A note on minke whales (Cetacea: Balaenopteridae) in Uruguay: strandings review

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ABSTRACT

The minke whale is the smallest of the living rorquals and is widely distributed in the tropical, temperate and polar waters of both hemispheres. In the western Southwest Atlantic Ocean there are two currently recognised species, the dwarf form of the common minke whale, *Balaenoptera acutorostrata* unnamed subsp. and the Antarctic minke whale *B. bonaerensis*. All stranding records and collected specimens of minke whale on the coast of Uruguay were reviewed and analysed. Between 1962 and 2018, 33 records were gathered in a non-systematic way, 22 specimens of *B. acutorostrata* and 11 of *B. bonaerensis*. It was found that most animals were discovered alive or recently dead and assigned as neonates/young calves. This supports the hypothesis that Uruguayan coasts are part of an important region for reproduction and breeding for the species.

KEYWORDS: DISTRIBUTION; MORPHOMETRICS; STRANDINGS; SOUTHERN HEMISPHERE; SOUTHWEST ATLANTIC OCEAN

INTRODUCTION

Minke whales (Balaenopteridae) are the smallest living rorquals and are widely distributed in the tropical, temperate and polar waters of both hemispheres (Leatherwood and Reeves, 1983). There are two currently recognised species: the common minke whale, *Balaenoptera acutorostrata* (Lacépède, 1804) and the Antarctic minke whale *B. bonaerensis* (Burmeister, 1867) (Mead and Brownell, 2005). The common minke whale presents three distinguishable subspecies that segregate spatially, the North Atlantic form (*B. a. acutorostrata*), the North Pacific form (*B. a. scammoni*) and the dwarf form (*B. a.* unnamed subspecies) in the Southern Hemisphere (Rice, 1998). The Antarctic minke whale is known to inhabit primarily Southern Hemisphere waters (Perrin and Brownell, 2008), nevertheless there have been records in the Northern Hemisphere (Glover *et al*., 2010; Rosel *et al*., 2016), although it is not known if these extra-limital movements have occurred over a long period of time. In the Southern Hemisphere the Antarctic minke whale is partially sympatric with the dwarf form of *B. acutorostrata* (Perrin and Brownell, 2008).

These two species differ in colour pattern, relative size and cranial features (Best, 1985; Arnold *et al*., 1987; Kato and Fujise, 2000; Zerbini and Simões-Lopes, 2000). As the distinction between the dwarf form of *B. acutorostrata* and the Antarctic minke whale (*B. bonaerensis*) only came to be fully recognised in the late 1990s (Perrin and Brownell, 2008) all the early specimen records of minke whales deserve a re-examination. Furthermore, the biology of these two species in the South Atlantic is poorly known (Zerbini *et al*., 1996; 1997). Consequently, the purpose of this note is: (1) to present a review of all stranding records and collected specimens of *B. acutorostrata* and *B. bonaerensis* on the coast of Uruguay, and (2) to assess some ecological differences between the two species on the basis of the available information.

MATERIALS AND METHODS

Several sources of information were investigated: specimens stored in national collections (Museo Nacional de Historia Natural at Montevideo; Museo del Mar of Punta del Este and the Mammalian Collection at the Facultad de Ciencias, Universidad de la República, Montevideo), published literature and unpublished stranding records. All records corresponded to live or dead stranded animals. For practical reasons, this study will refer to the term stranding in general, regardless of whether it is a stranding or a beached animal in the sense of Hofman (1991).

The specimens were identified to a species-specific level using cranial or external morphological characteristics and the maturity status of each was assessed. When the skull was available, the species was determined following the main criteria proposed by Omura (1975), Arnold *et al*. (1987) and Zerbini and Simões-Lopes (2000). In the Antarctic minke whale, the parietals and interparietal are not in contact in the vertex, the anterior border of frontals is concave and the anterior margin of the supraoccipital is convex. In the dwarf minke whale, the parietals and interparietal are in contact in the vertex, the anterior border of frontals is straight and the anterior margin of the supraoccipital is curved posteriorly in the midline.

