Latin American Journal of Aquatic Mammals

ISSN: 2236-1057 | Vol. 19 No. 2, November 2024

Franciscana, *Pontoporia blainvillei*, stranding records from systematic beach surveys, opportunistic and incidental capture reports at theRío Negro Estuary, Patagonia, Argentina (2003 – 2023)

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Abstract

Detailed here are records of 34 franciscanas (*Pontoporia blainvillei*) that stranded, including nine rescued alive and returned to sea, from the Río Negro Estuary, Patagonia, Argentina, between 2003 and 2023. The years with the highest stranding records were 2014 and 2020 (n = 6/ each). Autumn and winter/ spring were the seasons with the lowest and highest number of strandings, respectively. These strandings comprised 15 females, six males, and 13 unknowns. Total body length of females ranged from 64 to 155 cm and for males ranged from 70 to 138 cm. Five of the strandings involved calves and occurred within the birthing periods previously reported for the species at the Río Negro Estuary. A complete necropsy was performed on three animals. One showed multifocal pneumonic lesions from which *Klebsiella pneumoniae* was isolated and identified microbiologically. In a second specimen, *Pseudomonas* sp. and coagulase-negative *Staphylococcus* sp. were identified, and in a third individual tuberculosis caused by a member of the *Mycobacterium tuberculosis* complex was identified. Despite these results, it was not possible to be certain that they were the causes of death of these three individuals. Three franciscanas had beak deformities. A total of 79 otoliths representing 41 specimens of white croaker (*Micropogonias furnieri*) were found in one stomach content analyzed. Eleven franciscanas showed signs of having been bycaught (four with net marks, four entangled in gillnets or reported by the fishermen who bycaught them (n=3)). This is the first report of franciscana entanglements in sport fishing gear at the Río Negro Estuary. This paper provides information highlighted as important by the International Whaling Commission Conservation Management Plan for franciscana, and contributes to knowledge of the species in the Franciscana Management Area IVe.

Keywords:
bycatch, calves, disease, fishing rods, gillnets, odontocetes

ARTICLE INFO

Manuscript type: Article

Article History
Received: 16 September 2023
Received in revised form: 03 March 2024
Accepted: 15 March 2024
Available online: 24 November 2024

Handling Editor: Miriam Marmontel

Citation:
Iñíguez Bessega, M. A., Winter, M., Abate S., Seijas, V. A., Hevia, M., & Failla, M. (2024). Franciscana, *Pontoporia blainvillei*, stranding records from systematic beach surveys, opportunistic and incidental capture reports at the Río Negro Estuary, Patagonia, Argentina (2003 – 2023). *Latin American Journal of Aquatic Mammals, 19*(2), 202-210. https://doi.org/10.5597/lajam00337

Introduction

The franciscana dolphin *Pontoporia blainvillei* is a small endemic odontocete that inhabits the coastal waters of the Southwestern Atlantic Ocean from Itaúnas (18°25′ S), Espírito Santo State, Brazil (Siciliano et al., 2002) to Golfo San Matias (42°00′ S), Chubut, Argentina (Denuncio et al., 2019). It is considered the most threatened small cetacean in South America (Secchi et al., 2021). Bycatch in gillnet fisheries has been a main conservation concern for franciscanas for at least 50 years (Ott et al., 2002; Secchi, 2010; Secchi et al., 2021). However, the franciscana is also exposed to other potentially concerning threats throughout its range, such as coastal development, marine and agricultural debris, chemical and noise pollution, diseases, and vessel traffic (*e.g.*, Denuncio et al., 2011, Di Beneditto & Ramos, 2014; Domit et al., 2022).

