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Entanglement and death of a Critically Endangered Eastern South Pacific southern right whale (Eubalaena australis) in Chile

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INTERNATIONAL WHALING COMMISSION

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Abstract

Entanglement in fishing gear is one of the greatest threats to large whales. On February 9th, 2017, an Eastern South Pacific (ESP) right whale (*Eubalaena australis*) was sighted alive in northwestern Isla de Chiloe, Chile. The whale swam slowly, had a significant cyamid infestation on most of its body and had evident lesions consistent with human interaction. It was found stranded dead on February 16th, 2017, but it was reported the 18th. The necropsy was performed the following day (10 days after it was sighted alive). Although no ropes or nets were found on its body, the pattern of the marks observed upon external examination of the carcass suggested that the whale was severely entangled and this was among the main factors that caused its death. ESP southern right whales are Critically Endangered and any anthropogenic mortality should be kept to zero. However, this is the third entanglement reported in Chile since 1986 and the second in a relatively short period of time (over two years), raising concerns about the negative impacts this threat is causing to the recovery of this population. Therefore, urgent actions are needed to prevent further entanglements of whales in fishing gear.

Introduction

Southern right whales (*Eubalaena australis*) from the eastern South Pacific were once numerous off the coast of Peru and Chile. British, French, and American whaling fleets begun hunting them in 1789 and Chilean land-based whaling started in 1860 (Pastene and Quiroz, 2010) and ended in 1976 (Aguayo *et al*., 1998). However, there are few details about these catches. Best (1987) estimated that over 14,600 southern right whales were killed in the 19th century in the South Pacific by American whalers alone, but he did not allocate the catch to geographic regions. Along the coast of Chile, approximately 2,372 right whales were taken by French whalers in the 19th century (DuPasquier, 1986). No known Soviet pelagic catches of right whales were reported from Chilean waters during the 1960s, when over 3,000 right whales were illegally hunted (Tormosov *et al*., 1998).

Little information about southern right whales in the eastern South Pacific has been collected since the end of commercial exploitation, except for relatively few sightings of individuals, despite increasing efforts to document records of the species off the Chilean coast by the Centro de Conservacion Cetacea since 2003. The population does not show the growth rates observed in other regions (e.g. the eastern South American seaboard, Southern Africa and Australia), and possibly has a mature population size of around 50 individuals. In 2008, the International Union for Conservation of Nature (IUCN) classified the Chile/Peru "sub-population" of *E. australis* as "critically endangered" on the Red List of Threatened Species (Reily *et al.*, 2008). Since 2012, a Conservation Management Plan (CMP) for this population endorsed by both range states, Chile and Peru (Galletti Vernazzani *et al*., 2016), has been implemented through the International Whaling Commission (IWC). This CMP considers that any anthropogenic removal would be very detrimental to the population. Therefore, potential impacts from entanglements/vessel strikes are a major concern and should be kept to zero.

Due in part to its biological imperatives of concentrating in coastal areas during the mating/calving season, right whales are particularly vulnerable to negative physical interactions with human-made devices. Many have been subject to entanglement in fishing gear and collisions with ships, to the extent that the survival of at least one species, the North Atlantic right whale (*E. glacialis*), may be impaired by these human threats (Knowlton and Kraus, 2001). In the Southern Hemisphere, entanglements and ship strikes of several southern right whales have been recorded in Brazil (Pontalti and Danielski, 2011; Greig *et al*., 2001), Argentina (Bellazzi *et al.*, 2012; Sironi, 2004) and South Africa (Best *et al.*, 2001). A calf stranded and died in central-southern Chile (37°S) in 1986 that bore both net (apparently from entanglement) and small-boat propeller

marks (Canto *et al.,* 1991). Furthermore, an entangled southern right whale was reported on October 2014 in Pichilemu (34,3°S-72°S) , central Chile with at least three ropes that were wrapped around the right fin and over the head. The whale was not seen again and thus could not be disentangled. The case was considered a "complex" entanglement and received an adverse prognosis of survival (Galletti Vernazzani, 2015).

The present article reports the entanglement of a southern right whale that was first sighted alive at sea and was found dead later in southern Chile in 2017. This is the third confirmed entanglement event for this Critically Endangered population, raising increasing concerns about the negative impact entanglements are causing to the recovery of this population.

Methodology

Marine surveys

Since 2004, the Alfaguara Project (Centro de Conservacion Cetacea-CCC) has conducted systematic monitoring of blue whales (*Balaenoptera musculus*) during summer and fall off southern Chile using aerial, marine and land-based platforms (Galletti Vernazzani *et al.,* 2012).