Whenever possible, the specific identification was also achieved based on external colour patterns described by Best (1985), Arnold *et al*. (1987), Zerbini *et al*. (1996) and Arnold *et al*. (2005). The Antarctic minke whale presents flippers in shades of grey, without the white shoulder patch or white basal flipper blaze. The dark throat patch does not extend ventrally further than a line roughly between the eye and flipper insertion, so that the ventral grooves appear almost entirely white in the throat region. The dwarf minke whale presents a distinct white patch in the shoulder area and a white basal flipper blaze. The dark throat patch extends further ventrally, with as many as 15 ventral grooves down from the level of the eye to flipper insertion.

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The maturity status of each whale was assessed and specimens were separated into three classes based on total body length following Zerbini and Simões-Lopes (2000): Class I (sexually immature – neonates and young calves), Class II (sexually immature – possibly subadults) and Class III (sexually mature). Furthermore, all the data associated with the strandings was retrieved and verified. For each specimen the total body length, sex, date of stranding, locality, geographic coordinates, and body condition were recorded. Total body length was taken after Norris (1961). Sex was obtained by visual inspection of external or internal genitalia. The date of stranding corresponds to the day on which the animal was first encountered in the field. Therefore, this date must be considered as an approximation for specimens in an advanced state of decay. The strandings registered by the authors have geographic coordinates obtained by GPS *in situ*. In the case of stored museum specimens, the stranding locality was read from the original label and the geographical coordinates were estimated as approximations (coastal centroids of locality). Determination of body condition state for each specimen followed Kuiken and García-Hartmann (1991): 1. Animal alive; 2. Recently dead (no bloating); 3. Moderate decomposition (bloating, skin peeling but organs still intact); 4. Advanced decomposition (major bloating, organs beyond recognition); and 5. Very advanced decomposition (no organs are present).

RESULTS

Thirty three records of minke whales were obtained, from 1962 to 2018. Twenty two specimens (67%) were identified as *B. acutorostrata* (7 females, 15 indeterminate) and 11 (33%) as *B. bonaerensis* (4 males, 4 females, 3 indeterminate) (see Table 1). It was found that seven specimens held in zoological collections were previously misidentified, two were re-identified as *B. acutorostrata* and five as *B. bonaerensis*.

The total body length of *B. acutorostrata* ranged from 200 to 800cm (Mean = 349cm, SD = 173cm, see Fig. 1). Strandings of this species occurred between April and December (apparently almost absent in austral summer) with two strong peaks in April and November (see Fig. 2). The specimens were classified as Class I (n = 13; 59%), Class II (n = 7; 32%) and Class III (n = 2; 9%). The spatial distributions of the strandings is illustrated in Fig. 3 and were as follows: 12 records on the coast of Rio de la Plata, 9 on the coast of the Atlantic Ocean and 1 whose location is unknown. Of the 16 specimens for which the body condition was known, 15 exhibited almost no signs of decomposition (states 1 and 2), 1 moderate decomposition (state 3) and 6 in an unknown state. The observed sexual ratio was biased towards females (1 male: 7 female), but the low number of records does not allow us to make any inferences.

For *B. bonaerensis* the total body length ranged from 240 to 950cm (Mean = 391cm, SD = 202, Fig. 1). There were no signs of any seasonal pattern in the frequency of standings, possibly due to the low number of observations. Nevertheless, a continuum of strandings was observed between July and February, with absence in the months of March to June and October. The specimens classified as Class I (n = 9, 81.8%) were far more common than those of Class II (n = 1, 9.1%) and Class III (n = 1, 9.1%). Four strandings were on the coast of Rio de la Plata, 6 on the coast of the Atlantic Ocean and 1 whose location is unknown (Fig. 3). Of the 10 specimens for which the condition is known, 9 exhibited almost no signs of decomposition (states 1 and 2) and 1 showed advanced decomposition (state 4). The stranded specimens with information on sex suggested a 1:1 sexual ratio (4 male: 4 female).

