

# SC/69A/CMP/25

**Sub-committees/working group name: CMP**

**First documented records of Southern right whale (*Eubalaena australis*) of the Chile-Peru Population: first observations in Ecuador and north of Peru**

**Cristina Castro, Ana M. García-Cegarra, Piero Uceda-Vega, Luis Aguilar, Shaleyla Kelez, Susannah J. Buchan, Koen Van, Waerebeek**



INTERNATIONAL  
WHALING COMMISSION

Papers submitted to the IWC are produced to advance discussions within that meeting; they may be preliminary or exploratory.

It is important that if you wish to cite this paper outside the context of an IWC meeting, you notify the author at least six weeks before it is cited to ensure that it has not been superseded or found to contain errors.

# First documented records of Southern right whale (*Eubalaena australis*) of the Chile-Peru Population: first observations in Ecuador and north of Peru

Cristina Castro<sup>1</sup>, Ana M. García-Cegarra<sup>2,3</sup>, Piero Uceda-Vega<sup>4</sup>, Luis Aguilar<sup>3</sup>, Shaleyla Kelez<sup>4,5</sup>, Susannah J. Buchan<sup>6,7,8</sup>, Koen Van Waerebeek<sup>9,10</sup>

<sup>1</sup> Pacific Whale Foundation-Ecuador. Malecón Julio Izurieta. Puerto López, Manabí, Ecuador

<sup>2</sup> Instituto de Ciencias Naturales Alexander von Humboldt, Facultad de Ciencias del Mar y Recursos Biológicos, Universidad de Antofagasta, Chile.

<sup>3</sup> Marine Megafauna Research Laboratory (CETALAB), Antofagasta, Chile.

<sup>4</sup> World Wildlife Foundation-WWF Peru.

<sup>5</sup> Ecoceanica, Lima, Peru

<sup>6</sup> Center for Oceanographic Research COPAS Sur-Austral and COPAS COASTAL, Universidad de Concepción, Casilla 160-C, 4070043, Concepción, Región del Bio, Chile.

<sup>7</sup> Departamento de Oceanografía, Facultad de Ciencias Naturales y Oceanográficas, Universidad de Concepción, Casilla 160-C, 4070043, Concepción, Región del Bio, Chile.

<sup>8</sup> Centro de Estudios Avanzados en Zonas Áridas (CEAZA), Raul Bitran 1305, La Serena, Chile.

<sup>9</sup> Peruvian Centre for Cetacean Research, Centro Peruano de Estudios Cetológicos (CEPEC), Museo de Delfines, Lima-20, Peru

<sup>10</sup> ProDelphinus, Miraflores, Lima-18, Peru

[cristinacastro@pacificwhale.org](mailto:cristinacastro@pacificwhale.org)

## Abstract

This report presents the northernmost record of the **Southern right whale SRW** (*Eubalaena australis*) of the Chile-Peru population on the Southeast Pacific coast. On 11 September 2022, a mother-calf pair SRW (*Eubalaena australis*) was recorded off the coast east of Salango Island (01°35'48" S, 80°52'15" W) in the marine area of Machalilla National Park, Ecuador. On August 8<sup>th</sup>, 2022, a mother-calf pair SRW was observed off El Ñuro (-4.20842, -81.1888), Peru. A third mother-calf pair was observed from the 15<sup>th</sup> to the 18<sup>th</sup> of August in the Antofagasta Region (-23.4842, -70.4704), Northern Chile. And the last sighting on August 17<sup>th</sup>, 2022, the same mother-calf pair was observed in Pisagua (-19.58001, -70.2111), Iquique Region in the North part of Chile; these individuals traveled 570 km in 13 days, an estimated 43.8 km per day. Aerial photo data were collected using the drone to identify their head callosities in the Peru and Chile sightings. We confirm that Antofagasta is an important nursery area for conserving this species. Our data show mother-calf body size and evidence of animal stress-related behaviors with possible low-frequency calls in the presence of humans.

