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Report of the Working Group on the Distribution of *Tursiops truncatus* in the Southwest Atlantic Ocean

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Introduction

Knowledge of the distribution of a species is essential to understand its ecology and to establish sound conservation strategies (Karczmarski *et al.*, 2000). The common bottlenose dolphin (*Tursiops truncatus* Montagu, 1821), hereafter bottlenose dolphin, is a cosmopolitan species distributed throughout tropical and temperate coastal and pelagic waters, between 45°N and 54°S[1] (Goodall *et al.*, 2011). Studies on this species in the Southwest Atlantic Ocean (SWAO) have intensified in the last two decades, albeit with irregular effort.

The present study reviews the information available on the distribution patterns of bottlenose dolphins within the SWAO (04°N-56°S, 25°W-67°W) including the northern portion of Brazil (see Fruet *et al.*, 2016 Introduction, this volume) covering the period from 1904 to 2012. To facilitate discussion, the SWAO was divided into: 1) insular and oceanic and 2) coastal zones. Because more data were available for the coastal zone, the latter was further sub-divided into five regions: 2.1) northern Brazil, 2.2) northeastern Brazil, 2.3) southeastern Brazil, 2.4) southern Brazil and Uruguay and 2.5) Argentina (see Fruet *et al.*, 2016 Introduction, this volume). This division was standardized during the *First Workshop on the Research and Conservation of* Tursiops truncatus*: Integrating knowledge about the species in the Southwest Atlantic Ocean*, held in Rio Grande, Brazil, 21-23 May 2010, in order to elaborate all reviews based on political regions of Brazil, Uruguay and Argentina. Data from southern Brazil and Uruguay were grouped based on the results from photo-identification studies, which indicated the movement of bottlenose dolphins among these adjacent areas (Laporta, 2009).

Data sources and terminology

Distributional information was compiled from scientific articles, undergraduate monographs, master's and doctoral theses, books, book chapters, conference abstracts and working papers presented during the *Workshop*. Technical reports and personal communications provided by specialists were also included. All information available on the species distribution at the SWAO was compiled into a Miscrosoft™ Access database. A geographic information system[2] was used to create two base maps: one including the location of recorded sightings reported in the literature (Figure 1), and another one with the location of strandings (Figure 2). Both figures show areas where systematic surveys or studies on the species have been conducted, and thus they indicate areas where the species is frequently observed.

We considered systematic surveys as those that had bottlenose dolphins as the target species, that were conducted in the same study area throughout the year, and for which

[1]Perrin, W.F. (2009) World Cetacea Database. *Tursiops truncatus* and *T. aduncus.* Available online at <http://www.marinespecies.org/cetacea>. Consulted on 14 April 2011.

[2]GIS; ArcMap™ version 9.2, ESRI Inc., Redlands, CA, USA

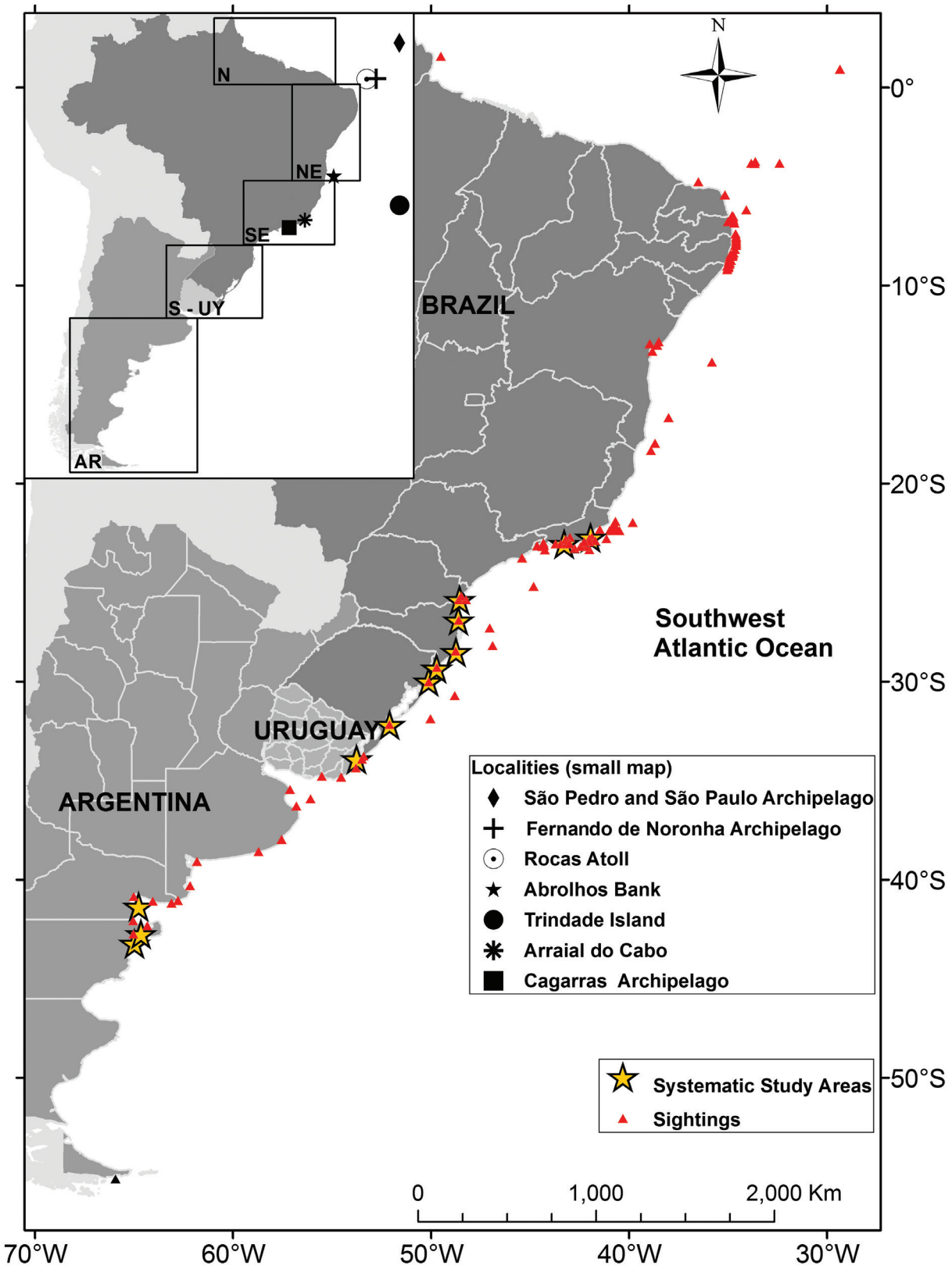

Figure 1. Sighting records of bottlenose dolphins in the Southwest Atlantic Ocean reported in the literature and areas where systematic studies of the species have been carried out. N = northern Brazil, NE = northeastern Brazil, SE = southeastern Brazil, S-UY = southern Brazil and Uruguay, AR = Argentina.