It is listed as Vulnerable by the IUCN Red List of Threatened Species (Zerbini et al., 2017) as well as by the Red List of

Argentina (Denuncio et al., 2019). More recently, the province of Buenos Aires has declared franciscana as Monumento Natural Provincial (Provincial Natural Monument, Law/ Buenos Aires No. 14,992, published in 2018), which is the highest category of protection that a species can have in the province and would be equivalent to the IUCN Habitat/Species Management Areas (Category IV) (Ott et al., 2022).Based on scientific information the species distribution range has been divided into 11 "Franciscana Management Areas" (FMAs) (Secchi et al., 2003; Costa-Urrutia et al., 2012; Cunha et al., 2014; Gariboldi et al., 2016; Nara et al., 2022; IWC, 2023). The area under study is the Río Negro Estuary at the Buenos Aires and Río Negro provinces and it is included in FMA IVe, which is the southernmost area of distribution for this species. The Río Negro Estuary is an area of priority for the actions identified in the International Whaling Commission Conservation Management Plan for franciscana (IWC CMP for franciscana) (IWC, 2016, 2023) mainly due to the lack of knowledge about the franciscana in this FMAe.

This paper contributes information on the temporal distribution of strandings by sex, length and age class (calves and adults), necropsy results, including stomach contents, and probable cause of death.

Material and Methods

Study area

Data were gathered in the Río Negro Estuary (41°03' S, 63°50' W), northeastern Patagonia, Argentina. This estuary and the surrounding areas (Fig. 1) contain islands, sandbars, channels, and salt marshes. Generally, the coast drops off steeply with depths of up to 2 m at only 5 m from the coastline. The Río Negro, which terminates in this estuary, is the longest river in Patagonia. The annual mean tidal amplitude is approximately 2.2 m (Servicio de Hidrografía Naval, 2024).

Data collection

Since 2003, information on franciscana strandings has been systematically recorded and plotted into a chart using *QGIS 3.30.0* (Fig. 1). A stranding event is defined as a cetacean in a helpless position ashore, ill, weak, simply lost or dead (adapted from Geraci & Lounsbury, 2005). Information was collected both systematically (beach monitoring programs were carried out between 2003 to 2014 and 12 km/month by foot) and opportunistically (telephone calls from local people, coast guard staff, government officials, fishers, nature photographers).

For each stranding event, at minimum, the following information was recorded: species, number of animals, location and date of stranding, decomposition state (according to Geraci & Lounsbury, 2005), sex, and location. When feasible, morphometrics were taken following Norris (1961) and the corresponding photographs and samples for genetic, toxicological, and pathological analysis were collected. When it was not possible to identify the species reliably, a sample was taken for subsequent genetic analysis to confirm the species. To maintain as much consistency as possible with previous studies regarding age classification based on length (Botta et al., 2010; Negri, 2010), we considered calves to be those individuals of 67 - 81.6 cm and adults those larger than 129.4 cm. If a carcass was sufficiently fresh, partial or complete necropsies were performed by veterinarians or trained personnel using standard cetacean necropsy techniques (Geraci & Lounsbury, 2005). For the estimation of live and dead franciscana records per year, month and season, specimens classified under decomposition category 5 (body mummified or skeleton) were not considered. To visualize the seasonal variability of strandings, this study considered summer (January, February, and March), autumn (April, May, and June), winter (July, August, and September) and spring (October, November, and December)

Results

Temporal distribution of strandings

Between 2003 and 2023, 34 franciscana dolphin strandings were recorded at the Río Negro Estuary (Table 1, Fig. 1). The years with the highest stranding records were 2014 and 2020 (n = 6/ each, mean = 2, sd = 1.88) by year. Seventeen of the events occurred in December (n = 8), September (n = 5), and February (n = 4) (Fig. 2). Autumn and winter/spring were the seasons with the lowest and highest number of strandings, respectively.

Sex and Length

Sex was determined for 21 franciscanas (61.7%) (Table 1). The remaining cases could not be sexed due to the state of decomposition of the carcasses - either 4 (advanced decomposition) or 5 - and because were found alive and immediately released without confirming their sex. For those where sex could be determined, 71% were females and 29% males.

Total body length of females ranged from 64 to 155 cm and males ranged from 70 to 138 cm (Table 1).

