SC/66b/SH/20

Sei whales, Balaenoptera borealis, in the South-Western Atlantic Ocean: the discovery of a calving ground in Brazilian waters

Vanessa L. Heissler, Karina B. do Amaral, Nathalia Serpa, Guilherme Frainer, Salvatore Siciliano, Eduardo Secchi & Ignacio B. Moreno

INTERNATIONAL WHALING COMMISSION

SEI WHALES, *Balaenoptera borealis*, IN THE SOUTH-WESTERN ATLANTIC OCEAN: THE DISCOVERY OF A CALVING GROUND IN BRAZILIAN WATERS

Vanessa L. Heissler[1], Karina B. do Amaral[1], Nathalia Serpa[1], Guilherme Frainer[1,2], Salvatore Siciliano[3], Eduardo Secchi[4] & Ignacio B. Moreno[1,2*]

1. Laboratório de Sistemática e Ecologia de Aves e Mamíferos Marinhos (LABSMAR), Departamento de Zoologia – IB/UFRGS. Av. Bento Gonçalves, 9500 - Bloco IV - Prédio 43435 - Sala 206. Porto Alegre/RS, CEP 91509-900, Brazil.
2. Centro de Estudos Costeiros, Limnológicos e Marinhos - CECLIMAR/IB/UFRGS, Av. Tramandaí, 976, Imbé/RS, CEP 95625-000, Brazil.
3. Instituto Oswaldo Cruz/Fiocruz, Pavilhão Mourisco – sala 122. Av. Brasil, 4.365 Manguinhos, Rio de Janeiro/RJ, CEP 21040-900, Brazil & Grupo de Estudos de Mamíferos Marinhos da Região dos Lagos (GEMM-Lagos).
4. Laboratório de Ecologia e Conservação da Megafauna Marinha (EcoMega), Instituto de Oceanografia Universidade Federal do Rio Grande/FURG, Cx.P. 474, Rio Grande/RS, CEP 96203-900, Brazil.

*Corresponding author: iggy.moreno@gmail.com

Abstract

Sei whales (*Balaenoptera borealis* Lesson, 1838) occurs in all oceans, but appears to be more usual in temperate waters than others balaenopterids. Over 200,000 sei whales are recorded taken by modern whaling in the southern hemisphere during 1905–1979. It is listed as "endangered" according to the IUCN. Like other mysticetes, sei whales perform annual long distance north-south migrations. Furthermore, its occurrence is correlated with offshore, pelagic waters and the shelf-slope break. In the South-western Atlantic Ocean (SWA), besides whaling data, there are few records of sei whales in Argentinian and Brazilian waters. In this sense, there is a lack of information on its feeding and breeding areas as well as migratory destinations in the southern hemisphere. Herein, the distribution of sei whale was reviewed based on literature and new records from SWA. Surveys were conducted on Vitória-Trindade Seamount Chain (VTC), Brazil, between 2011 and 2015. Thirteen groups of sei whales were recorded during the expeditions. The groups size range from one to five individuals, including adults and calves. These new records and the presence of new-born individuals indicate that Trindade Island and Martin Vaz Archipelago represent the winter concentration and breeding area for the species in the SWA. These data add new considerable information to the distribution knowledge of sei whales as well as contributes with conservation efforts in the southern hemisphere.

Keywords: Sei whale –Breeding grounds – Distribution – South-western Atlantic Ocean

Introduction

The sei whale, *Balaenoptera borealis* Lesson, 1838, the third largest baleen whale, occurs in all oceans, but tends to be found in more temperate waters than others balaenopterids. Like most rorquals, sei whales engage in annual long distance migrations. During the austral summer, the sei whale moves to high latitude areas to feed, while on the winter they migrate to low latitudes to reproduce (Horwood, 1987). Furthermore, the occurrence of the sei whale is correlated with offshore, pelagic waters, and the shelf-slope (Deméré, 2014).

The sei whale is considered one of the most poorly known of all baleen whales (Horwood, 2009). Currently, sei whale is listed as "endangered" by the IUCN (Reilly *et al.*, 2008), due to population reduction caused by the commercial whaling in the nineteenth and twentieth centuries. Estimates suggest that the

global population of mature individuals declined by *ca.* 80% between 1937 and 2007. In the southern hemisphere, there are no estimates for population size more recent than 1979, with around 9,800-12,000 individuals (Deméré, 2014). Ever since, the *International Whaling Commission* (IWC) established full protection to sei whales in the southern hemisphere. Furthermore, it is not totally clear if this species has recovered from the impacts of the whaling period (Reilly *et al.*, 2008).

In the South-western Atlantic Ocean (hereafter, SWA), sei whales were caught in waters of Brazil and South Georgia Island (Horwood, 2009). In Brazilian whaling stations, sei whale catches were prevalent during the 40-60 years of whaling period (1947 to 1965), when approximately 5,000 individuals were captured (Paiva and Grangeiro, 1965, 1970; Williamson, 1975; Toledo and Langguth, 2009). However, sei and Bryde's (*Balaenoptera edeni*) whales were not distinguished in the catch statistics prior to 1967. Nevertheless, Williamson (1975) mentioned that sei whales represented about 90% of these species combined.