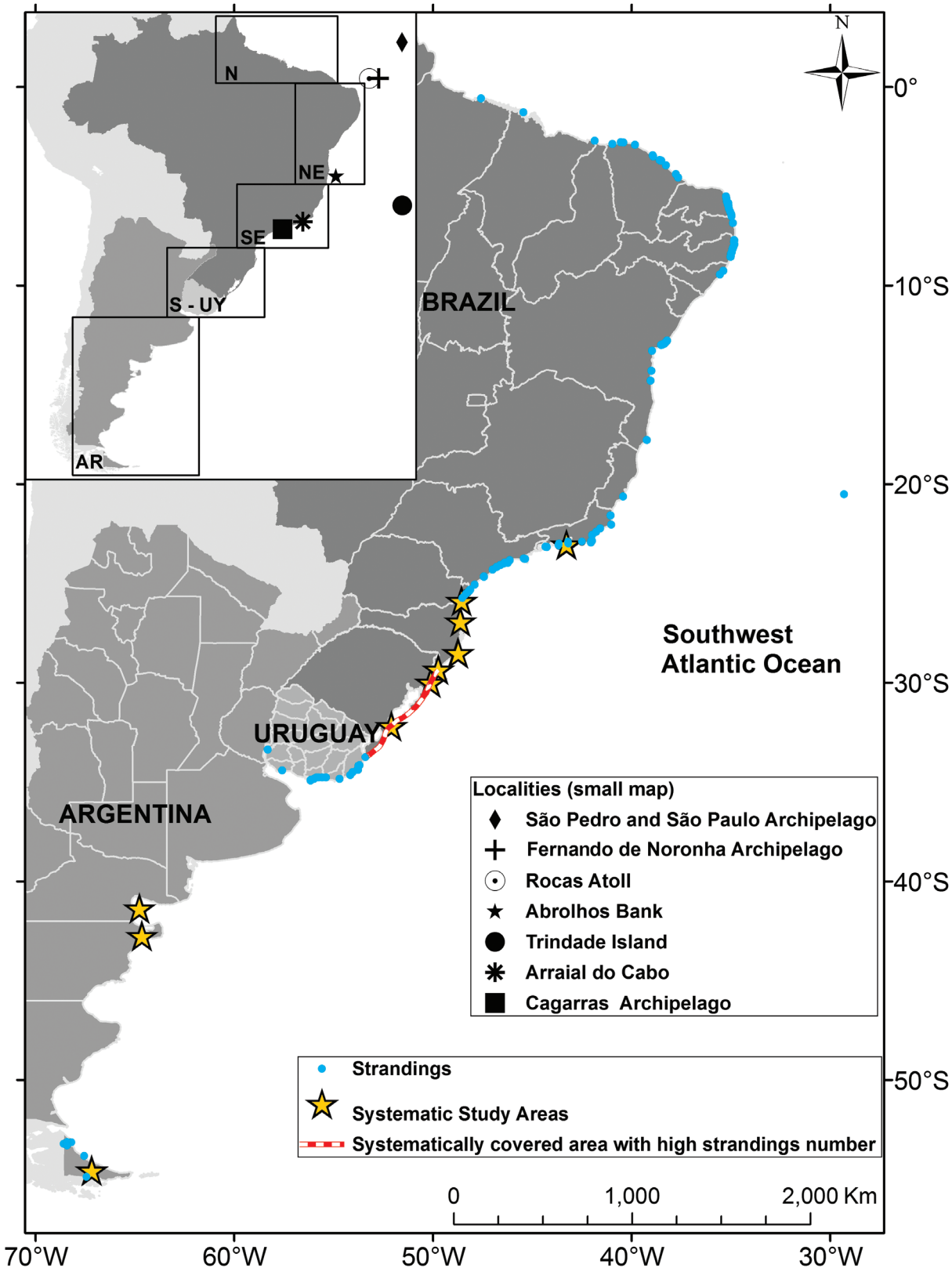

Figure 2. Locations of strandings of bottlenose dolphins in the Southwest Atlantic Ocean reported in the literature and from areas where systematic studies of the species have been carried out. N = northern Brazil, NE = northeastern Brazil, SE = southeastern Brazil, S-UY = southern Brazil and Uruguay, AR = Argentina.

survey effort covered all seasons of the year (even if only during one single year) or the same seasons during two or more years. Opportunistic surveys were those that came from studies focused on other species (*e.g.* general cetacean monitoring surveys), those focused on bottlenose dolphins but with a limited survey effort (not covering all seasons for at least one year or of short duration, *e.g.* a month or less), or if the study area changed between surveys (*e.g.* data from seismic ships).

The term 'population' in the present study refers to the areas in which the research effort was concentrated, and not necessarily the standard biological concept of this term. In order to standardize a definition of resident population we proposed one based on the studies by Wells (1991), Ballance (1992), Simões-Lopes and Fabian (1999), Zolman (2002) and Hardt *et al.* (2010). We defined a resident population as one in which most identified individuals exhibited year-round presence within the study area limits. A seasonally resident population was defined as one in which individuals were present at the same specific seasons during consecutive years within the boundaries of a study area.

Sightings reported in the reviewed literature for oceanic islands and offshore zone are listed in Table 1 and opportunistic sighting records reported for coastal zone are listed in Table 2. Table 3 summarizes available information regarding resident and seasonally resident populations already identified within the SWAO. All records of strandings within the study area and period are shown in Table 4. It is important to highlight that not all geographic coordinates were available from the primary authors (Tables 1, 2 and 3). Consequently, Figures 1 and 2 do not represent all of the records reported and cited herein.

1. Islands and oceanic zones

1.1. Brazilian oceanic islands

1.1.1 São Pedro and São Paulo Archipelago

Skaf and Secchi[3] reported the first sighting of bottlenose dolphins in São Pedro and São Paulo Archipelago (SPSPA) (00°56'N, 29°22'W) during a voyage between Santos (southeastern Brazil) and the Canary Islands, Spain. Another two groups of bottlenose dolphins were sighted at 05°35'S, 35°02'W and 00°41'N, 29°33'W in January 2005 during a trip from Rio Grande do Norte (RN) to SPSPA (Caon *et al.*, 2009). From June 1999 to June 2001 and from December 2003 to February 2005, a total of seven expeditions were carried out to the SPSPA (each expedition with 13-27 days of permanence in the archipelago), comprising 86 daily surveys in the waters around the archipelago during which 59 groups of the species were recorded on 74 days (86%) (Moreno *et al.*, 2009; Ott *et al.*, 2009). Between 1999 and 2006, a total of four expeditions were carried out to the SPSPA totaling 60 days of permanency in the archipelago. Bottlenose dolphins were recorded on 45 days (75%) (Caon *et al.*, 2009). The studies carried out in SPSPA were considered as opportunistic based on the adopted definition; the area has been monitored annually since 1999, although not always during the same seasons.

In 2006, from 27 March to 19 April, 23 field surveys were carried out (60.83h survey effort) during which 35 groups of dolphins were observed[4]. From May 2006 until August 2012, fourteen expeditions of 15 days each totaled a survey effort of 210 days around the archipelago, where groups of bottlenose dolphins were observed but no detailed information was provided.

Two other studies were undertaken in the SPSPA. In August 2004, three sightings were recorded during three days of research (Meirelles *et al.*, 2016 this volume). In April 2010, four sightings were recorded in the area during four consecutive days of research (Meirelles *et al.*, 2016 this volume).

1.1.2 Rocas Atoll

Near Rocas Atoll (03°50'S, 33°39'W) one sighting was recorded between 15 August and 10 December, 1993[3]. Other five sightings were reported in the vicinity of the Atoll: one in January 1999 (Meirelles *et al.*, 2016 this volume), another in December 2003, one in January 2004 and two others in October 2004, the latter as a result of over 18h of effort distributed across two days (Baracho *et al.*, 2007).

Between April 2009 and May 2010, eleven systematic cruises of three days each were carried out from Natal (RN) to Rocas Atoll Biological Reserve, totaling 33 days of survey effort. Only one group of bottlenose dolphin was sighted in the reserve area[5].

1.1.3 Fernando de Noronha Archipelago

For this archipelago (03°50'S, 32°24'W) just one sighting record exists: in March 2004, when one group of 50 individuals was observed displaying agonistic behavior towards spinner dolphins (*Stenella longirostris*) (Silva Jr, 2010).

1.1.4 Trindade Island

Near this island (20°30'S, 29°18'W) nine opportunistic boat-based surveys were carried out between December 2009 and March 2010, totaling 54h of survey effort. During this survey, two sightings of bottlenose dolphins were recorded on 15 December and one on 23 February (Carvalho and

[3]Skaf, M.K. and Secchi, E. (1994) Avistagens de cetáceos na travessia do Atlântico: Santos-Tenerife. Pages 72-73 *in* Abstracts, *6ª Reunião de Trabalho de Especialistas em Mamíferos Aquáticos da América do Sul.* 24-28 October 1994, Florianópolis, Brazil.