Calves

Five of the strandings involved calves, which occurred in December (n = 2), January (n = 1), February (n = 1), and March (n = 1). Total body length ranged from 64 to 70 cm (n = 4). Three of the calves (specimens FCRNPB161211, FCRNPB170114, and FCRNPB130323) stranded alive and were soon returned to the sea. Two of the released specimens measured 70 cm and the length of franciscana FCRNPB130323 was not obtained. No teeth were observed on any of these three calves. Before the release, calves were placed in tidal pools of up to 10 x10 m and depths of up to 70 cm, where they remained for 30 minutes to two hours. In these tidal pools, the specimens recovered their buoyancy and were then returned to the sea. Although the likelihood of these specimens having survived is low, it is important to note that in all cases and in the days following the release, beach and water searches were carried out looking for the animals or possible strandings, but none were found. Three calves found stranded in December, January, and March still bore traces of the umbilical cord, indicating that the animals had been recently born.

Necropsy findings

According to the decomposition category most specimens (n

Table 1. Franciscana dolphin *Pontoporia blainvillei* strandings recorded at the Río Negro Estuary from 2003 to 2023.

#	ID	Date	Lat and Long	Sex	Length (cm)	Decomposition stage *	Notes
1	FCRN-PB101203	10 Dec 2003	41°03′ S, 62°49′ W	M	130	4	
2	FCRN-PB100204	10 Feb 2004	41°03′ S, 62°49′ W	F	113	2	Pneumonia by *Klebsiella pneumoniae.* Beak deviation. Weight = 16kg.
3	FCRN-PB090404	09 Apr 2004	41°02′ S, 62°48′ W	F	NA	5	Incomplete skeleton
4	FCRN-PB060506	06 May 2006	41°03′ S, 62°49′ W	F	NA	5	Incomplete skeleton
5	FCRN-PB270307	27 Mar 2007	41°02′ S, 62°48′ W	F	NA	4	
6	FCRN-PB010907	01 Sep 2007	41°01′ S, 62°47′ W	NA	NA	5	Bycaught. Skull
7	FCRN-PB021208	02 Dec 2008	41°03′ S, 62°51′ W	NA	<100	4	
8	FCRN-PB021009	02 Oct 2009	41°01′ S, 62°46′ W	NA	NA	5	Fragment of mandible
9	FCRN-PB050210	05 Feb 2010	40º59 S, 62º47´ W	F	NA	1	Caught in a hook and release
10	FCRN-PB110710	11 Jul 2010	41°02′ S, 62°48′ W	M	108.2	2	Bycaught
11	FCRN-PB200611	20 Jun 2011	41°01′ S, 62°47′ W	NA	NA	5	
12	FCRN-PB161211	16 Dec 2011	41°03′ S, 62°50′W	F	70	1	Stranded alive and released, umbilical cord.
13	FCRN-PB290212	29 Feb 2012	41°03′ S, 62°50′ W	NA	NA	5	One vertebra
14	FCRN-PB110912	11 Sep 2012	41°02′ S, 62°48′ W	F	114	2	Presence of net marks
15	FCRN-PB160912	16 Sep 2012	41°02′ S, 62°48′ W	M	138	2	Presence of net marks
16	FCRN-PB290912	29 Sep 2012	41°02′ S, 62°48′ W	F	135	4	
17	FCRN-PB121013	12 Oct 2013	41°02′ S, 62°48′ W	F	154	3	Shark bite marks
18	FCRN-PB021213	02 Dec 2013	41º01´ S, 62º47´ W	M	NA	1	Entangled in beach seine and released alive
19	FCRN-PB170114	17 Jan 2014	41°09′ S, 63°07′ W	M	70	1	Stranded alive and released. Umbilical cord.
20	FCRN-PB010214	01 Feb 2014	41°03′ S, 62°52′ W	F	64	4	
21	FCRN-PB040514	30 Apr 2014	41°01′ S, 62°47′ W	NA	NA	4	Presence of net marks
22	FCRN-PB110814	11 Aug 2014	41°02′ S, 62°49′ W	F	132.5	2	Presence of net marks
23	FCRN-PB011214	01 Dec 2014	41º01´ S, 62º46´ W	NA	NA	1	Beak entangled with a fishing line from sports fishing rod)
24	FCRN-PB011214	01 Dec 2014	41º03´ S, 62º49´ W	NA	NA	1	Entangled with a fishing line at the beak and freed itself
25	FCRN-PB270720	27 Jul 2020	41°02′ S, 62°49′ W	F	104	3	Tuberculosis. *Mycobacterium* spp member of *Mycobacterium tuberculosis* complex