In 2017, dedicated marine surveys for photo-identification and other research activities were conducted primarily off northwestern Isla de Chiloe, between Chacao Channel (41º45'S) and south of Isla Metalqui (42º 12'S), within 12 n. miles of the coastline, on board the 7 m *Alfaguara* research vessel. Data collected during marine surveys included photo-ID, group composition, behavior, weather and sea conditions, associated fauna and sea surface temperatures (SST). The position of a whale or group of whales was determined using a GPS.

Photo-identification catalog

A photographic catalog of identified southern right whale individuals from Chile was developed based on photographs collected by CCC, with contributions from the Chilean Navy (Directemar), Ecoceanos Center, the Natural Science and Archeological Museum of San Antonio, and members of the Chile National Marine Mammal Sighting Network (Chile NMMSN). Photographs were taken opportunistically and the oldest pictures are from 1984. Photographic documentation increased significantly after 2003, when the NMMSN sighting network was created by CCC to archive right whale sightings. Sighting network participants included a wide range of coastal communities, maritime authorities, media, and tourist companies. Sighting data include date, location, group size, group composition, and contributor. Whenever possible, individual whales are photo-identified to record the callosity patterns found on the lower lip and rostrum (Payne *et al*., 1983) and any unusual skin pigmentation on the head or back (Eroh *et al.*, 2017; Patenaude, 2003). The photo-identification matching process has been conducted with assistance of one of us (MS), who is scientific director of the Instituto de Conservacion de Ballenas, an organization that has been conducting scientific research on southern right whales in Argentina for more than 40 years.

Necropsy protocols

The whale carcass was methodically inspected according to a right whale necropsy protocol developed by one of us (AC), who worked for three years on the Southern Right Whale Health Monitoring Program (SRWHMP) in Puerto Madryn, Argentina. This protocol is based on personal experience and earlier protocols developed by the SRWHMP (Geraci *et al.,* 1993; McLellan *et al.,* 2004). The animal was first photographed and then an external exam was performed to detect any visible signs of injury, with special emphasis in detecting those injuries that could be involved in the death of the animal, including signs of human interaction (such as entanglement in ropes or propellers marks). Body and blubber measurements were taken and only a partial necropsy was conducted due to the advanced state of decomposition of the carcass as well as the position of the whale (ventral-dorsal). Samples from external and internal organ/tissue were collected for analysis.

Results

The whale was first seen by one of us (EC) alive at sea on February 9th, 2017 at Cocotue Bay (41,87°S - 74,08°W) (Figure 1) behaving in an unusual way, swimming too slowly, showing extensive cyamid

infestation and clear scars and lesions produced by entanglement along its entire body. On 10th February, an exceptional tide (full moon) and strong current near Chacao Channel prevented us from searching for the whale. Bad weather conditions followed the next few days and there were no working days at sea. On 16th February, the whale was found dead stranded at Playa Mar Brava, Carelmapu (41,42°S-73,42°W) (Figure 1) by local people. CCC received the report of the stranding on 18th February. On19th February, the CCC team conducted the necropsy. The carcass was buried by personnel of the Carelmapu Municipality and the National Fisheries and Aquaculture Service on 24th February.

Sighting at sea

From 30 January to 24 March 2017, ten marine surveys totaling 50,83h were conducted off northwestern Isla de Chiloe. Several cetacean species were recorded including blue whales, humpback whales (*Megaptera novaeangliae*), southern right whale, orca (*Orcinus orca*) and Peale's dolphin (*Lagenorhynchus australis*). Only one sighting of one southern right whale was recorded: the whale seen 09 February.

The whale was moving slowly at the surface. The body of the animal had clear scars, most probably caused by entanglement in fishing gear though ropes or nets were not present. There were large abnormal white areas on both sides of the whale, suggesting either that the skin was absent and the blubber was exposed or deep wounds that were partially healed. The whale had a great amount of cyamids, with an abnormal distribution that extended beyond the head and all around the body (Figure 2).

The callosity pattern of the whale was compared to the CCC southern right whale catalogue comprised of 39 individuals recorded from 1984 to 2012. No matches were found.

Necropsy findings and sample collection

Based on the callosity pattern and human interaction marks, the whale sighted on 09th February corresponded to the same individual stranded at Carelmapu seven days later.

At the time the team conducted the necropsy, the carcass was in an advanced state of decomposition (code 4). Thus, the estimated time after death was between 6 to 10 days, suggesting the whale died shortly after it was sighted alive. Total length of the animal was 13 m and sex could not be determined due to the carcass' position and the unviability to conduct a full internal exam.

Although we planned to conduct the work at low tide, due to harsh weather conditions, the carcass remained in the water and thus only partial measurements and necropsy were conducted. External examination revealed skin abrasions, impressions and lacerations (adjacent blubber affected) through all the visible dorsal and lateral aspect of the body, except the head. Most of the skin was absent due to decomposition (only about 30% of the skin remained, Figure 3) and blubber thickness measured along the lateral mid-line ranged from 10 to 12cm, which is considered normal for the species (i.e. it was not "skinny").