[4]Genoves, R.C., Fruet, P.F., Di Tullio, J.C., Hoffmann, L., Caon, G., Pedone, F., Barcellos, L.J.P. and Freitas, T.R.O. (2010) Tamanho mínimo da população de golfinhos-nariz-de-garrafa, *Tursiops truncatus*, associada ao Arquipélago de São Pedro e São Paulo, Brasil. Working Paper 61 presented during the *First Workshop on the Research and Conservation of* Tursiops truncatus *in the SWAO*, 21-23 May 2010, Rio Grande, RS, Brazil.

[5]Silva, M. and Godoy, T. (2010) Avistagens oceânicas de cetáceos entre Natal e a Reserva Biológica do Atol das Rocas /RN. Abstract number 8029 *in* Abstracts *XIV Reunião de Trabalho de Especialistas em Mamíferos Aquáticos da América do Sul*, 24-28 October 2010, Florianópolis, Brazil.

Table 1. Sightings of bottlenose dolphins recorded in the oceanic islands and offshore zone of the Southwest Atlantic Ocean (1981-2010). Number of opportunistic sightings (N) is indicated when available. (* = not considered the number of groups, ? = no information available).

Country	Region	State/Department/Province	N	Recorded year	References
Brazil	Oceanic Islands	São Pedro and São Paulo Archipelago	103*	1999-2001; 2003-2005; 2006; 2010; 2006	Skaf and Secchi[3]; Caon *et al.* (2009); Moreno *et al.* (2009); Ott *et al.* (2009); Genoves *et al.*[4]; Meirelles *et al.* (2016 this volume)
		Rocas Atoll	7*	1993; 1999; 2003; 2004	Skaf and Secchi[3]; Baracho *et al.* (2007); Silva and Godoy[5,*]; Meirelles *et al.* (2016 this volume)
		Fernando de Noronha Archipelago	1	2004	Silva Jr. (2010)
		Trindade Island	5	2009-2010	Carvalho and Rossi-Santos (2011)
	Offshore zone	4°S-15°S	6	1981	Best *et al.*[6]
		Rio Grande do Norte-SPSPA	1	2005	Caon *et al.* (2009)
		Rio Grande do Norte-Sergipe	54	1998-2001	Simões-Lopes and D. Danilewicz[7]
		Between Foz do Amazonas Basin and Santos Basin	173	2000-2008	Britto (2009)
		Pernambuco, Paraíba, Rio Grande do Norte	13	2004	Conceição (2008)
		Pernambuco-Paraíba	26	2006, 2007	Conceição (2008)
		Maranhão-Santa Catarina	76	2001-2007	Ramos *et al.* (2010)
Uruguay		05°N-45°S, 20°-60°W	2	1996-2007	Passadore *et al.*[8]; PNOFA[9]
Argentina		Buenos Aires, Chubut and Rio Negro provinces	?	review up to 2008	Crespo *et al.* (2008)

Rossi-Santos, 2011). Two other sightings were recorded in August 2010 by the Instituto Baleia Jubarte (Carvalho and Rossi-Santos, 2011).

1.2 Oceanic zones

1.2.1 Brazilian oceanic region

During surveys for the common minke whale (*Balaenoptera acutostrata*) along the northeastern Brazilian coast (between 04°S and 15°S) in November 1981, six sightings of bottlenose dolphins were recorded[6]. From 1998 to 2001, other four cruises with the same goal were carried out between Rio Grande do Norte and Sergipe states (04°33'S, 36°50'W-10°32'S, 36°00'W). A total of 54 groups of bottlenose dolphins were recorded during all cruises along the continental shelf, mostly up to 200m depth with only four sightings made within the 400m isobath[7]. This information is not included in Figure 1 because the geographic coordinates were not available.

Surveys from shipboard observers during seismic activities along coastal and oceanic regions from Foz do Amazonas Basin to Santos Basin, resulted in 173 sightings of bottlenose dolphins between 2000 and 2008 (Britto, 2009). Those records are not shown in Figure 1 because the geographic coordinates were not available.

Another study was conducted in the continental shelf and continental slope aboard the ship N/M *Frotargentina* in January/February 2004 (from São Paulo - SP - to RN), in August 2006 (from Rio Grande do Sul- RS - to RN) and January/March 2007 (RS to Pará states). During this period, 13 surveys were carried out involving 45 days and 359h of observational effort, resulting in 39 sightings of bottlenose dolphins (Conceição, 2008). In 2004, 76.4% (n = 13) of the sightings occurred between 04°45'S and 09°01'S, corresponding to the states of Pernambuco, Paraíba and Rio Grande do Norte. During the following survey in 2006, 93% (n = 14) of the sightings were between Pernambuco and Paraíba states (07°43'S, 09°12'S), and in 2007 all sightings were recorded off these two states.

Between October 2001 and January 2007, during the monitoring of marine life by seismic prospecting ships

[6]Best, R.C., Rocha, J.M. and Silva, V.M.F. (1986) Registros de pequenos cetáceos na costa nordeste brasileira. Pages 23-32 *in* Actas *1° Reunión de Trabajo de Expertos en Mamíferos Acuaticos de la America del Sur*, 25-29 June 1986, Buenos Aires, Argentina.

[7]P. Simões-Lopes and D. Danilewicz, unpub. data.

Table 2. Strandings and incidental captures (N) of bottlenose dolphins in the Southwest Atlantic Ocean (1904-2010) by region and survey effort (opportunistic or systematic). (? - no information available).

Country	Region	State/Department/Province	N	Recorded year	References
Brazil	Northern	Pará	1	2001	Siciliano *et al.*(2008); Sousa *et al.*[10]
	Northeastern	Bahia	63	1988, 1997, 1997-2004, 2000-2006, 2007	Sampaio and Reis[12]; Rossi-Santos *et al.* (2006); Carvalho-Souza *et al.*[11]; Rossi-Santos *et al.* (2009); Meirelles *et al.* (2016 this volume)
	Southeastern	Rio de Janeiro	111	1994, 2005, 1983-2010	Oliveira *et al.* (1994); Lodi *et al.* (2008); Lodi (2016 this volume), Lodi (unpub. data)
		São Paulo	2	1993-1995, 2003	Santos (1997); Souza and Begossi (2007); Santos *et al.* (2010)
	Southern Brazil and Uruguay	Paraná	8	2008, 2009	Domit *et al.*[15]
		Santa Catarina - Florianópolis Island	71 36	1989- 2005 1993- 2002	Wedekin *et al.* (2008) Flores and Fontoura (2006)
		Rio Grande do Sul - Patos Lagoon	?	?	Castello and Pinedo (1977)
Uruguay		Atlantic coast - Rocha	?	?	Pilleri and Gihr (1972); Brownell *et al.* (1973); Lázaro and Praderi (2000)
		La Plata River - Canelones and Montevideo	?	1960-2011, 1993	Risso (2005); Laporta (unpub. data); Bastida[23]
		Interior rivers - Soriano, Salto and Paysandú	5	?	Figueira (1894); Lichter and Hooker (1983)
Argentina	Argentina	La Plata River- Buenos Aires	?	1950-1956, 1974-1980	Bastida *et al.* (2007); Bastida[23]
			18	?	Crespo *et al.* (2008)
		Rio Negro - Coast	5	Review up to 2008	Crespo *et al.* (2008)
		Rio Negro- San Matías Gulf		2006-2007	Svensen *et al.*[24]
		Chubut - Valdés Peninsula	?	1958-1964, 1979-1990	Bastida[23]
		Chubut- Coastal area	16	Review up to 2008	Crespo *et al.* (2008)
		Chubut-Nuevo Gulf	85	2001-2007	Coscarella *et al.* (2012)
		Chubut –San José Gulf	1	1999-2000, 2003-2007	Coscarella *et al.* (2012)
		Santa Cruz	1	Review up to 2008	Crespo *et al.* (2008)
		Tierra del Fuego	1	2003	Crespo *et al.* (2008); Goodall *et al.* (2011)

from Pará/Maranhão Basin (01°20'N) to Santos Basin (27°10'S), 76 groups of bottlenose dolphin were recorded (Ramos *et al.*, 2010). They were more frequently observed in Campos Basin, representing 39.5% of total sightings, followed by Santos Basin (18.4%) and Camamu/Almada Basin (17.1%). The greatest number of sightings occurred between 20°S-29°S (63.2%) followed by 10°S-19°S (25%) and 01°S-09°S (11.8%). This information is not included in Figure 1 because the geographic coordinates were not available. However, a map on these sightings is available (Ramos *et al.*, 2010).