## Introduction

Southern right whales (SRW) (*Eubalaena australis*) from the eastern South Pacific, also referred to as the Chile-Peru subpopulation (CPe) (Kenney, 2002), move seasonally from feeding areas located in high-latitude waters to breeding areas located in mid-latitude waters (Mackintosh, 1942). This species mainly inhabits coastal waters during breeding and rearing, although they may move in pelagic waters during their migrations (Aguayo-Lobo et al.,

1998). SRW populations were hunted extensively by various local communities in Chile and Peru since the 18th and 19th centuries by American and French whaling fleets and in the 20th century by Chilean whalers (Clarke, 1965, Aguayo-Lobo et al., 1998). Past unsustainable exploitation and their proximity to the coast, which makes them more vulnerable to anthropogenic impacts, have led to their near extinction (Segarra et al., 2021).

The CPe subpopulation has shown different signs of recovery than other populations in the Southern Hemisphere (Argentina, South Africa, Australia, and New Zealand) Galletti et al., 2011 (Richards, 2009, Aguayo-Lobo et al., 1998). It is considered among the only two Critically Endangered whales in the world (Cooke, 2018), with fewer than 50 mature individuals and 79 confirmed observations of this species in southern Peru and Chile, the months of most significant observation from June to November (Van Waerebeek et al., 1998; 2009; Reilly et al., 2008, Galletti et al., 2011; Garcia-Cegarra et al., 2021).

The last northernmost confirmed observation of this whale is on the west coast of South America; the CPe subpopulation of SRW is distributed from Lima, central Peru (12°11' S) to the Gulf of Penas, southern Chile (47°58' S) (Aguayo-Lobo, 1974, Van Waerebeek et al., 1998; 2009; Orihuela & Cortegana-Arias, 2013; Galletti Vernazzani et al., 2014). Antofagasta being a potential nursery area (Garcia-Cegarra et al., 2021). However, a 'probable record' of two whales off Punta Sal, Tumbes, in northern Peru in early August 2005, partially supported by low-resolution photographs (Van Waerebeek et al., 2009), first suggested that Lima is not the northern distribution range for CPe right whales. All previous records of SRW have been recorded only in Peru and Chile for the last two centuries.

The records in this report confirm the premise of Van Waerebeek et al. (2009) in northern Peru and provide evidence of new, more northerly sightings of this subpopulation, with the first sighting of this species in Ecuador and north of Peru. We confirm that Antofagasta is an important nursery area for conserving this species. Our data show mother-calf body size and evidence of animal stress-related behaviors with possible low-frequency calls in the presence of humans.

### **First record in Ecuador (Observation A)**

On 11 September 2022, at 03:59 pm hours, a mother-calf pair SRW (*Eubalaena australis*) was recorded off the coast east of Salango Island (01°35'48" S, 80°52'15" W) in the marine area of Machalilla National Park, Ecuador (Figure 1). The sighting lasted 40 minutes and was observed by four whale-watching vessels at a minimum distance of 50 m. In the distance, the adult whale remained close to the surface, exposing parts of its head, and its breathing was observed. As the first boat approached, it moved to the side, and the whale changed its behavior and began to travel rapidly.



**Figure 1:** New observations of SRW. A) Observation of a mother-calf pair, in front of Salango Island, Ecuador. B) Observation of a mother-calf pair, off El Ñuro, Perú. C) Observations of the same mother-calf pair in the Antofagasta area from August 15 to 18, 2022. D) Observation in Pisagua, Iquique Region, North of Chile, of the same mother-calf pair sighted in Antofagasta area.



**Figure 2:** Southern right whale mother and calf observed on 11 September 2022 on Salango Island in Ecuador. Note the absence of the dorsal fin and the arched shape of the mouthline. The head of the calf is visible at the left of the photo.

