# A REVIEW OF *BALAENOPTERA* STRANDINGS ALONG THE EAST COAST OF SOUTH AMERICA

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## ABSTRACT

The genus *Balaenoptera* comprises seven species and 15 subspecies whose conservation statuses range from "Endangered" to "Least Concern" and "Data Deficient". In addition to data from whaling and offshore cruises, much of the information related to these whales in the Southwestern Atlantic Ocean (SWAO) comes from beached carcass analysis. We reviewed published and unpublished confirmed records of *Balaenoptera* strandings along the east coast of South America (from ~12°N to 55°S) to evaluate spatio-temporal ecological and habitat use patterns. A total of 223 strandings from the seven species were documented from 1865 to 2018: *B. edeni*, more recently referred to as *B. brydei* in the SWAO (n=83), *B. acutorostrata* (n=64), *B. bonaerensis* (n=23), *B. borealis* (n=19), *B. physalus* (n=25), *B. musculus* (n=8), and *B. omurai* (n=1). As expected, most of the species occurred in higher numbers during the winter and spring migration seasons to/from low latitudes. *Balaenoptera brydei* and some individuals of *B. acutorostrata* were found year-round along the Brazilian coast. Although we may be underestimating the total number of strandings because unidentified whales were not included, and some records were probably not recorded considering the vast area as well as effort differences among regions, this is the most complete data set for strandings in Eastern South America. This supported different theories, such as possible sexual segregation for *B. borealis* (especially of pregnant females), a calving area for the same species in mid-latitude waters of the SWAO, and a larger *B. acutorostrata* calving area than previously expected (from ~17°S to 35°S). The apparent increase in efforts towards beach surveys in Eastern South America, such as a network for marine mammal stranding information in Brazil (REMAB), will be of great value to fill knowledge gaps related to *Balaenopteridae* species in the area.

**KEYWORDS:** Cetacea, whale, rorqual, *Balaenoptera*, whaling sites.

**RUNNING HEAD:** *Balaenoptera* strandings in South America.

## 1. INTRODUCTION

The genus *Balaenoptera* comprises seven extant species and 15 subspecies (Committee of Taxonomy 2018). Globally, their conservation status ranges from endangered, for example for the blue whale (*B. musculus*), to least concern for Bryde's whale (*B. edeni*) and data deficient for Omura's whale (*B. omurai*) (IUCN 2018). Owing to the absence of data, more species are considered to be data deficient in regional red list assessments, such as those from Argentina (Crespo 2012), Brazil (ICMBio/MMA 2018), and Venezuela (Rodriguez and Rojas-Suárez 2008). These whales, in conjunction with the humpback whale (*Megaptera novaeangliae*), are often called rorquals and generally perform annual migrations to high latitudes, giving birth in mid-latitude areas, which likely increases the chances of offspring survival (Corkeron and Connor 1999). However, Bryde's whale and some populations of other balaenopterids, such as the blue whale and common minke whale (*B. acutorostrata*) are exceptions and can occupy and feed in mid-latitude areas in the Southern Hemisphere during other seasons of the year (Zerbini *et al.* 1997, Secchi *et al.* 2003, Hucke-Gaete *et al.* 2004, Siciliano *et al.* 2004, Moura and Siciliano 2012, Milmann *et al.* 2018). Rorquals have different ecological roles in the ecosystem as well as cultural and economic value (Bowen 1997, Branch *et al.* 2004), despite most species having been affected by historical whaling activities (Moore *et al.* 1999, Thomas *et al.* 2016). Currently, ice shelf reduction may influence these whales (Rignot *et al.* 2019), as this has been forecast to lead to a 95% decrease in Antarctic krill biomass, their main resource, over the next 100 years (Murphy *et al.* 2007).

In the Western South Atlantic Ocean the genus *Balaenoptera* is still poorly known, although all seven species have been recorded in Brazil (Zerbini *et al.* 1997, Rocha-Campos and Câmara 2011, Cypriano-Souza *et al.* 2016). Among them, two are considered data deficient or have not had their conservation status evaluated (IUCN 2018). Furthermore, there are some particularities for different species of the genus that makes evaluation of their conservation status more difficult, such as the recent recognition of the common and Antarctic minke as separate species (see Thomas *et al.* 2016). In addition, a smaller form of Bryde's whale has recently been recognized as a new species, *B. omurai* (Wada *et al.* 2003), with the first record confirmed in Brazil in 2016 (Cypriano-Souza *et al.* 2016). Likewise, *B. edeni* is supposedly composed of a coastal and an offshore form in this area (Zerbini *et al.* 1997), as in South Africa, where a high degree of population differentiation was observed in relation to many morphological and ecological features (Best 2001) as well as molecular data (Penry *et al.* 2018). Moreover, several molecular studies have proposed the recognition of two distinct species of Bryde's whales worldwide, including a larger form called *B. brydei* (*e.g.,* Wada *et al.* 2003, Pastene *et al.* 2015, Penry *et al.* 2018).

The information generated from whaling activities in the Western South Atlantic Ocean is mostly related to relative abundance (number of catches) and periods of peaks whale occurrence, as these whaling activities had economic purpose. The whaling stations along the coast of Brazil or "*armações*", as they were called during the colonial period, were located from Southern Brazil in the state of Santa Catarina, to Northeastern Brazil in the state of Bahia (Morais *et al.* 2016). Modern land-based whaling stations, however, extend further north to the state of Paraíba (Hart and Edmundson 2017). Colonial whaling activity in Brazil began in 1602 and lasted until 1922, whereas modern whaling started in 1911 and lasted until

1985 (Morais *et al.* 2016, Hart and Edmundson 2017). After this period, most information on balaenopterid whales in Brazilian waters came from dedicated surveys in offshore waters (*e.g.,* Zerbini *et al.* 2004, Andriolo *et al.* 2010, Di Tulio *et al.* 2016), local scale studies of coastal populations (Tardin *et al.* 2017) or animals found ashore (Zerbini et al., 1997).

Studies and reviews of beached carcasses have been widely conducted for investigations on seabirds, cetaceans, and sea turtles (*e.g.,* Caretta *et al.* 2016, Prado *et al.* 2016, Lenz *et al.* 2017, Valente *et al.* 2018). In this context, stranded individuals found on the beach can reveal the presence of unsuspected (*e.g.,* Cypriano-Souza *et al.* 2016) and novel species (Dalebout *et al.* 2002), which are important for rare cetacean species. In addition, the advantages of this method such as its relatively low cost, and the opportunity for tissue collection allied with the possibility of morphometric and molecular analysis of specimens, makes long-term beach surveys an established methodology for the study of marine mammals. It provides a glimpse of the species present in the marine community, although the lower probability of oceanic animals beaching compared to individuals who died near the coast (Caretta et al. 2016) and other parameters need to be considered. Moreover, the continental shelf configuration and the influence of ocean currents affect the carcass drift process (Prado *et al.* 2013).

The present review of strandings in the Central West and Southwest Atlantic Ocean aided the identification of a series of spatial, ecological, and seasonal patterns in the distribution of different *Balaenoptera* species. Here we aim to shed light on the habitat use of these species, as there are still large knowledge gaps in the Western South Atlantic (Rocha-Campos and Câmara 2011). Using this historical database and current knowledge about these species from this region and other areas, we discuss both possible ecological implications at the population level, and conservation implications for these rorqual species.

## 2. MATERIAL AND METHODS

The area considered for review was the Southwestern Atlantic Ocean and the Central Western Atlantic Ocean, from Chile, at the east end of Patagonia Channels, to Venezuela. We also included a stranding from the Falkland Islands region, using records from a total of seven countries (Venezuela, Suriname, Brazil, Uruguay, Argentina, United Kingdom, Chile). In order to gather the most reliable stranding information for genus *Balaenoptera* as possible, peer-reviewed papers, PhD theses, books, and technical reports (*i.e.,* International Whaling Commission and NOAA Technical Reports) were reviewed. In addition, new records from the authors were presented. For those records, geographic location (i.e., latitude/longitude) was registered, and species identification in the field were based on literature guides (e.g., Stewart *et al*. 2002). Whenever possible, total body length and sex were determined according to the protocol established by Norris (1961).

Some specimens from past publications were identified based on molecular analysis, such as a *B. omurai* calf, and individuals of *B. brydei* and *B. acutorostrata* (e.g., Sholl *et al*. 2013, Pastene *et al*. 2015, Cypriano-Souza et al. 2016). Only records identified at the species level were included, and the strandings

were cross-referenced by the date and the size of the individual to avoid repeating a stranding. Moreover, information such as species identification of the whale, date, location of stranding, and total length was gathered whenever available in the original publication. When an interval of size was provided for an individual, it was included in Table I, but for the analysis of average size per species, we used the mean value. The age class of individuals, when not provided in the reviewed papers, was estimated based on length according to information in the literature (*e.g.,* Williamson 1975, Lockyer 1984, Best 1985). The season when strandings occurred was based on the beginning and end of each season in the Southern Hemisphere: summer from December 22 to March 21, fall from March 22 to June 21, winter from June 22 to September 22, and spring from September 23 to December 21.

To better display the stranding locations, maps were generated using ARCGis software 10.5, considering either the coordinates when available or the described location. Stranding data were also mapped in 5° latitude grid cells using ARCGis.

The nomenclature for all the species followed the indication of Committee of Taxonomy (2018), except for Bryde's whale, where we used the name *B. brydei* following Wada *et al.* (2003) and Pastene *et al.* (2015). In addition, the dwarf minke whale is considered an unnamed sub-species of *B. acutorostrata* occupying the Southern Hemisphere but is henceforth referred to as *B. acutorostrata* only.

## 3. RESULTS AND DISCUSSION

We reviewed 70 references from 1865 to 2018 with information on strandings of genus *Balaenoptera* (Table I). From these, 223 strandings of seven *Balaenoptera* species were compiled. The number of individuals recorded per species ranged from one, in the case of *B. omurai*, to 83 individuals for the complex *B. edeni*/*B. brydei.* Data were compiled from seven countries with coastlines in the Central West and Southwest Atlantic Ocean (Table I); however, most records were from Brazil (n=161, 72.32%). In general, stranding information appears in one publication or two, yet the same *B. musculus* stranding was mentioned in at least six different sources (ID 193, Table I).

The literature related to *Balaenoptera* strandings in this review is the most complete compilation of this type of record in the region so far, as it includes published reviews and records (*e.g.,* Agudo 1995a, Zerbini *et al.* 1997, Siciliano *et al.* 2004, 2011, Santos *et al.* 2010) as well as previously unreported data. The information regarding some specimens may have been cited in multiple publications, due to their differing approaches. For some *B. brydei* specimens, for example, first the stranding record was published (Moura and Siciliano 2012) followed by molecular analysis of the individual (Pastene *et al.* 2015). In this context, cross-referencing all the information from a single individual will provide easier access to all available published information from a stranding to future researchers. On the other hand, not all papers that used whale strandings provided geographical data with individual information, and only some or none of the information could be extracted (*e.g.,* Gomes *et al.* 2011, Prado *et al.* 2016).

Even though this is the most complete dataset for South America, it is important to mention that the coastline of the area extends approximately 7500 km from the Caribbean coast to Cape Horn, and there are places where there was no effort or the effort was not systematic. Therefore, it is likely that the number of strandings was underestimated for these reasons and also because unidentified whales were not included, as we analyzed *Balaenoptera* strandings at the species level. In all cases, we do not believe that the loss in absolute numbers was significant, especially in relation to unidentified whales. In any case, for future reference, data from unidentified individuals can be found in other published studies (*e.g*., Zerbini *et al*. 1997, Santos *et al*. 2010, De Boer 2015). Another important aspect to be highlighted is that South America is only a part of most *Balaenoptera* whales' home range, with the exception of *B. brydei* (Moura and Siciliano 2012), and their occurrence patterns were therefore not evaluated in the lower latitudes of the Southern Oceans, which are areas used for feeding and reproduction activities (Corkeron and Connor 1999, Aguilar 2009).

The first documented records of *Balaenoptera* strandings on the east coast of South America refer to the late 19th century, including original descriptions from naturalists (*e.g.,* Burmeister 1867, 1872) (see Table I). The number of records increased in the 1970s (Figure 1) when systematic beach surveys began to be carried out in many areas, mainly in Southern and Southeastern Brazil (*e.g.,* Pinedo *et al.* 1992, Moura and Siciliano 2012, Prado *et al.* 2016). In this context, it should be mentioned that the relatively small number of records in the last decade (*i.e.,* 2010-2019) is probably more related to the delayed scientific publication of the stranding records than any natural phenomenon.

As expected, the number of strandings varied across species, with some more rare such as *B. omurai* and some more common such as *B. brydei* and *B. acutorostrata*. For the latter, we were able to infer more aspects based on the greater quantity of information available. Pooling data for all species, the greatest number of records is concentrated between the latitudes of 20°S and 35°S (Figure 2), mainly encompassing the Southern Brazilian coast. The greater number of records and publications from Brazil could be related to increased effort, country size, and because the area is used for wintering grounds and calving areas by many species (Zerbini *et al.* 1997). Moreover, Southern Brazil and the region close to it is particularly suited for a great diversity of different marine mammals due to its productivity, resulting from the interaction between the warm Brazil current and cold Malvinas/Falklands current (*i.e.,* Subtropical Convergence Zone), and due to the influence of the discharge of many great bodies of water from the continent (Campos et al. 1995, Seeliger and Odebrech 1998, Odebrecht and Castello 2001, Crespo 2009). In contrast, a gap in records was observed in some areas, such as Guyana and French Guiana, where no published records of the genus were found.

### 3.1. MINKE WHALES

Two minke whale species have been documented in the South Atlantic Ocean: the common minke (*B. acutorostrata*) and the Antarctic minke (*B. bonaerensis*). Records of stranded *B. acutorostrata* ranged from close to the equatorial line in the state of Maranhão (2.69°S), Brazil, to Navarino Island, in the southeastern portion of Chile (54.90°S, Figure 3) (Acevedo et al. 2006, Siciliano et al. 2008). Out of 64

193 records, 47 (73.43%) occurred between the states of Rio Grande do Sul, in Southern Brazil (33.45°S) and
194 the state of Rio de Janeiro, in Southeastern Brazil (22.93°S). We defined the season of 61 strandings from
195 *B. acutorostrata*; most of the strandings occurred in winter (n=25), followed by spring (n=18), fall (n=13),
196 and summer (n=5, Figure 4). The total body lengths were obtained from 51 individuals and ranged from a
197 minimum of 2.2 m to a maximum of 10 meters ($\bar{x}$=4.93, SD=1.85).