1.2.2 Uruguayan oceanic region

In the area of the SWAO between southeastern Brazil and province of Buenos Aires, Argentina (19°-40°S, 30°-54°W) research was carried out between 1998 and 2007 to study the interaction between killer whales (*Orcinus orca*) and a pelagic long-line fishery from Uruguay. Data of cetacean observations were obtained over 1098 days from vessel skippers and from the National Observer Program of the Tuna Fleet of the National Administration of Aquatic Resources (PNOFA-DINARA). Two sightings of bottlenose dolphin were recorded in Uruguayan offshore waters (Passadore *et al.,* 2008). The first one occurred on 24 April 2005, corresponding to a group of 10 individuals and the second one was on 30 April 2005 and the group size exceeded 100 individuals. The depths of both sightings were 83 and 957m, respectively[8,9].

1.2.3. Argentinean oceanic region

A few sighting records of bottlenose dolphin exist for the Argentinean oceanic region: during aerial surveys some groups were observed in the direction of Buenos

[8]C. Passadore, pers. comm., 7 April 2013
[9]PNOFA, unpub. data
[10]Sousa, M.E.M., Arcoverde, D.L., Costa, A.F., Emin-Lima, N.R., Santos, G.M.A., Martins, B.M., Rodrigues, A.L.F., Siciliano, S. and Silva Júnior, J.S. (2010) O golfinho-nariz-de-garrafa (*Tursiops truncatus*) na Costa Norte do Brasil. Working Paper 13 presented during the *First Workshop on the Research and Conservation of* Tursiops truncatus *in SWAO*, 21-23 May 2010, Rio Grande, RS, Brazil.

Table 3. Resident and seasonally resident populations of bottlenose dolphins based on systematic studies conducted from 1974 in the Southwest Atlantic Ocean.

Region	State/ Department/ Province	Local	Residency pattern	Recorded year	References
Southeastern	Rio de Janeiro	Cagarras Archipelago	Seasonal resident	2004-2010	Barbosa *et al.* (2008); Lodi *et al.* (2008); Lodi (2009); Lodi and Monteiro-Neto (2012); Lodi *et al.* (2014)
Southern Brazil and Uruguay	Santa Catarina	Itajaí River mouth	Resident	2001-2007, 1982-2011	Barreto *et al.*[18]; Demessiano and Barreto[20]
		Santo Antonio Lagoon	Resident	1984-1994, 2007-2009	Simões-Lopes *et al.* (1998); Simões-Lopes and Fabian (1999); Daura-Jorge *et al.* (2013)
	Rio Grande do Sul	Mampituba River mouth	Resident	1998-1999	Bernardi (2000)
		Imbé/ Tramandaí	Resident	1982-1995, 1991-2008, 1996, 2002, 2003, 2009-2010	Simões-Lopes *et al.* (1998); Simões-Lopes and Fabian (1999); Hoffmann (2004); Hoffmann *et al.* (2008); Giacomo and Ott (2016 this volume)
		Patos Lagoon	Resident	1998 2005-2012	Dalla Rosa (1999); Fruet *et al.* (2011; 2015a)
	Uruguay	Atlantic coast (Rocha Department)	Resident	2002-2008	Laporta (2009)
Argentina	Rio Negro	San Antonio Bay	Resident	2006-2008, 2008-2010	Vermeulen and Cammareri (2009)
	Chubut Province	San José Gulf	Resident	1974-1976	Würsig and Würsig (1977); Würsig (1978)

Aires, Chubut and Rio Negro provinces, but no detailed information was provided (Crespo *et al.*, 2008).

2. Coastal zones

2.1 Northern Brazil

In the area of Algodoal/Maiandeua Island (00°35'S, 47°34'W), in Pará State, two strandings of bottlenose dolphin were recorded during beach surveys from January 2008 to March 2010, representing the northernmost stranding records for the SWAO. Another two strandings were recorded for Poldros Island and Comunidade Portugal, Maranhão State[10] (Siciliano *et al.*, 2008). One sighting was confirmed during oil and gas exploration studies along the mouth of the Amazonas River and Amapá coast in 2001[11] (Siciliano *et al.*, 2008). The geographic coordinates of these records were not mentioned in the article and are not included in Figure 1.

2.2 Northeastern Brazil

Since 2002, several research institutions from Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Alagoas and Bahia states (02°56'S, 41°17'W-18°20'S, 39°40'W) have worked in collaboration as part of the Northeast Aquatic Mammal Stranding Network (Rede de Encalhes de Mamíferos Aquáticos do Nordeste, REMANE). This network monitors systematically, but not uniformly, 2437km of coastline. Through this network, 71 strandings of bottlenose dolphins were reported along the northeast coast between 1992 and 2010: Ceará (n = 13), Rio Grande do Norte (n = 14), Paraíba (n = 2), Pernambuco (n = 24), Alagoas (n = 2) and Bahia (n = 16) (Alves-Júnior *et al.*, 1996; Meirelles *et al.*, 2009; 2016 this volume).

For the coast of Bahia State, from northern Praia do Forte to surroundings of Camamu Bay, 230 field surveys were carried out between 2000 and 2006, totaling 1645h of observational effort, during which 36 sightings of bottlenose dolphins were recorded (Rossi-Santos *et al.*, 2009). In 2004, three sightings were observed opportunistically in Cairú Archipelago, Tinharé Island (Meirelles *et al.*, 2016 this volume) and in March 2007, two other sightings were made in Todos os Santos Bay[11].

In the Abrolhos Bank, between southern Bahia and northern Espírito Santo (ES) states (17°20'S, 38°35'W-18°10'S, 39°20'W), there were three sightings in March 1988 (Meirelles

[11]Carvalho-Souza, G.G., Santos, G.R.L., Carneiro, M., Reis, M.S.S., Watanabe-Ferreira, Y. and Maia-Nogueira, R. (2008) Golfinho flipper, *Tursiops truncatus*, e golfinho de dentes rugosos, *Steno bredanensis*, grupo misto na Baía de Todos os Santos, Bahia, Brasil. *in* III Congresso Brasileiro de Oceanografia & I Congresso Ibero-Americano de Oceanografía, 20-24 May 2012, Fortaleza, CE, Brazil.

et al., 2016 this volume) and one in June 1997[12]. Between Caravelas and Regência (ES), more than 500 days of field effort were undertaken to study humpback whales (*Megaptera novaengliae*) during winter and spring 1997-2004 and 18 groups of bottlenose dolphins were subsequently observed (Rossi-Santos *et al.,* 2006).

2.3 Southeastern Brazil

This area covers ES, SP and Rio de Janeiro (RJ) states (18°25'S-25°18'S). We found a total of 130 bottlenose dolphin stranding records in the reviewed literature: two for ES , 67 for RJ and 61 for SP (see Table 4).

In total, 30 bottlenose dolphin strandings were recorded between 1980 and 1998: one for ES, 14 for RJ and 15 for SP (Siciliano *et al.,* 2007). Another stranding was recorded for ES, at Setiba/Guarapari Beach (20°38'S, 40°25'W), in April 1994 (Barros, 1991).

The first recorded occurrence of the bottlenose dolphin in RJ, southeastern Brazil, was by Geise and Borobia (1988), and involved a stranding on Flamengo Beach, Guanabara Bay, in April 1980. Another stranding was reported by the same authors in Foguete Beach, Cabo Frio, in July 1984. Between June 1994 and 1995, during a 20km beach survey, two complete skeletons were found at Restinga da Marambaia (southern RJ) (Oliveira *et al.*, 1994), but these records are not shown in Figure 2. One sighting of bottlenose dolphin was recorded in Barra de Guaratiba (southern RJ) in May 1994 (Oliveira *et al.*, 1994). This record is not shown in Figure 1.