The individuals were zigzagging in an easterly direction offshore (4 miles approx.) at high speed; the calf was swimming very close to the mother and stayed more time at the surface; it seemed more curious. At one point, the calf stuck out its head and the pectoral fin, like spy-hopping. They never jumped. The size of the adult whale was estimated at approximately 12-14 m when compared to one of the nearby vessels.

The species was readily identified based on the absence of a dorsal fin and the presence of callosities ('excrescences') located on the upper and lateral part of the head, above the eye, and on both sides and the upper edge of the jaws (Matthews, 1938). The captains and guides of the four vessels that observed the whales directly were interviewed; they all agreed that the whales were more robust (fat) than the humpback whales, had no hump or dorsal fin, the pectoral fins were small, and had protuberances on their heads close to the eyes (Figure 2). Although the callosities are not very noticeable, one of the guides described them as white and mustard-colored pimples. The authors and experts confirmed the species as right whales with video<sup>1</sup> and photos (Figure 2) from the whale-watching boats.

### **New record in Northern Peru (Observation B)**

On August 8<sup>th</sup>, 2022, an SRW mother-calf pair was observed by two of us (PVU and LAC) off El Ñuro (around -4.20842, -81.1888), Peru (Figure 1). Aerial photo data were collected using the drone DJI Phantom 4 Pro (DJI Innovation, Shenzhen, Chile) equipped with a gimbaled camera (1''CMOS, 20 M effective pixels). Fitted with a flight controller and equipped with an Android system tablet 5.5-inch screen, the two intelligent batteries (LiPo 4S, 15.2V, 5879 mAh) allow a maximum flight time of 25 min each. During 12 mins, a high-quality drone steered from a 6.3 m boat recorded high-quality video of the mother and calf; the head of the mother and calf allowed us to photo-identify their callosities (Figure 3). We also registered the size of both whales compared to the size of our vessel.

Furthermore, passive acoustic monitoring was carried out with a Cetacean Research<sup>TM</sup> CR1-UDP hydrophone deployed from a 6.3 m vessel with an outboard motor at 5 m—depth in an approximate water column of 18 m. at -4.196481, -81.168530. Acoustic data were recorded continuously at 48 kHz with a Zoom four-track H5 portable recorder in the presence (within 50 - 80 m) of a right whale mother-calf pair, obtaining a total of 12 min 27 seconds. Acoustic data were viewed in Raven Pro 2.0 (K. Lisa Yang Center for Conservation Bioacoustics at the Cornell Lab of Ornithology, 2022) as spectrograms (Hann Window; FFT = 8192 samples; 50% overlap; page duration = 40 s) by an experienced bio-acoustician (SJB) to manually annotate right whale calls, identifying calls based on frequency and duration call characteristics reported by Dombroski et al. 2016. Based on Dombroski et al. 2016, seven