Almost all the skin showed lineal marks of monofilament fishing line (Figure 4), most of them in the form of an 8x8cm (±2cm) net. A linear impression of 3cm of thickness was found around the neck area, behind the blowholes (Figure 5), probably caused by a rope. The observed marks appear to be acute because granulation tissue was not observed macroscopically, indicating that the net remained attached to the skin for a brief period of time. Unusual large amounts of live cyamids were found around the lesions, particularly the peduncle and the pectoral fin, which were in contact with the water. On the right side of the body, four white circles of about 20cm in diameter were found (Figure 6). We inferred from the pictures and video of the live animal that these were already present before the whale died and were a healing wound. We believe these round wounds were probably caused by buoys.

Skin samples (with and without lesions), baleen plates, blubber (with and without lesions), barnacles, cyamids, right eye and blood were collected and preserved in alcohol, RNAlater, frozen and/or buffered 10% formalin. These samples were collected with the aim of performing further molecular analysis (sex, phylogenetic analyses), stable isotopes, histopathology, contaminants and infectious diseases, among others, and will be analyzed in the near future. As a way of examples, this individual provided the first sample for genetic analyses available for this population.

Discussion

Although ropes, nets or buoys were not present on the animal, our findings clearly show that the whale had been severely entangled. It is not known how it was disentangled but most probably, someone intervened and disentangled the animal but did not report it.

Entanglement in fishing gear can lead to emaciation and energy budget depletion (van der Hoop *et al*., 2014). Cyamid infestation is considered a sign of poor health (Pettis *et al*., 2004). When the whale was sighted alive, it swam slowly at the surface and had a significant cyamid infestation on its entire body. The entanglement must have caused energetic stress so that the whale could not survive the strong current and bad weather on the days that followed the first sighting, and it washed ashore dead. Therefore, we argue that this death was caused by the entanglement in fishing gear, or at least it was one of the main factors of its death.

Several types of fishing gear are used in southern Chile and are currently being investigated in order to better assess which type most likely caused this southern right whale death.

Preliminary results of this research were presented to the first international coordination meeting of the eastern South Pacific southern right whale CMP that was held in March 2017 in Santiago, Chile. The CMP steering committee agreed to request IWC Conservation Committee Working Group on by-catch and IWC Scientific Committee Human Induced Non-Intentional Mortality Working Group to include and prioritize entanglements of eastern South Pacific southern right whales in its agenda, in order to identify the specific fishing gear that are more likely to cause entanglements, and to propose or search for mitigation measures.

Although the data are limited, one small area in southern Chile appears to be more utilized by right whales than previously thought. Based on recent sightings off southern Chile (40°-44°S), the southernmost sighting of a mother-calf pair, the first documented reproductive behavior, and the first between-year resighting of an individual, Isla de Chiloe has been proposed as part of a possible breeding and calving area where further monitoring is needed (Galletti Vernazzani *et al*., 2014). Isla de Chiloe was also a former whaling ground for southern right whales. Between 1830 and 1832, 91 British whaling vessels operated around Isla de Chiloe (Gay, 1847). Therefore, it is crucial to increase efforts in this area to prevent any future entanglements.

As it has been highlighted by the CMP, any anthropogenic mortality is detrimental at the population level and should be kept to zero (Galletti Vernazzani *et al*., 2016). Considering that the last two entanglement events occurred in the last 2 years and a half, this threat is certainly hampering the recovery of this population and every effort should be made to eliminate it.

Conclusions

Entanglements are one of the most severe anthropogenic threats to large whales (Thomas *et al.*, 2016). The specimen reported here was severely entangled and the entanglement very likely caused its death. This unfortunate event is the third entanglement reported for the species in Chile and the second in about two years. As first step in mitigating this threat, we will try to identify the types of fishing gear more likely to entangle southern right whales and mitigation measures that can be adopted as soon as possible. In the future, the identification of aggregation areas for southern right whales in Chile will likely facilitate the adoption of more effective measures such as designation of protected areas with no-take zones.