After the whaling period, few sightings and strandings of sei whales were recorded off southwestern South America (Bastida and Lichtschein, 1984; Barros, 1991; Simões-Lopes and Ximenez, 1993; Andriolo *et al.*, 2010; Iñíguez *et al.*, 2010; Ramos *et al.*, 2010; Santos *et al.*, 2010; Leonardi *et al.*, 2011; Richardson *et al.*, 2012; Reyes and Iñíguez, 2013; Mandiola *et al.*, 2015; Reyes *et al.*, 2015). Remarkably, no records of sei whale calves have been documented in the Atlantic Ocean and the calving and breeding grounds remains undefined in these waters (e.g. Prieto *et al.*, 2012).

In view of this, we provide new sighting records of sei whales and indicate the putative breeding area of the species in the SWA. In addition, a detailed revision of the present knowledge regarding the occurrence of this species since the end of the whaling period in South America is presented.

Materials and Methods

The SWA is defined here as waters west of 20°W and waters up to 60°S limited by the Southern Ocean. The Vitória-Trindade Seamount Chain (hereafter, VTC) is a series of volcanic seamounts of different depths disposed in a West to East alignment off the Brazilian coast between 20 and 21°S (Almeida, 2006; Pinheiro *et al.*, 2015). The chain begins off the Brazilian shelf-break near Abrolhos Bank (~18ºS) and ends in the Trindade island (20°30'S; 029°20'W) and Martin Vaz Archipelago (Almeida, 2006). The origin of Trindade Island and Martin Vaz Archipelago dates back to Pliocene and they form the most isolated insular group off the Brazilian coast at about 1,160 km from the mainland (Almeida, 2006; Pinheiro *et al.*, 2009).

Sightings of sei whales were recorded between 2011 and 2015 during cetacean surveys conducted in adjacent waters and over the VTC under the ProTrindade Program (see acknowledgements). The objective of the surveys was to conduct sightings of cetaceans on the VTC region and around the Trindade Island and Martin Vaz, to increase knowledge on the distribution of oceanic cetaceans. These records were obtained by marine mammal's observers in different platforms and vessels. Data were collected following standard line transect methodology (Buckland *et al.*, 1993). When a group of sei whales was sighted information of date, time, position (latitude and longitude), weather, sea state condition (Beaufort), estimated number of individuals, and the presence of calves were collected and behavioural information were taken. Sei whales were identified based on a combination of external characters, including: body size (usually larger than 13m); pigmentation (dark body with patches of lighter grey, both sides of head evenly dark); a sickle-shaped dorsal fin, a head slightly arched, and a single rostral ridge on the head. The sightings were documented by photographic records and confirmed later by whale experts.

In order to compile the highest number of information regarding sei whales occurrence in the SWA (*e.g.* sightings, strandings and captures), several whaling documents available by IWC and scientific articles

were accessed. The searched was conducted in Scholar Google, IWC site and Web of Science with keywords as “sei whale”, “baleen whales”, “SWA”, “distribution” and others.

Results

Seven surveys were conducted during the course of the project (Table 1). Sei whales were recorded in three surveys, with a total of 13 sightings on the region of the VTC (Table 2). The first sei whale sighting was obtained on late May 2011 when a solitaire adult was observed between Trindade and Maritn Vaz. The remaining observations were made on the May-June 2015 expedition. In this year, three groups were composed of adults and calves. The first group consisted of two adults and one sub-adult, the another was composed of a mother-calf (new-born calf with c.450 cm, Best & Lockyer, 2002) (Figure 2); and the last one was a group of 4-6 individuals including a calf. The mother-calf pair was sighted very close (aprox. 1.5nm) to Trindade Island at depth of 103m.

Table 1. Survey periods along Vitória-Trindade Seamount Chain and adjacent waters conducted under ProTrindade Program from 2011 to 2015

Surveys	Months											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
ProTrindade I					X	X						
ProTrindade II											X	
ProTrindade III			X									
ProTrindade IV							X					
ProTrindade V							X	X				
ProTrindade VI								X				
ProTrindade VII					X							
ProTrindade VII[1]						X						

1- This survey was performed as a return trip to mainland only by two observers searching whales off effort.

Table 2 - New records of sei whales along Vitória-Trindade Seamount Chain and adjacent waters.

Date	N° Individuals (calf/sub-adults)	Latitude	Longitude	Depth (meters)	Water temperature (°C)
27 May 2011	1	20°35’S	031°40’W	3670	-
24 May 2015	3(1)	20°50’S	030°46’W	4690	25°C
24 May 2015	3	20°50’S	030°44’W	4665	25°C
28 May 2015	2(1)	20°33’S	029°19’W	103	25°C
30 May 2015	1	22°23’S	037°24’W	3588	24,5°C
31 May 2015	1	23°11’S	040°22’W	2442	23°C
21 June 2015	2-3	20°30’S	028°55’W	1486	-
21 June 2015	1	20°29’S	029°13’W	2949	-
23 June 2015	1	20°35’S	032°27’W	4286	-
24 June 2015	4-6(1)	20°27’S	035°35’W	3322	-
24 June 2015	1	20°28’S	035°33’W	3410	-
24 June 2015	2	20°27’S	035°38’W	2551	-
24 June 2015	1	20°25’S	035°58’W	44	-

Altogether, the literature review resulted in 65 records including sightings and strandings after the whaling period (Figure 3) – see Table 3.