198 The wide geographical range of strandings from warm waters in Northern Brazil to the cold Strait
199 of Magellan, Chile, and data from dietary studies indicate adaptation to different environmental conditions
200 and flexibility in feeding strategies in *B. acutorostrata*. The stomach contents of two *B. acutorostrata*
201 individuals from Southern Brazil were analyzed and showed completely different food contents (Secchi *et*
202 *al.* 2003, Milmann *et al.* 2018). Moreover, a site where other *B. acutorostrata* died as bycatch (143 m deep)
203 and a spawning area for known prey *Illex argentinus* are proximal to the continental slope, showing that
204 immature individuals may be using offshore waters of Southern Brazil for feeding. Likewise, individuals
205 have been observed at a depth of 548 m in an adjacent area in Santa Catarina, Southern Brazil (Zerbini *et*
206 *al.* 2004). If many individuals have an offshore distribution, there is probably an underestimation of the
207 local abundance of *B. acutorostrata*, even though it is the species with the second highest number of
208 stranding records in this review.

209 It has been suggested that some individuals of this species do not migrate to the Antarctic and
210 instead stay closer to the South American continent (Zerbini *et al.* 1996, 1997). It is worth noting that the
211 four strandings recorded in summer were located between Southern Brazil and Northern Argentina,
212 confirming that at least some individuals do not migrate and may stay in this area. The presence of the
213 species in mid-latitude waters throughout the year is supported by strandings in all seasons, although peaks
214 in the number of strandings occurred in winter and fall (Figure 4). The species has been observed during
215 mid-summer in very coastal waters off Arraial do Cabo, Southeastern Brazil (Hassel *et al.* 2003).
216 Comparing individual total size with season, we observed that there were calves in all seasons, except in
217 fall. It was previously assumed that individuals from the species would give birth between 25°S and 35°S
218 (Simões-Lopes and Ximenez 1993, Zerbini *et al.* 1997), which is corroborated by our results, with the
219 exception of new records of individuals as small as calves from latitudes up to 17.33°S and juveniles up to
220 12.71°S. This may signify that the possible calving area of the species in the Southwestern Atlantic Ocean
221 may be larger than previously suspected. In relation to common minke whales, it is also important to notice
222 the documentation of bycatch of at least three individuals in gillnets in Southern Brazil (Simões-Lopes and
223 Ximenez 1993, Secchi *et al.* 2003).

224 Strandings of *B. bonaerensis* ranged from Goede Hoop, Suriname (5.52°N), along the Brazilian
225 coast to Uruguay and Argentina (45.97°S) (Figure 5). An apparent absence of records was observed from
226 roughly 10°S to 20°S; strandings were divided between the central west of Suriname to Northern Brazil
227 and between Southeast Brazil to the Northern Argentinean coast. Most strandings occurred in spring (n=13),
228 followed by summer (n=5), winter (n=3), and fall (n=1, Figure 4). Total body length was obtained from 16
229 individuals and varied from a minimum of 3.5 m to a maximum of 11 m ($\bar{x}$= 6.70, SD=2.50).

*B. bonaerensis* is considered endemic to the Southern Hemisphere (Deméré 2014), and thousands of individuals were captured and processed in the whaling station of Costinha (6.95°N; 34.88°W) in the state of Paraíba, Brazil, which operated from 1911 to 1985 (Williamson 1975, Horwood 1990, Andriolo *et al.* 2010). The broad range of the records indicates the species' great dispersal capability. There are at least six unusual migration records for the species in the North Atlantic, including records of two hybrids with North Atlantic *B. acutorostrata*, a stranding in Suriname, Gulf of Mexico, and in the north of the Arctic circle (Husson 1978, Glover *et al.* 2010, 2013, Rosel *et al.* 2016). The offshore distribution of the species has been confirmed by surveys in Northeast Brazil, where it is the most abundant *Balaenoptera* species, particularly offshore of the continental shelf break (Andriolo *et al.* 2010). However, one individual travelled more than 1,000 km upstream inside Tapajós Rivers, Northern Brazil, prior to the stranding (Balensiefer *et al.* 2014).

In the present review, there were two stranding records of calves in the state of São Paulo and three more in the states of Santa Catarina and Rio Grande do Sul, indicating a possible calving area in the offshore waters of South and Southeastern Brazil. A record of a juvenile collected in Santa Catarina in 1912 supports this hypothesis (Brandão 1914). Moreover, more recently, juveniles and calves were observed on the east coast of São Paulo state at the 610 m isobath (Zerbini *et al.* 2004), over 2,000 km away from the coast. In contrast to these results, no pregnant females were documented during the exploitation of this species in Northeastern Brazil (*i.e.,* whaling station of Costinha - Paraíba) (Horwood 1990), and very few calves were found during surveys in the region (Zerbini *et al.* 2004). Moreover, the concentration of the strandings in summer and spring is in accordance with data from cruises in Northeast Brazil, where the sighting rate of minke whale groups gradually increased from August to October (Andriolo *et al.* 2010).

### 3.2. SEI WHALE

Records of *B. borealis* strandings in the Central West and Southwestern Atlantic Ocean ranged from east of Nieuw Nickerie, Northwest Suriname to Southern Argentina (Figure 6). From the 19 records, 13 (68.42%) occurred between Rio Grande do Sul (32.28°S), Southern Brazil, and Tierra del Fuego province (~54.04°S), Southern Argentina. Seasons were provided for 12 strandings: six in spring, one in summer, one calf in fall, and four individuals during the winter season (Figure 4). Total body lengths were obtained for five individuals of this species, which ranged from 3.1 m to 15.5 m ($\bar{x}$=10.32, SD=4.53). The smallest individual was the only calf, which was stranded in late fall in Montevideo, Uruguay (ID 106, Table I).

The range of strandings and previous literature records indicate that *B. borealis* migrates to warm waters north of the Equator and inhabits temperate waters of Argentina and Uruguay (Horwood 2009), with an individual record in the Falkland Islands (Leonardi *et al.* 2011). It is worth mentioning that the northernmost and southernmost record locations herein were estimated based on the local description, not the actual coordinates. However, one individual which was tagged with a Discovery tag off the South Georgia coast was captured on the coast of Rio de Janeiro, Brazil (Brown 1977). This demonstrates a possible link between the Scotia Sea and Brazilian coastal populations. More than 110,000 individuals were captured in the Southern Hemisphere between 1960 and 1970 (Horwood 2009) and 3,500 individuals in

pelagic waters in Northeastern Brazil from 1947 to 1965 (Andriolo *et al.* 2010). In fact, sei whales were the most common species caught at the whaling station of Costinha, Paraíba, which operated until 1985 (Paiva and Grangeiro 1965, Williamson 1975). Although there are not numerous sightings, the species has been spotted in the offshore waters of Eastern and Southern Brazil (Di Tullio *et al.* 2016), and a potential breeding and calving area for the species has been hypothesized to be close to Trindade Island and Martin Vaz Archipelago, in the central Atlantic (Heissler *et al.* 2016). Very few pregnant females were caught at the whaling station of Costinha over the years (Paiva and Grangeiro 1965) and the recent stranding of a female of only 3.1 meters in Uruguay (Pérez *et al.* 2017) supports this hypothesis. Moreover, the concentration of strandings from Southern Brazil to Southern Argentina, despite the low absolute number of strandings (n=19), also indicates some occupancy of this area by the species. In this context, it is noteworthy that the northern coast of Brazil and Central America seems to be occupied by the northern population, while the area with the most records is used by individuals coming from the Southern Hemisphere (Horwood 2009). Furthermore, the fact that this species has a wide feeding habit (Kawamura 1980) could provide a benefit in the offshore waters of Southern Brazil as resources are relatively abundant during the cold season (Campos *et al*. 1995, Odebrecht and Castello 2001), when most strandings occurred.

### 3.3. BRYDE'S WHALE

Bryde's whales off South America have been commonly classified as *B. edeni*, but a recent genetic survey suggests that only individuals of *B. brydei* occur on the South American coast (Pastene *et al.* 2015). Thus, we considered records of both species in the literature for the Central West and Southwestern Atlantic Ocean, although throughout we will refer to Bryde's whales in this region as *B. brydei* (Pastene *et al.* 2015). Bryde's whales strandings were recorded from tropical waters in Venezuela (11.92° N) to subtropical waters in Southern Brazil (32.12°S), in the state of Rio Grande do Sul (Figure 7). Of 83 strandings, 50 (60.24%) occurred between Guaratuba, in the state of Paraná (25.88°S), and Quissamã, in the state of Rio de Janeiro (22.17°S), in Southeast Brazil. The season of strandings was defined for 77 specimens, where 15 were in summer, 19 in fall, 30 in winter, and 13 in spring (Figure 4). The total body length was provided for 55 whales and varied from 3.8 m to 15 m ($\bar{x}$=10.64, SD=3.20).

The strandings of *B. brydei* from Venezuela to Southern Brazil (with no records in Uruguay and Argentina) show a preference for relatively warmer and subtropical waters from this species, which differs from most whales of the genus (Zerbini *et al.* 1997). This species was the most commonly stranded in the present review and is likely one of the most common *Balaenoptera* on the Brazilian coast (Zerbini *et al.* 1997, Siciliano *et al.* 2004). In the present review, records of *B. brydei* outnumber records of *B. acutorostrata*, which was previously the balaenopterid species with the greatest number of stranding records along the Brazilian coast (Zerbini *et al.* 1997). In fact, an annual increase in the number of Bryde's whale strandings was previously noticed in Southeastern Brazil (Moura and Siciliano 2012).

In addition, most stranding records were from Southern and Southeastern Brazil, where site fidelity of live animals has been observed (Lodi *et al.* 2015) and seems to be linked to preferential prey distribution

(*i.e., Sardinella brasiliensis*, *Scomber japonicus*) (Siciliano *et al.* 2004, Tardin *et al.* 2017). A peak of abundance in lactating females has been observed in April and May in a local area of Southeast Brazil (Tardin *et al.* 2017). Other studies have shown no peak abundance in strandings in the same area (Siciliano *et al.* 2004), and the constant number of strandings across seasons previously reported and found herein indicates the common occurrence of this species along the Brazilian coast (Zerbini *et al.* 1997, Siciliano *et al.* 2004).

*B. brydei* was also exploited by two modern whaling stations in Brazilian waters: Costinha station (Paraíba State) and Cabo Frio station (22.88°S; 42.01°W, Rio de Janeiro State) (Williamson 1975, Zerbini *et al.* 1997), although it was not officially distinguished from the sei whale until 1967, which precludes an accurate estimate of the catches of both species. Nevertheless, at least 390 Bryde's whales were estimated to have been taken in the two Brazilian whaling stations (Williamson 1975, Zerbini *et al.* 1997).

*B. brydei* seems to have several breeding grounds distributed along the Brazilian coast, as there were strandings of five individuals smaller than 5 m in length (probably calves) and a pregnant individual at different sites from Pará, Northern Brazil, to Rio Grande do Sul, Southern Brazil. In Southeastern Brazil, for example, although most strandings were from adults, individuals from all age classes were observed (Moura and Siciliano 2012). Whether records of *B. brydei* constitute one or more populations, or different ecotypes, remains to be elucidated. For example, coastal and oceanic ecotypes have been observed in South Africa (Best 2001, Penry *et al.* 2018), and previously suggested for Brazil (Zerbini *et al.* 1997). This species has been observed in the oceanic waters of Brazil (Andriolo *et al.* 2010, Di Tulio *et al.* 2016); therefore, longitudinal migration from coastal waters or the presence of a second form occupying oceanic habitats are viable hypotheses. A molecular analysis of stranded and biopsied whales from inshore and offshore waters would aid in elucidating this issue and verify whether there are other *B. omurai* records amidst those identified previously as *B. brydei,* as this species was only recently described and both are morphologically similar.

### 3.4. BLUE WHALE

Records of *B. musculus* are widely distributed in the Southwestern Atlantic Ocean, although not numerous, probably because this species has been severely exploited through modern whaling, which dates from 1903 in this region (Tønnessen and Johnsen 1982). In the Southern Hemisphere, the Antarctic blue whale was reduced to less than 1% of pre-exploitation levels (Thomas *et al.* 2016) and is rare in the Western South Atlantic (Branch *et al.* 2007).

Partially as a consequence of its stock depletion or its offshore distribution (Thomas *et al.* 2016), there are few modern whaling records of blue whale capture along the Brazilian coast. In the two main whaling stations that operated in Brazil, Costinha, Paraíba, and Cabo Frio, Rio de Janeiro, only three blue whales were taken between 1910 and 1985 (Zerbini *et al.* 1997).

In the present review, only eight confirmed blue whale stranding records were found, including the stranding of a live female on the southernmost coast of Brazil (33.75°S) (ID 193, in Table I and Figure 8). The strandings were distributed from Paraíba, Brazil (7.01°S), to Isla Galiano, Argentina (45.1°S, Figure 8), with four of the seven individuals recorded between Southern Brazil and Northern Argentina (32.10°S. 34.30°S). The stranding records ranged from late April to October (Table I, Figure 4), and total body length values were obtained for three individuals varying from 14.9 m to 23.12 m ($\bar{x}$=18.5, SD=3.41). Despite the lack of neonate records, three sightings of mother–calf pairs were reported during the winter in offshore Brazilian waters. The first two sightings occurred in July 2011, in two close locations in the Potiguar Basin (~04.70°S; 36.66°W), Northeastern Brazil (Oliveira 2015), which may have been the same animal. The third mother-calf pair was observed in deep waters (2,645 m) off Southeastern Brazil (22.11°S; 38.96°W) in July 2014 (Rocha *et al.* 2019).

### 3.5. OMURA'S WHALE

The only record of *B. omurai* is of a calf that was stranded on the northeastern coast of Brazil (3.54°S, 38.80°W) during winter (Cypriano-Souza *et al.* 2016) (ID 198, in Table I and Figure 8), which is coincident with species records across the globe, mainly from tropical waters (Cerchio *et al.* 2019). However, this species was only described in 2003 and due its similar morphological characteristics to Bryde's whale (*B. brydei*); it is likely that there are mistakenly identified specimens in collections. This assertion emphasizes the need for a molecular approach from Bryde's whale specimens in collections and museums to confirm previous identifications. The present record of *B. omurai* was identified through molecular analysis. This is due to the fact that the identification of carcasses in an advanced state of decomposition is often inaccurate (*e.g.,* Sholl *et al.* 2013). Moreover, the fact that a neonate was recorded reinforces the possibility that this species could at least inhabit Northeast Brazil (Cypriano-Souza *et al.* 2016).