---

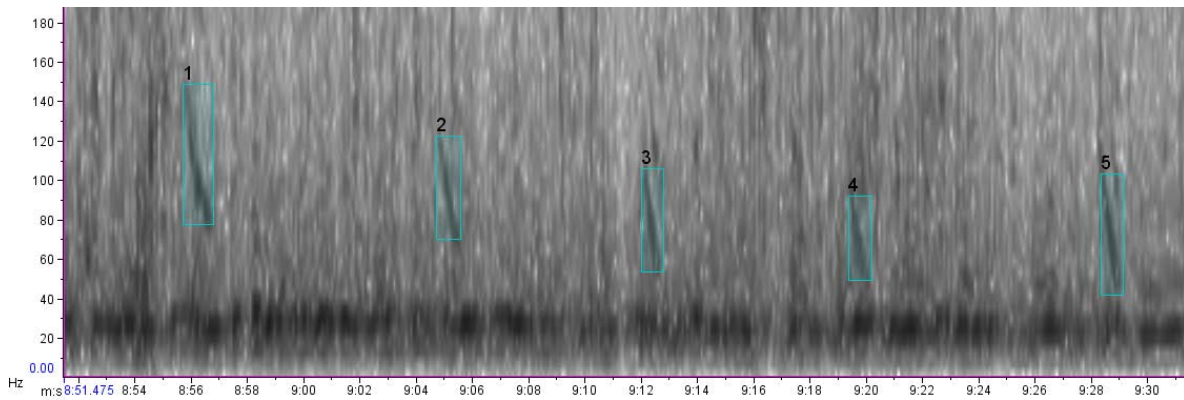
<sup>1</sup> Link video

call types may have been present (upcall, downcall, down-upcall, tonal constant, tonal variable, hybrid and pulsive), all below approximately 500 Hz. For each potential call, peak frequency (the frequency at which peak power occurs), beginning and end frequency of the selected call, and the duration of the call were measured using the Selection Table function in Raven Pro 2.0. Average peak frequency, beginning and end frequency, and duration ( $\pm$  s.d.) were reported for comparison to calls reported by Dombroski et al. 2016.

Only nine possible right whale faint downcalls were identified in the passive acoustic monitoring (Fig. 4), no other call types were identified. The downcalls had lower frequencies and longer durations than those reported by Dombroski et al. (2016) (Table 1). However, the values we report are based on a significantly smaller sample size than reported by Dombroski et al. (2016) and are still within similar ranges, given that Dombroski et al. (2016) reported large standard deviations for frequency and duration characteristics.



**Figure 3:** Aerial image of a mother and calf southern right whales observed in El Ñuro (Peru) on the 8<sup>th</sup> of August 2022.



**Figure 4.** Spectrograms of possible right whale downcalls highlighted in light blue (Hann Window; FFT = 8192 samples; 50% overlap; page duration = 40 s).

**Table 1.** Frequency and duration characteristics of possible right whale downcalls using metric tools in Raven Pro 2.0 and comparison with calls reported by (Dombroski et al. 2016).

	<b>Sample size</b>	<b>Start frequency (Hz) (<math>\pm</math> s.d.)</b>	<b>End frequency (Hz) (<math>\pm</math> s.d.)</b>	<b>Peak frequency (Hz) (<math>\pm</math> s.d.)</b>	<b>Duration (s) (<math>\pm</math> s.d.)</b>
Possible downcalls (This study)	9	112 $\pm$ 16.42	51.82 $\pm$ 12.99	75.53 $\pm$ 15.88	0.83 $\pm$ 0.13
Downcalls (Dombroski et al. 2016)	184	163 $\pm$ 66	100 $\pm$ 57	128 $\pm$ 61	0.6 $\pm$ 0.2

### **New records in Northern Chile (Observation C and D)**

On August 15th, 2022, during a coastal fishing operation, a local fisherman reported the presence of an SRW mother-calf pair in La Rinconada Marine Protected Area (-23.4842, -70.4704), Antofagasta Region, Northern Chile. No images were obtained. The following day, on August 16th, 2022, a team member of (AGC) surveyed the area and found presumably the same mother and calf reported by the fisherman the day before. The observation occurred in La Rinconada Marine Protected Area (-23.4749, -70.5063) (Figure 5). On this occasion, a DJI Mavic 2 Pro Zoom drone was flown for 10 min to record the behavior of the whales; the pair were swimming slowly close to shore. The images taken were also used to photo-identify the mother; unfortunately, due to high turbidity seawater, we were unable to measure the head of the calf concerning the mother (Figure 5).





**Figure 5:** Image of the mother-calf pair observed in La Rinconada Marine Protected Area, Antofagasta Region, on August 16<sup>th</sup>, 2022.

On August 17<sup>th</sup>, 2022, the third day of the field, the same mother-calf pair was observed in La Portada Natural Reserve (-23.4941, -70.449), only around 15 km away from the area observed on the previous day (Figure 5). The observation lasted 8 hours (09:00-17:00), and the behavior was recorded by a drone operated from shore. They behaved similarly to the day before, moving very close to shore (Figure 6).