Table 3 - Literature review including sightings and strandings events after the whaling period.

Nº	Date	Type of record	Latitude	Longitude	Local/Other information	Number of individuals	Source
1	07 March 1980	Stranding	20°21'S	040°17'W	Praia da Costa, Vila Velha, state of Espírito Santo (BRA)	1	Barros 1991
2	24 December 1981	Sighting	52°28'S	062°50'W	Water temp.= 8°C	1	Bastida and Bastida 1984
3	24 December 1981	Sighting	52°47'S	061°49'W		1	Bastida and Bastida 1984
4	25 December 1981	Sighting	54°36'S	061°12'W		2	Bastida and Bastida 1984
5	25 December 1981	Sighting	55°57'S	057°12'W	Water temp.= 5°C	1	Bastida and Bastida 1984
6	18 August 1988	Stranding	23°45'S	045°50'W	Boracéia, Bertioga, state of São Paulo (BRA)	1	Zerbini *et al*., 1997; Santos *et al.*, 2010.
7	November 1989	Stranding	27°27'S	048°22'W	Santinho, Florianópolis, state of Santa Catarina (BRA)	1	Simões-Lopes and Ximenez 1993
8	1994	Skull dredged from the sea bottom.	32°40'S	050°20'W	Southern coast of the state of Rio Grande do Sul (BRA) – Record not present in map.	1	Siciliano *et al.,* 2011
9	27 Jan to 12/13 Feb, 1997	Sighting	53°21'S	042°19'W			Moore *et al*., 1999
10	27 Jan to 12/13 Feb, 1997	Sighting	53°18'S	042°11'W			Moore *et al*., 1999
11	27 Jan to 12/13 Feb, 1997	Sighting	53°14'S	042°22'W			Moore *et al*., 1999
12	27 Jan to 12/13 Feb, 1997	Sighting	53°14'S	042°33'W			Moore *et al*., 1999
13	27 Jan to 12/13 Feb, 1997	Sighting	53°26'S	039°34'W			Moore *et al*., 1999
14	30 Jan to 11 Feb, 1997	Sighting	53°38'S	037°22'W			Moore *et al*., 1999
15	30 Jan to 11 Feb, 1997	Sighting	53°24'S	037°6.5'W			Moore *et al*., 1999
16	30 Jan to 11 Feb, 1997	Sighting	53°56'S	035°44'W			Moore *et al*., 1999
17	30 Jan to 11 Feb, 1997	Sighting	54°8'S	035°22'W			Moore *et al*., 1999
18	30 Jan to 11 Feb, 1997	Sighting	54°12'S	035°10'W			Moore *et al*., 1999
19	04 August 2000	Stranding	13°S	038°27'W	North of the state of Bahia (BRA)	1	Velozo, 2007
20	August 2000	Sighting	8°28'S	033°40'W	80 miles off state of Pernambuco (BRA)	1	Andriolo *et al.,* 2010
21	August 2000	Sighting	8°41'S	033°17'W	100 miles off state of Pernambuco (BRA)	1	Andriolo *et al.,* 2010
22	1996-2000	Sighting	54°31'S	036°0.5'W			Richardson *et al.,* 2012
23	1996-2000	Sighting	53°36'S	040°60'W			Richardson *et al.,* 2012
24	27 May 2002	Sighting	24°25'S	044°1'W	BS-400 Santos, state of São Paulo (BRA)	3	Ramos *et al.,* 2010
25	01 August 2004	Sighting	46°14'S	067°36'W	Land platform	3	Iñíguez *et al.,* 2010
26	2004	Stranding	-	-	Mar del Sud (ARG)	1	Leonardi *et al*, 2011
27	February 2005	Sighting	51°45'S	061°10'W	Land platform	17	Iñíguez *et al.,* 2010