26	FCRN-PB250820	28 Aug 2020	41°02′ S, 62°48′ W	F	143	2	Removed from fishing gear. Beak deviation
27	FCRN-PB100920	10 Sep 2020	41°02′ S, 62°49′ W	F	85	3	Presence of net marks
28	FCRN-PB250920	25 Sep 2020	41°02′ S, 62°48′ W	F	155	2	Presence of net marks. Removed from fishing gear
29	FCRNPB021220A	02 Dec 2020	41°03′ S, 62°51′ W	M	123	2	Beak deviation.
30	FCRNPB021220B	02 Dec 2020	41°02′ S, 62°48′ W	NA	64	2	
31	FCRNPB030322	03 Mar 2022	41°02′ S, 62°49′ W	NA	NA	1	Stranded alive and released
32	FCRNPB151122	15 Nov 2022	41°02´ S, 60°49´ W	NA	NA	5	Skull
33	FCRNPB060223	06 Feb 2023	41°01′ S, 62°48′ W	NA	<100	1	Stranded alive and released
34	FCRNPB130323	13 Mar 2023	41°03 S, 62°50´ W	NA	NA	1	Newborn, umbilical cord, , stranded alive and released

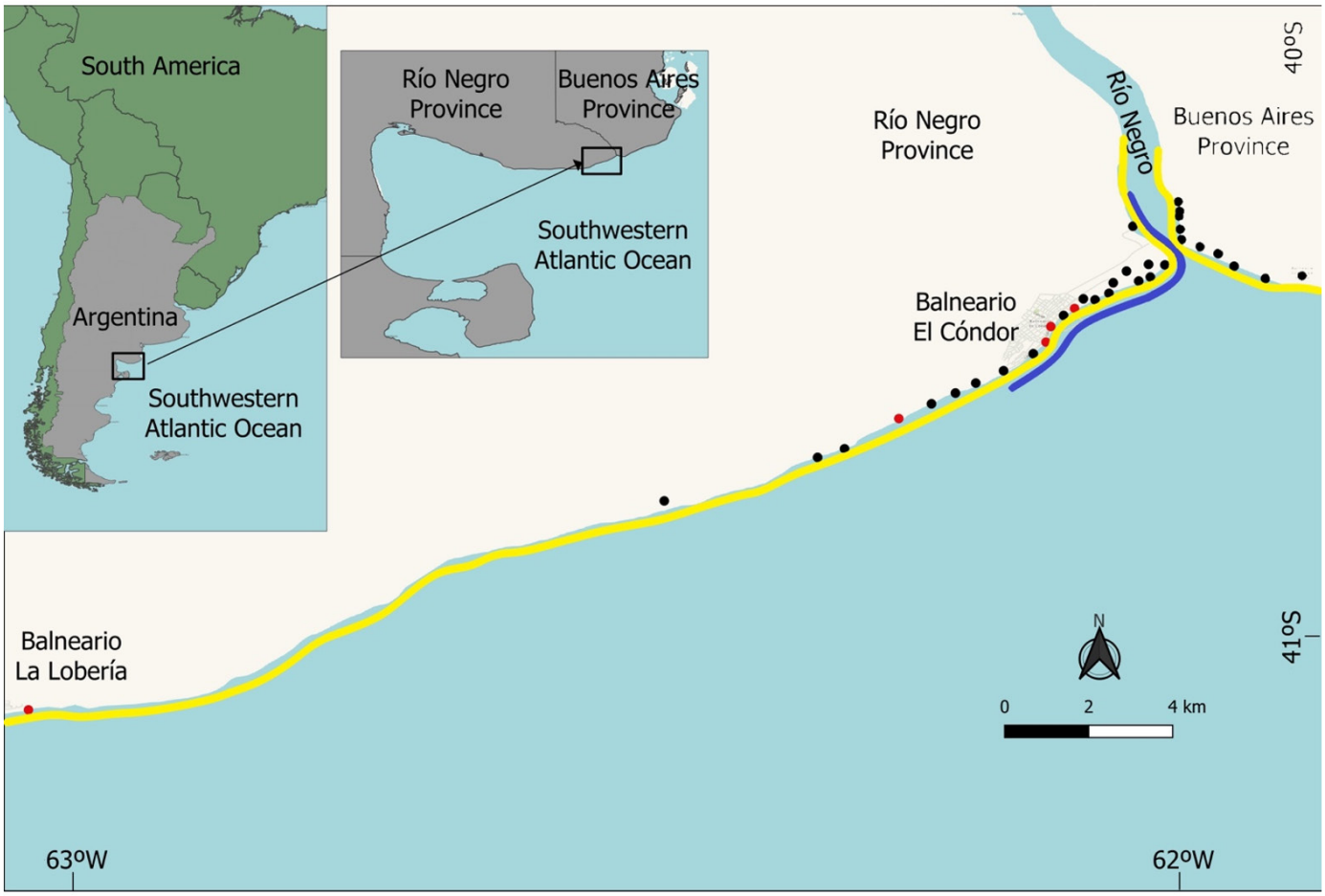

Figure 1. Map showing the Río Negro Estuary and locations of franciscana strandings from 2003 to 2023. Stranded calves are indicated with red dots and the remaining age categories with black dots. The yellow line represents the area covered during the systematic beach survey and the blue line the closed area for gillnets from 15 November to 15 March.