**Figure 6:** Image of the mother-calf pair observed in La Portada Natural Park, Antofagasta Region, on August 17<sup>th</sup>, 2022.

On August 18<sup>th</sup>, 2022, the mother-calf pair was seen again in La Rinconada Marine Protected Area (-23.4888, -70.5076). Weather conditions were unfavorable to fly the drone, but blows were seen from shore. All the observations made in the Antofagasta area are considered observation C (Figure 6).

On August 31<sup>st</sup>, 2022, the Chilean Navy (*Dirección General del Territorio Marítimo y de Marina Mercante, Armada de Chile*), during coastal navigation in Pisagua, Iquique Region in the North part of Chile, a SRW mother-calf pair was reported. The pair was recorded by drone swimming very close to the shore (-19.58001, -70.2111) (Figure 1). The images allowed the identification of the pair by the callosities on the head. It was found that they were the same mother-calf observed in Antofagasta from the 15<sup>th</sup> to the 18<sup>th</sup> of August. According to this resighting, these individuals traveled 570 km in 13 days, an estimated 43.8 km per day (Figure 7, observation D).



**Figure 7:** Image of the mother-calf pair observed in Pisagua, Iquique Region in the north of Chile, on August 31<sup>st</sup>, 2022.

## DISCUSSION

It is known that SRW populations prefer cold waters (Clarke, 1965), except when calving and nursing. The CPe population then occupies shallow waters from south-central Peru to Chile. So far, the northernmost confirmed observation of an SRW mother-calf pair was recorded on 21 August 2012, off Chorrillos in Lima, Peru (Orihuela and Cortegana-Arias, 2013).

In addition to the probable record off Punta Sal, Tumbes, in 2005 (Van Waerebeek et al., 2008), these two other previous records exist of the possible presence of SRW in equatorial waters. The first one made by Christensen in 1926 states that SRW occasionally visit the

coasts of Ecuador, where they take advantage of the sandbanks in winter but was considered as speculation by Clarke (1965). The second is a record made by the Regional Information System on Biodiversity and Protected Areas in the Southeast Pacific Project (SIBIMAP), including one unconfirmed sighting on the border with Ecuador at 4°S (Félix and Escobar, 2011). Possibly these three records were accurate, and the presence of SRW in equatorial waters is more common than we think, especially in La Niña years when oceanic conditions include lower water temperatures and higher productivity than normal in the Humboldt Current and Eastern Pacific. SRW may tend to migrate further north then, to find water less cold before calving and nursing.

NOAA Climate Prediction Center records developed the Ocean Niño Index (ONI), a measure of the condition of the El Niño-Southern Oscillation (ENSO) and its warm (El Niño) and cold (La Niña) phases in the central equatorial Pacific. During September 2022 the index was -1.0 confirming that sightings were made during the coldest months of the year<sup>2</sup>. 2020 - 2022 has been described as the longest-recorded La Niña event since the previous century<sup>3</sup>.

The observation of the SRW in Ecuador is precisely off Salango Island, where the Humboldt current meets to head towards the Galapagos Islands<sup>4</sup>. Clarke (1965) suggested that the whales could take advantage of the cold waters of California and Humboldt Currents to move to other latitudes, such as the Equator, which theoretically could also allow a mixture of the northern and southern forms, despite the migratory time phase difference of 6 months. In the case of observation of Ecuador, it is difficult to recognize the callosities in the videos; however, all the interviewed captains and guides talk about them, and one described these mustard-colored calluses. Although we are certain it is a right whale, no compelling evidence could exclude a record of *Eubalaena japonica*. However, the latter species is unknown in the eastern Pacific.