### 3.6. FIN WHALE

Records of *B. physalus* strandings (n=25) were distributed between the Peninsula of Paraguana, Venezuela (11.72°N), and Rio Negro, Argentina (41°S, Figure 9). However, records seem to be concentrated mainly between Venezuela and Pará (0.87°S), and between Southeastern Brazil and Northern Argentina (~24°S to 35°S), with few additional records in Northeast Brazil (~10°S). The seasons were defined for 17 of 25 strandings where four were in fall, seven were in winter, four were in summer, and two were in spring (Figure 4). The total body length was given for 14 individuals and ranged from 7.5 m to 23 m ($\bar{x}$=15.64, SD=4.45).

It is known that fin whale strandings range from the temperate waters of the Southern Ocean to tropical waters (Zerbini *et al.* 1997). The fin whale is the second largest member of genus *Balaenoptera* after *B. musculus* and has been heavily exploited in several places including the Southern Ocean, where

15,000 individuals are estimated to remain, and populations are recovering from commercial whaling (Aguilar 2009). Their relatively low abundance, offshore distribution, and the fact that some individuals may not migrate could contribute to the low number of fin whale strandings in the area (Aguilar 2009).

In this context, it is worth mentioning that a greater number of whales were caught at the whaling station of Cabo Frio, Rio de Janeiro (n=84 whales) than in the more equatorial whaling station of Costinha, Paraíba (n=48) (Williamson 1975, Zerbini *et al.* 1997). Moreover, dedicated cetacean surveys did not record the species in the offshore waters of Northeastern Brazil (Andriolo *et al.* 2010), despite the existence of some sightings during the whaling period (1980-1986) (Antonelli *et al.* 1987), while cruises in South and Southeastern Brazil recorded the species during fall in two consecutive years (Di Tullio *et al.* 2016).

This pattern of populations from different hemispheres occupying the same area has been observed for humpback whales in Costa Rica (Acevedo and Smultea 1995). In addition, a survey study showed a high similarity between cetacean species compositions described for Northern and Northeastern Brazil and the southern Caribbean region, suggesting cetacean dispersal between these two regions (Costa *et al.* 2017). Unfortunately, the wintering grounds of fin whales are not known (Aguilar *et al.* 2009). In any case, this mixed population hypothesis can be tested by comparing the genetic profiles or stable isotope values of whales present in this region in both seasons with individuals from both hemispheres.

## 4. CONCLUSIONS

Although there are a significant number of records of *Balaenoptera* species from the east coast of South America, few studies have proposed a large-scale analysis of the spatio-temporal behavior of whales, despite the large home ranges of most species within the genus. This dataset is robust for evaluating occurrence patterns, but there is an underestimation of the absolute number of records due to difference in effort among countries in the vast area covered by this review, and because unidentified whales were not included. Fortunately, the apparent increase in effort and commitment from different institutions to share data on marine mammal strandings, such as the national stranding network for marine mammals in Brazil (REMAB), which is managed governmentally, are promising and can promote both knowledge of these whales and higher detection rates of stranded individuals. Studies using stranded animals are a very important source of information for the *Balaenoptera* genus and gathering them in one place allowed the confirmation of possible occurrence patterns for different species, such as the possible residence of *B. acutorostrata* and *B. brydei* in Brazilian waters. The increased number of stranding records of *B. brydei*, mainly over the last few decades, is worth noting and, although speculative could signify an increase in population size followed by an increase in natural or human-induced mortality. The documentation of a few records of common minke whale bycatch in gillnets in Southern Brazil is also a matter of concern. Finally, the published information about *Balaenoptera* strandings on the east coast of South America is now comprehensively organized for records from the 1800s to the present.

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Fig. 1

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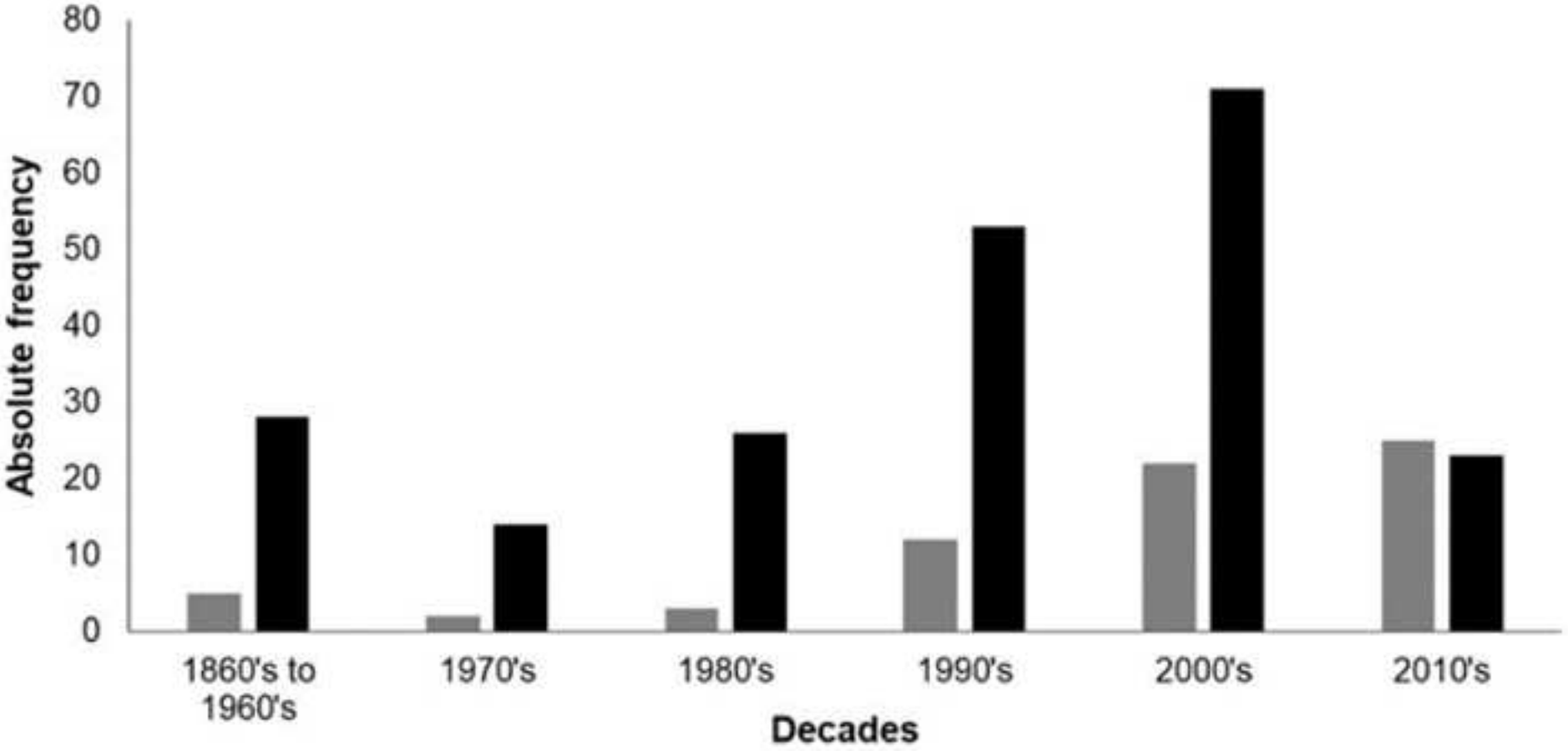


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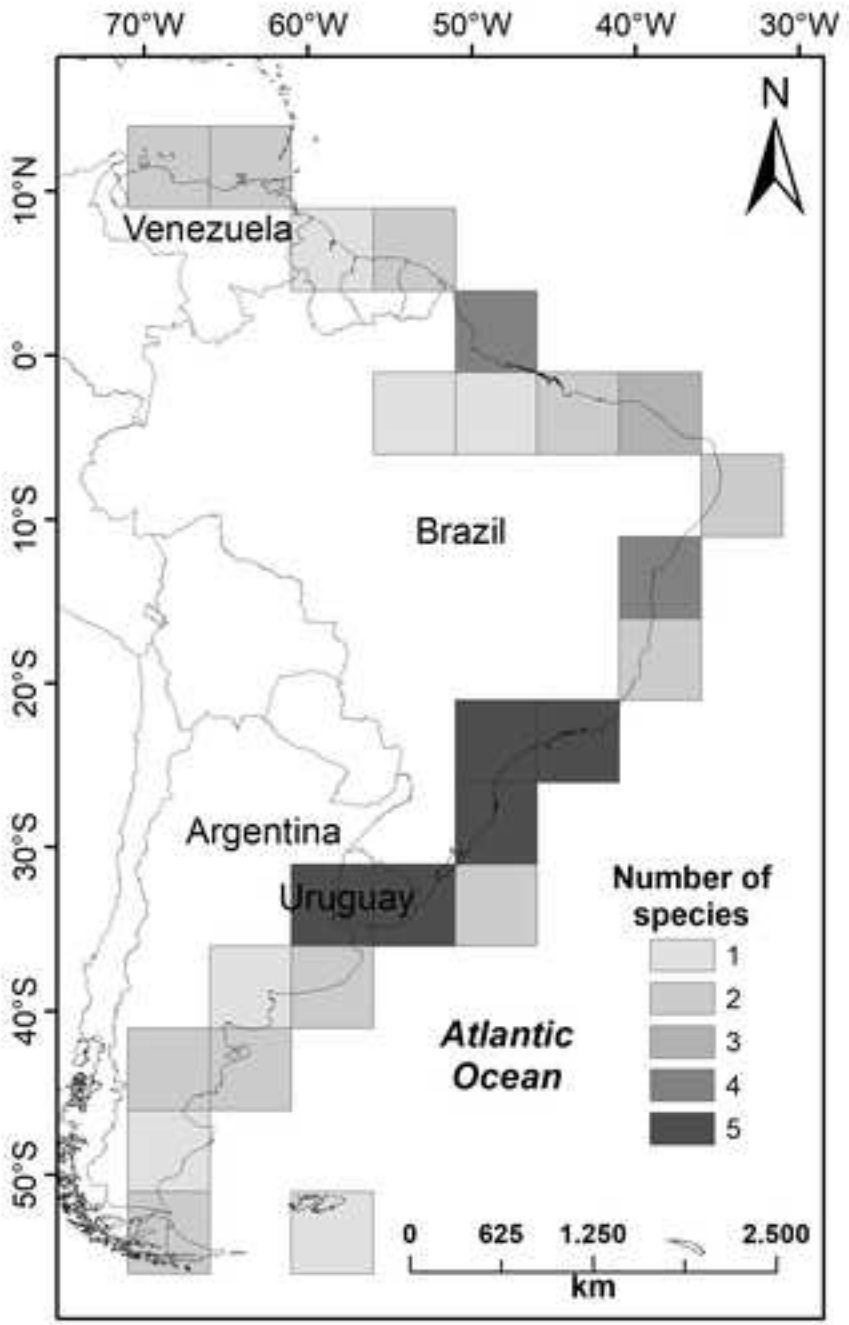

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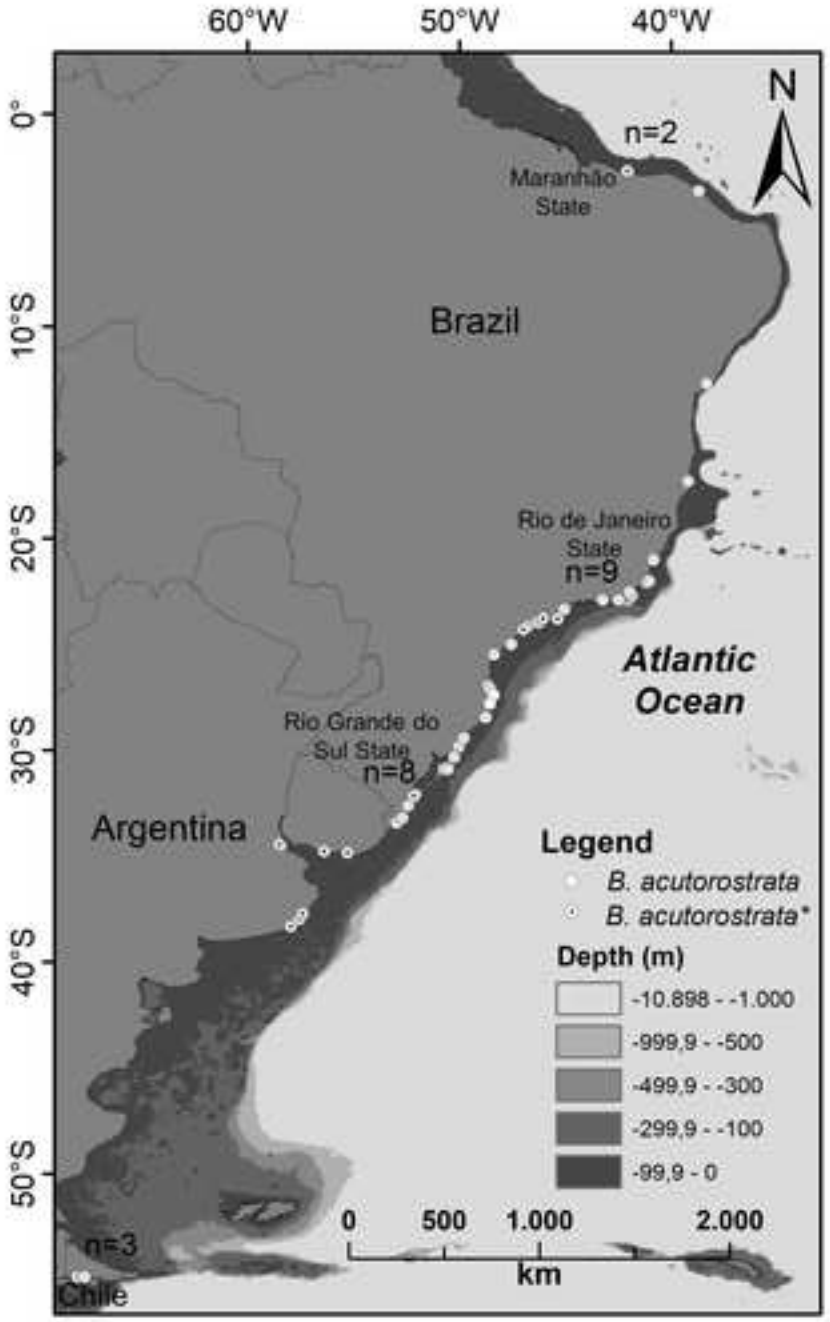