For the coastal region of RJ, between Paraty (23°10'S, 44°39'W) and Atafona (21°37'S, 41°00'W), a recent literature review found 24 records of bottlenose dolphin strandings between April 1980 and May 2010, while 100 sightings were reported between April 1983 and May 2010 (Lodi, 2016 this volume). The review conducted by Lodi (2016, this volume), which included information from various source-types (*e.g.* scientific literature; the scientific collection of the Mammalogy Sector of the National Museum, RJ; personal observations and reliable communications from scientists and the general public based on familiarity with this species), included 85 new records of bottlenose dolphins for RJ (71 sightings and 14 strandings). In another literature review, Moura *et al.* (2016 this volume) reported on 49 strandings (35 were new records) from São Francisco de Itabapoana (21°25'S, 41°00'W) to Saquarema (22°55'S, 42°30'W), northern RJ, between 1984 and the first quarter of 2012.

Lodi (2016 this volume) describes the potential patterns and trends of occurrence of bottlenose dolphins in RJ based on opportunistic sighting and stranding data collected between 1980 and 2010. The greatest frequency of records (61.2%, n = 76) was from the northern area of RJ. The species was recorded in every month of the year, but most records were from the austral summer months (50.8%, n = 63).

Between April 1983 and 1984, 29 field surveys were carried out in Arraial do Cabo (22°57'S, 42°01'W), RJ, totaling 717h of effort during which 130 groups of bottlenose dolphins were observed. In this region, sightings were more frequently recorded in autumn and winter[13]. This information is not included in Figure 1 because the geographic coordinates were not available. Bottlenose dolphins are common in the coastal waters off Arraial do Cabo and Búzios (Siciliano *et al.*, 2006). Groups of approximately 150 bottlenose dolphins were also observed in deeper waters off Campos Basin but the geographic coordinates were not provided by the authors (Siciliano *et al.*, 2006).

The Southeastern Cetacean Expedition (SCE) in RJ comprised two phases, during which more than 3700km were sampled in 56 days of effort. The first phase occurred 6-26 June 2005, and the second phase started on 1 November and lasted until 5 December 2005. During the SCE, nine groups of bottlenose dolphins were sighted in Campos Basin (six groups in June, one in November and two in December 2005) and in Grande Island (one group in November 2005) (Lodi *et al.*, 2008; unpub. data).

Bottlenose dolphins occur in the Cagarras Archipelago (23°01'S, 43°12'W-23°03'S, 43°12'W), RJ, during the austral winter and spring, forming a seasonal resident group (Lodi, 2009). Two studies, involving 29 field surveys with a total effort of 148.16h were undertaken at Cagarras Archipelago from June to December in 2004 and 2005. Twenty-one groups of bottlenose dolphins were observed on 18 different occasions, for a total of 64.66h of effective effort (Barbosa *et al.*, 2008). Further systematic studies were also carried out in the same area. Specifically, a total of 65 censuses were conducted in the Cagarras Archipelago from August through November during 2004, 2006 and 2010 and from August through October during 2007, 2008 and 2009, covering 229h of effort. A total of 51 groups of bottlenose dolphins were sighted in the study area during 219h of effective observation (Lodi *et al.*, 2008; Lodi, 2009; Lodi and Monteiro-Neto, 2012; Lodi *et al.*, 2014).

Schmiegelow (1990) reports the stranding of two individuals on Comprida Island and at Marujá Beach (SP), both in October 1987. In addition, Martuscelli *et al.* (1996) reported 14 strandings and one sighting between October 1985 and December 1994 at São Sebastião, Ubatuba, Grande and Peruíbe beaches, and Comprida, Cardoso and Castilho islands. A review of stranded bottlenose dolphins along the coast of SP indicated 40 previously unpublished records between August 1994 and January 2008 (Santos *et al.,* 2010). In another study, five strandings of bottlenose dolphins were recorded in Comprida Island between 1986 and 1998 within a range of

[12]Sampaio, C.L.S. and Reis, M.S.S. (1998) Registro de cetáceos na costa nordestina. Page 22 *in* Abstracts *8ª Reunião de Trabalho de Especialistas em Mamíferos Aquáticos da América do Sul and 2° Congresso da Sociedade Latinoamericana de Especialistas em Mamíferos Aquáticos*, 25-29 October 1998, Olinda, Brazil.

[13]Gomes, L.A. (1986) Análise sobre a ocorrência de *Tursiops truncatus* na região de Arraial do Cabo (Rio de Janeiro). Pages 122-131 *in* Actas, *1ª Reunión de Trabajo de Expertos en Mamíferos Acuáticos de América del Sur*, 25-29 June 1986, Buenos Aires, Argentina.

Table 4. Strandings (N) of bottlenose dolphins in the Southwest Atlantic Ocean (1904-2012) by region and survey effort (opportunistic or systematic). (? = no information available).

Region	State/Department/ Province	N	Recorded Years	References	Survey effort
Northern Brazil	Pará	2	2008, 2010	Siciliano *et al.*(2008); Sousa *et* al.[10]	Opportunistic
	Maranhão	2	2009		
Northeastern Brazil	Ceará	13	1992, 1994-1998, 2000, 2005, 2008, 2010	Alves-Junior *et al.* (1996); Meirelles *et al.* (2009; 2016 this volume)	Systematic
	Rio Grande do Norte	14	1999, 2000, 2004, 2006-2010		
	Paraíba	2	2005		
	Pernambuco	24	1999-2007, 2009		
	Alagoas	2	2000, 2008		
	Bahia	16	1996, 1999, 2002-2004, 2006, 2007, 2009		
Southeastern Brazil	Espírito Santo	1	1984	Barros (1991)	Opportunistic
		1	1994	Siciliano *et al.* (2007)	Opportunistic
	Rio de Janeiro	2	1994-1995	Oliveira *et al.* (1994)	Systematic
		2	1980-1984	Geise and Borobia (1988)	Opportunistic
		14	1985-1997	Siciliano *et al.* (2007)	Opportunistic
		14	1980-2010	Lodi (2016 this volume)	Opportunistic
		35	1984-2012	Moura *et al.* (2016 this volume)	Opportunistic and Systematic
	São Paulo	61	1985-1994, 1987, 1994-2008	Schimiegelow (1990); Martuscelli *et al.* (1996); Siciliano *et al.* (2007); Santos *et al.* (2010); Santos *et al.*[14]	Opportunistic
Southern Brazil and Uruguay	Paraná	17	1996-1999	Santos *et al.* (2002); Siciliano *et al.* (2007); Santos *et al.*[14]; Domit *et al.*[15]	Opportunistic
		11	2007-2009	Domit *et al.*[15]	Systematic
	Santa Catarina	28	1985, 1987-1991, 2005	Simões-Lopes and Ximenez (1993); Cherem *et al.* (2004); Barreto *et al.*[16]; Flores *et al.*[17]	Opportunistic
	Rio Grande do Sul	47	1969-1979, 1981-1982, 1984, 1987-1992	Fruet *et al.* (2012)	Opportunistic
		206	1980, 1983, 1985-1986, 1993-2006, 1991-2008	Fruet *et al.* (2012); Moreno *et al.*[22]	Systematic
	Rocha	13	1947-2010	Del Bene *et al.* (2006); Laporta (unpub. data); Praderi *et al.* (2012)	Opportunistic
	Maldonado	2	1962, 1991		
	Canelones	5	1958-1975		
	Montevideo	3	1951-1962		
	Colonia	1	1905		
	Soriano	1	1909		
Argentina	Buenos Aires	15	1904-1982	Lahille (1908); Marelli (1953); Mermoz (1977); Moreno *et al.* (1984); Crespo *et al.* (2008)	Opportunistic
	Rio Negro	8	2006-2010	Crespo *et al.* (2008); Vermeulen (unpub. data)	
	Chubut	8	?	Crespo *et al.* (2008); Coscarella *et al.* (2012)	
	Tierra del Fuego	13	1977-2006	Goodall (1989); Crespo *et al.* (2008); Goodall *et al.* (2011)	

approximately 115km of beaches (from Comprida Island to Superagüi Island in Paraná State)[14]. None of these records are included in Figure 1.