28	02 March 2005	Sighting	45°52'S	067°28'W	Land platform	1	Iñíguez *et al.,* 2010
29	02 March 2005	Sighting	45°52'S	067°28'W	Land platform	1	Iñíguez *et al.,* 2010
30	21 June 2005	Sighting	19°46'S	033°29'W			Siciliano *et al.,* 2011
31	21 June 2005	Sighting	20°1'S	032°53'W			Siciliano *et al.,* 2011
32	14 August 2005	Sighting	46°14'S	067°36'W	Land platform	1	Iñíguez *et al.,* 2010
33	16 August 2005	Sighting	46°14'S	067°36'W	Land platform	1	Iñíguez *et al.,* 2010
34	19 August 2005	Sighting	46°14'S	067°36'W	Land platform	1	Iñíguez *et al.,* 2010
35	31 August 2005	Sighting	46°14'S	067°36'W	Land platform	3	Iñíguez *et al.,* 2010
36	12 September 2005	Sighting	46°14'S	067°36'W	Land platform	4	Iñíguez *et al.,* 2010
37	17 September 2005	Sighting	46°14'S	067°36'W	Land platform	1	Iñíguez *et al.,* 2010
38	26 September 2005	Sighting	46°14'S	067°36'W	Land platform	2	Iñíguez *et al.,* 2010
39	29 September 2005	Sighting	46°14'S	067°36'W	Land platform	1	Iñíguez *et al.,* 2010
40	03 October 2005	Sighting	46°27'S	067°29'W	Land platform	3	Iñíguez *et al.,* 2010
41	2001-2005	Sighting	53°55'S	037°48'W			Richardson *et al.,* 2012
42	2001-2005	Sighting	53°36'S	041°27'W			Richardson *et al.,* 2012
43	2001-2005	Sighting	53°18'S	042°13'W			Richardson *et al.,* 2012
44	08 March 2006	Sighting	51°45'S	061°10'W	Aircraft platform	20	Iñíguez *et al.,* 2010
45	02 May 2006	Sighting	46°14'S	067°36'W	Land platform	1	Iñíguez *et al.,* 2010
46	04 September 2006	Sighting	46°14'S	067°36'W	Land platform	1	Iñíguez *et al.,* 2010
47	14 March 2007	Sighting	51°15'S	059°15'W	Aircraft platform	4	Iñíguez *et al.,* 2010
48	Dec 2006 to Mar 2007	Sighting	39°36'S	054°39'W	Brazil-Malvinas confluence (ARG)		Mandiola *et al*., 2015
49	Dec 2006 to Mar 2007	Sighting	41°32'S	054°10'W	Brazil-Malvinas confluence (ARG)		Mandiola *et al*., 2015
50	Dec 2006 to Mar 2007	Sighting	41°38'S	051°37'W	Brazil-Malvinas confluence (ARG)		Mandiola *et al*., 2015
51	12 July 2007	Stranding	33°36'S	053°10'W	South of the state of Rio Grande do Sul (BRA)	1	Prado *et al.,* 2016
52	02 August 2008	Sighting	46°14'S	067°36'W	Land platform	4	Iñíguez *et al.,* 2010
53	20 August 2008	Sighting	46°14'S	067°36'W	Land platform	2	Iñíguez *et al.,* 2010
54	27 August 2008	Sighting	46°19'S	067°36'W	Land platform	1	Iñíguez *et al.,* 2010
55	20 September 2008	Stranding	1°12'S	046°8'W	Viseu, state of Pará (BRA)	1	Siciliano *et al.,*2008
56	November 2008	Stranding	40°43'S	064°56'W	East coast of San Antonio, Patagonia (ARG)	1	Leonardi *et al*, 2011
57	December 2008	Stranding	46°26'S	067°31'W	Caleta Olivia, Santa Cruz province (ARG)	1	Leonardi *et al*, 2011
58	2006-2010	Sighting	53°27'S	041°58'W			Richardson *et al.,* 2012
59	2006-2010	Sighting	53°30'S	042°8'W			Richardson *et al.,* 2012
60	2006-2010	Sighting	53°35'S	042°10'W			Richardson *et al.,* 2012
61	16 November 2011	Stranding	32°17'S	052°16'W	South of the state of Rio Grande do Sul (BRA)	1	Prado *et al.,* 2016
62	03 October 2012	Stranding	33°41'S	053°17'W	South of the state of Rio Grande do Sul (BRA)	1	Prado *et al.,* 2016
63	19 Feb to 14 Mar 2013	Sighting	59°50'S	050°10'W			Reyes and Iñíguez 2013
64	19 Feb to 14 Mar 2013	Sighting	59°50'S	050°36'W			Reyes and Iñíguez 2013
65	28 Jan to 13 Feb 2015	Sighting	55°2'S	066°46'W			Reyes *et al*., 2015