fig3.jpg

Fig. 4



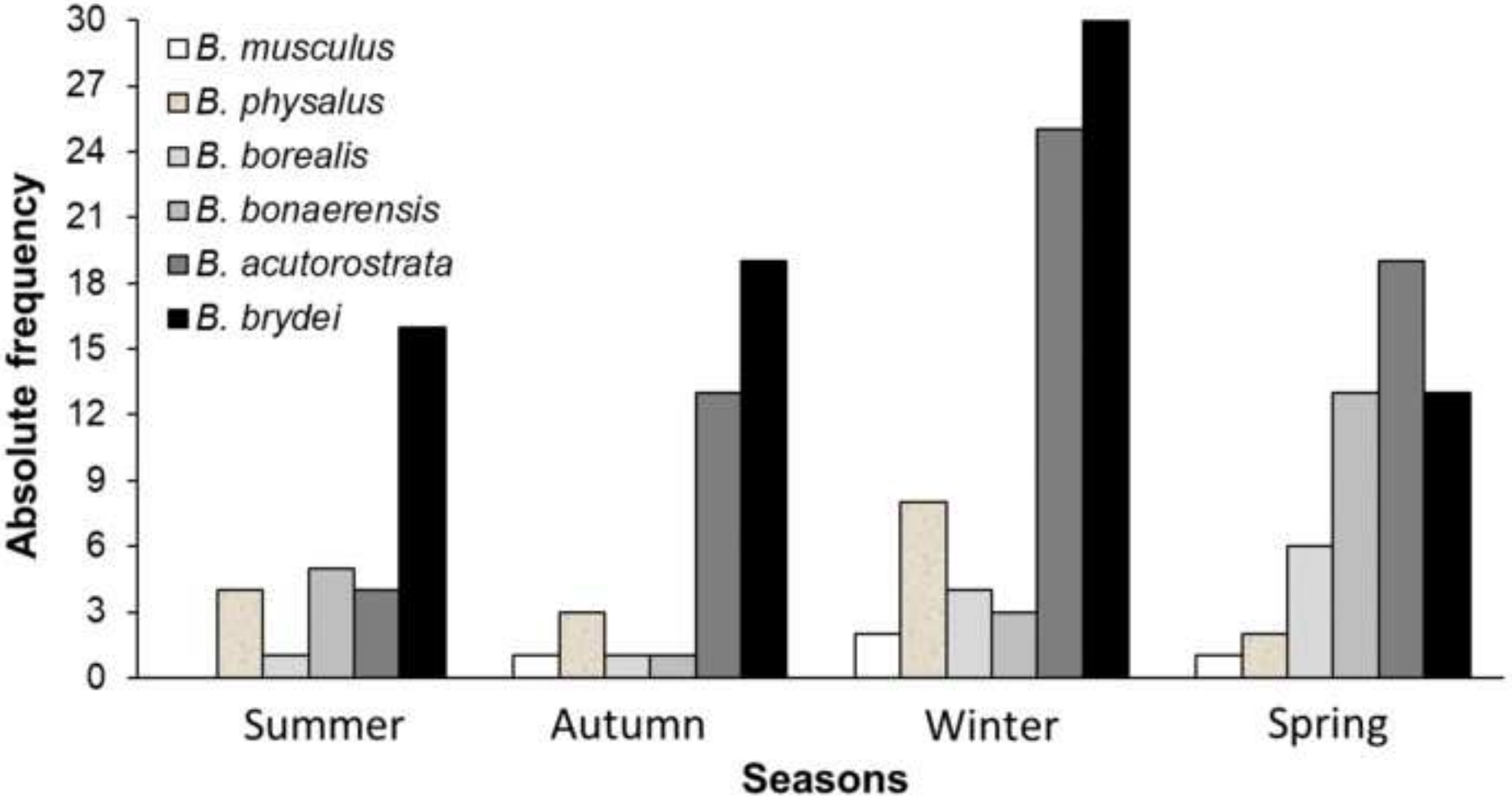

Fig. 5

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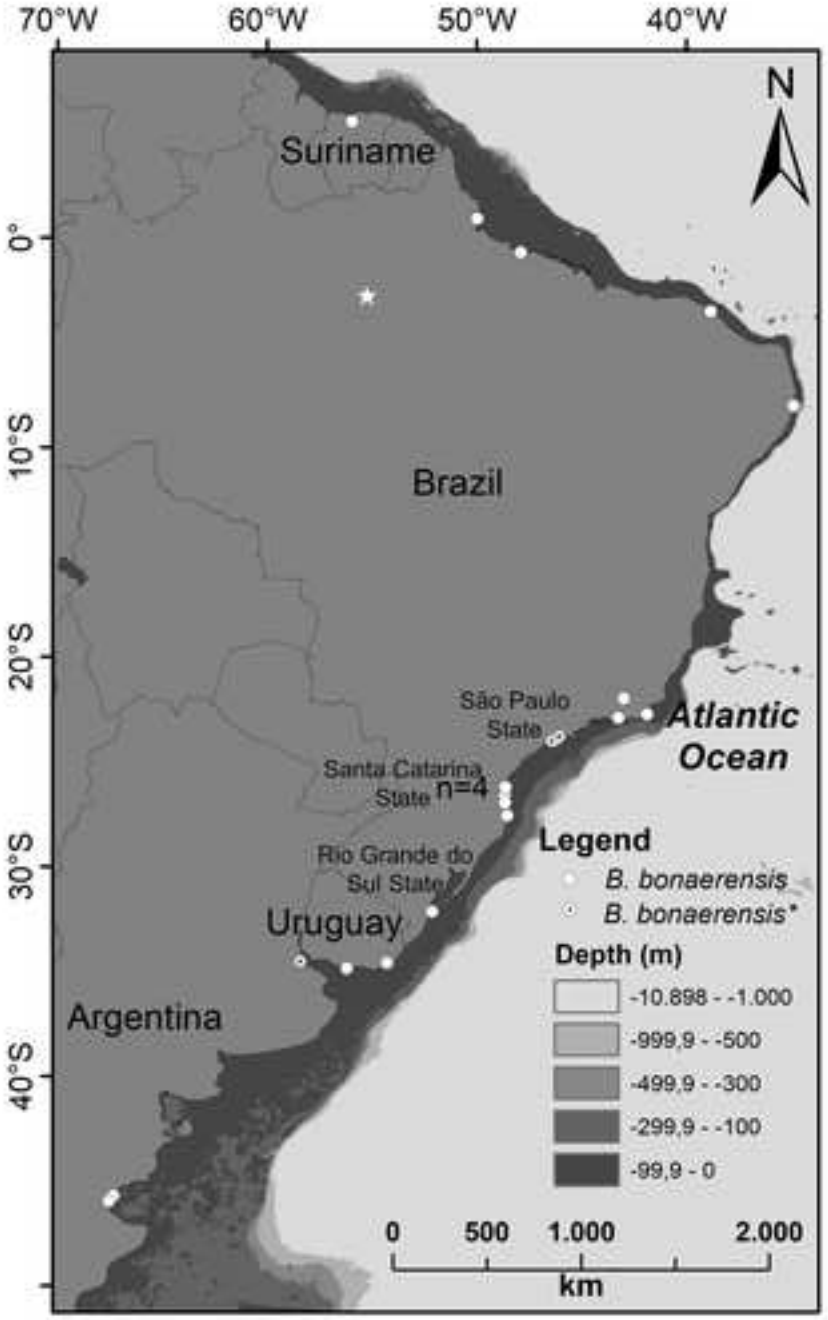


fig6.jpg

Fig 6.

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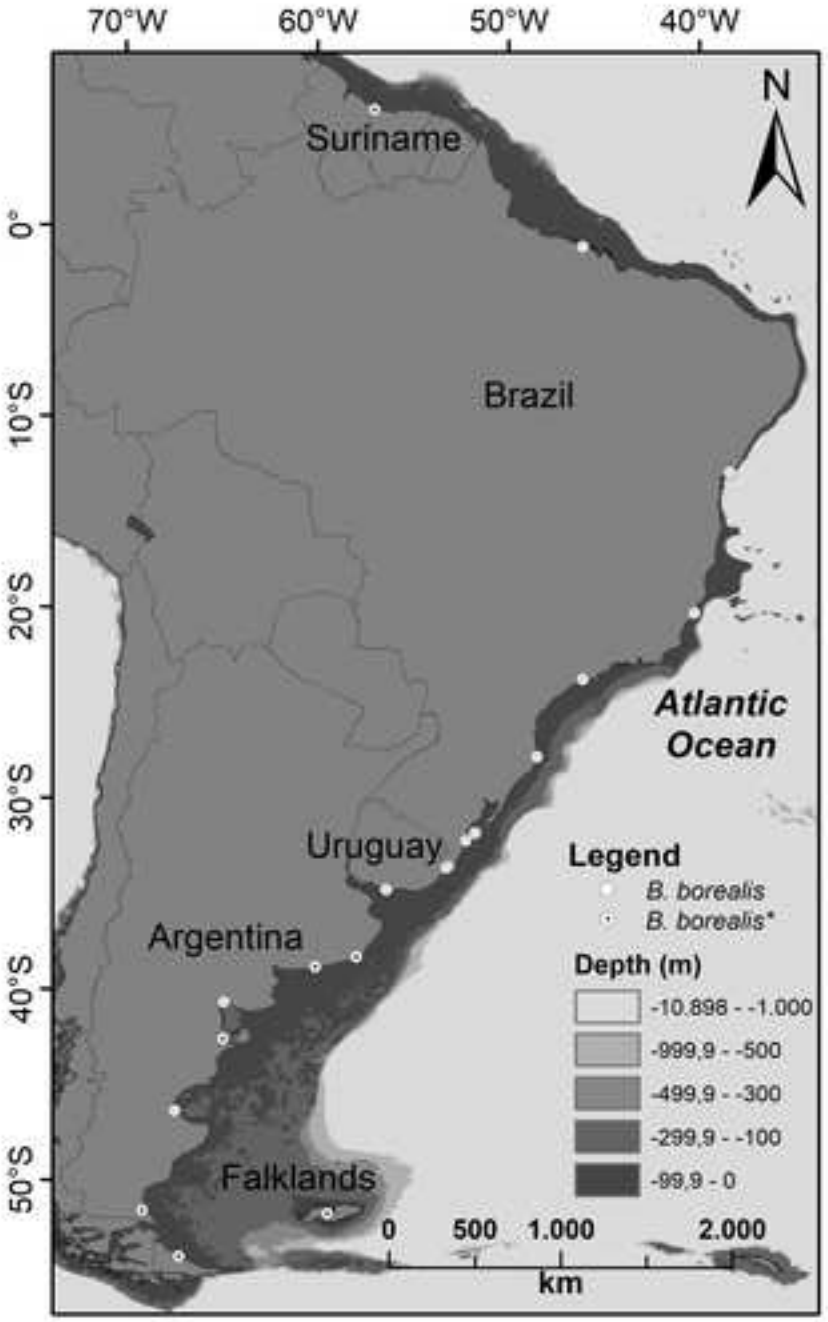

Fig. 7

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Fig. 8

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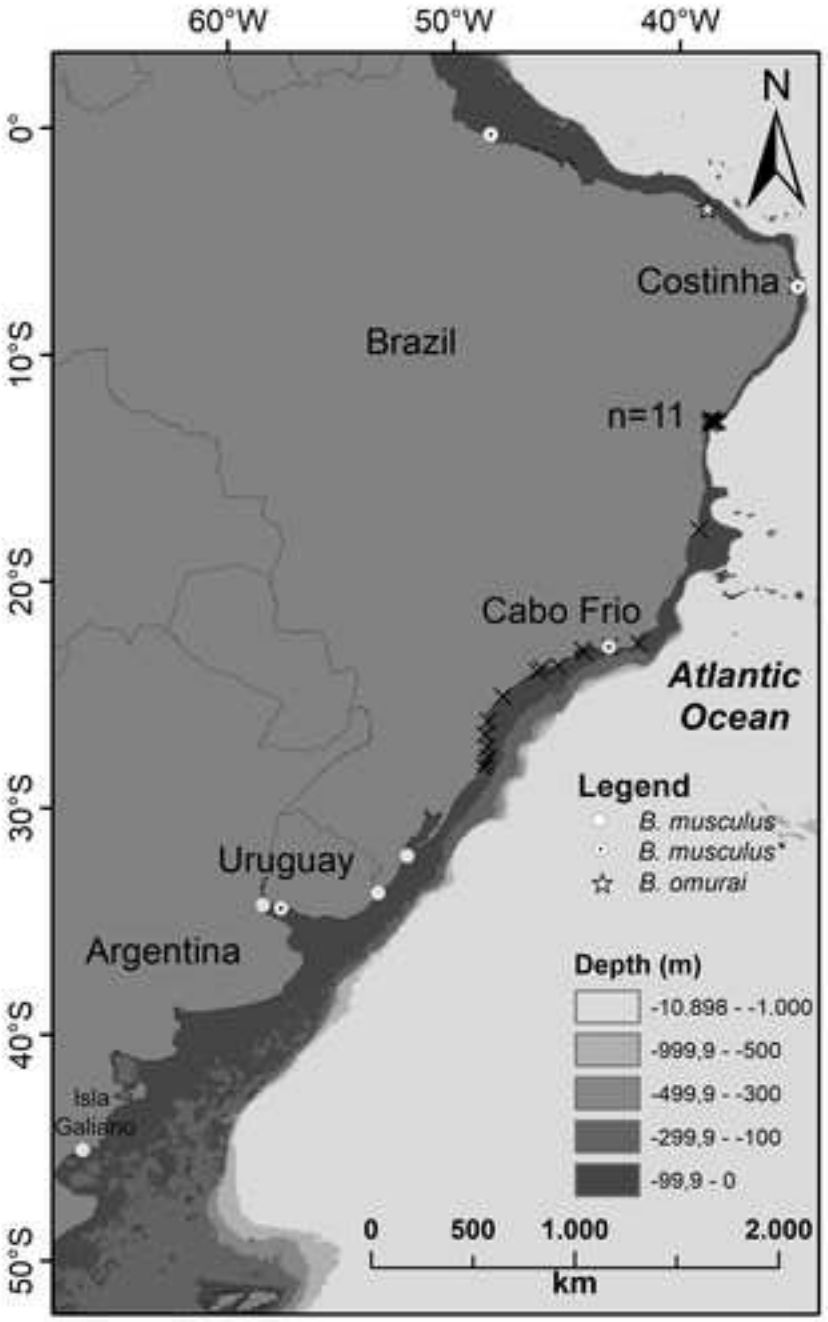