From 1993 to 1995, a lone and sociable bottlenose dolphin (male) was reported on the northern coast of SP (Santos, 1997). In 2003, another lone and sociable bottlenose dolphin (female) was observed traveling between Ubatuba and Bertioga. The latter was found dead in São Vicente in August 2003 after moving approximately 250km southwards from the location at which it was first sighted (Santos *et al.*, 2010). Artisanal fishermen also reported sightings of bottlenose dolphins in the São Sebastião region (Souza and Begossi, 2007).

2.4 Southern Brazil and Uruguay

In the state of Paraná, a communication network of fishermen and researchers was established to obtain information and carcasses of stranded animals. Beaches were monitored from 1997 to 1999 and from 2007 to 2009 (for the latter period the monitoring was systematic). A total of 18 strandings were recorded, seven in the first period and 11 in the second one. Most of the strandings (63%) occurred from Pontal do Sul (25°34'S, 48°20'W) to Praia de Leste (25°47'S, 48°30'W)[15]. Information gathered from unpublished data and scientific collections identified 28 individual strandings along the coast of Paraná, from Superagüi Island to south of Guaratuba Bay[15,16] (Santos *et al.*, 2002; Siciliano *et al.,* 2007).

During opportunistic boat surveys in a coastal area of Paraná State, eight sightings of bottlenose dolphins were recorded between 2008 and 2009: three near the estuary of Guaratuba Bay in April and July 2008, two at the surf zone in Pontal do Paraná Beach in January 2008, two around Currais Archipelago in June and July 2009 and one in the continental slope (25-30m depth) in February 2008[15]. Another study in this area, based on fishermen interviews, reported bottlenose dolphins sightings in Guaratuba Bay (between 25°50'S, 48°30'W and 25°54'S, 48°45'W) (Monteiro-Filho *et al.*, 1999). Fishermen affirm that it is common to see bottlenose dolphins during winter at the estuary of Guaratuba Bay, when an important prey (*Mugil* spp.) is also present.

In Santa Catarina State, 11 stranding records, most of which occurred during the summer and spring, were presented in a compilation made by Simões-Lopes and Ximenez (1993). In a review of mammal species of the state of Santa Catarina, Cherem *et al.* (2004) presented 13 records of the species. Barreto *et al.*[16] recorded the incidental capture of three other individual bottlenose dolphins in Barra Velha, and Flores *et al.*[17] reported that one individual was bycaught during February 2009 in Florianopolis Island.

At the Itajaí River mouth, in Santa Catarina State, around 989.6h of survey effort was made between 2001 and 2006, with bottlenose dolphins observed for 35% of the time[18,19]. After 2003, the sighting rate in the area fell drastically, with none recorded during 2006 due to anthropogenic activities at the Itajaí Port (dredging and wharf reparation). Since 2007, groups of dolphins have occasionally been observed in the region[18, 20].

From 1989 to 2005, groups of bottlenose dolphins (n = 71) were observed throughout the year along the coast of Florianópolis Island (Wedekin *et al.,* 2008). Between 1993 and 2002, 226 boat-based surveys were carried at North Bay of the island (27°30'S, 48°31'W) and 36 groups of bottlenose dolphins were reported. Although a greater sighting frequency was reported during the winter months (38.8%, n = 14), no significant seasonal differences were found. Similarly, dolphins were mostly found along the eastern coast of the bay, but without preference for a particular area (Flores and Fontoura, 2006). During the same study period, nine opportunistic sightings were made along the outer coast of the island, although the authors did not present information on temporal occurrence.

In Santo Antônio Lagoon, southern Santa Catarina State, sporadic observations from land-based locations were made from 1984 to 1994 and monthly observations were made from August 1989 to December 1991, totaling 880h of survey effort from shore station (Simões-Lopes *et al.,* 1998; Simões-Lopes and Fabian, 1999). From April 1991 to March 1992, boat-based surveys were carried out and a total of 52 groups of dolphins were recorded all year-round;

[14]Santos, M.C.O., Rosso, S. and Ramos, R.M.A. (2010) Bottlenose dolphins (genus *Tursiops*) in southeastern Brazil: insights on geographic variation based on skull morphology. Working Paper 51 presented during the *First Workshop on the Research and Conservation of Tursiops truncatus in SWAO*, 21-23 May 2010, Rio Grande, RS, Brazil.

[15]Domit C., Weber Rosas, F.C., Rosso-Londoño, M.C., Ougo, G., Bracarense, A.P.F.R., Domiciano, I.G., Beloto, N. and Monteiro-Filho, E.L.A. (2010) Ocorrência de *Tursiops truncatus* (Montagu, 1821) no litoral do estado do Paraná, no período de 1997/1999 e 2007/2009. Working Paper 15 presented during the *First Workshop on the Research and Conservation of* Tursiops truncatus *in SWAO*, 21-23 May 2010, Rio Grande, RS, Brazil.

[16]Barreto, A.S., Henrique-Garcia, J., Moreira, P.P. (2005) Histórico de 5 anos do Programa Pescador Amigo do Golfinho nas Comunidades de Barra-Velha, Penha e Balneário Camboriú, SC. Page 50 *in* Abstracts *IV Encontro sobre Conservação e Pesquisa de Mamíferos Aquáticos,* 12-15 November 2005, Itajai, SC, Brazil.

[17]Flores, P.A.C., Pretto, D.J. and Rocha, H.J.F. (2010) A note on a stranded bottlenose dolphin with intensive fishing gear. Working Paper 63 presented during the *First Workshop on the Research and Conservation of* Tursiops truncatus *in SWAO*, 21-23 May 2010, Rio Grande, RS, Brazil.

[18]Barreto, A.S., Suenaga, H., Castro, M., Santos, P.O. and Tonini, F. (2007) Redução na ocorrência de *Tursiops truncatus* (Delphinidae, Cetacea) no estuário do Rio Itajaí Açú. CD-ROM *in* Anais *XXII Congresso Latino-Americano de Ciências do Mar* - COLACMAR, 15-19 April 2007, Florianópolis, Brazil.

[19]Britto, M.K. and Barreto, A.S. (2010) Effects of human activities on the behavior of bottlenose dolphins (*Tursiops truncatus*) in the Itajaí river mouth. Working Paper 39 presented during the *First Workshop on the Research and Conservation of* Tursiops truncatus *in SWAO*, 21-23 May 2010, Rio Grande, RS, Brazil.

[20]Demessiano, K.Z. and Barreto, A.S. (2010) Estimativa populacional de *Tursiops truncatus*, da Foz do Rio Itajaí, SC, a partir da técnica de foto-identificação e de modelos de marcação-recaptura. Working Paper 42 presented during the *First Workshop on the Research and Conservation of* Tursiops truncatus *in SWAO*, 21-23 May 2010, Rio Grande, RS, Brazil.

mostly between May and August 1991 (Simões-Lopes and Fabian, 1999). More recently, from September 2007 to September 2009, during 48 field-sampling days carried out in the same area, bottlenose dolphins were observed all year-round. It was found an average of 82% of recapture rates of individuals between seasons (Daura-Jorge *et al*., 2013).

At the mouth of the Mampituba River, located in Torres (northern RS), a study carried out between November 1998 and November 1999 suggested the existence of nine resident individuals (Bernardi, 2000). Occasional land-based photo-identification surveys (n = 10) carried out from 1995 to 2008 in Mampituba River and Tramandaí River identified six individuals from this dolphin community[21].