As a result of the analysis of the data recorded in each event both species shared some other characteristics in relation to the mode of strandings, e.g. very recent death or still alive (Fig. 4) or isolated events (i.e. not accompanied with sightings or reports of other living individuals at sea). Stranded specimens also shared no obvious evidence or signs of bycatch, ship strikes or visible pathologies that could have caused the stranding. This does not mean that these are not implicated in the death of the whales since it was not possible to perform post-mortem necropsies.

DISCUSSION

In spite of the modest extent of the Uruguayan coastline (ca. 600km), the total number of stranding records of minke whales is high if compared to the results of Zerbini *et al*.

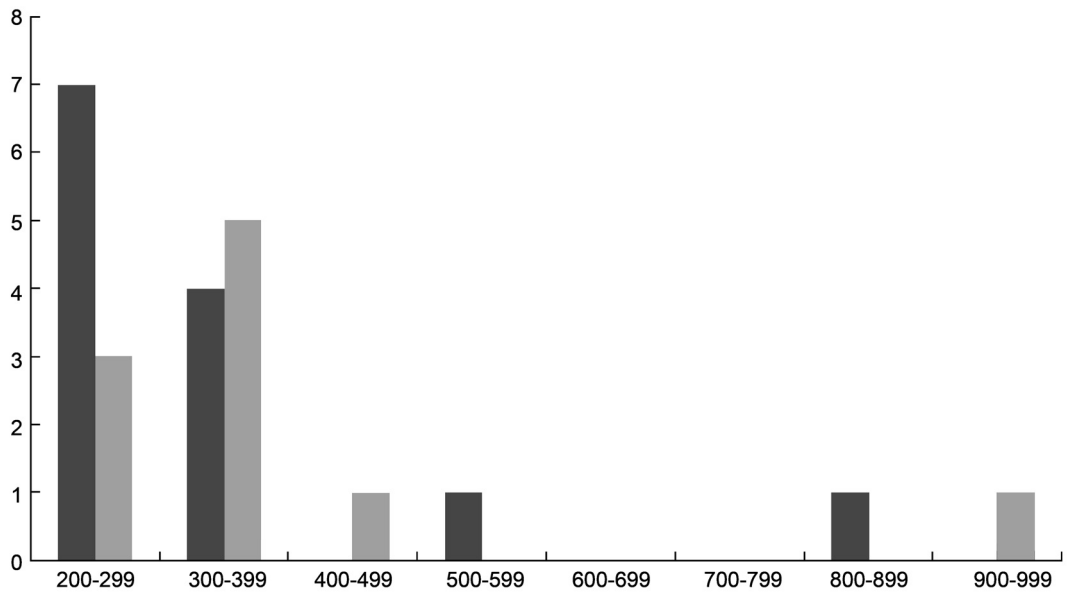

Fig. 1. Total body length of recorded specimens (cm). Dark grey bars: B. *acutorostrata*; light grey bars: *B. bonaerensis*.

Table 1
Records of stranded minke whales in Uruguay.