fig9.jpg

Fig. 9

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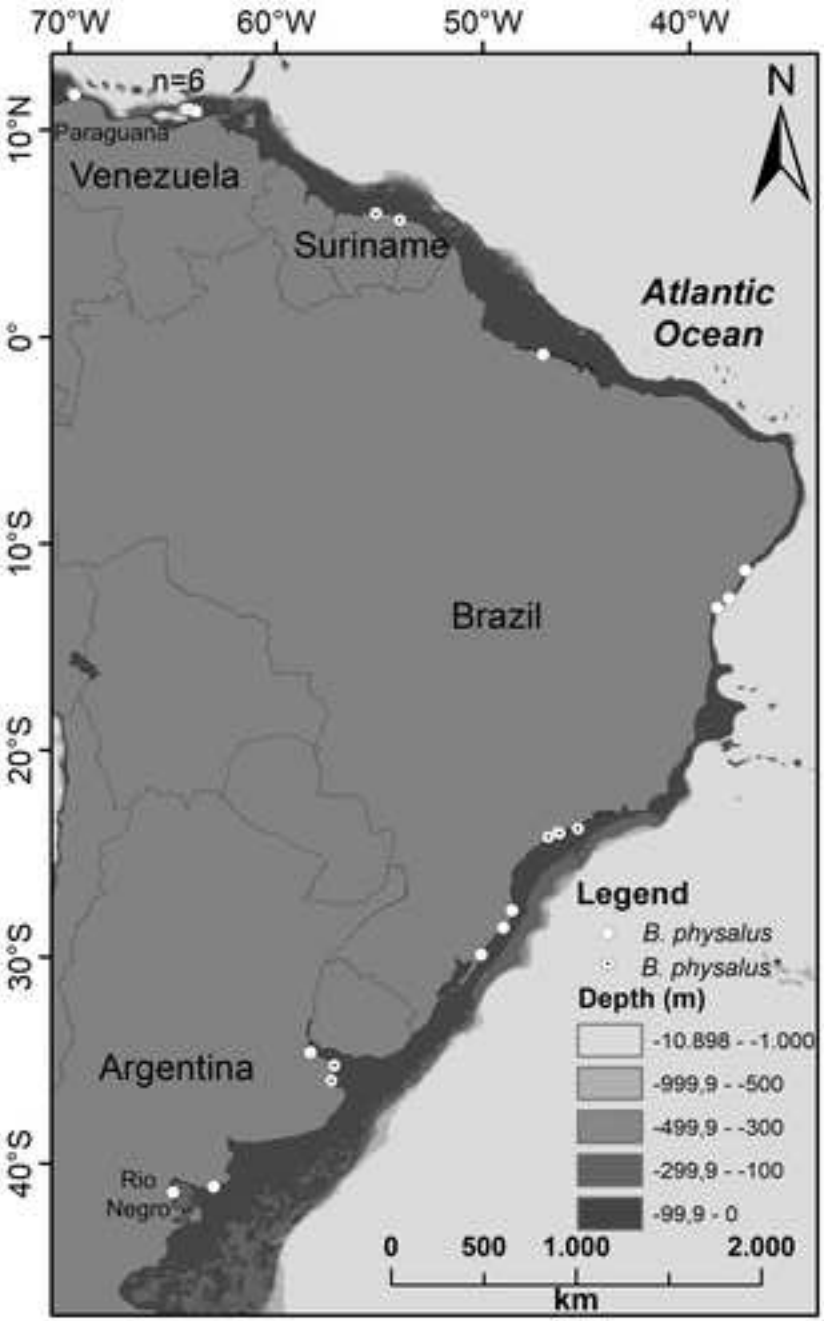


