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Report of the ICG on southern right whale acoustics

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INTERNATIONAL
WHALING COMMISSION

Report of the ICG on southern right whale acoustics

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ICG: Andrews-Goff, Buchan, Burkhardt, Carroll, Charlton, Galletti, McPherson, McCauley, Miller, Shabangu, Ward

In 2020, the Scientific Committee formed an Intersessional Correspondence Group (ICG) to assess offshore southern right whale (SRW) distribution using passive acoustic monitoring in the Southern Ocean (Item 8.2.3.4, IWC, 2021). The main goal of this ICG is to assess what SRW call data exists offshore and at high latitudes (including data from both Australia's Integrated Marine Observing System (IMOS) and the Southern Ocean hydrophone network (SOHN)) and consider an appropriate analysis framework for using these data to assess southern right whale offshore distribution. This work relates to the current ongoing assessment of SRWs on a global scale, as well as the related IWC-SORP Theme 6. This report serves to provide an update on the work conducted in 2023.

Subsequent a series of emails after SC69a, a virtual meeting was held on 25 May 2023 during which a plan of action was discussed. During the meeting, different research interests were identified, including;
- Circumpolar distribution of SRW detections on feeding grounds and correlation with environment/sightings
- Temporal occupancy of SRWs on Antarctic feeding grounds
- Long-term trend in SRW vocalisations on Antarctic feeding grounds
- Assessment of bias & variability of automated detectors of SRW calls
- Curation of a global test-dataset for assessing performance of SRW call detectors

Different available datasets were also identified, including:

- SOWER data would be an interesting source of information on SRW vocalisations, and would need to be reanalysed with a specific focus on SRWs;
- Australian Antarctic Division holds a separate near circumpolar dataset of Antarctic calibrated sonobuoy recordings over 7 Antarctic summers spanning 2006-2021, and continuous recordings at 1-3 sites off East Antarctica in 15 years spanning 2004-present. These would also need to be reanalysed with a specific focus on SRW calls.
- Recordings made off Elephant Island .
- PAM data from South Orkney Islands which could be interesting to add (Åsvestad et al., 2024).
- Also include some breeding ground data from Australia, New Zeeland, Chile, Argentina, South Africa.
- Re-annotate the blue and fin whale library published by Miller et al. (2021) for SRW and humpback whale calls (at least parts that are sampled at minimum 2kHz).

As a conclusion of this first meeting, three points of action were identified;
(1) Visualise known SRW distribution in the Southern Ocean (using offshore sightings and telemetry data) to identify areas where there may be data gaps as well as areas that can be used to ground-truth existing acoustic data. In general, it has been agreed upon that passive acoustic monitoring is useful to get longer-term overviews of seasonality and inter-annual variability of SRW presence on the feeding grounds than what could be generated with any other type of data collection (e.g., opportunistic sighting and telemetry data are usually single data points). It was additionally mentioned that also whaling data should be reviewed to get an idea on historic SRW distribution on potential feeding grounds.
(2) Create a good training dataset for SRW calls (considering most detectors are trained by calls from NARW)
(3) test the three different detectors (LFDCS / PAM deep learning / JASCO) in a mark-recapture framework to assess performance.

Progress are being made towards action point (1) through the SRW Consortium.

Progress towards point (2) and (3) can be detailed as follows:

For the assessment of automatic detection techniques for SRW calls including the assembly of an adequate training/testing dataset, it was agreed it is important to study potential overlap in vocalization characteristics with other species. In the Southern Hemisphere, humpback whales produce vocalizations with acoustic characteristics that overlap to a large extent with the characteristics of SRW vocalizations. In a recent study, this overlap between SRW upcalls, the most commonly detected right whale call, and humpback whale upcalls was assessed and quantified, and recommendations on how to differentiate between these species was provided (Wöhle et al., 2023). This study highlighted the importance to include humpback whale vocalizations in the efforts involved towards both points (2) and (3).

Specifically, regarding point (2), the Alfred-Wegener-Institute's Ocean Acoustic Group (Schall and Burkhardt) has started the progress of assembling a training/test dataset from their Southern Ocean recording network. For this, a multi-year recording was chosen from two recording locations which are located at the eastern and western edges of the Atlantic sector of the Southern Ocean and as close as possible to the 60°S confinement of the Southern Ocean (Greenwich: 59 2.82° S & 000 5.78° E; Elephant Island: 61 1.07° S & 055 58.67° W). From the Elephant Island data, 200 hours of recordings were randomly sampled from the years 2013 and 2019 (with up to 10% of files of known SRW or humpback whale acoustic presence). From the Greenwich data 200 hours of recordings were randomly sampled from between December 2010 and August 2011 and December 2012 and July 2013. An experienced student assistant (Linnea Pankoke) was instructed to log SRW and humpback whale vocalizations (upcalls and other vocalizations such as moans) in the frequency range of up to 1kHz on the basis of the findings presented in Wöhle et al. (2023). Questionable sound logs were also revised by a more experienced analyst (Elena Schall).

Elena Schall was indicated and accepted as a new co-convenor.

On 28 March 2024, a second online meeting was conducted, during which the following plan of action was established:

(1) A training/test dataset was started by the Ocean Acoustics Group. More data and recording locations should be sampled and added to this database and from these, SRW and humpback whale vocalizations should be logged. It is envisioned that all data contributors also participate in the discussion on the resolution of data analysis (e.g., daily presence, hourly presence, or call rates), depending on their needs in future application of detectors. Data sharing shall be agreed upon using the IWC standard data sharing agreements.

(2) It was discussed that most often there will be no funding available through the data contributors for (experienced) analysts to do the annotation. Therefore, it was agreed that, if the proposed outcomes of this ICG are a priority for the IWC, funding would need to be requested to progress efficiently with the annotation of available datasets.

(3) It is envisioned that the final training/test dataset should be published with open access so that also other researchers can use it for their purposes. At the same time, additional researcher groups should be motivated to assist in developing detectors and join forces with the SRW Acoustics ICG.

(4) Within the ICG, efforts shall be made to test different detector setups including signal processing, machine learning and deep learning frameworks.

(5) A publication on the evaluation of these different detector setups shall be prepared as a joint effort among interested ICG members.

(6) Available long-term datasets from potential SRW feeding grounds shall be analysed with the developed detector for SRW acoustic presence and results shall be published.

An update on progress on this matter will be presented at the next SC in 2026.

References

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