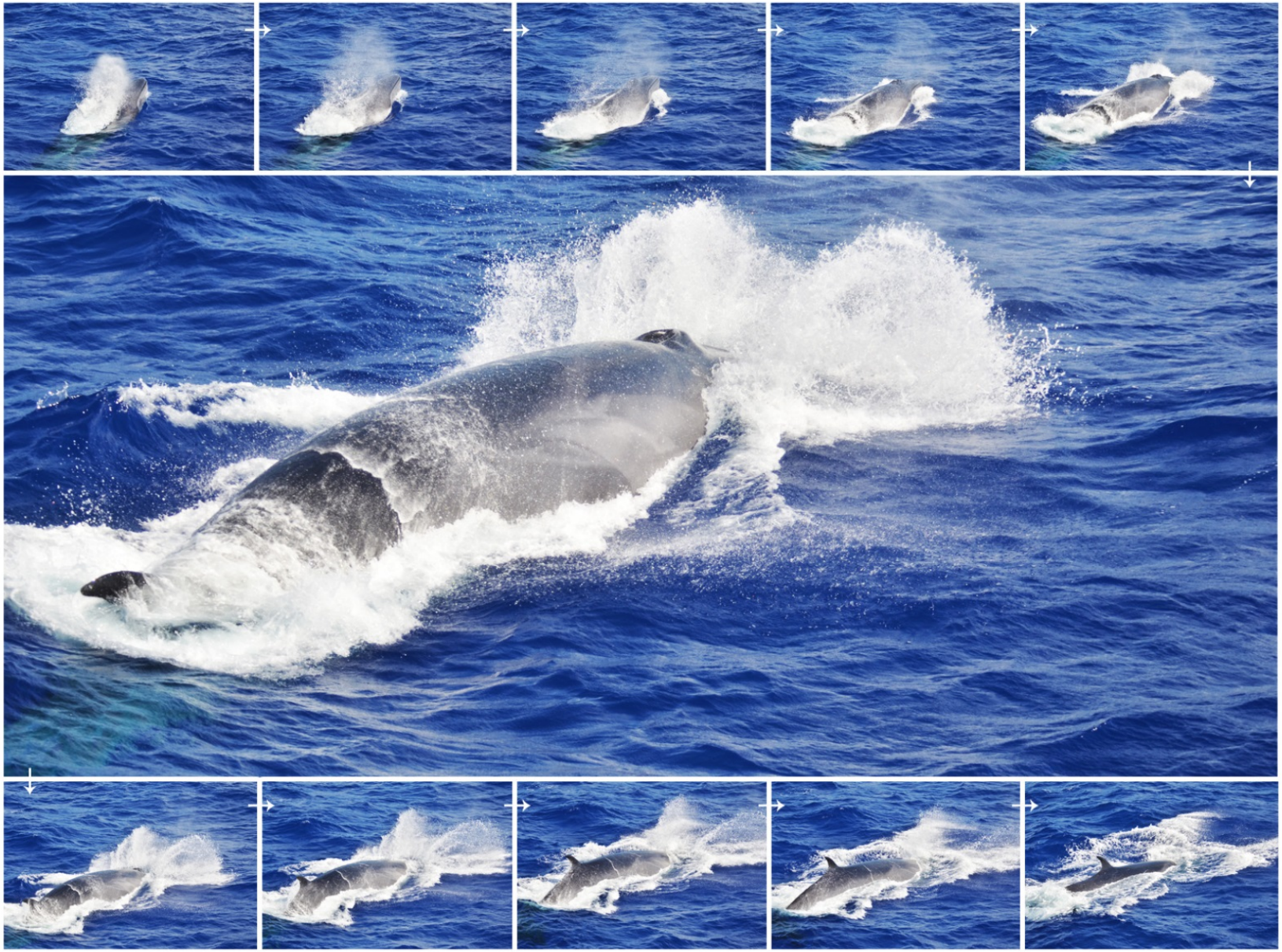

Figure 1 – Surfacing behaviour of an adult sei whale in the Vitória-Trindade Chain.

Figure 2 – Adult sei whale and her new-born calf (estimated size of 4.5m), near Trindade Island (see the mother's peduncle and their fluke at the bottom of the left picture).