fig10.jpg

| ID | Species | Locality (City, State) | Country | Lat. | Long. | Date | Age class | Sex | TL | Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | *B. acutorostrata** | Nuñes, Buenos Aires | **Argentina** | -34.54 | -58.44 | xx/05/1917 | Calf | U | 3.5 | Baldas and Castello 1986 |
| 2 | *B. acutorostrata** | Rio de la Plata, Buenos Aires | **Argentina** | -34.54 | -58.44 | xx/06/1958 | Calf | U | 3.6 | Baldas and Castello 1986 |
| 3 | *B. acutorostrata** | Mar del Plata | **Argentina** | -38.00 | -57.62 | xx/07/1977 | Juvenile | U | U | Bastida and Rodriguez 2006 |
| 4 | *B. acutorostrata** | Playa Bristol, Mar del Plata | **Argentina** | -37.98 | -57.54 | 27/07/1977 | Calf | M | 3.9 | Baldas and Castello 1986 |
| 5 | *B. acutorostrata** | San Isidro, Buenos Aires | **Argentina** | -34.46 | -58.50 | 06/08/1981 | Calf | F | 3.0 | Baldas and Castello 1986 |
| 6 | *B. acutorostrata** | Mar del Plata | **Argentina** | -38.00 | -57.62 | xx/01/1985 | Juvenile | U | U | Bastida and Rodriguez 2006 |
| 7 | *B. acutorostrata* | Praia do Leme, Rio de Janeiro, RJ | **Brazil** | -22.93 | -43.25 | 13/08/1968 | Juvenile | F | 5.0 | Geise and Borobia 1988, Zerbini *et al.* 1996, Zerbini *et al.* 1997 |
| 8 | *B. acutorostrata* | Praia do Cassino, RS | **Brazil** | -32.12 | -52.08 | 26/06/1976 | Calf | M | 2.9 | Best 1985, Baldas and Castello 1986, Zerbini *et al.* 1996, Zerbini *et al.* 1997, Baldas and Castello 1986 |
| 9 | *B. acutorostrata* | Praia do Leblon, Rio de Janeiro, RJ | **Brazil** | -22.93 | -43.25 | 28/06/1977 | Juvenile | U | 6.0 | Geise and Borobia 1988; Zerbini *et al.* 1996, Zerbini *et al.* 1997 |
| 10 | *B. acutorostrata* | Praia Vermelha, Rio de Janeiro, RJ | **Brazil** | -22.93 | -43.25 | 05/08/1977 | Juvenile | U | 5.0 | Geise and Borobia 1988; Zerbini *et al.* 1996, Zerbini *et al.* 1997, |
| 11 | *B. acutorostrata* | Balneário Rincão, SC | **Brazil** | -28.67 | -49.37 | xx/09/1980 | Juvenile | U | 4.5 | Zerbini *et al.* 1996, Simões-Lopes and Ximenez 1993, Zerbini *et al.* 1997, Baldas and Castelo 1986, Cherem *et al.* 2004 |
| 12 | *B. acutorostrata* | Praia do Cassino, Rio Grande, RS | **Brazil** | -32.12 | -52.08 | 01/10/1984 | Calf | M | 2.7 | Zerbini *et al.* 1996, Zerbini *et al.* 1997 |
| 13 | *B. acutorostrata* | Balneário Camburiú, SC | **Brazil** | -26.98 | -48.65 | xx/xx/1986 | Juvenile | U | 5.0 | Zerbini *et al.* 1997 |
| 14 | *B. acutorostrata* | Ilha Comprida, SP | **Brazil** | -25.02 | -47.57 | 05/09/1986 | Juvenile | U | 5.0 | Zerbini *et al.* 1996, Zerbini *et al.* 1997, Santos *et al.* 2010 |
| 15 | *B. acutorostrata** | Praia dos Ingleses, SC | **Brazil** | -27.83 | -48.39 | 06/11/1987 | Calf | U | 3.2 | Simões-Lopes and Ximenes 1993 |
| 16 | *B. acutorostrata** | Praia do Sonho, Palhoça, SC | **Brazil** | -27,83 | -48,58 | 24/12/1987 | Calf | U | U | Simões-Lopes and Ximenes 1993 |
| 17 | *B. acutorostrata** | Bertioga, SP | **Brazil** | -23.81 | -46.06 | xx/12/1988 | Adult | M | 8-9 | Martuscelli *et al.* 1996 |
| 18 | *B. acutorostrata* | Praia da Gaivota, Sombrio, SC | **Brazil** | -29.12 | -49.55 | xx/06/1989 | U | U | U | Simões-Lopes and Ximenez 1993, Zerbini *et al.* 1997, Cherem *et al.* 2004 |
| 19 | *B. acutorostrata* | Ponta de Corumbau, Prado, BA | **Brazil** | -17.33 | -39.22 | xx/08/1989 | Calf | U | 4.0 | Zerbini *et al.* 1996; Zerbini *et al.* 1997 |
| 20 | *B. acutorostrata* | Marataízes, ES | **Brazil** | -21.03 | -40.83 | 04/08/1989 | Calf | F | 3.7 | Zerbini *et al.* 1996, Zerbini *et al.* 1997 |
| 21 | *B. acutorostrata* | Ubatuba, SP | **Brazil** | -23.38 | -45.07 | 12/10/1989 | Juvenile | F | 6.0 | Zerbini *et al.* 1996, Zerbini *et al.* 1997, Santos *et al.* 2010 |
| 22 | *B. acutorostrata* | Ilha do Mel, PR | **Brazil** | -25.50 | -48.38 | 26/06/1990 | U | U | U | Zerbini *et al.* 1996, Zerbini *et al.* 1997 |
| 23 | *B. acutorostrata* | Praia de Busca Vida, Camaçari, BA | **Brazil** | -12.72 | -38.33 | 17/07/1992 | Juvenile | U | 4.5 | Zerbini *et al.* 1996, Zerbini *et al.* 1997 |
| 24 | *B. acutorostrata* | Praia do Cassino, Rio Grande, RS | **Brazil** | -33.45 | -52.97 | 15/08/1992 | Calf | U | 2.6 | Zerbini *et al.* 1996, Zerbini *et al.* 1997 |
| 25 | *B. acutorostrata* | Praia do Centro, Itanhaém, SP | **Brazil** | -24.18 | -46.78 | 05/11/1992 | Juvenile | M | 5.0 | Zerbini *et al.* 1996, Zerbini *et al.* 1997, Santos *et al.* 2010 |
| 26 | *B. acutorostrata* | Praia do Cassino, Rio Grande, RS | **Brazil** | -32.63 | -52.43 | 11/01/1993 | Calf | U | 4.0 ~ | Zerbini *et al.* 1996, Zerbini *et al.* 1997 |
| 27 | *B. acutorostrata* | Praia do Cassino, Rio Grande, RS | **Brazil** | -33.22 | -52.70 | 11/01/1993 | Calf | U | 3.0 ~ | Zerbini *et al.* 1996, Zerbini *et al.* 1997 |
| 28 | *B. acutorostrata* | Praia do Cassino, Rio Grande, RS | **Brazil** | -33.22 | -52.70 | 10/02/1993 | Juvenile | U | 7.0 | Zerbini *et al.* 1996, Zerbini *et al.* 1997 |
| 29 | *B. acutorostrata** | Bertioga, SP | **Brazil** | -23.81 | -46.06 | 23/11/1993 | U | F | 9.0 | Martuscelli *et al.* 1996 |
| 30 | *B. acutorostrata** | Bertioga, SP | **Brazil** | -23.81 | -46.06 | 26/11/1993 | U | M | U | Martuscelli *et al.* 1996 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 31 | *B. acutorostrata* | Atlântida Sul, Osório, RS | **Brazil** | -29.87 | -50.05 | 14/12/1993 | Juvenile | U | 7.0 | Zerbini *et al.* 1996, Zerbini *et al.* 1997 |
| 32 | *B. acutorostrata* | Laguna, SC | **Brazil** | -28.47 | -48.77 | xx/12/1993 | U | U | U | Zerbini *et al.* 1997 |
| 33 | *B. acutorostrata* | Porto Belo, SC | **Brazil** | -27.15 | -48.55 | 16/06/1995 | U | M | U | Zerbini *et al.* 1997 |
| 34 | *B. acutorostrata* | North of Lagoa do Peixe, RS | **Brazil** | -30.92 | -50.75 | 19/08/1995 | Calf | U | 4.2 | Zerbini *et al.* 1997 |
| 35 | *B. acutorostrata* | Rio Grande, RS | **Brazil** | -32.12 | -52.08 | 08/09/1995 | Calf | F | 3.1 | Zerbini *et al.* 1997 |
| 36 | *B. acutorostrata** | Peruíbe, SP | **Brazil** | -24.32 | -46.99 | 13/09/1995 | Adult | U | 10.0 | Martuscelli *et al.* 1996 |
| 37 | *B. acutorostrata* | Tramandaí, RS | **Brazil** | -29.48 | -50.12 | 28/10/1995 | Calf | U | 2.6 | Zerbini *et al.* 1997 |
| 38 | *B. acutorostrata* | North of Lagoa do Peixe, RS | **Brazil** | -30.92 | -50.75 | 17/12/1995 | Calf | U | 3.2 | Zerbini *et al.* 1997 |
| 39 | *B. acutorostrata** | Santos, SP | **Brazil** | -23.97 | -46.36 | 31/10/1997 | Juvenile | U | 4.0 | Santos *et al.* 2010 |
| 40 | *B. acutorostrata* | Praia Seca, RJ | **Brazil** | -22.94 | -42.30 | 10/09/2000 | Juvenile | U | 4.5 | New record |
| 41 | *B. acutorostrata* | Arraial do Cabo, RJ | **Brazil** | -22.96 | -42.06 | 29/06/2001 | Calf | M | 3.1 | New record |
| 42 | *B. acutorostrata** | Ilhabela, SP | **Brazil** | -23.81 | -45.37 | 12/09/2002 | Calf | M | 3.0 | Santos *et al.* 2010 |
| 43 | *B. acutorostrata* | Rio Grande do Sul state | **Brazil** | -30.90 | -50.55 | 04/07/2004 | U | U | U | Sholl *et al.* 2013 |
| 44 | *B. acutorostrata* | Ilha do Caju, MA | **Brazil** | -02.73 | -42.03 | 29/07/2004 | Adult | U | 7.3 | Magalhães *et al.* 2008a, Magalhães *et al.* 2008b, Siciliano *et al.* 2008 |
| 45 | *B. acutorostrata* | Armação dos Búzios, RJ | **Brazil** | -22.73 | -41.97 | 19/08/2004 | Adult | M | 7.1 | New record |
| 46 | *B. acutorostrata* | Saquarema, RJ | **Brazil** | -22.93 | -42.51 | 14/11/2004 | U | U | U | New record |
| 47 | *B. acutorostrata* | Armação dos Búzios, RJ | **Brazil** | -22.74 | -41.88 | 04/11/2005 | U | U | 4.0 | New record |
| 48 | *B. acutorostrata* | Praia de Tabuba, Caucaia, CE | **Brazil** | -03.64 | -38.71 | xx/07/2005 | Juvenile | U | 6.7 | Meirelles *et al.* 2009, Meirelles *et al.* 2011 |
| 49 | *B. acutorostrata** | Guarujá, SP | **Brazil** | -24.00 | -46.25 | 07/08/2007 | Calf | F | 2.2 | Santos *et al.* 2010 |
| 50 | *B. acutorostrata* | Quissamã, RJ | **Brazil** | -22.11 | -41.16 | 19/12/2007 | U | U | U | New record |
| 51 | *B. acutorostrata* | Praia do Quintão, Pinhal, RS | **Brazil** | -30.34 | -50.27 | xx/09/2008 | U | U | U | Ott *et al.* 2013 |
| 52 | *B. acutorostrata* | Rio Grande do Sul state | **Brazil** | -30.33 | -50.25 | 25/09/2008 | Juvenile | M | 4.5 | Ott *et al.* 2013, Milmann *et al.* 2018 |
| 53 | *B. acutorostrata* | Rio das Ostras, RJ | **Brazil** | -22.56 | -41.98 | 31/07/2010 | Juvenile | M | 3.7 | New record |
| 54 | *B. acutorostrata* | Saquarema, RJ | **Brazil** | -22.94 | -42.47 | 16/10/2010 | Adult | F | 8.8 | New record |
| 55 | *B. acutorostrata* | São Francisco de Itabapoana, RJ | **Brazil** | -22.04 | -41.05 | 23/10/2010 | Juvenile | M | 4.0 | New record |
| 56 | *B. acutorostrata* | Cabo Frio, RJ | **Brazil** | -22.71 | -41.99 | 18/07/2011 | Juvenile | U | 5.6 | New record |
| 57 | *B. acutorostrata* | Cabo Frio, RJ | **Brazil** | -22.91 | -42.04 | 07/11/2011 | Adult | M | 7.5 | New record |
| 58 | *B. acutorostrata* | Rio de Janeiro state | **Brazil** | -22.93 | -42.52 | U | U | U | U | Sholl *et al.* 2013 |
| 59 | *B. acutorostrata** | Praia da Melancieia, Ilha do Caju, MA | **Brazil** | -02.69 | -42.09 | U | Juvenile | U | U | Siciliano *et al.* 2008 |
| 60 | *B. acutorostrata* | Honda Bay | **Chile** | -54.87 | -68.04 | 12/04/2004 | U | U | U | Acevedo *et al.* 2006 |
| 61 | *B. acutorostrata* | Robaldo beach | **Chile** | -54.90 | -67.79 | 17/04/2004 | Juvenile | M | 6.8 | Acevedo *et al.* 2006 |
| 62 | *B. acutorostrata* | Robaldo beach | **Chile** | -54.88 | -67.71 | 19/04/2004 | Juvenile | M | 6.9 | Acevedo *et al.* 2006 |
| 63 | *B. acutorostrata** | Isla del Trigre, San José | **Uruguay** | -34.78 | -56.40 | 30/09/1962 | Juvenile | U | 6.0 | Baldas and Castello 1986 |
| 64 | *B. acutorostrata** | Piriápolis, Maldonado | **Uruguay** | -34.86 | -55.30 | 17/04/1974 | Juvenile | U | 5.5 | Baldas and Castello 1986 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 65 | *B. bonaerensis** | La Plata River, Buenos Aires | **Argentina** | -34.54 | -58.43 | 05/02/1867 | Adult | M | 9.7 | Burmeister 1867, Baldas and Castello 1986, Zerbini and Castello 2003 |
| 66 | *B. bonaerensis* | Caleta Córdova, Chubut | **Argentina** | -45.73 | -67.35 | xx/11/2001 | U | U | U | Reyes 2006 |
| 67 | *B. bonaerensis* | Bajada de Los Palitos, Chubut | **Argentina** | -45.97 | -67.57 | 24/12/2001 | U | U | U | Reyes 2006 |
| 68 | *B. bonaerensis* | São Francisco do Sul, SC | **Brazil** | -26.23 | -48.63 | 01/09/1912 | Juvenile | U | 6.0 | Brandão 1914, Simões-Lopes and Ximenez 1993, Zerbini *et al.* 1997, Cherem *et al.* 2004 |
| 69 | *B. bonaerensis* | Rio de Janeiro, RJ | **Brazil** | -22.93 | -43.25 | 15/10/1958 | U | U | U | Zerbini *et al.* 1997 |
| 70 | *B. bonaerensis* | Barra Velha, SC | **Brazil** | -26.64 | -48.68 | xx/01/1986 | U | U | U | Simões-Lopes and Ximenez 1993, Cherem *et al.* 2004 |
| 71 | *B. bonaerensis* | Balneário Camburiú, SC | **Brazil** | -26.98 | -48.65 | 14/09/1986 | Calf | U | U | Simões-Lopes and Ximenez 1993, Zerbini *et al*. 1997, Cremer *et al.* 2004 |
| 72 | *B. bonaerensis* | Floranópolis, SC | **Brazil** | -27.58 | -48.55 | 25/05/1988 | Adult | F | 8.2 | Simões-Lopes and Ximenez 1993, Zerbini *et al.* 1997 |
| 73 | *B. bonaerensis* | Guarujá, SP | **Brazil** | -23.98 | -46.25 | 10/10/1990 | Adult | U | 8.0 | Zerbini *et al.* 1997, Santos *et al.* 2010 |
| 74 | *B. bonaerensis* | Bertioga, SP | **Brazil** | -23.83 | -46.13 | 03/12/1990 | Adult | U | 8.5 | Zerbini *et al.* 1997, Santos *et al.* 2010 |
| 75 | *B. bonaerensis* | São Francisco do Sul, SC | **Brazil** | -26.23 | -48.63 | 22/02/1995 | Calf | F | 4.0 | Carvalho 1975, Zerbini *et al.* 1997, Cherem *et al.* 2004 |
| 76 | *B. bonaerensis** | Bertioga, SP | **Brazil** | -23.81 | -46.06 | 17/11/1997 | Calf | M | 3.5 | Santos *et al.* 2010 |
| 77 | *B. bonaerensis* | Between Taiba and Praia do Pecém, CE | **Brazil** | -03.54 | -38.84 | xx/10/2001 | Adult | U | U | Meirelles and Furtado-Neto 2004, Meirelles *et al.* 2009 |
| 78 | *B. bonaerensis* | Armação dos Búzios, RJ | **Brazil** | -22.75 | -41.88 | 01/08/2004 | Juvenile | U | 11.0 | New record |
| 79 | *B. bonaerensis* | 3km south of Barra de Rio Grande, RS | **Brazil** | -32.17 | -52.13 | xx/11/2004 | Calf | U | 3.7 | Ott *et al*. 2013 |
| 80 | *B. bonaerensis** | Praia Grande, SP | **Brazil** | -24.02 | -46.41 | 27/10/2006 | Calf | F | 3.8 | Santos *et al.* 2010 |
| 81 | *B. bonaerensis* | Rio Muriá, Curuçá, PA | **Brazil** | -00.72 | -47.91 | 09/01/2007 | Adult | M | 10.4 | Siciliano *et al.* 2008, Siciliano *et al.* 2014 |
| 82 | *B. bonaerensis* | National Forest of Tapajós, Belterra, PA | **Brazil** | -02.87 | -55.07 | 14/11/2007 | Juvenile | M | 5.5 | Siciliano *et al.* 2014, Balensiefer *et al.* 2014 |
| 83 | *B. bonaerensis* | Biological Reserve of Parazinho, AP | **Brazil** | 00.88 | -49.98 | 15/04/2009 | Juvenile | F | 5.4 | Siciliano *et al.* 2014 |
| 84 | *B. bonaerensis* | Recife, PB | **Brazil** | -08.05 | -34.88 | U | U | U | U | Hetzel and Lodi 1993, Zerbini *et al.* 1997 |
| 85 | *B. bonaerensis* | near Goede Hoop | **Suriname** | 05.52 | -55.95 | 23/10/1963 | Adult | F | 8.2 | Husson 1978, De Boer 2013, De Boer 2015 |
| 86 | *B. bonaerensis* | Montevideo beach | **Uruguay** | -34.87 | -56.22 | 26/10/2014 | Juvenile | F | 6.7 | Pérez *et al.* 2017 |
| 87 | *B. bonaerensis* | coast of Laguna de Rocha | **Uruguay** | -34.62 | -54.29 | 18/10/2015 | Juvenile | U | 4.5 | Pérez *et al.* 2017 |
| 88 | *B. borealis** | Tres Arroyos, Buenos Aires province | **Argentina** | -38.88 | -60.15 | xx/xx/1899 | U | U | U | Leonardi *et al.* 2011 |
| 89 | *B. borealis** | Tierra del Fuego province | **Argentina** | -54.04 | -67.29 | xx/xx/1902 | U | U | U | Leonardi *et al.* 2011 |
| 90 | *B. borealis** | Río Gallegos, Santa Cruz province | **Argentina** | -51.62 | -69.2 | xx/xx/1940 | U | U | U | Leonardi *et al.* 2011 |
| 91 | *B. borealis** | San José Gulf, Chubut province | **Argentina** | -42.65 | -64.98 | xx/xx/1973 | U | U | U | Leonardi *et al.* 2011 |
| 92 | *B. borealis** | Mar del Sud, Buenos Aires province | **Argentina** | -38.35 | -57.99 | xx/xx/2004 | U | U | U | Leonardi *et al.* 2011, Heissler *et al.* 2016 |
| 93 | *B. borealis* | San Antonio Oeste, Rio Negro province | **Argentina** | -40.73 | -64.93 | xx/11/2008 | Juvenile | F | 10.7 | Leonardi *et al.* 2011, Heissler *et al.* 2016 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 94 | *B. borealis* | Caleta Olivia, Santa Cruz province | **Argentina** | -46.42 | -67.52 | xx/12/2008 | U | U | U | Leonardi *et al.* 2011, Heissler *et al.* 2016 |
| 95 | *B. borealis* | Praia da Costa, Vila Velha, ES | **Brazil** | -20.36 | -40.29 | 07/03/1980 | U | U | U | Barros 1991, Zerbini *et al.* 1997, Heissler *et al.* 2016 |
| 96 | *B. borealis* | Bertioga, SP | **Brazil** | -23.83 | -46.13 | 18/08/1988 | Juvenile | M | 12.0 | Zerbini *et al.* 1997, Santos *et al.* 2010, Heissler *et al.* 2016 |
| 97 | *B. borealis* | Praia do Santinho, Florianópolis, SC | **Brazil** | -27.88 | -48.55 | xx/11/1989 | U | U | U | Simões-Lopes and Ximenez 1993, Zerbini *et al.* 1997, Cherem *et al.* 2004, Heissler *et al.* 2016 |
| 98 | *B. borealis* | Rio Grande do Sul state | **Brazil** | -32.67 | -50.33 | xx/xx/1994 | U | U | U | Zerbini *et al.* 1997, Heissler *et al.* 2016 |
| 99 | *B. borealis* | Bahia state | **Brazil** | -13.00 | -38.45 | 04/08/2000 | U | U | U | Velozo 2007, Heissler *et al.* 2016 |
| 100 | *B. borealis* | Rio Grande do Sul state | **Brazil** | -33.60 | -53.17 | 12/07/2007 | U | U | U | Prado *et al.* 2016, Heissler *et al.* 2016 |
| 101 | *B. borealis* | Viseu, PA | **Brazil** | -01.20 | -46.13 | 13/09/2008 | Juvenile | F | 10.3 | Costa 2015, Heissler *et al.* 2016, Costa *et al.* 2017 |
| 102 | *B. borealis* | Rio Grande do Sul state | **Brazil** | -32.28 | -52.27 | 16/11/2011 | U | U | U | Prado *et al.* 2016, Heissler *et al.* 2016 |
| 103 | *B. borealis* | Rio Grande do Sul state | **Brazil** | -33.68 | -53.28 | 03/10/2012 | U | U | U | Prado *et al.* 2016, Heissler *et al.* 2016 |
| 104 | *B. borealis** | east of Nieuw Nickerie | **Suriname** | 05.98 | -57.04 | 11/02/1964 | Adult | M | 15.5 | Husson 1978, De Boer 2013, De Boer 2015 |
| 105 | *B. borealis** | Falkland/ Malvinas Islands | **UK** | -51.80 | -59.52 | xx/xx/1952 | U | U | U | Leonardi *et al.* 2011 |