In Imbé/Tramandaí, also in the northern region of RS, sporadic surveys from shore-based locations were made between 1982 and 1995, covering all seasons (Simões-Lopes and Fabian, 1999). Systematic observations were carried out between April and June 1994, totaling 144h of observation effort (Simões-Lopes *et al.,* 1998). Both studies confirmed the annual presence of dolphins in the area. In addition, Moreno *et al*.[22] conducted 120 observational days between October 1991 and April 2008. Both studies recorded a maximum number of 10 identified individuals using the area. In 1996, 2002 and 2003, a total of 1446h of direct observation were carried out, resulting in 28, 45 and 45 groups of dolphins observed each year, respectively (Hoffmann, 2004; Hoffmann *et al*., 2008). This area was then studied again from January 2009 to February 2010, during 128 days of observation effort, and nine dolphins (including three calves) were sighted all year-round with greater frequencies in fall and winter months and limited sightings during summer (Giacomo and Ott, 2016 this volume). All these studies verified the annual presence of the species in Imbé/Tramandaí and moderate seasonal and annual recapture rates of individuals.

Between 1991 and 2008, systematic beach surveys of northern RS coast, along 270km of sandy beaches from Torres (29°19'S, 49°42'W) to Peixe Lagoon National Park (31°21'S, 51°02'W) were carried out and a total of 65 bottlenose dolphin carcasses were recovered[22].

In the Patos Lagoon, southern RS, studies of bottlenose dolphins have been carried out since the late 1960s, and with considerable spatial and temporal variability (Castello and Pinedo, 1977; Pinedo, 1982; Möller, 1993; Dalla Rosa, 1999; Mattos *et al.,* 2007; Fruet *et al*., 2011; 2012; 2015*a*, *b*; Lopez, 2014; Di Tullio *et al*., 2015).

From 1969 to 2006, 914 opportunistic and systematic beach surveys were carried out in southern coast of Rio Grande do Sul state, from Peixe Lagoon National Park to Chuí (31°21'S, 51°02'W - 33°44'S, 53°22'W), resulting in a total of 188 stranding records of bottlenose dolphins. Most strandings occurred during spring and summer, with the greatest amount in January. A small percentage of carcasses were recorded during autumn and winter, although only one carcass was found in April. Most strandings were concentrated in the vicinity of Patos Lagoon estuary, but records were present all along the southern coast of the Rio Grande do Sul state (Fruet *et al.,* 2012).

Apparently, the distribution of bottlenose dolphins in Uruguay has changed in the last 50 years. Some documents suggest that dolphins occurred over a larger area, extending along the entire coast, especially in the La Plata River estuary[23] (Lázaro and Praderi, 2000; Risso, 2005). Specimens of bottlenose dolphins housed at the National Museum of Natural History, the Vertebrate Zoology Collection of the Faculty of Science and other local museums in Uruguay, revealed 25 strandings along the Uruguayan coast between 1905 and 2010 from Colonia to Rocha Department (33°49'S, 58°25'W - 33°44'S, 53°21'W), including one stranding in the Uruguay River (Soriano Department) (Pilleri and Gihr, 1972; Praderi, 1985; Del Bene *et al*., 2006; Praderi *et al*., 2012). Between 2002 and 2010, four strandings were recorded along the Rocha Department coast (P. Laporta, unpub. data).

Over the past 50 years groups of bottlenose dolphins have commonly been observed in the estuarine coast of the La Plata River. Moreover, there are five sighting records of the species in interior rivers such as Negro (Soriano Department) and Uruguay (Salto and Paysandú departments) (Figueira, 1894; Litcher and Hooker, 1983). In December 1949 and March 1950, the species was frequently observed off Carrasco Beach, Montevideo Department[23]. One sighting of the species was recorded in Punta del Diablo (Rocha Department), between 18 and 24 July 1973 (Brownell *et al.,* 1973), whereas Pilleri and Gihr (1972) reported frequent observations for that region.

Systematic surveys along the Uruguayan coast (Rocha Department) started in 2002. At Coronilla Beach (33°38'S, 53°24'W) monthly surveys were undertaken from September 2002 to May 2004, totaling 53 field surveys and 326.2h of observation. Bottlenose dolphins were observed in 64.2% of these surveys, totaling 57 groups (Laporta, 2004). Later, from January 2006 to December 2008, boat and land surveys were conducted at Cabo Polonio (34°23'S, 53°46'W) and Coronilla beaches (115 and 153 surveys, respectively), during which 343 groups of dolphins were recorded (74 and 269,

[21]Bernardi, L.R. and Freitas, T.R.O. (2000) Uso de fotoidentificação para o reconhecimento individual do boto, *Tursiops truncatus* (Cetacea, Delphinidae) no Rio Mampituba, Torres, RS. Page 13 *in* Abstracts, *9a Reunión de Trabajo de Especialistas en Mamíferos Acuáticos de America del Sur* and *3° Congreso de la Sociedad Latinoamericana de Mamíferos Acuáticos*, 30 October-3 November 2000, Buenos Aires, Argentina.

[22]Moreno, I.B., Ott, P.H., Tavares, M., Oliveira, L.R., Borba, M.R., Driemeier, D., Nakashima, S.B., Heinzelmann, L.S., Siciliano, S. and Van Bressem, M-F. (2010) Mycotic dermatitis in *Tursiops* spp. from southern Brazil, with a confirmed record of lobomycosis disease. Working Paper 31 presented during the *First Workshop on the Research and Conservation of* Tursiops truncatus *in SWAO*, 21-23 May 2010, Rio Grande, RS, Brazil.

[23]R. Bastida, pers. comm., 21 May 2010.

respectively). The presence of the species was verified year-round (Laporta, 2009).

2.5 Argentina

Bottlenose dolphins have been observed from Samborombón Bay (province of Buenos Aires) to the southern province of Chubut, although occasional records exist further south in the provinces of Santa Cruz and Tierra del Fuego (Goodall, 1989; Bastida *et al.*, 2007; Goodall *et al.*, 2011). The earliest record of bottlenose dolphins for this region was based on the capture of two individuals reported by Lahille (1908) in the La Plata River. The first was in November 1904 at Quilmes and the second in September 1907 at Punta Lara. Both specimens were deposited in the National Museum of Buenos Aires and were described as *T. gephyreus* by the author. In Argentina, the first research efforts concerning this species were conducted between 1974 and 1976 (Würsig and Würsig, 1977; 1979; Würsig, 1978). But these studies were not continued, rendering it difficult to validate the apparently decreasing frequency of bottlenose dolphin sightings along the coasts of Buenos Aires and Patagonia (Bastida *et al.*, 2007; Coscarella *et al.*, 2012).

Only a few strandings of bottlenose dolphins have been documented along the coast of the province of Buenos Aires. Lahille (1908) mentioned the existence of five specimens of bottlenose dolphins in La Plata Museum, one of them from Necochea. Marelli (1953) found a stranded individual at Punta Blanca in July 1951, while Mermoz (1977) recorded an individual stranded at Punta Indio (northern Samborombón Bay) in March 1976. The coastal area has been monitored for several decades during which only one individual was found incidentally captured near Mar del Plata Port in January 1982 (Moreno *et al.*, 1984) and only one other stranding was recorded at Chapadmalal Beach, south of Mar del Plata City[23].

In the province of Buenos Aires, from Necochea (38°37'S, 58°50'W) to Piedras Point (35°23'S, 57°07'W), Samborombón Bay and along the coast of Mar del Plata (38°01'S, 57°31'W), occasional sightings of bottlenose dolphins have been made since 1950. However, the most frequent records occurred between 1974 and 1980 (E. Vermeulen, unpub. data). Mermoz (1977) mentioned the presence of a group of bottlenose dolphins in Punta Indio in March 1976.

In San José Gulf (42°23'S, 64°03'W), province of Chubut, 443 observation days were completed between July 1974 and March 1976, of which 44% had sightings. Records of bottlenose dolphins occurred in all seasons and a total of 53 individuals were identified (Würsig, 1978; Würsig and Würsig, 1979).

Crespo *et al.* (2008) compiled strandings and sightings of bottlenose dolphins along the Argentinean coast from the province of Buenos Aires south to the province of Tierra del Fuego, including: four strandings and 18 sightings off province of Buenos Aires; two strandings and five sightings off Rio Negro; five strandings and 15 sightings off Chubut; one sighting off Santa Cruz; and two strandings and one sighting off Tierra del Fuego. However, no information of occurrence was available.

