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Largest aggregation of eastern South Pacific southern right whales found off Isla Grande de Chiloé, Chile during austral summer 2023

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The Eastern South Pacific population of southern right whales (*Eubalaena australis*) is classified as Critically Endangered by IUCN (Chile-Peru subpopulation). It was drastically reduced during commercial whaling and its current estimate is assumed to be less than 50 mature individuals. Until recently, these whales have been difficult to locate, no breeding or feeding ground has yet been identified and the population has not shown any sign of increasing (Galletti Vernazzani *et al.* 2016).

Here we report on the largest aggregation of southern right whales seen in Chilean waters since the end of commercial whaling when 150 whales were taken during the 1930s (Aguayo L. 1974).

Between January to March 2023, 20 marine surveys were conducted off northwestern Isla Grande de Chiloe (Isla de Chiloe) under the Alfaguara (blue whale) Project of Centro de Conservacion Cetacea. More than 120 cetacean sightings comprising over 200 individuals were made with several cetacean species recorded including blue whales, humpback whales, fin whales, southern right whales and Peale's dolphins. The 2023 summer season was very unusual compared to previous seasons. Blue whales used to be the most frequent and sometimes almost the only species recorded, however this year many individuals of other species were recorded, while blue whales started to be sighted more frequently after mid-February. Sea surface temperatures (11-15°C in 2023) were among the lowest recorded since the project started in 2004.

Due to the lack of sightings of blue whales in our normal survey area off Chiloé, marine surveys were extended to explore a wider area some 50km further south (42°S to 42.25°S - 74.1°W to 74.25°W), an area frequented by the project researchers on previous years to locate blue whales. Surprisingly, during three marine surveys on 28 January and 2 and 6 February large groups of southern right whales were encountered. We made 28 sightings of 44 animals (24, 11 and 9 animals respectively on the three days). Photo-identification of individuals is still ongoing. It is very likely that some individuals were sighted more than once and therefore, the total number of individuals may be less. However, whales were close to shore (about 5-7km) and the different groups were in a relatively small area (about 5km diameter). We saw different groups simultaneously around the boat, including an estimated minimum of 10 to 15 different individuals on 28 January. On all days, feces were seen, as well as possible feeding behaviour inferred from surface swimming in circles and frequent dives on the same area. On 6 February, we recorded a whale that breached several times and also stayed with the fluke out of the water for an extended period.

In addition, a mother-calf pair was also observed on 6 February and with seven other whales that were also present in the area (Fig. 1). The calf had a grey-morph coloration (Schaeff *et al.* 1999) and appeared to be in very good shape. It approached the boat for several minutes while the mother was diving nearby. We estimated that calf size was a little shorter than the 7.9 m long vessel, suggesting that the calf was born during 2022 calving season (August-October). According to Christiansen *et al.* (2022), southern right whale calves from other populations with similar body length would correspond to calves that are 3 to 4 months old. Orange cyamids (*Cyamus erraticus*) and white cyamids (*C. ovalis*) were observed on its head of the calf (Fig. 2). A sample from the calf faeces was collected for future analyses.

Of special note was at least ten perpendicular indentations on the dorsal side of the calf's peduncle near its insertion to the flukes (Fig. 3). This type of scarring on the peduncle region is consistent with anthropogenic wounds observed on North Atlantic right whales (Knowlton *et al.* 2012). The almost equal spacing of these indentations suggests they were caused by the propeller of a small motor and not fishing gear. Another larger perpendicular indentation and a smaller one were noted behind the genital slit (Fig. 4). These marks could be from either the normal fetal folds, or

they could be superficial cuts from a rope or net from fishing gear. There were also a number of irregular marks on the ventral lateral region below the genital slit. Therefore, if these marks represent human interactions in such a young whale, it raises concerns on the conservation threats that affect this Critically Endangered population. The back of the calf was totally smooth with no kelp gull marks and therefore it is unlikely that this calf was born in the Peninsula Valdes calving ground in Argentina, where most whales have gull-inflicted wounds on their back (Marón *et al.*, 2015).

On 1 January 2023, one southern right whale was recorded close to our land-based platform (41.9°S-74°W) on the northwestern coast of Isla de Chiloé. The whale was swimming south. This sighting suggests that southern right whales used the area since at least early January.

From 1964 to 2011, a total of 108 sightings comprising 179 animals, including 39 calves, have been reported for the eastern South Pacific southern right whale population (Galletti Vernazzani *et al.* 2014). Furthermore, on 07 and 16 February 2022 four sightings totaling seven southern right whales were reported off Isla de Chiloe. Defecation was seen, and this unusual aggregation was considered then the largest recorded (Galletti Vernazzani, 2022).