| 106 | *B. borealis* | coast of Punta Espinillo, Montevideo | **Uruguay** | -34.83 | -56.42 | 03/06/2016 | Calf | F | 3.1 | Pérez *et al.* 2017 |
| 107 | *B. brydei* | Cananéia, SP | **Brazil** | -24.99 | -47.84 | xx/08/1972 | Adult | M | 12.5 | Zerbini *et al.* 1997, Siciliano *et al.* 2004, Moura and Siciliano 2012 |
| 108 | *B. brydei* | Paraguaçu River, Maragogipe, BA | **Brazil** | -12.80 | -38.92 | 30/09/1981 | Adult | F | 14.0 | Zerbini *et al.* 1997, Lima *et al.* 2006 |
| 109 | *B. brydei* | Canal do Mangue, RJ | **Brazil** | -22.97 | -43.17 | 28/01/1983 | Juvenile | M | 7.1 | Geise and Borobia 1988, Zerbini *et al.* 1997, Siciliano *et al.* 2004, Moura and Siciliano 2012 |
| 110 | *B. brydei* | Superagui Island, PR | **Brazil** | -25.42 | -48.00 | 29/06/1983 | Adult | M | 13.0 | Bittencourt 1983, Zerbini *et al.* 1997 |
| 111 | *B. brydei* | Itanhaém, SP | **Brazil** | -24.17 | -46.74 | xx/xx/1986 | U | U | U | Zerbini *et al.* 1997, Moura and Siciliano 2012 |
| 112 | *B. brydei* | Angra dos Reis, RJ | **Brazil** | -23.03 | -44.33 | 03/04/1989 | Juvenile | M | 10.6 | Zerbini *et al.* 1997, Siciliano *et al.* 2004, Moura and Siciliano 2012 |
| 113 | *B. brydei* | Rio Grande, RS | **Brazil** | -32.12 | -52.08 | xx/08/1989 | Adult | U | 15.0 | Zerbini *et al.* 1997, Van Waerebeek *et al.* 2007, Ott *et al.* 2013 |
| 114 | *B. brydei* | Ilha do Caju, MA | **Brazil** | -02.75 | -42.00 | 21/10/1991 | Adult | U | 10.0 | Zerbini *et al.* 1997, Magalhães *et al.* 2008b, Siciliano *et al.* 2008 |
| 115 | *B. brydei* | Guaratuba, PR | **Brazil** | -25.88 | -48.57 | 28/04/1993 | Calf | F | 3.9 | Zerbini *et al.* 1997 |
| 116 | *B. brydei* | Laguna, SC | **Brazil** | -28.47 | -48.77 | 17/09/1993 | Juvenile | F | 8.8 | Zerbini *et al.* 1997 |
| 117 | *B. brydei* | Ilha do Superagui, PR | **Brazil** | -25.42 | -48.00 | 30/09/1993 | Adult | M | 14.0 | Zerbini *et al.* 1997 |
| 118 | *B. brydei* | Floranópolis, SC | **Brazil** | -27.58 | -48.55 | xx/01/1994 | U | U | U | Zerbini *et al.* 1997 |
| 119 | *B. brydei* | Ilha Comprida, SP | **Brazil** | -24.75 | -47.54 | xx/11/1994 | Adult | U | 14.0 | Siciliano *et al.* 2004, Moura and Siciliano 2012 |
| 120 | *B. brydei* | Tramandaí, RS | **Brazil** | -29.98 | -50.12 | 22/12/1994 | Juvenile | M | 10.8 | Zerbini *et al.* 1997 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 121 | *B. brydei* | Saquarema, RJ | **Brazil** | -22.93 | -42.48 | 07/04/1995 | Adult | M | 12.4 | Zerbini *et al.* 1997, Siciliano *et al.* 2004, Moura and Siciliano 2012 |
| 122 | *B. brydei* | Tramandaí, RS | **Brazil** | -29.98 | -50.12 | 29/02/1996 | Calf | M | 4.0 | Zerbini *et al.* 1997 |
| 123 | *B. brydei** | Rio Grande do Sul state | **Brazil** | -32.12 | -52.08 | xx/08/1996 | U | U | U | Sanfelice and Ferigoto 2012 |
| 124 | *B. brydei* | Ilha do Cardoso, SP | **Brazil** | -25.18 | -47.94 | 03/09/1996 | Adult | F | 14.0 | Siciliano *et al.* 2004, Moura and Siciliano 2012 |
| 125 | *B. brydei** | Ilha das Canárias, MA | **Brazil** | -02.72 | -41.91 | xx/xx/1996 | Adult | U | 10-12 | Magalhães *et al.* 2008b, Siciliano *et al.* 2008 |
| 126 | *B. brydei* | Ilha Comprida, SP | **Brazil** | -24.82 | -47.65 | 30/01/1997 | Juvenile | U | 11.0 | Siciliano *et al.* 2004, Moura and Siciliano 2012 |
| 127 | *B. brydei* | Peruíbe, SP | **Brazil** | -24.34 | -47.00 | 07/12/1997 | Adult | U | 15.0 | Siciliano *et al.* 2004, Moura and Siciliano 2012 |
| 128 | *B. brydei* | Mostardas, Tavares, RS | **Brazil** | -31.11 | -50.92 | 04/04/1998 | U | U | U | Museu da PUCRS - http://www.splink.org.br/index?lang=pt |
| 129 | *B. brydei* | Quissamã, RJ | **Brazil** | -22.17 | -41.28 | xx/06/1998 | Juvenile | F | 8.0 | Siciliano *et al.* 2004, Moura and Siciliano 2012 |
| 130 | *B. brydei* | Guarujá, SP | **Brazil** | -23.69 | -46.18 | 18/06/1998 | Adult | F | 12.4 | Siciliano *et al.* 2004, Moura and Siciliano 2012 |
| 131 | *B. brydei* | Rio de Janeiro, RJ | **Brazil** | -22.98 | -43.17 | 22/08/1998 | Juvenile | U | 10.0 | Siciliano *et al.* 2004, Moura and Siciliano 2012 |
| 132 | *B. brydei* | Praia Grande, SP | **Brazil** | -24.02 | -46.41 | 22/09/1998 | Adult | U | 14.0 | Siciliano *et al.* 2004, Moura and Siciliano 2012 |
| 133 | *B. brydei* | Mongaguá, SP | **Brazil** | -24.10 | -46.62 | 09/04/1999 | U | U | 12.0 | Siciliano *et al.* 2004, Moura and Siciliano 2012 |
| 134 | *B. brydei* | Praia Grande, SP | **Brazil** | -24.02 | -46.43 | 21/08/1999 | Adult | U | 12.2 | Siciliano *et al.* 2004, Moura and Siciliano 2012 |
| 135 | *B. brydei** | Ilha do Caju, MA | **Brazil** | -02.69 | -42.09 | xx/xx/1999 | Calf | U | 5.0 | Magalhães *et al.* 2008b, Siciliano *et al.* 2008 |
| 136 | *B. brydei* | Praia do Félix, Ubatuba, SP | **Brazil** | -23.44 | -45.07 | 24/07/2000 | Adult | F | 14.0 | Siciliano *et al.* 2004, Moura and Siciliano 2012 |
| 137 | *B. brydei* | Juréia, SP | **Brazil** | -23.77 | -45.8 | xx/04/2001 | Adult | M | 15.0 | Siciliano *et al.* 2004, Moura and Siciliano 2012 |
| 138 | *B. brydei* | Barra de São João, Casemiro de Abreu, RJ | **Brazil** | -22.60 | -41.99 | 11/12/2001 | Juvenile | U | 9.0 | Siciliano *et al.* 2004, Moura and Siciliano 2012 |
| 139 | *B. brydei* | Ilha do Cardoso, SP | **Brazil** | -22.60 | -41.99 | xx/09/2002 | Adult | M | 12.0 | Siciliano *et al.* 2004, Moura and Siciliano 2012 |
| 140 | *B. brydei* | Maricá, RJ | **Brazil** | -25.30 | -48.08 | 30/01/2003 | Adult | F | 12.0 | Siciliano *et al.* 2004, Moura and Siciliano 2012 |
| 141 | *B. brydei* | Quissamã, RJ | **Brazil** | -22.23 | -41.54 | 26/02/2004 | Juvenile | U | 9.5 | Magalhães-Pinto *et al.* 2004, Moura and Siciliano 2012, Pastene *et al.* 2015 |
| 142 | *B. brydei* | Rio Grande do Sul state | **Brazil** | -30.22 | -50.22 | 20/01/2005 | U | U | U | Pastene *et al.* 2015 |
| 143 | *B. brydei* | Rio Grande do Sul state | **Brazil** | -30.33 | -50.27 | 21/01/2005 | U | U | U | Pastene *et al.* 2015 |
| 144 | *B. brydei* | Praia do Abricó, Rio das Ostras, RJ | **Brazil** | -22.53 | -41.95 | 23/01/2005 | U | U | U | Moura and Siciliano 2012, Pastene *et al.* 2015 |
| 145 | *B. brydei* | Maricá, RJ | **Brazil** | -22.97 | -42.91 | 14/02/2005 | Adult | M | 15.0 | Moura and Siciliano 2012 |
| 146 | *B. brydei* | Barra da Tijuca, Rio de Janeiro, RJ | **Brazil** | -23.01 | -43.36 | 06/08/2005 | Juvenile | U | 11.0 | Moura and Siciliano 2012 |
| 147 | *B. brydei* | Figueira, Arraial do Cabo, RJ | **Brazil** | -22.95 | -42.19 | 03/09/2005 | U | U | U | Moura and Siciliano 2012, Sholl *et al.* 2013 |
| 148 | *B. brydei* | São Sebastião, SP | **Brazil** | -23.68 | -45.42 | 13/10/2005 | Adult | M | 12.0 | Santos *et al.* 2010, Moura and Siciliano 2012 |
| 149 | *B. brydei* | Praia do Boqueirão, Ilha Comprida, SP | **Brazil** | -25.04 | -47.88 | 09/06/2006 | Juvenile | M | 8.0 | Moura and Siciliano 2012 |
| 150 | *B. brydei* | Praia de Ilha Comprida, Ilha Comprida, SP | **Brazil** | -24.98 | -47.85 | 12/08/2006 | Adult | U | 12.0 | Moura and Siciliano 2012 |
| 151 | *B. brydei* | Praia de Unamar, Cabo Frio, RJ | **Brazil** | -22.63 | -42.00 | 28/09/2006 | Adult | M | 12.0 | Moura and Siciliano 2012, Pastene *et al.* 2015 |
| 152 | *B. brydei* | Praia do Pecado, Macaé, RJ | **Brazil** | -22.42 | -41.82 | 30/09/2006 | Calf | U | 3.8 | Moura and Siciliano 2012 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 153 | *B. brydei* | São Sebastião, SP | **Brazil** | -23.59 | -45.21 | 23/10/2006 | Adult | M | 12.8 | Santos *et al.* 2010, Moura and Siciliano 2012 |
| 154 | *B. brydei* | Praia de Itaipuaçú, Maricá, RJ | **Brazil** | -22.97 | -42.99 | 14/02/2007 | Adult | M | 14.0 | Moura and Siciliano 2012 |
| 155 | *B. brydei* | Peruíbe, SP | **Brazil** | -24.28 | -46.93 | 20/07/2007 | Adult | U | 12.0 | Santos *et al.* 2010, Moura and Siciliano 2012 |
| 156 | *B. brydei* | Praia Grande, SP | **Brazil** | -24.03 | -46.46 | 12/08/2007 | Juvenile | F | 4.5 | Santos *et al.* 2010, Moura and Siciliano 2012 |
| 157 | *B. brydei* | Praia Grande, Arraial do Cabo, RJ | **Brazil** | -22.96 | -42.05 | 18/08/2007 | U | U | U | Moura and Siciliano 2012, Pastene *et al.* 2015 |
| 158 | *B. brydei* | Guarujá, SP | **Brazil** | -24.02 | -46.3 | 08/03/2008 | Juvenile | M | 8.4 | Santos *et al.* 2010, Moura and Siciliano 2012 |
| 159 | *B. brydei* | Figueira, Arraial do Cabo, RJ | **Brazil** | -22.95 | -42.17 | 15/04/2008 | U | U | U | Moura and Siciliano 2012 |
| 160 | *B. brydei* | Ilha de Águas Lindas, Mangaratiba, RJ | **Brazil** | -22.95 | -43.91 | xx/09/2008 | Juvenile | U | 10.0 | Moura and Siciliano 2012 |
| 161 | *B. brydei* | Praia do Afonso, Arraial do Cabo, RJ | **Brazil** | -22.96 | -42.09 | 11/10/2008 | Adult | U | 14.1 | Moura and Siciliano 2012, Pastene *et al.* 2015 |
| 162 | *B. brydei* | Praia das Palmeiras, Caraguatatuba, RJ | **Brazil** | -23.67 | -45.43 | 14/10/2008 | Calf | U | 7.0 | Moura and Siciliano 2012 |
| 163 | *B. brydei* | Praia de Ilha Comprida, Ilha Comprida, RJ | **Brazil** | -24.74 | -47.54 | 27/04/2009 | Juvenile | U | 9.0 | Moura and Siciliano 2012 |
| 164 | *B. brydei* | Guarujá, SP | **Brazil** | -23.99 | -46.21 | 25/07/2009 | Adult | M | 13.0 | Santos *et al.* 2010, Moura and Siciliano 2012 |
| 165 | *B. brydei* | Lagoa Comprida, Jurubatiba, Macaé, RJ | **Brazil** | -22.28 | -41.66 | 08/03/2010 | Juvenile | M | 7.2 | Moura and Siciliano 2012, Pastene *et al.* 2015 |
| 166 | *B. brydei* | Mongaguá, SP | **Brazil** | -24.10 | -46.62 | 13/06/2010 | Calf | F | 7.0 | Moura and Siciliano 2012 |
| 167 | *B. brydei* | Praia de Carapebus, Carapebus, RJ | **Brazil** | -22.26 | -41.61 | 30/10/2010 | Juvenile | F | 8.8 | Moura and Siciliano 2012 |
| 168 | *B. brydei* | Praia do Visgueiro, Quissamã, RJ | **Brazil** | -22.23 | -41.53 | 09/03/2011 | Juvenile | U | 8.0 | Moura and Siciliano 2012 |
| 169 | *B. brydei* | Arraial do Cabo, RJ | **Brazil** | -22.95 | -42.10 | 06/07/2011 | Adult | U | 12.0 | New record |
| 170 | *B. brydei* | Salvaterra, Marajó bay (MB), PA | **Brazil** | -00.91 | -48.00 | 15/09/2012 | Calf | U | 4.2 | Costa 2015, Costa *et al.* 2017 |
| 171 | *B. brydei* | São Francisco do Sul, SC | **Brazil** | -26.22 | -48.47 | 23/06/2014 | Adult | M | 13.1 | Groch *et al.* 2018 |
| 172 | *B. brydei* | Isla de Margarita, N. Esparta | **Venezuela** | 10.97 | -64.17 | xx/08/1932 | U | U | U | Agudo 1995a, Agudo and Romero 1996, Romero *et al.* 2001 |
| 173 | *B. brydei* | close to Los Totumos, Miranda | **Venezuela** | 10.53 | -66.07 | 04/08/1961 | U | U | U | Agudo 1995a, Agudo and Romero 1996, Romero *et al.* 2001 |
| 174 | *B. brydei* | Caiguire, Golfo de Cariaco, Sucre | **Venezuela** | 10.48 | -64.13 | 06/08/1962 | U | U | U | Agudo 1995a, Romero *et al.* 2001 |
| 175 | *B. brydei* | Isla de Cubagua, N. Esparta | **Venezuela** | 10.82 | -64.17 | xx/xx/1963 | U | U | U | Agudo 1995a, Agudo and Romero 1996, Romero *et al.* 2001 |
| 176 | *B. brydei* | Pampatar, Isla de Margarita, N. Esparta | **Venezuela** | 11.00 | -63.80 | xx/xx/1970 | U | U | U | Agudo 1995a, Agudo and Romero 1996, Romero *et al.* 2001 |
| 177 | *B. brydei* | Península de Aray, Sucre | **Venezuela** | 10.58 | -64.28 | xx/04/1974 | U | U | U | Agudo 1995a, Romero *et al.* 2001 |
| 178 | *B. brydei* | 2km NW from I. La Tortuga | **Venezuela** | 10.98 | -65.37 | xx/xx/1978 | U | U | U | Agudo 1995a, Romero *et al.* 2001 |
| 179 | *B. brydei* | Punta de Piedras, Isla de Margarita, N. Esparta | **Venezuela** | 10.90 | -64.12 | xx/03/1979 | U | U | U | Agudo 1995a, Romero *et al.* 2001 |
| 180 | *B. brydei* | Between Puerto La Cruz and Isla de Margarita | **Venezuela** | 10.50 | -64.33 | xx/11/1979 | U | U | U | Romero *et al.* 2001 |
| 181 | *B. brydei* | Between Puerto La Cruz and Isla de Margarita | **Venezuela** | 10.50 | -64.33 | xx/11/1979 | U | U | U | Romero *et al.* 2001 |
| 182 | *B. brydei* | La Blanquilla | **Venezuela** | 11.92 | -64.58 | xx/05/1993 | U | U | U | Agudo 1995a, Agudo and Romero 1996, Romero *et al.* 2001 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 183 | *B. brydei* | Cubagua, Nueva Esparta | **Venezuela** | 10.86 | -64.16 | 14/07/2000 | U | U | U | Bermúdez-Villapol *et al.* 2005 |
| 184 | *B. brydei* | Playa Punta Arenas, Nueva Esparta | **Venezuela** | 10.97 | -64.42 | 24/08/2000 | U | U | U | Bermúdez-Villapol *et al.* 2005 |
| 185 | *B. brydei* | Playa La Caracola, Nueva Esparta | **Venezuela** | 10.95 | -63.81 | 21/10/2000 | U | U | U | Bermúdez-Villapol *et al.* 2005 |
| 186 | *B. brydei* | El Silguero, Nueva Esparta | **Venezuela** | 10.90 | -63.89 | 05/06/2002 | U | U | U | Bermúdez-Villapol *et al.* 2005 |
| 187 | *B. brydei* | Punta Gorda, Nueva Esparta | **Venezuela** | 11.02 | -63.79 | 16/06/2003 | U | U | U | Bermúdez-Villapol *et al.* 2005 |
| 188 | *B. brydei* | El Manglillo, Nueva Esparta | **Venezuela** | 10.96 | -64.33 | 20/06/2003 | U | U | U | Bermúdez-Villapol *et al.* 2005 |
| 189 | *B. brydei* | Playa La magnesita, Nueva Esparta | **Venezuela** | 10.99 | -63.80 | 13/09/2003 | U | U | U | Bermúdez-Villapol *et al.* 2005 |
| 190 | *B. musculus* | mouth of Río Luján, Buenos Aires | **Argentina** | -34.30 | -58.45 | 14/08/1866 | Juvenile | F | 17.7 | Burmeister 1872, Branch *et al.* 2007, Brownell *et al.* 2009 |
| 191 | *B. musculus* | Isla Galiano "Ballena Azul" | **Argentina** | -45.10 | -66.42 | xx/10/1993 | U | U | U | Reyes 2006 |
| 192 | *B. musculus** | Cabo Maguari, Ilha de Marajó, PA | **Brazil** | -00.29 | -48,37 | xx/xx/1990 | U | U | U | Siciliano *et al.* 2008 |
| 193 | *B. musculus* | Chui, RS | **Brazil** | -33.75 | -53.37 | 29/04/1992 | Juvenile | F | 23.1 | Zerbini *et al.* 1997, Dalla-Rosa and Secchi 1997, Branch *et al.* 2007, Brownell *et al.* 2009, Siciliano *et al.* 2011, Ott *et al.* 2013, |
| 194 | *B. musculus* | Rio Grande, RS | **Brazil** | -32.12 | -52.08 | U | U | U | U | Siciliano and Franco 2005, Siciliano *et al.* 2011 |
| 195 | *B. musculus** | Paraíba state | **Brazil** | -07.01 | -34.81 | U | U | U | U | Hetzel and Lodi 1993, Martuscelli *et al.* 1996 |
| 196 | *B. musculus** | Rio de Janeiro state | **Brazil** | -22.90 | -43.17 | U | U | U | U | Martuscelli *et al.* 1996 |
| 197 | *B. musculus** | Puerto Platero, Rio de la Plata | **Uruguay** | -34.44 | -57.64 | 09/07/1983 | Juvenile | F | 18.3 | Brownell *et al.* 2009 |
| 198 | *B. omurai* | Praia do Pecém, CE | **Brazil** | -3.54 | -38.80 | 10/09/2010 | Calf | F | 4.2 | Cypriano-Souza *et al.* 2016 |
| 199 | *B. physalus** | Punta Indio, Rio de la Plata | **Argentina** | -35.27 | -57.20 | xx/09/1996 | U | U | 10.0 | Junín *et al.* 2018 |
| 200 | *B. physalus* | La Pastera, Rio Negro | **Argentina** | -41.40 | -65.00 | xx/07/2012 | U | U | 12.0 | Junín *et al.* 2018 |
| 201 | *B. physalus* | Dock Sur, Rio de la Plata | **Argentina** | -34.64 | -58.35 | xx/07/2017 | U | U | U | Junín *et al.* 2018 |
| 202 | *B. physalus* | Punta Bermeja, Rio Negro | **Argentina** | -41.14 | -63.04 | 31/03/2018 | U | U | 19.8 | Junín *et al.* 2018 |
| 203 | *B. physalus** | Rio de la Plata | **Argentina** | -36.00 | -57.33 | U | Adult | U | 18-24 | Burmeister 1867, Archer *et al.* 2013 |
| 204 | *B. physalus** | São Sebastião, SP | **Brazil** | -23.81 | -45.40 | xx/xx/1905 | U | U | U | Santos *et al.* 2010 |
| 205 | *B. physalus** | Santos, SP | **Brazil** | -23.97 | -46.36 | xx/xx/1916 | U | U | U | Santos *et al.* 2010 |
| 206 | *B. physalus* | Peruíbe, SP | **Brazil** | -29.32 | -47.02 | 08/09/1941 | Adult | U | 20.0 | Zerbini *et al.* 1997, Siciliano *et al.* 2011, Santos *et al.* 2010, Ott *et al.* 2013 |
| 207 | *B. physalus** | Itanhaem, SP | **Brazil** | -24.20 | -46.82 | xx/05/1943 | Adult | U | 23.0 | Martuscelli *et al.* 1996 |
| 208 | *B. physalus* | Guarajuba, BA | **Brazil** | -12.66 | -38.07 | 08/12/1991 | Calf | M | 11.1 | Zerbini *et al.* 1997, Siciliano *et al.* 2011, Ott *et al.* 2013 |
| 209 | *B. physalus* | Praia de Mariluz, Imbé, RS | **Brazil** | -29.92 | -50.08 | 13/06/2002 | Juvenile | M | 13.6 | Siciliano *et al.* 2011, Ott *et al.* 2013 |
| 210 | *B. physalus* | Jaguaruna, SC | **Brazil** | -28.60 | -49.02 | 29/08/2003 | Calf | F | 9.2 | Siciliano *et al.* 2011 |
| 211 | *B. physalus** | São Paulo state | **Brazil** | -24.02 | -46.30 | xx/xx/2008 | U | U | U | Gomes *et al.* 2011 |
| 212 | *B. physalus* | Praia de Mosqueiro, Acaraju, SE | **Brazil** | -11.50 | -37.12 | 25/02/2009 | Calf | F | 7.5 | Siciliano *et al.* 2011 |