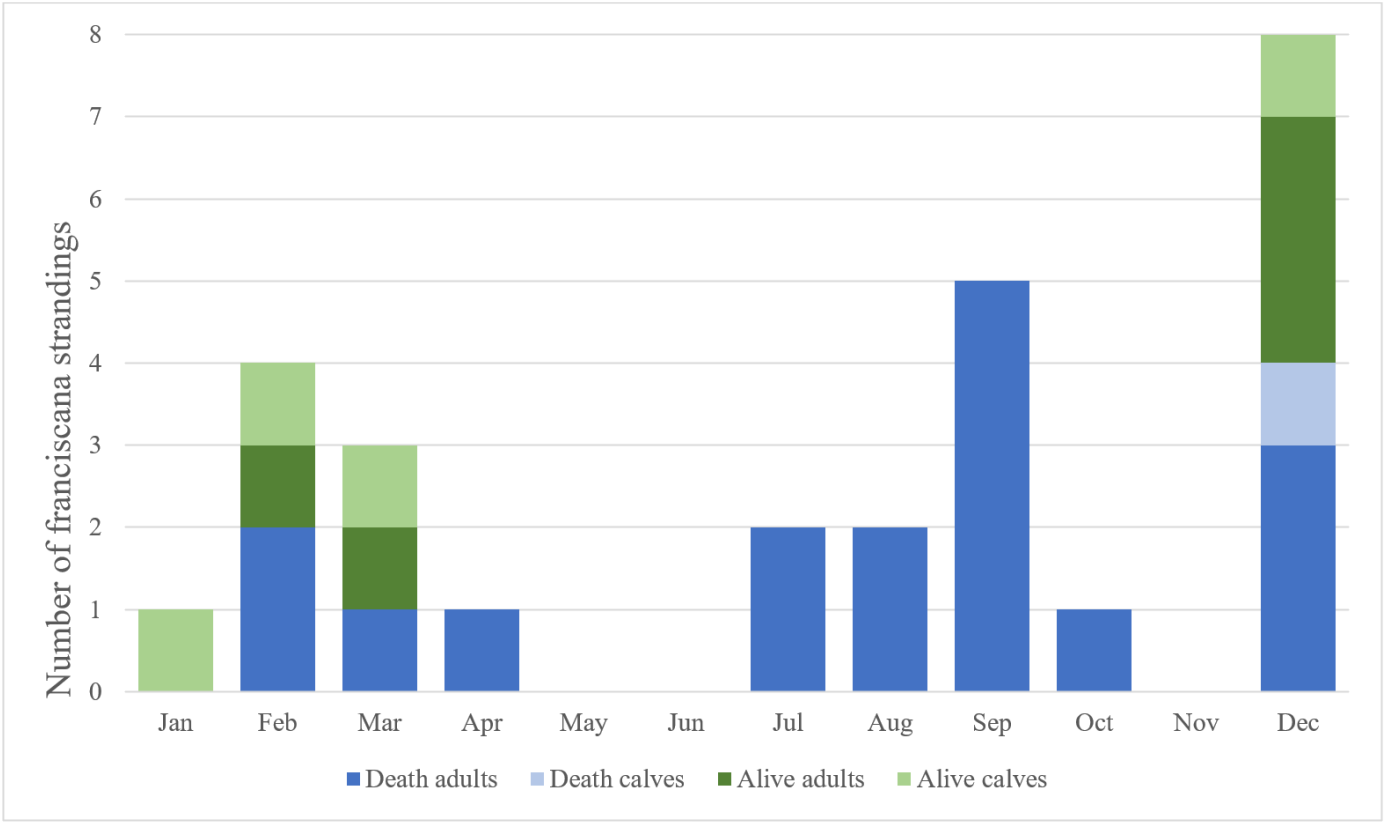

Figure 2. Number of franciscana dead and alive records by month at Río Negro Estuary from 2003-2023.

= 9) were classified as 1 (alive) and 2 (recent death), followed by category 5 (n = 7) (Table 1).

A complete necropsy was only performed in three franciscana dolphins. In specimen FCRNPB100204 the following findings were reported: congestion of the left eye conjunctiva, some bloody fluid (bloody hydrothorax) in the thoracic cavity, bilateral general congestive parenchyma and frothy serous-bloody exudate in the lung airways, and generalized congestion in the gastrointestinal vascular system. The heart did not show any gross lesions and the right ventricle did not contain any blood clots. This animal showed multifocal pneumonic lesions from which *Klebsiella pneumoniae* was isolated and identified microbiologically.

Pseudomonas sp. and coagulase-negative *Staphylococcus* sp. were isolated and identified microbiologically from blowhole and oral samples taken from franciscana FCRN161211, but are probably part of the normal bacterial flora.

A member of *Mycobacterium tuberculosis* complex was isolated and identified microbiologically from dolphin FCRNPB270720 - this being the first reported record of tuberculosis in a franciscana. Despite these detailed descriptions, it was not possible to identify the causes of death of these three individuals.

Stomachs of four specimens were analyzed and only two of them contained macroparasites: Nematoda (Family Anisakidae) and Acantocephala (Family Polymorphidae). Species identification is still in process. The presence of microplastics and plastics was not detected. The intestines of each individual were frozen for further analysis. Seven franciscanas had full stomach contents, which could suggest acute death from interaction with human activities.

Three franciscanas had beak deformities (Fig. 3). One specimen had shark bites, but the species could not be identified, and neither could it be determined whether the dolphin was alive at the time of the attack.

Diet

A total of 79 otoliths (38 left otoliths + 41 right otoliths) representing 41 specimens of white croaker (*Micropogonias furnieri*) were obtained from a single stomach content.

Bycatch

Table 1 shows in detail all recorded cases of bycatch. Out of the 34 franciscanas reported, eleven showed signs of bycatch (4 with net marks, 4 entangled in fishing gears or reported by the fishermen who bycaught them (n=3)). In addition to the specimens entangled in gillnets, entanglements in fishing rod lines and beach seine were also recorded for this area. This is the first report of entanglement of this species in sport fishing gear and a new type of interaction with human activities.

