very close to recording sites where they were not detected. Is there any explanation for why this might be? Response: we incorporate a table with more detail about the sei whale recordings at the Penas Gulf and we explain this difference in the discussion: The few calls obtained in both expeditions maybe was due the duration of recorded in each site since they were opportunistic recordings, so visual observations, tagging efforts and genetic studies are needed to verify this hypothesis.

Discussion: Overall, there is no discussion of one of the main outcomes of this study – that despite the number of sites sampled, putative sei whales were only detected very rarely, and only in two locations. Why might this be? Could this have to do with the sampling scheme (ie duration of sampling at each site) or noise conditions (ie masking of signals)? How does this conform to your expectation? Response: the response above explain better the idea.

Line 157: No information on visual survey data collection was given to support this statement. Were visual surveys conducted during this expedition? If so, and if that information is to be used as supporting evidence, then details on data collection methodology and results need to be presented. Response: we incorporate a table with more detail about the sei whale recordings at the Penas Gulf and we introduces photos of sei whales in the area when we detected acoustically and a better description of the methods

Line 160: Johnson et al (2010) did not describe sei whale calls. Their report only shows two example spectrograms from recordings during different periods and/or places, and the report cited actually concluded that no sei whale calls were recorded during that period at that site. This citation should be removed from the manuscript. Response:

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we appreciate the correction, changes it as the reviewer suggestion

Line 196-217: With a sample of only 41 calls, it is doubtful that you have enough data to assess diel trends. However, if you would like to attempt this, you need to quantify your recording effort by diel period, and present the results accordingly. As it stands, there is no foundation for this section of the discussion. Response: We appreciate the comments and we are conscient that we cannot do formal diel trends because our data were opportunistic, for this, we only reflected our diel results, and future work will be necessary to establish better these patterns.

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