During the 2022 southern right whale virtual expert workshop (IWC, 2022), Olavarria reported multiple sightings of cow-calf pairs and adult whales at San Quintin Bay, Golfo de Penas (46.81°S-74.33°S) during the austral winter on three out of five different years (2017, 2020 and 2021). The number of sightings most probably included duplicate individuals as no photo-identification work was conducted. The consistent presence of mothers and calves at Golfo de Penas suggest that this area could be part of an unknown breeding and/or calving ground for this population (IWC, 2022).

The sightings of southern right whales off Isla de Chiloe reported here for January-February 2023 are certainly the largest aggregation recorded since the end of commercial whaling, assuming that these individuals are from the Chile-Peru population.

Possible explanations for the unusually large number of southern right whales observed in Chile during the 2023 summer season include: (a) these whales or some of them belong to the western South Atlantic population; (b) unusual oceanographic conditions in 2023; (c) a general shift in summer distribution due to climate change; and/or (d) the population is increasing.

With the recent occurrence of the La Nina phenomenon and the lowest sea surface temperature recorded in 2023 since 2004, it seems the most likely hypothesis could be attributed to the unusual oceanographic conditions. It may also be possible that changes in distribution are happening in the South Pacific, just like the North Atlantic where right whales have changed their distribution dramatically as a result of climate change (Meyer-Gutbrod *et al.*, 2023). However, an increase in population size can't be ruled out nor migration from the SW Atlantic population, although the latter seems less probable than the other hypotheses.

Photo identification of individuals photographed in 2023 is ongoing. The identified Chilean animals will be compared with other southern right whales seen in the past in either Chile, Peru, and the South Atlantic to check for possible matches. We did not have a drone on the vessel, which would have facilitated collection of better photographs for our photo-ID of individuals and health assessment.

Unfortunately, no biopsy samples were taken from these individuals. To date, we have only been able to collect one genetic sample from a southern right whale in Playa Mar Brava, Carelmapu, Chile (41°42'S, 73°42'W). This single sample had a mtDNA haplotype that had previously only been reported from in the Indo-Pacific population (Australia, New Zealand) and had a nuclear genotype that based on genetic clustering and an assignment algorithm appeared admixed between the Indo-Pacific and South Atlantic populations (Carroll *et al.* 2020).

Isla de Chiloe has been highlighted as a possible part of a breeding area because it is the only area photo-ID recaptures between years have been recorded, the presence of surface active groups (SAG) with likely reproductive behavior and the presence of cow-calf pairs (Galletti Vernazzani *et al.*, 2014). Sightings in this region have been reported from January to October, therefore the species is present almost the entire year. In addition, recent sightings were reported off Isla de Chiloé during February 2022 of seven southern right whales that defecated and were likely

feeding (Galletti Vernazzani *et al.*, 2022). These new data, along with the large aggregations reported here for 2023, also suggest that this area may also be an important feeding ground.

The presence of upcalls in almost all seasons suggests Isla de Chiloé as an important area for the species (Rojas-Cerda *et al.* 2022). Jacobs *et al.* (2019) also detected the presence of southern right whale calls using five months of continuous acoustic data (January-June 2012) collected off the southwestern tip of Isla de Chiloé. Call occurrence increased over the course of the deployment and peaked between April and June, indicating an increase in use of this area during the fall.

The acoustic data off Isla de Chiloé also highlights the importance of this area for this population, the likely year-round presence of these whales inferred through sightings, and further supports the possibility of both mating and feeding occurring on the same area. It is also important to highlight that these recent sightings and acoustic detections from Isla de Chiloe to Golfo de Penas overlapped with the historical distribution of catches in the Los Lagos and Aysen Regions (IWC, 2022).

Furthermore, the intercoastal area of Isla de Chiloé is intensively used for salmon farming, which continues to expand southwards, as well as artisanal and industrial fishing. Concerns have already been expressed on the potential impacts it may have on the species (IWC, 2022). An entangled southern right whale was found dead in 2017 in northern Isla de Chiloé (Galletti Vernazzani *et al.*, 2017). The marks on the peduncle and ventral side of the grey morph calf reported here are of extreme concern if they were confirmed to be of anthropogenic origin. Any deaths of southern right whales caused by human activities would be very detrimental to the population (Galletti Vernazzani *et al.* 2016) and therefore urgent efforts must be undertaken to protect this important area for the species.

The new information on the presence of southern right whales during austral summer in 2022 and 2023 off Isla de Chiloé (part of the former whaling area), warrant the need to undertake more visual surveys that will cover larger areas, increase photo-ID surveys including the use of drones, and collect biopsy samples for genetic analyses as well as assess the health status and body condition of Chile's Critically Endangered southern right whale population.

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