The encounter with the right whale is an opportunistic observation. Only when the boats were with the animal did they realize it was another species they had never observed. It can be seen that the animal was highly stressed by its change in behavior, direction and increased speed of travel. This type of behavior is considered tourist harassment and produces short-term impacts on whales (Scheidat et al., 2004). The videos show that the four boats remain at their side (two on each side), and the whale comes within 10 m of the boat, trying to avoid it. During forty minutes, it approached and moved away approximately four miles from Salango Island (zigzag movement), possibly a deterrent behavior to get away from the boats. From June to October, the humpback whale season in Ecuador is one of the main economic activities of Ecuadorian coastal towns, generating almost 6 million dollars in income in a

---

<sup>2</sup> [https://origin.cpc.ncep.noaa.gov/products/analysis\\_monitoring/ensostuff/ONI\\_v5.php](https://origin.cpc.ncep.noaa.gov/products/analysis_monitoring/ensostuff/ONI_v5.php)

<sup>3</sup> <https://camaradepesqueria.ec/category/analisis-sectoriales/analisis-de-pesquerias-y-condiciones-oceanograficas/>

<sup>4</sup> <http://www.ballenitasi.org/2012/01/corrientes-frente-las-costas-del.html>

single community (Castro et al., 2022). The captains and guides of the Machalilla National Park, who go out twice daily for five months to look for whales as their only daily sustenance, could be considered expert observers. It is essential to consider the continuous training of guides and captains and seek ways to share information with tourists and citizens through citizen science. Finally, it is necessary to continue monitoring cetaceans in continental Ecuador, especially during severe ENSO events and adverse oceanographic conditions.

In the observation of Northern Peru, the lack of many calls in the acoustic recorder, despite proximity to the mother-calf pair, is in line with what is known about right whale mother-calf pairs, i.e., acoustic crypsis (Parks et al. 2019; Zeh et al., 2022). Acoustic crypsis is where right-whale mother-calf pairs will be silent, display low call rates, produce low-amplitude calls, or select acoustically isolating habitats to avoid predator eavesdropping. The presence of humpback whales in this study area, and the clear presence of a single sequence of male humpback songs in the acoustic data analyzed, means that we cannot exclude the possibility of these possible right whale calls being confused with another humpback further away. Most humpback songs occur above 500 Hz and do not generally look like the calls in Figure 4; however, some humpback sounds can be made below 100 Hz (Cerchio et al., 2001) and reference therein. This is why we report these as “possible” right whale mother-calf downcalls.

The resighting of the mother-calf SRW pair in northern Chile 570 km apart and in a northward migration confirms that northern Chile is a nursing area for the species, as stated by Garcia-Cegarra et al. (2021). The northward migration of the mother and the calf could be probably due to the above-mentioned La Niña event during the study period (austral winter 2022). The presence of cold waters could have potentially led the SRW to travel to low latitudes during nursing. Overall these records confirm the presence of SRW mothers and calves every 3 years apart in northern Chile (Garcia-Cegarra et al., 2021). These bring more hope to the critically endangered SRW Chile-Peru population, as mother-calf pairs could indicate a population recovery. However, the nearshore presence of the sightings (from 10-200 m from the coast) may risk the survival of both the mother and the calf due to the encounter with anthropogenic activities such as marine traffic and fishing. Northern Chile is an area with growing and intense marine traffic due to the mining and shipping industry in the Atacama Desert. Locations such as Mejillones (40 km from La Rinconada Marine Reserve) are a potential collision area for fin and humpback whales (Garcia-Cegarra & Pacheco, 2019). Moreover, industrial and artisanal fishing activities overlap with the area's coastal bottlenose dolphins (*Tursiops truncatus*). Hence, despite the presence of mother-calf pairs being a relief for the recovery of this critically endangered population, conservation efforts should focus on alerting ships to the presence of whales and, if not decrease, regulate marine traffic (e.g., reduce vessel speed, adapt shipping lanes) in the nearby areas where the whales are nursing.