No.	Species	Locality, Department	Coordinates	Date	Sex	TL	Condition	Identification criteria	Source
1	*B. acutorostrata*	Isla del Tigre, SJ	34°47'11"S; 56°23'55"W	30/09/1962	–	300	2	CP	Ximénez *et al*. (1972)
2	*B. acutorostrata*	Santa Teresa, RO	34°00'58"S; 53°32'21"W	1972	–	–	–	SM	MPD w/n
3	*B. acutorostrata*	Piríapolis, MA	34°53'20"S; 55°16'34"W	17/04/1974	–	550	2	CP	Praderi (1980)
4	*B. acutorostrata*	Boca del Cufré, CO	34°26'49"S; 57°09'14"W	20/08/1983	F	397	2	SM	MNHN 4794
5	*B. acutorostrata*	Cabo Polonio, RO	34°24'10"S; 53°46'37"W	05/11/1992	F	320	2	CP	Present study
6	*B. acutorostrata*	Undetermined, MA	–	1996	–	–	1	CP	Present study
7	*B. acutorostrata*	Piríapolis, MA	34°52'29"S; 55°16'45"W	15/09/1999	–	200	2	SM	MMPE 23
8	*B. acutorostrata*	Solymar, CA	34°50'11"S; 55°57'01"W	27/06/2002	F	800	2	CP	Present study
9	*B. acutorostrata*	Las Flores, MA	34°48'59"S; 55°19'44"W	11/04/2005	F	495	2	CP	Present study
10	*B. acutorostrata*	Cerro de Montevideo, MO	34°53'46"S; 56°14'48"W	26/11/2006	F	266	1	CP and SM	MNHN 5841
11	*B. acutorostrata*	Punta del Este, MA	34°55'55"S; 54°53'40"W	04/11/2008	F	236	2	CP and SM	MNHN 6461
12	*B. acutorostrata*	El Calabrés, CO	34°28'18"S; 57°48'15"W	19/11/2011	–	280	3	SM	MNHN 7295
13	*B. acutorostrata*	Piríapolis, MA	34°51'59"S; 55°16'39"W	15/04/2012	–	250	1	CP	Present study
14	*B. acutorostrata*	Trouville, MO	34°55'09"S; 56°08'52"W	06/11/2012	–	200	1	CP	Present study
15	*B. acutorostrata*	La Barra, MA	34°54'60"S; 54°51'33"W	15/08/2014	–	–	1	CP	Present study
16	*B. acutorostrata*	Playa Hermosa, MA	34°50'26"S; 55°18'17"W	01/12/2015	F	244	1	CP	Present study
17	*B. acutorostrata*	Punta del Este, MA	34°54'43"S; 54°59'37"W	17/04/2018	–	–	1	CP	Present study
18	*B. acutorostrata*	Jose Ignacio, MA	34°49'45"S; 54°37'25"W	04/07/2018	–	–	1	CP	Present study
19	*B. acutorostrata*	Los Botes, RO	34°39'50"S; 54°10'24"W	–	–	–	–	SM	MMPE 01
20	*B. acutorostrata*	Unknown, RO	–	–	–	–	–	SM	Present study
21	*B. acutorostrata*	Unknown, SJ	–	–	–	–	–	SM	Present study
22	*B. acutorostrata*	Undetermined	–	–	–	–	–	SM	MNHN 6911
23	*B. bonaerensis*	Punta del Este, MA	34°57'54"S; 54°56'25"W	14/11/1995	F	290	2	SM	ZVCM 2106
24	*B. bonaerensis*	Punta Colorada, MA	34°54'15"S; 55°15'40"W	15/12/1997	–	370	2	SM	MMPE 14
25	*B. bonaerensis*	Valizas, RO	34°18'36"S; 53°47'29"W	30/2/1998	–	400	1	CP	Present study
26	*B. bonaerensis*	Lagomar, CA	34°50'52"S; 55°58'20"W	26/08/2000	F	335	2	CP	Present study
27	*B. bonaerensis*	La Coronilla, RO	33°53'32"S; 53°30'21"W	13/07/2003	F	369	2	CP	Present study
28	*B. bonaerensis*	Punta del Diablo, RO	34°01'53"S; 53°32'26"W	12/11/2006	M	350	2	CP	Present study
29	*B. bonaerensis*	Cabo Polonio, RO	34°24'13"S; 53°47'54"W	28/02/2007	M	950	4	SM	Present study
30	*B. bonaerensis*	El Pinar, CA	34°48'10"S; 55°53'15"W	02/08/2009	M	240	1	CP	Present study
31	*B. bonaerensis*	La Paloma, RO	34°39'20"S; 54°08'28"W	23/08/2011	M	281	2	CP	Present study
32	*B. bonaerensis*	Kiyú, SJ	34°42'29"S; 56°41'44"W	10/09/2018	F	325	1	CP	MNHN 8203
33	*B. bonaerensis*	Undetermined	–	–	–	–	–	SM	ZVCM 2128