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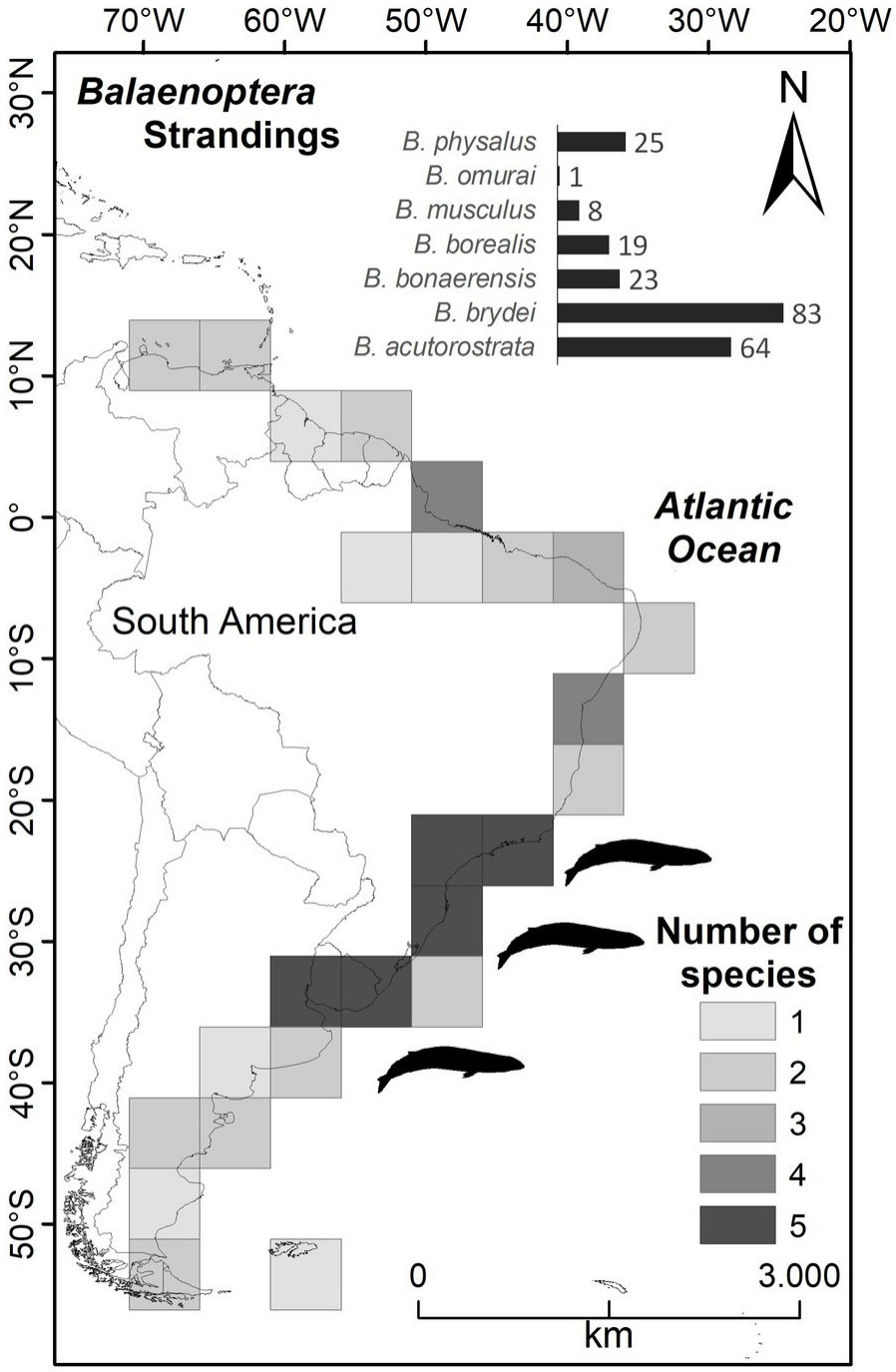
|---|---|---|---|---|---|---|---|---|---|---|---|
| 213 | *B. physalus* | Pirabas river estuary, Pirabas, PA | **Brazil** | -00.87 | -47.08 | 17/01/2010 | Juvenile | M | 14.9 | Siciliano *et al.* 2011, Costa 2015, Costa *et al.* 2017 |
| 214 | *B. physalus** | Rio Caravelas, BA | **Brazil** | -12.71 | -39.15 | U | U | U | U | Gray 1866 |
| 215 | *B. physalus* * | between Suriname and Marowijne Rivers | **Suriname** | 05.63 | -54.01 | xx/xx/1910 | Adult | U | 20.0 | Husson 1978, De Boer 2013, De Boer 2015 |
| 216 | *B. physalus* * | East of Braamspunt | **Suriname** | 05.95 | -55.16 | 22/05/1923 | Juvenile | U | 17.0 | Husson 1978, De Boer 2013, De Boer 2015 |
| 217 | *B. physalus* | Isla de Margarita, N. Esparta | **Venezuela** | 10.97 | -64.17 | xx/08/1932 | U | U | U | Agudo 1995a |
| 218 | *B. physalus* | Isla de Margarita, Estado Nueva Esparta | **Venezuela** | 10.97 | -64.18 | xx/08/1932 | Adult | U | U | Agudo 1995a |
| 219 | *B. physalus** | Isla de Margerita, N. Esparta | **Venezuela** | 10.94 | -63.88 | xx/xx/1954 | U | U | U | Agudo and Romero 1996, Romero *et al.* 2001, Bolaños-Jiménez *et al.* 2015 |
| 220 | *B. physalus* | Península de Paraguana | **Venezuela** | 11.72 | -69.77 | xx/02/1959 | U | U | U | Agudo 1995a, Dalla-Rosa and Secchi 1997, Romero *et al.* 2001, Bolaños-Jiménez *et al.* 2015 |
| 221 | *B. physalus* | Isla de Margarita, Esparta | **Venezuela** | 10.89 | -63.89 | 28/01/1993 | Adult | U | U | Agudo 1995b |
| 222 | *B. physalus* | Playa El Silguero, Isla de Margarita | **Venezuela** | 10.88 | -63.9 | xx/08/1993 | U | U | U | Bolaños Jiménez and Lira 1993, Agudo 1995a, Romero *et al.* 2001, Bolaños-Jiménez *et al.* 2015 |
| 223 | *B. physalus* | Isla de Margarita, Estado Nueva Esparta | **Venezuela** | 10.99 | -64.39 | 04/12/2013 | Adult | M | 19.9 | Esteves *et al.* 2018 |

Table I. Data on *Balaenoptera* strandings from the east coast of South America, including date of stranding, locality, location, sex, and total length (TL) as well as the reference from where the information was extracted.

TL, total length in meters F, females. M, males. U, unidentified. *Coordinates estimated by the described location. Date is expressed by day, month, and year (D/M/Y), and "xx" was used when there was no record.


70°W
60°W
50°W
40°W
30°W
20°W
30°N
20°N
10°N
0°
10°S
20°S
30°S
40°S
50°S
Balaenoptera
Strandings
N
B. physalus 25
B. omurai 1
B. musculus 8
B. borealis 19
B. bonaerensis 23
B. brydei 83
B. acutorostrata 64
Atlantic
Ocean
South America
Number of
species
1
2
3
4
5
0
3.000
km