## Acknowledgements

CC is grateful for the information and videos provided by the Association of Naturalist Guides of Machalilla National Park, especially Lady Pincay, Silvano Quimiz, Julio Pin and Winston Lucas. Special thanks to Spondylus Tour Operators, Puerto Lopez Tours and Captain Antonio Pincay for all the information provided. Thanks for comments and reviews to Juliana Castrillon. The research, education and training project in Machalilla National Park is funded by the Pacific Whale Foundation with the support of all its members. SJB thanks the Centro COPAS Coastal FB210021 funded by the Agencia Nacional de Investigación y Desarrollo (ANID) and the Centro de Estudios Avanzados en Zonas Áridas, as well as expert input from Dr. Renata Sousa-Lima, Dr. Elena Schall and Dr.(c) Julia Dombroski. Peru observations were funded by AGC Rufford 2<sup>nd</sup> Small Grant (29456-2). AGC thanks to Alex Sanchez for providing pictures of southern right whale in Antofagasta and the Chilean Navy for the records in Pisagua. AGC is funded by ANID FONDECYT Postdoctoral Fellow (No. 3210483).

## REFERENCES

- AGUAYO-LOBO, A. 1974. Chapter 8. Baleen Whales off Continental Chile. *In*: WILLIAM, E. S. (ed.) *The Whale Problem*. Cambridge, MA and London, England: Harvard University Press.
- AGUAYO-LOBO, A., TORRES, D. & ACEVEDO, J. 1998. Los mamíferos marinos de Chile: I. Cetacea. *Serie Científica INACH*, 48, 19-159.
- CASTRO, C., CASTRILLÓN, J. & GÓMEZ, W. 2022. Whale-watching tourism as a driving force for socioeconomic development in Puerto López, Machalilla National Park, Manabí, Ecuador. *Mammalia aequatorialis*, 4, 67-80.
- CERCHIO, S., JACOBSEN, J. K., & NORRIS, T. F. 2001. Temporal and geographical variation in songs of humpback whales, *Megaptera novaeangliae*: Synchronous change in Hawaiian and Mexican breeding assemblages. *Animal Behaviour*, 62(2), 313–329. <https://doi.org/10.1006/anbe.2001.1747>
- CLARKE, R. 1965. Southern right whales on the coast of Chile. *Norsk Hvalfangst-Tidende*, 54, 121-128.
- COOKE, J.G., 2018. *Eubalaena australis* (Chile-Peru subpopulation). The IUCN Red List of Threatened Species 2018: e.T133704A50385137. Accessed on 16 April 2023.
- CHRISTENSEN, A. F. 1926. Hvalfeltet paa Ecuador. *Norsk Hvalfangsttidende*, vol. 15, No 7, p. 111-112.
- DOMBROSKI J.R.G., PARKS, S.E., GROCH, K.R., FLORES P.A.C., SOUSA-LIMA R.S. 2016. Vocalizations produced by southern right whale (*Eubalaena australis*) mother-calf pairs in a calving ground off Brazil. *Journal of the Acoustical Society of America*, 1850-1857, 140(3).
- FÉLIX, F. & ESCOBAR, G. 2011. Efforts in developing spatial planning analysis for the Southeast Pacific Right Whale (*Eubalaena australis*). *IWC Southern Right Whale Assessment Workshop*.
- GALLETTI VERNAZZANI, B. G., Brito, J. L., Cabrera, E., Cárdenas, J. C., & Brownell Jr, R. L. 2011. Sightings of southern right whales (*Eubalaena australis*) off Chile and