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Figure 1 – Location of southern right whale sighting (dot 1) and stranding (dot 2)

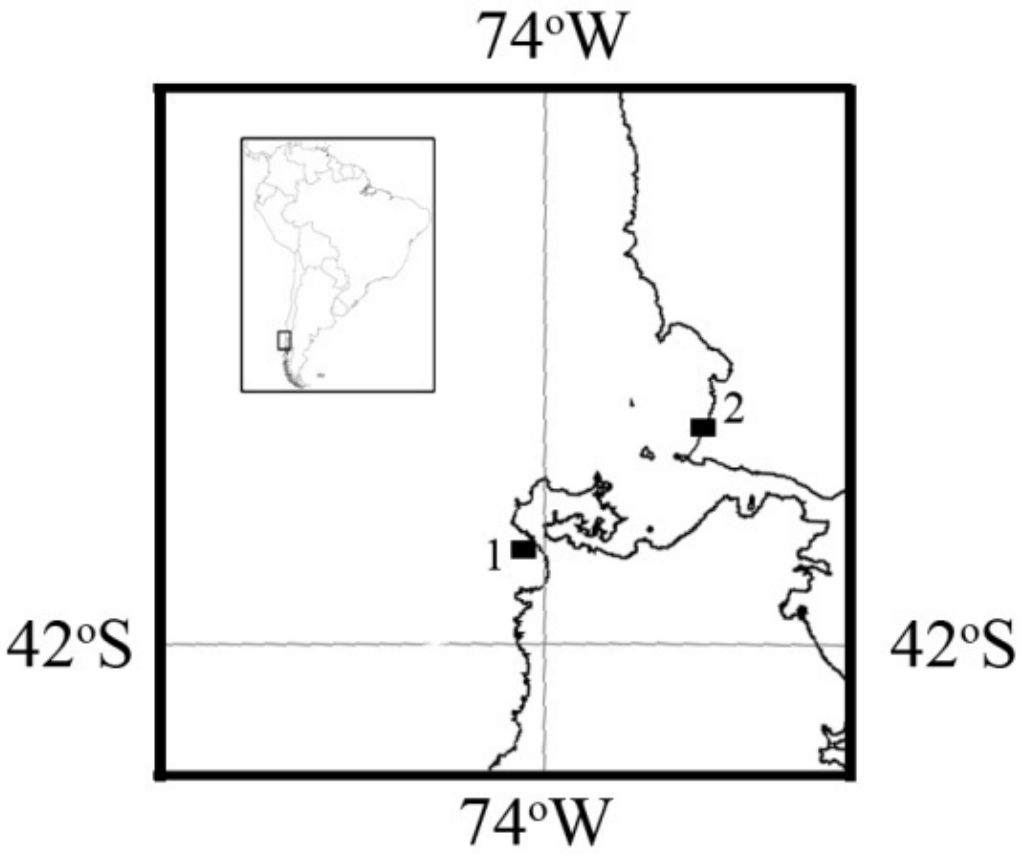
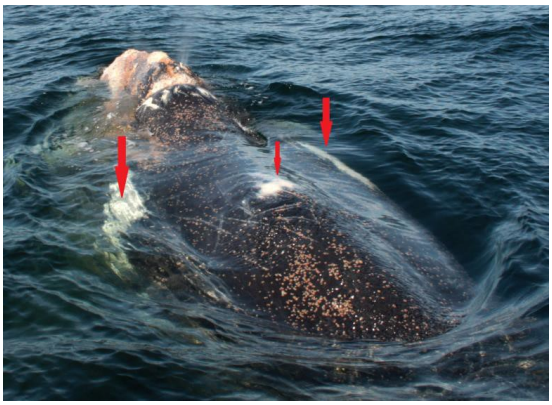
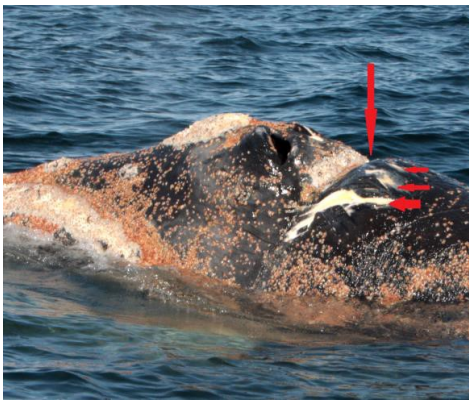


Figure 2 – Southern right whale sighting on 09 February 2017 showing large lesions (red arrows) and significant cyamid infestation



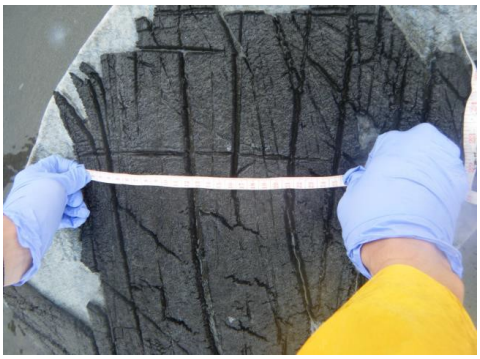
a) lesions with white pigmentation pattern on the body



b) scars near the head

Figure 3 – Southern right whale on 19th February 2017 stranded ventrally recumbent and showing large areas where the skin was absent

Figure 4 – Monofilament fishing line impressions



a) on top of skin

b) below the skin

Figure 5 – Linear impression behind blowhole

Figure 6 – Round wounds on right side of the body