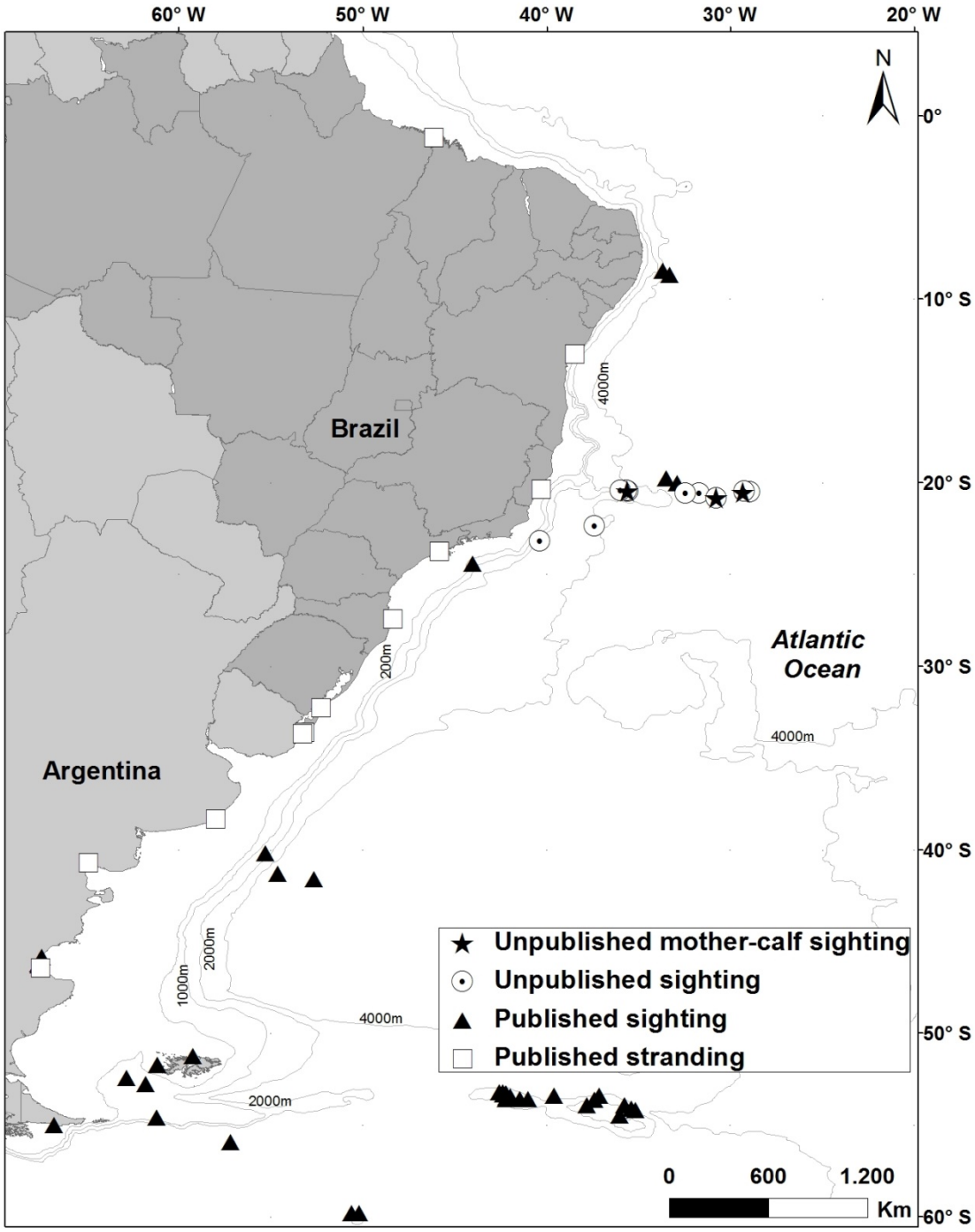

Figure 3 – Sixty-five records in the Southwestern Atlantic of sei whale (*Balaenoptera borealis)* sightings and strandings after the whaling period were assembled from the literature review (See Table 3)**.**

Discussion

The sei whale is considered one of the most poorly known of all baleen whales (Horwood, 2009) by reason of the scarce information published after the whaling period. There is few evidence of the reproductive areas of sei whales worldwide and some putative areas are still speculative (Perry *et al.*, 1999). Smultea *et al.* (2010) reported a first record of a group of sei whale sub-adults (n=3) off the Hawaiian Islands to the North Pacific Ocean and suggest the area as part of the winter breeding range for the North

Pacific sei whales. In the North Atlantic Ocean unverified evidences include off north-western Africa as a wintering ground for the species (see Prieto *et al.*, 2014).

Although the hypothesis that South American waters might have been used by sei whales for breeding and calving purposes, no records of sei whales accompanied by calves had been obtained for this area until now. This hypothesis is based on indirect evidence obtained during the whaling period, of which some of the whales caught between 1960 and 1963 in north-eastern Brazilian waters presented empty stomachs and pregnancy (Paiva and Grangeiro, 1965). These evidences were used to support the idea that sei whales migrate to low latitudes to reproduce on Brazilian waters, as widely recognized by almost baleen whales (e.g. humpback and minke whales - Rocha and Braga, 1982; Siciliano, 1997; Lucena, 2006). Until now the wintering area of sei whales remained essentially unknown in the south-western Atlantic as occur worldwide. In recent years, a series of dedicate surveys for minke whales in the former whaling area off north-eastern Brazil recorded only two sightings of sei whales (Andriolo *et al.*, 2010). It is noteworthy to stress that the last sei whale records made in Brazilian waters were in 2005 (Siciliano *et al.*, 2011, also see table 3) and after that, only in 2015 the species was recorded again (this study). However, it is still premature to link these new records with the sei whale recovery from the impacts of commercial whaling. The data present here is more likely to be related with the increase of search effort in an area do not surveyed in detail before.

Our records strongly indicate the use of the Vitória-Trindade Chain as a calving ground for sei whales in the SWA. As a matter of fact, the observation of new-born calf and sub-adults in the 2015 survey are remarkably relevant to the breeding stock of SWA and represent the first records in the Atlantic Ocean (see Prieto *et al.*, 2012). Our records were all concentrated in a relatively narrow period in both years, *i.e.,* late May to late June. In spite of that, more surveys should be conducted along the VTC to confirm this area as a calving ground for sei whales in the SWA. Anyhow, it possibly indicates the use of the VTC in the early stage of the migration period of sei whales in the SWA in route to north-eastern Brazil. Alternatively, mother and calves could continue moving to some other area in the SWA yet to be detected.

The sightings presented in this work are of extreme importance to add knowledge on sei whale distribution in the SWA and indicate the discovery of the first confirmed reproductive area of this endangered species in the Atlantic Ocean.

Acknowledgements

We would especially like to thank the following people and institutions for providing all support for this work: Vanessa L. Heissler received an undergraduate scholarship BIC/UFRGS/CNPq. Funding of the Financial and logistical support to the Projects: "*A Fauna de Odontocetos no Brasil, Biogeografia e Taxonomia: Subsídios para a Conservação* (processes 557182/2009-3 and 404558/2012-7)" and "*Distribuição, riqueza, abundância e uso do habitat pelos cetáceos e aves marinhas entre a costa Brasileira e o Arquipélago de Trindade e Martin Vaz em relação a parâmetros fisiográficos e oceanográficos* (cetaceans and seabirds of the Pro-Trindade I) (processes 557064/2009-0)" was provided by Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) and Marinha do Brasil, respectively. Many thanks to the colleagues Camila T. Rigon, Dandara Rodrigues, Elisa B. Ilha, Gabrieli S. Afonso, Janaína C. Wickert, Paola G. Foletto, Sophie von Eye and Yuri C. Roxo from the Laboratório de Sistemática e Ecologia de Aves e Mamíferos Marinhos – LABSMAR, and Rodrigo Genoves from Laboratório de Ecologia e Conservação da Megafauna Marinha – EcoMega, who helped with data collection. This is a contribution of the Research Group "*Evolução e Biodiversidade de Cetáceos*/CNPq".