Key to abbreviations: Departments: CA = Canelones, CO = Colonia, MA = Maldonado, MO = Montevideo, RO = Rocha, SJ = San José. Date is noted as dd/mm/year. TL: total body length (cm). Condition (see text). Identification criteria: CP = colour pattern, SM = skull morphology. Sources: MMPE = Museo del Mar de Punta del Este (Maldonado), MNHN = Museo Nacional de Historia Natural (Montevideo), MPD = Museo de Punta del Diablo (Rocha), ZVCM = Collection of the Sección Zoología – Vertebrados of the Facultad de Ciencias (Universidad de la República, Montevideo).

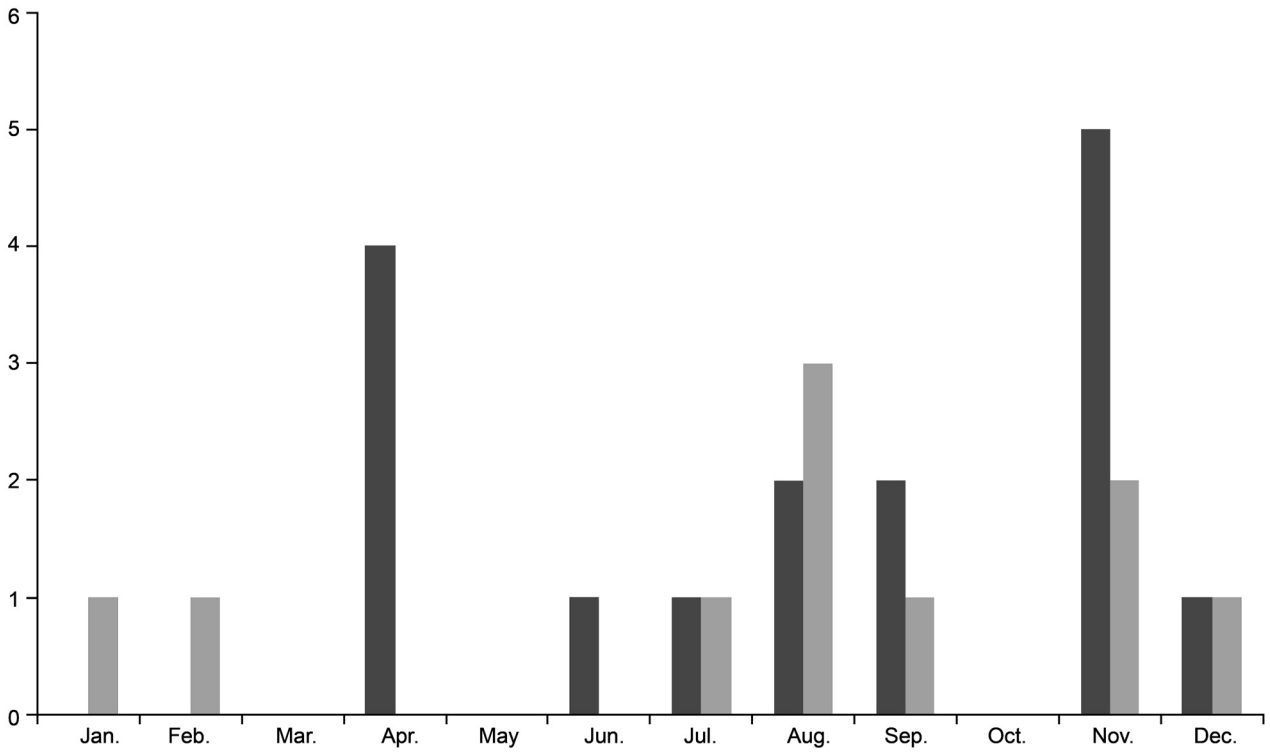

Fig. 2. Occurrences according to the month. Dark grey bars: *B. acutorostrata*; light grey bars: *B. bonaerensis*.