- Peru from 1975 to 2010. Working paper SC/S11/RW22 presented in the Scientific Committee of the International Whaling Commission.
- GALLETTI VERNAZZANI, B., CABRERA, E. & BROWNELL JR, R. L. 2014. Eastern South Pacific southern right whale photo-identification catalog reveals behavior and habitat use patterns. *Marine Mammal Science*, 30, 389-398.
- GARCIA-CEGARRA, A.M., PACHECO, A.S. 2019. Collision risk áreas between fin and humpback whales with large cargo vessels in Mejillones Bay (23°S) northern Chile. *Marine Policy* 103, 182-186.
- GARCIA-CEGARRA, A., MALEBRAN, M. & VAN WAEREBEEK, K. 2021. Antofagasta Region in northern Chile, a potential nursing ground for the Southern right whale *Eubalaena australis*. *Latin American Journal of Aquatic Mammals*, 16, 40-45.
- DOMBROSKI J.R.G., PARKS, S.E., GROCH, K.R., FLORES P.A.C., SOUSA-LIMA R.S. 2016. Vocalizations produced by southern right whale (*Eubalaena australis*) mother-calf pairs in a calving ground off Brazil. *Journal of the Acoustical Society of America*, 1850-1857, 140(3).
- KENNEY, R. 2002. North Atlantic, North Pacific, and Southern hemisphere right whales in WF Perrin, B. Wursig, and JGM Thewissen, eds., *Encyclopedia of Marine Mammals*. Academic Press, CA.
- K. LISA YANG. 2022. Center for Conservation Bioacoustics at the Cornell Lab of Ornithology. *Raven Pro: Interactive Sound Analysis Software (Version 1.6.3)*.
- MACKINTOSH, N. A. 1942. The southern stocks of whalebone whales. *Discovery Rep*, 22, 197-300.
- MATTHEWS, L. H. (1938). Notes on the southern right whale. *Eubalaena australis*. *Discovery Rep*, 17, 169-182.
- ORIHUELA M. & D. CORTEGANA-ARIAS. 2013. Registro de un par madre-cría de ballena franca austral (*Eubalaena australis*) en la costa de Lima, Perú. *Rev. peru. biol.* 20(2): 187 - 188 (Diciembre 2013).
- PARKS S.E, CUSANO, D., VAN PARIJS S.M., NOWACEK, D.P. (2019) Acoustic crypsis in communication by North Atlantic right whale mother–calf pairs on the calving grounds *Biology Letters*, (2019), 15(10)
- REILLY, S., BANNISTER, J., BEST, P., BROWN, M., BROWNELL, R., BUTTERWORTH, D., CLAPHAM, P., COOKE, J., DONOVAN, G. & URBAN, J. 2008. *Eubalaena australis* (Chile-Peru subpopulation). IUCN 2009 IUCN Red List of Threatened Species Version 20092.
- RICHARDS, R. 2009. Past and present distributions of southern right whales (*Eubalaena australis*). *New Zealand Journal of Zoology*, 36, 447-459.
- SCHEIDAT, M., CASTRO, C., GONZALEZ, J., & WILLIAMS, R. 2004. Behavioural responses of humpback whales (*Megaptera novaeangliae*) to whalewatching boats near Isla de la Plata, Machalilla National Park, Ecuador. *Journal of Cetacean Research and Management*, 6(1), 63-68.
- VAN WAEREBEEK, K., REYES, J. & VAN BRESSEM, M. 1998. Sighting of a mother-calf pair of southern right whale *Eubalaena australis* in Peruvian waters. *Estudios Oceanológicos*, 17, 105-107.
- VAN WAEREBEEK, K., SANTILLANA, L. & SUAZO, E. 2008. Incidental sightings of southern right whales off Peru, 1987-2007: Recovery remains uncertain. Scientific Committee document SC/60/BRG33, International Whaling Commission, June 2008, Santiago, Chile.

- VAN WAEREBEEK, K., SANTILLÁN, L. & SUAZO, E. 2009. On the native status of the southern right whale *Eubalaena australis* in Peru. *Boletín Museo Nacional de Historia Natural, Chile*, 58, 75-82.
- ZEH, J. M., DOMBROSKI, J. R. G., & PARKS, S. E. (2022). Preferred shallow-water nursery sites provide acoustic crypsis to southern right whale mother-calf pairs. *Royal Society Open Science*, 9(5). <https://doi.org/10.1098/rsos.220241>