References

Almeida, F. F. M. 2006. Ilhas oceânicas brasileiras e suas relações com a tectônica atlântica. *Terrae Didatica* 2:3-18.

Andriolo, A., Rocha, J. M. D., Zerbini, A. N., Simões-Lopes, P. C., Moreno, I. B., Lucena, A., Danilewicz, D. and Bassoi, M. 2010. Distribution and relative abundance of large whales in a former whaling ground off eastern South America. *Zoologia* 27:741-750.

Barros, N. B. 1991. Recent cetacean records for southeastern Brazil. *Mar. Mam. Sci.* 7:296-306.

Bastida, R. O. and Lichtschein, V. 1984. Avistajes de cetáceos realizados por buques balleneros en aguas Argentinas. [Cetacean sightings made by whaling ships in argentine waters]. *Revista del Museo Argentino de Ciencias Naturales Bernardino Rivadavia (Serie Zoología)* 13:211-224.

Best, P. B. and Lockyer, C. H. 2002. Reproduction, growth and migrations of sei whales *Balaenoptera borealis* off the west coast of South Africa. *S. Afr. J. Mar. Sci.* 24:111-133.

Buckland, S. T., Breiwick, J. M., Cattanach, K. L. and Laake, J. L. 1993. Estimated population-size of the California gray whale. *Mar. Mam. Sci.* 9:235-249.

Deméré, T. 2014. Sei whale *Balaenoptera borealis.* pp. 287-289 *in* Wilson, D. E. and Mittermeier, R. A. (eds.). *Handbook of the mammals of the world*. Lynx Edicions, Barcelona. 614 pp.

Horwood, J. 1987. *The sei whale: population biology, ecology and management*. Croon Helm, London. 375 pp.

Horwood, J. 2009. Sei whale *Balaenoptera borealis.* pp. 1001-1003. *in* Perrin, W. F., Würsig, B. and Thewissen, J. G. M. (eds.). *Encyclopedia of Marine Mammals*. Academic Press, San Diego. 1352 pp.

Iñíguez, M., Masello, J. F., Gribaudo, C., Arcucci, D., Krohling, F. and Belgrano, J. 2010. On the occurrence of sei whales, *Balaenoptera borealis*, in the south-western Atlantic. *Mar. Biodivers. Rec.* 3:e68.

Leonardi, M. S., Grandi, M. F., García, N. A., Svendsen, G., Romero, M. A., González, R. and Crespo, E. A. 2011. A stranding of *Balaenoptera borealis* (Lesson 1828) from Patagonia, Argentina, with notes on parasite infestation and diet. *Afr. J. Mar. Sci.* 33:177-179.

Lucena, A. 2006. Estrutura populacional da a populacional da *Balaenoptera bonaerensis* (Burmeister) (Cetacea, Balaenopteridae) nas áres de reprodução do Oceano Atlântico Sul. *Rev. Bras. Zool.* 23:176-185.

Mandiola, M. A., Giardino, G. V., Bastida, J., Rodríguez, D. H. and Bastida, R. O. 2015. Marine mammal occurrence in deep waters of the Brazil-Malvinas confluence off Argentina during summer. *Mastozool. Neotrop.* 22:397-402.

Paiva, M. P. and Grangeiro, B. F. 1965. Biological investigations on the whaling seasons 1960-1963, off northeastern coast of Brazil. *Arquivos Estação Biologia Marinha Universidade Ceará* 5:29-64.

Paiva, M. P. and Grangeiro, B. F. 1970. Investigations on the whaling seasons 1964-1967, off northeastern coast of Brazil. *Arquivos de Ciências do Mar* 10:111-126.

Perry, S. L., Demaster, D. P. and Silber, G. K. 1999. The great whales: history and status of six species listed as endangered under the U.S. endangered species act of 1973. *Mar. Fish. Rev.* 61:1-74.

Pinheiro, H. T., Camilato, V., Gaspatini, J. L. and Joyeux, J. 2009. New records of fishes for Trindade-Martin Vaz oceanic insular complex, Brazil. *Zootaxa* 2298:45-54.

Pinheiro, H. T., Mazzei, E., Moura, R. L., Amado-Filho, G. M., Carvalho-Filho, A., Braga, A. C., Costa, P. S., Ferreira, B. P., Ferreira, C. E. L. and Floeter, S. R. 2015. Fish biodiversity of the Vitória-Trindade Seamount Chain, southwestern Atlantic: an updated database. *PLoS ONE* 10:e0118180.

Prado, J. H. F., Mattos, P. H., Silva, K. G. and Secchi, E. R. 2016. Long-term sasonal and interannual patterns of marine mammal strandings in subtropical western South Atlantic. *PLoS ONE* 11:e0146339.