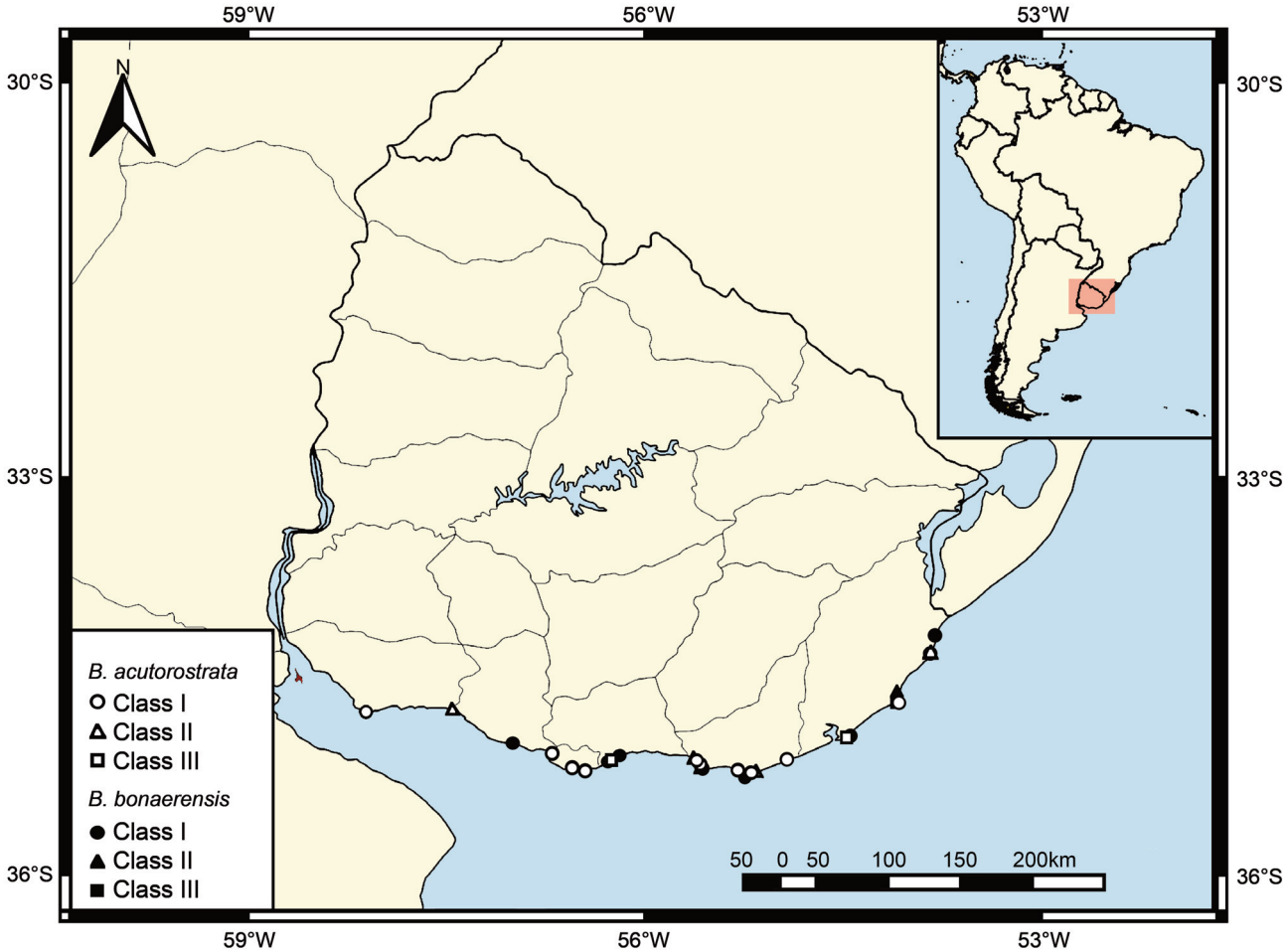

Fig. 3. Spatial distribution of strandings of minke whale species in Uruguay.