Discussion

Temporal distribution of strandings

Autumn and winter/spring were the seasons with the lowest

Figure 3. Franciscana specimens with beak deformities at the Río Negro Estuary. A: FCRNPB250820; B: FCRNPB021220A.

and highest number of strandings, respectively, similar to what has been found in other FMAs, with the exception of the northern zone of FMA IV, where summer and winter were the periods with the highest and lowest stranding records (Cremer et al., 2022). For the years 2005, 2015 – 2019, and 2021 there were no monitoring efforts, therefore there are no records for those years, and it cannot be assumed that there was no mortality of animals. The 34 stranded specimens for the period 2003-2023 represent only a fraction of the total strandings in this area. Another explanation is that the greatest effort has been made on the southern margin of the estuary, which corresponds to the province of Río Negro, and very sparsely in the province of Buenos Aires, where it is necessary to increase sampling effort.

This work responds to the priority actions on research and monitoring of the IWC CMP for franciscana (IWC, 2016, 2023). Bycatch is the greatest threat to franciscana throughout its range (Secchi et al., 2021), and the Río Negro Estuary is no exception. The information so far published shows the dolphin population in the Río Negro region to be genetically distinct and geographically isolated (Gariboldi et al., 2016). Additionally, the presence of live stranded calves reinforces the importance of the area for the species.

Sex and Length

The number of female strandings is higher than male. The same pattern was described for all FMAs, with females found in higher proportions than males in stranding records, except for FMA III (Cremer et al., 2022). The total body length of females and males of the Río Negro Estuary are within those described for the asymptotic length of specimens from FMA IV (Botta et al., 2010; Negri, 2010). The pattern of females being larger than males was also observed for this area and it is consistent with the sexual dimorphism found for the species (Kasuya & Brownell, 1979; Ramos et al., 2002; Botta et al., 2010; Conversani et al., 2020).

Calves

Calf strandings occurred in spring and summer, which corresponds to the main birth period of the species (Danilewicz, 2003; Denuncio et al., 2013). Previous studies for the Río Negro Estuary suggested a breeding season from November to March (Failla et al., 2012), The presence of calves shows that the Río Negro Estuary is in fact a calving area.

With respect to live calves, the most important action is to reunite them with their mothers. This requires that the calf be reintroduced to the sea as quickly as possible once it has regained its buoyancy and that effort is made to find the mother. Even if the mother is not apparent it is expected that a swiftly-released calf still be found by the mother which may be searching for it nearby. For the FMA IV, a size at birth of 68.8 cm for males and 67.9 cm for females was reported for estuarine franciscanas (Denuncio et al., 2018). Similar results were obtained in the nearby marine area (67 cm for females; Denuncio et al., 2018). The size at birth found in the waters of Río Negro were within the parameters described by Danilewicz et al. (2022), calculated by the Börjesson & Read (2003) overlap method, resulting in 60.7 cm for marine franciscanas of FMA IV.

Necropsy findings

Beak anomalies of franciscanas from the coastal waters of Argentina were described and quantified in another area of the FMA IV, where 12% of the carcasses recovered showed beak deformities (Denuncio et al., 2016). Natural or anthropogenic causes of these anomalies are still unknown, but Denuncio et al. (2016) argued that some cases are probably associated with chronic lesions caused by fishing gear entrapment. In Brazil, less than 1% of animals had beak deviations (Ott et al., 1996). The dead specimens reported here would represent the southernmost reports of beak anomalies for the species in its entire range.

One franciscana specimen had shark bites, but the predator species could not be identified, nor could it be determined if the dolphin was alive at the time of the attack. The broadnose sevengill shark (*Notorhynchus cepedianus*), which is known from the area along with other shark species, has been reported to attack franciscana in Uruguayan waters (Praderi, 1985; Heithaus, 2001). Considering that the FMAe is one of the least studied areas, any study showing the health status of franciscana is potentially important.