Prieto, R., Janiger, D., Silva, M. A., Waring, G. T. and Gonçalves, J. M. 2012. The forgotten whale: a bibliometric analysis and literature review of the North Atlantic sei whale *Balaenoptera borealis*. *Mammal Rev.* 42:235-272.

Prieto, R., Silva, M. A., Waring, G. T. and Gonçalves, J. M. A. 2014. Sei whale movements and behaviour in the North Atlantic inferred from satellite telemetry. *Endanger. Species Res.* 26:103-113.

Ramos, R. M. A., Siciliano, S. and Ribeiro, R. 2010. *Monitoramento da biota marinha em navios de sísmica: seis anos de pesquisa (2001-2007)*. Everest Tecnologia em Serviços, Vitória. 1151 pp.

Reilly, S. B., Bannister, J. L., Best, P. B., Brown, M., Jr., R. L. B., Butterworth, D. S., Clapham, P. J., Cooke, J., Donovan, G. P., Urbán, J. and Zerbini, A. N. 2008. *Balaenoptera borealis*. *The IUCN Red List of Threatened Species* 2008:e.T2475A9445100.

Reyes, M. V. R. and Iñíguez, M. 2013. Occurrence of cetaceans in the Scotia Sea during February-March 2013. Paper SC/65a/SH10 presented to the *IWC Scientific Committee*, June 2013. 7 pp. [Avaiable from IWC website].

Reyes, V. R., Hevia, M., Jones, J., Trickey, J. S., Baumann-Pickering, S., Melcón, M. L., Hildebrand, J. A. and Iñíguez, M. A. 2015. Sightings and acoustic records of cetaceans during the SORP Voyage 2015 along the Western Antarctic Peninsula. Paper SC/66a/SH/20 presented to the *IWC Scientific Committee*, May 2015. 8pp. [Avaiable from IWC webpage].

Richardson, J., Wood, A. G., Neil, A., Nowacek, D. and Moore, M. 2012. Changes in distribution, relative abundance, and species composition of large whales around South Georgia from opportunistic sightings: 1992 to 2011. *Endanger. Species Res.* 19:149-156.

Rocha, J. M. and Braga, N. M. A. 1982. Progress report on cetacean research June 1980 to May 1981. *Rep. Int. Whal. Commn.* 32:155-159.

Santos, M. C. O., Siciliano, S., Vicente, A. F. D. C., Alvarenga, F. S., Zampirolli, E., Souza, S. P. D. and Maranho, A. 2010. Cetacean records along São Paulo state coast, southeastern Brazil. *Braz. J. Oceanogr.* 58:123-142.

Siciliano, S. 1997. Características da população de baleia-jubarte (*Megaptera novaeangliae*) na costa brasileira com ênfase nos Bancos de Abrolhos. Master's Dissertation, Universidade Federal Rural do Rio de Janeiro, Rio de Janeiro, Rio de Janeiro - Brazil. 113 pp.

Siciliano, S., Emin-Lima, N. R., Costa, A. F., Rodrigues, A. L. F., Magalhães, F. A., Tosi, C. H., Garri, R. G., Silva, C. R. D. and Júnior, J. D. S. E. S. 2008. Revisão do conhecimentosobre os mamíferos aquáticos da costa norte do Brasil. *Arquivos do Museu Nacional* 66:381-401.

Siciliano, S., Moura, J. F. D., Emin-Lima, R., Arcoverde, D. L., Sousa, M. E. M., Martins, B. M. L., Jr., J. D. S. E. S., Tavares, M., Santos, M. C. D. O. and Ott, P. H. 2011. Large baleen whales on the coast of Brazil: a review of post-1997 data on strandings and sightings. Paper SC/63/SH2 presented to the IWC Scientific Committee, June 2011. 12 pp. [Avaiable on IWC webpage].

Simões-Lopes, P. C. and Ximenez, A. 1993. Annotated list of the cetaceans of Santa Catarina coastal waters, Southern Brazil. *Biotemas* 6:67-92.

Smultea, M. A., Jefferson, T. A. and Zoidis, A. M. 2010. Rare sightinhs of a Bryde's Whale (*Balaenoptera edeni*) and Sei Whales (*B. borealis*) (Cetacea: Balaenopteridae) Northeast of O'ahu, Hawai'i. *Pac. Sci.* 64:449-457.

Toledo, G. and Langguth, A. 2009. Data on biology and exploitation of West Altantic sperm whales, *Physeter macrocephalus* (Cetacea: Physeteridae) off the coast of Paraíba, Brazil. *Zoologia* 26:663-673.

Velozo, R. S. 2007. Encalhe de mamíferos aquáticos entre a foz dos rios Pardo (BA) e São Francisco (SE). Dissertação de mestrado. Master's Dissertation, Universidade Estadual de Santa Cruz, Ilhéus, Bahia - Brasil. 111 pp.

Williamson, G. R. 1975. Minke whales off Brazil. *Scientific Reports Whales Research Institute* 27:37-59.

Zerbini, A. N., Secchi, E. R., Siciliano, S. and Simões-Lopes, P. C. 1997. A review of the occurrence and distribution of whales of the genus Balaenoptera along the Brazilian coast. *Rep. Int. Whal. Commn.* 47:407-417.