(1996; 1997), who found a total of 42 specimens stranded for all the coasts of Brazil (ca. 7,400km) from 1914 to 1995. This incidence could be related to the oceanographic dynamics of the subtropical convergence and the contribution of fresh water from the Uruguay and Parana rivers (Wainer *et al*., 2000, Jaime *et al*., 2002), which make the mouth of La Plata River a highly variable estuarial region (Guerrero *et al*., 2010). Such variability, as well as its funnel shape, the presence of many sand banks, the important eolic tides and intense maritime traffic, may contribute to the amount of strandings recorded in this region (Del Bene *et al*., 2006).

Due to the absence of a national stranding program and therefore the lack of systematic field surveillance, our records of minke whales strandings in Uruguay are most likely to be underestimated. Nevertheless, in a regional context the frequencies by species are not very different from those reported for Brazil (Zerbini *et al*., 1996; 1997). Our sample size does not allow the demonstration of any significant seasonality of *B. acutorostrata* and *B. bonaerensis* stranding pattern. Nevertheless, when considering the published data all together, a greater occurrence of both species stranding during winter and spring months is observed in southern Brazil, Uruguay and for the northern coast of Argentina (Marelli, 1918; Baldas and Castello, 1986; Albareda and Castello, 1990; Bastida *et al*., 1992; Zerbini *et al*., 1996; 1997; Secchi *et al*., 2003; Ott *et al*., 2010).

For both species, we found a strikingly high frequency of newborns and calves, alive or recently dead, with no apparent injuries other than those of the stranding itself. It is however important to emphasise that bycatch, ship strike or other pathologies also cannot be ruled out as the cause of death or stranding. The high incidence of strandings of newborns and calves in the area is consistent with the Baldas and Castello (1986) hypothesis which proposes that these latitudes could be a breeding area for the dwarf form in the Southwest Atlantic Ocean (SWA). However, no sightings of adults in surrounding waters were reported at any of the strandings. This supports the Zerbini *et al*. (1997) suggestion that Antarctic minke whales may give birth in middle latitudes (between at least 25º–30ºS) of the SWA, according to the migratory pattern of this species (Williamson, 1975).

In general, Class III specimens were scarce for both species. For *B. acutorostrata* one individual was measured to be 800cm, this is unusually long for the species, since maximum lengths are considered to be 700cm and 650cm approximately for female and males respectively (Perrin and Brownell, 2008). This length determination could have resulted from lack of precision in the measurement taken by the collectors (none contributed to this study), or an estimate of the size made by the collectors in the field. Nevertheless, similar body lengths have been previously recorded in the region (Baldas and Castello, 1986).

CONCLUSION

Due to the scarce knowledge on the biology of both species of minke whale it is imperative that a systematic record of