Coscarella *et al.* (2012) compiled information about bottlenose dolphin sightings through aerial-, boat- and cliff-based observations from 1999 to 2007 in Chubut Province, particularly in San José and Nuevo gulfs, as well as adjacent areas. Specifically, a strip (624m wide) of the coast between 42°S and 43.5°S has been periodically surveyed (from the air) since 1999 as part of southern right whale (*Eubalena australis*) censuses, totaling 33 flights, 12 during 1999-2000 and 21 during 2003-2007. Seventeen groups of bottlenose dolphins were observed. Only one group was sighted inside San José Gulf on 17 December 2005. Bottlenose dolphins were recorded in Nuevo Gulf during the entire year, while their occurrence in the remaining areas was mostly during winter and spring.

Boat surveys were directed to study the dusky dolphin (*Lagenorhynchus obscurus*) in San José Gulf (800km^2) and Nuevo Gulf (2500km^2), covering almost the entire areas of these bays, and data of bottlenose dolphin were collected opportunistically. In San José Gulf, 25 surveys were conducted from September 2004 to June 2007, each lasting five hours on average. In Nuevo Gulf, 336 surveys were performed from January 2001 to December 2007, lasting four hours on average. A total of 85 sightings of bottlenose dolphins were recorded in Nuevo Gulf, most of them in summer and no sightings were observed in San José Gulf (Coscarella *et al.*, 2012).

Between February 1999 and December 2002, records of bottlenose dolphins were collected systematically in Engaño Bay from cliff-top based locations. Observations were conducted from a vantage point located about 3km south of the Chubut River mouth (43°20'S, 65°02'W). A total of 1081 scans were performed during 81 days. Dolphins were recorded during only 91 of these scans and were present throughout the year, with no differences among seasons (Coscarella *et al.*, 2012).

Coscarella *et al.* (2012) also mentioned that since 1990, regular surveys of the beaches found only three stranded bottlenose dolphins. Additionally, despite the high survey effort of the trawling fishing fleet operating in the Patagonian shelf during the 1990s, no entanglements were reported (Crespo *et al.*, 1997).

In Rio Negro Province, particularly in the bay of San Antonio, San Matías Gulf (40°50'S, 64°50'W), six strandings were recorded between 2006 and 2010 (E. Vermeulen, unpub. data). In this area, between August 2006 and December 2008, 218 land surveys were carried out, totaling 714h of effort and 132h of observation. In addition, 19 boat surveys were carried out totaling 83h of survey effort, resulting in 10h of observations. In this period, 224 groups were recorded (Vermeulen and Cammareri, 2009). Furthermore, a total of 99 boat surveys (462.3h) were carried out in the area between August 2008 and December 2010, resulting in 80.7 observational hours of 107 dolphin groups (Vermeulen and Cammareri, 2009; E.Vermeulen, unpub. data). A field survey

carried out in a larger area of San Matías Gulf between June 2006 and November 2007 recorded the annual presence of bottlenose dolphins[24].

The first record of a bottlenose dolphin in the province of Tierra del Fuego, the southern limit of the species distribution, was a specimen found buried in the mud of San Sebastián Bay, on the northeast coast of Tierra del Fuego, in 1977 (Goodall, 1989). No further specimens were found until March 2003, when a mass stranding of two males and two females (one with a large fetus) occurred on the shores of San Sebastián Bay. In the winter of 2004, the skeletal remains of a sixth specimen were found on the northeast coast of Puerto Harberton (54°52'S, 67°19'W), a bay off the eastern Beagle Channel in southern Tierra del Fuego (Goodall *et al*., 2011). In addition, one sighting of three individuals in Beagle Channel (54°55'S, 67°34'W), eastern Ushuaia, was recorded during February 2003 (Goodall *et al*., 2011).

Conclusions

In the SWAO, bottlenose dolphins have been recorded from Amapá State (~04°33'N, 37°00'W), northern Brazilian coast, to the province of Tierra del Fuego (54°55'S, 67°34'W), southern Argentina. For most areas where the species occurs, the available information is fragmented. However, the data summarized herein suggests a continuous and common distribution in coastal and estuarine waters along the SWAO. Further, while the range clearly extends to oceanic areas, including the continental slope, the lack of systematic research effort precludes a better understanding of the offshore distribution.

Concerning the Brazilian regions, the information regarding the occurrence of bottlenose dolphins in the north remains scarce, although records from Amapá and Maranhão states do exist. In the northeast, strandings were more frequent along Rio Grande do Norte, Pernambuco and Bahia states. For the coastal zone of that region, sightings have rarely been reported.

For the southeast region of Brazil, considering the available data on sightings and strandings in the absence of corrections for sampling effort, Rio de Janeiro State had the greatest numbers, followed by São Paulo. Information on bottlenose dolphins in Espírito Santo State is scarce.

In southern Brazil, systematic and long-term studies have been more frequent than in other regions. Clearly, the species is distributed along the Paraná coast and despite not being studied systematically, there seems to be a concentration in the Guaratuba Bay region and adjacent areas. Along the entire southern Brazilian coast, the species has mainly been observed around estuaries and river mouths (*e.g.* Itajaí, Mampituba and Tramandaí), lagoon mouths (*e.g.* Santo Antônio and Patos), and coastal islands (*e.g.* Florianópolis). Open beaches along the coast of Uruguay also seem to be a preferred location.

While the species occurs along the entire Uruguayan coast, it appears mostly concentrated along the Rocha Department, and especially between Cabo Polonio and the border with Brazil (Barra del Chuy). A change in the distribution range has been observed since 1960, when sighting frequencies were greater than today in the La Plata River. Systematic distributional studies are recent and have been carried out only along the open Atlantic coastal areas. It is important to extend the study area to La Plata River to obtain a better understanding of the full distributional range of the species.

In Argentina, bottlenose dolphins appear to be mostly restricted to the Samborombón Bay, province of Buenos Aires, and along the whole northern region of Patagonia, where the San Antonio Bay has the greatest numbers. The southernmost records of the species are in the province of Tierra del Fuego. Systematic studies undertaken in this area will bring valuable insights about the species distributional limits. This work would also facilitate an evaluation of possible distribution shifts along the Argentinean coast. Moreover, the decrease in bottlenose dolphin sightings along the coast of the provinces of Buenos Aires and Chubut may be regarded as a shift in its use by the dolphins. Additionally, a possible overall population decline could have occurred (Bastida *et al.,* 2007; Coscarella *et al*., 2012). For this reason, continuous monitoring of the resident populations (*e.g.* in San Antonio Bay) as well as areas of greater concentrations of dolphins (*e.g.* coast of Nuevo Gulf and Chubut provinces) seems of vital importance.

Recommendations

The research priorities suggested below were derived from a comparative analysis of the existing information on bottlenose dolphins in the SWAO and its recognized knowledge gaps. In order to improve our knowledge on the species within its range along the SWAO, it is suggested:

1. To stimulate systematic studies along the coastal and oceanic regions of the SWAO, aiming to determine and delimit the distribution of the species, especially regarding the oceanic and coastal populations along northern and northeastern Brazilian coast;

2. To monitor the resident and seasonally resident populations, particularly in environments with strong anthropogenic influences.

In relation to proposed conservation measurements, it is strongly recommended to:

3. Compile available information regarding the species occurrence inside existing Marine Protected Areas (MPA) to implement and/or reinforce conservation measures as part of the MPAs' management plans;

4. Develop zoning plans in areas where resident and seasonally resident populations are known to occur, in order to mitigate the effects of anthropogenic activities;

[24]Svensen, G.M., Dans, L.S., González, R., Crespo, E.A. and Romero, A. (2008) Distribución y caracterización de grupos de mamíferos marinos en el Golfo San Matías. Page 205 *in* Abstracts, *13ª Reunión de Trabajo de Especialistas en Mamíferos Acuáticos de América del Sur* and *4° Congreso de la Sociedad Latinoamericana de Mamíferos Acuáticos*, 13-17 October 2008, Montevideo, Uruguay.

5. Identify research groups that focus on other marine species in areas of strong occurrence of bottlenose dolphins in order to promote coordinated conservation strategies to ensure the sound management of the SWAO.

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