Diet

Despite being a single sample, this is the first time that the stomach contents of a franciscana from the Río Negro Estuary has been analyzed and reported. White croaker has been identified as a prey of franciscana for other FMAs (Rodríguez et al., 2002; Botta et al., 2022)

Bycatch

In addition to the specimens entangled in gillnets, entanglements in fishing rod lines and beach seine were also recorded for this area. This represents the first report of entanglement of this dolphin in fishing rod lines (sport fishing gear) and this is another type of interaction with human activities.

Franciscanas are bycaught in gillnets throughout their geographic distribution range (Ott et al., 2002; Negri et al., 2012) and that is probably the main cause of death in the study area. Since 2013, Balneario El Cóndor, municipality of Viedma (province of Río Negro) introduced a ban on the use of gillnets from 15 November to 15 March (Ordinance N°7326 - Concejo Deliberante de Viedma) and this has been implemented every year. Although the Ordinance was enacted to regulate nautical and fishing activity in the area, it benefits the franciscana indirectly, since it is applied during the reproductive season of the species at the Río Negro Estuary. The number of specimens reported during the same period that the ban on the use of gillnets was in place represents 38% of the total number reported, however, and considering that there is no estimate of abundance for FMAe, the Precautionary Approach should be considered until abundance is obtained. Therefore, it is suggested that the temporary ban on the use of gillnets be maintained.

Conclusions

Cetacean strandings are an important source of information about marine mammal species relative abundance and spatial distribution (Maldini et al., 2005; Pyenson, 2010, 2011), hence the importance of strengthening stranding networks, such as the Federal Network of Assistance to Marine Fauna Strandings (RESOL-2019-11-APN-SPARN#SGP) established in 2019 in Argentina. This will allow for more efforts for field stranding responses to better document and understand causes of morbidity and mortality of franciscana in the Río Negro Estuary.

However, effort has been uneven over the years. To increase the number of records it is important to emphasize the relevance of citizen participation, which has made it possible to receive records of stranded specimens that otherwise would have been lost. It is also necessary to carry out systematic monitoring on both margins of the estuary and to accompany this with an abundance estimate for the species in the area under study, to be able to determine the status of this population.

It is important to consider all the mitigation measures that are available to reduce bycatch, including those suggested by the National Action Plan to reduce the interaction of marine mammals with fisheries in Argentina (Consejo Federal Pesquero, 2016), as well as the recommendations by the IWC, and in particular from the franciscana CMP. The latter includes a recommendation for the creation and implementation of a protected area in the Río Negro Estuary (IWC, 2023).

Studies are needed to estimate bycatch mortality, as suggested by Wade (1998) and Moore et al. (2021), including both commercial and sports fisheries, to carry out a population estimate of the FMA IVe or, at least, of the estuary and continue with public awareness campaigns to increase reports of strandings and have a better evaluation of bycatch.

Building capacity to perform necropsies will help to better understand the causes of death of the animals, as well as their health status, thereby helping with species conservation. These recommendations become even more relevant when it is noted that the Río Negro Estuary is considered the southernmost reported breeding, calving, and feeding area (Failla et al., 2012) for these vulnerable dolphins.

Acknowledgements

The authors would like to thank the following institutions and persons: Prefectura Naval Argentina of Carmen de Patagones, town councils of Viedma and Carmen de Patagones, Police of the Río Negro Province, Fundación Cethus colleagues, L. Russo Lacerna, R. Espósito, C. Forlenza, C. Gasparrou, L. González, M. Rodeiro and particularly Ariana Alarcón Saavedra for ploting the records and to Antonio Fernández, Lorenzo Rojas Bracho, and Mark Simmonds for reviewing and improving the manuscript. This work was funded by the Whale and Dolphin Conservation, Fundación Cethus, CEAMSE, Kilverstone Trust, The Rufford Foundation, and the American States Organization.

Data were collected under permit of the environmental authorities of the Río Negro Province (Exp. Nº 132264-DFS-2010 - Dirección de Fauna de Río Negro) and of the Buenos Aires Province (Exp. Nº 2141-23358/18 - OPDS).

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