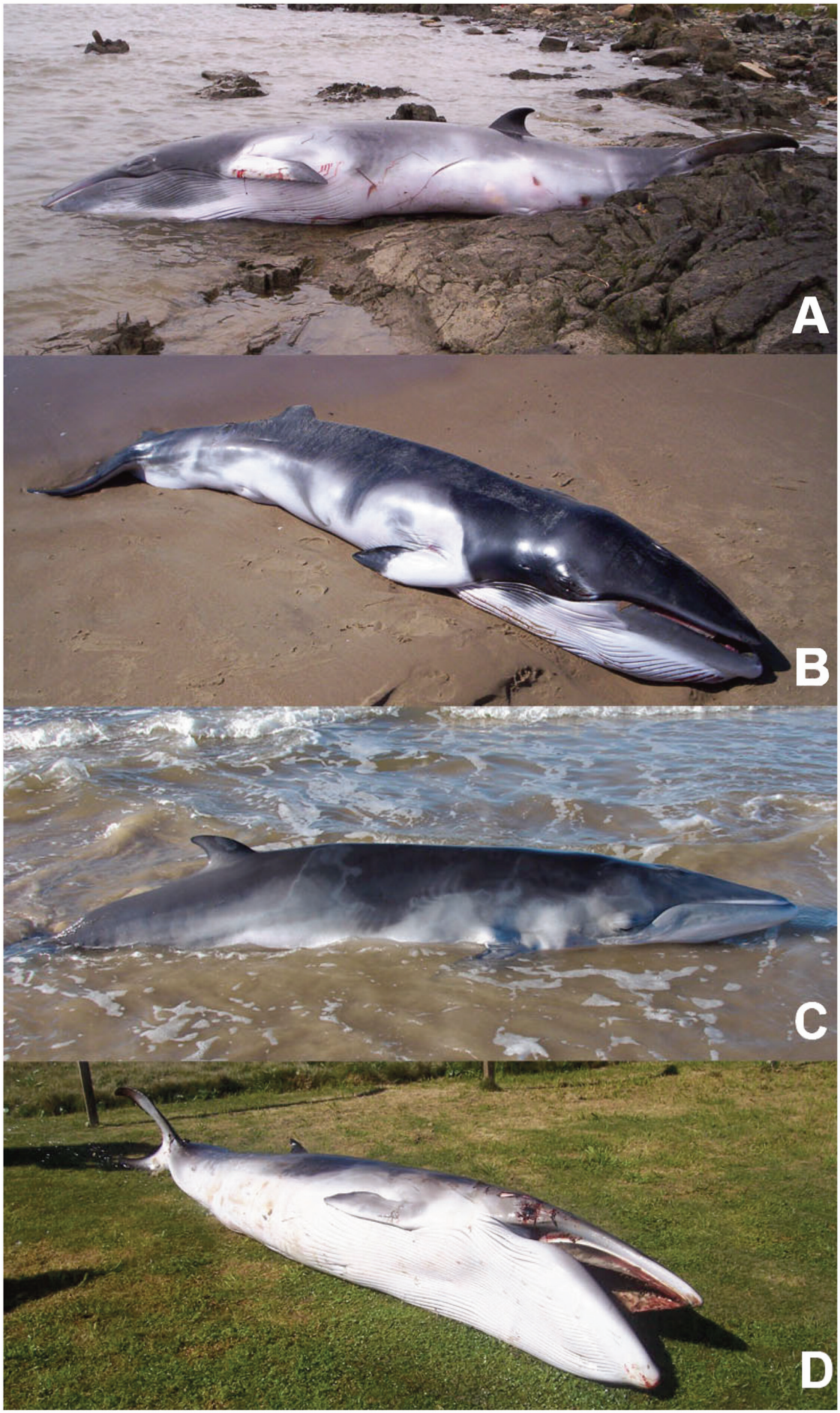

Fig. 4. Body condition showing colour pattern for *B. acutorostrata* (A, B) and *B. bonaerensis* (C, D).

their strandings be maintained. Where possible, necropsies should be conducted. This should be ideally coordinated at regional level. As previously suggested, the SWA represents an important area for reproduction and breeding of the species (Baldas and Castello, 1986; Zerbini *et al*., 1997; Ott *et al*., 2010).

Although it is not often that a cause of stranding can be determined, the systematic study of stranded cetaceans provides valuable information about relevant aspects of their biology and pathology. Furthermore, in the context of a reproduction and breeding area this type of information represents a valuable tool for planning future conservation actions towards the species.

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