

# **STRANDING OF MARINE MAMMALS IN THE PERIOD FROM 2003 TO 2016, IN THE SOUTH ERN COAST OF SANTA CATARINA, BRAZIL**

## **Rodrigo Ribeiro de Freitas**

Attending Master's Degree - Postgraduate Studies in Environmental Science at Universidade do Extremo Sul Catarinense – UNESC, Criciúma, Brazil. E-mail: [digogaucho@gmail.com](mailto:digogaucho@gmail.com)

## **Sarah Galatto Cancillier**

Undergraduate Student Full Degree - Mathematics at Universidade do Extremo Sul Catarinense – UNESC, Criciúma, Brazil E-mail: [sarah.gc@hotmail.com](mailto:sarah.gc@hotmail.com)

## **Guilherme de Sá**

Degree in Production Engineer from Universidade do Extremo Sul Catarinense – UNESC, Criciúma, Brazil. E-mail: [gui\\_dsa@hotmail.com](mailto:gui_dsa@hotmail.com)

## **Silvia Damiani Simões**

Degree in Biological Sciences from Universidade do Extremo Sul Catarinense – UNESC, Criciúma, Brazil. E-mail: [silvia.damiani@unesc.net](mailto:silvia.damiani@unesc.net)

## **Morgana Cirimbelli Gaidzinski**

Master in Geography. Coordinator of the Zoology Museum at Universidade do Extremo Sul Catarinense – UNESC, Criciúma, Brazil. E-mail: [mga@unesc.net](mailto:mga@unesc.net)

## **Kristian Madeira**

Doctor in Health Sciences. Professor of the Postgraduate Program in Productive Systems in Association between Universidade do Planalto Catarinense – UNIPLAC, Universidade do Extremo Sul Catarinense – UNESC, Universidade da Região de Joinville - UNIVILLE and Unversidad do Contestado - UnC. Criciúma, Brazil. E-mail: [kristian@unesc.net](mailto:kristian@unesc.net)

## **Cristina Keiko Yamaguchi**

Doctor in Engineering and Knowledge Management. Coordinator for the Postgraduate Program in Productive Systems in Association between Universidade do Planalto Catarinense – UNIPLAC, Universidade do Extremo Sul Catarinense – UNESC, Universidade da Região de Joinville - UNIVILLE and Unversidad do Contestado - UnC. Professor of the Postgraduate Program in Environment and Health – PPGAS at Universidade do Planalto Catarinense – UNIPLAC - Lages – Santa Catarina, Brazil. E-mail: [criskyamaguchi@gmail.com](mailto:criskyamaguchi@gmail.com)

**Jairo José Zocche**

Doctor in Science. Lecturer in the Postgraduate Studies in Environmental Science at Universidade do Extremo Sul Catarinense – UNESC. Criciúma, Brazil. E-mail: [jjz@unesc.net](mailto:jjz@unesc.net)

## **Summary**

*Stranding is the event in which a marine animal comes ashore after death or comes and is unable to return to the sea, which may occur due to natural, spatial tendencies and anthropic actions. It occurs in many countries, several of which have created formal programs to monitor. Mammals are at the top of the food chain, suffering more from changes in the environment, which is why they indicate the quality of the ecosystem. In the southern region of Brazil, inventories of marine mammal biodiversity emerged in the 1980s. Registering stranded data makes it possible to discover important information about marine animals and the oceans. This work aimed to collect information to identify the composition and abundance of strandings of marine mammals. The studied area is located on the southern coast of Santa Catarina, between the municipality of Jaguaruna and Passo de Torres. Data refer to collections made by the Zoology Museum Morgana Cirimbelli Gaidzinski, from the University of the Extreme South of Santa Catarina (UNESC), during the period from 2003 to 2016, through third-party activations and systematic monthly monitoring. The stranding frequency in this period was 344 mammals, belonging to 15 species, 10 genera, six families and two different orders. The occurrence of rare and unpublished animals was observed, such as *Balaenoptera physalus*, *Kogia breviceps* and *Arctocephalus gazela*.*

**Keyword:** Marine Animals; Strandings; Mammals.

## **1. INTRODUCTION**

Marine animals are recognized as those organisms that obtain most or all of their nutrition from the sea, oceans or estuarine environments (PYLE, 2001; BALLANCE, 2013). According to this definition, the organism does not necessarily need to take all of its ecological niche in the marine environment.

Among them are marine tetrapods, which are vertebrates adapted secondarily to live in marine environments, given that at some point in their evolutionary history primarily inhabited the terrestrial environment, today, still use it for playback and / or rest (POUGH; JANIS; HEISER, 2003; JEFFERSON; WEBBER; PITMAN, 2008).

Some marine animals are totally independent from the terrestrial environment (BALLANCE, 2013), but, globally, all are directly or indirectly affected by human activities, which result in serious compromises in the quality of marine environments, reaching, in many cases, extinction (JEFFERSON; WEBBER; PITMAN, 2008). Human actions are so striking about these environments since the years of 1970 marine mammals and sea turtles are recognized as *fee*, protected in the United States of America (USA) (Swingle et al., 2013).

In this study, as our records also depend on third-party drives and mammals, when stranded, remain on the beaches for a longer time and draw people's attention more quickly, but we limit the study to the Mammalia class.

This species is found on the top of marine food chains (SICILIANO; ALVES, HACON, 2005) and is more demanding regarding the quality of the environment, therefore, is the one that suffers with the environmental stress, thereby exercising the role of sentinel species for the health of seas, oceans, and coastal ecosystems (PETRY et al, 2010; KRÜGER; PETRY, 2011).

The stranding is considered an event described in marine animals, whose the individual or group of individuals comes to earth after death or is found alive on a sandy beach or on the coast (in mangroves, on rocks or in coral reefs) in a situation helpless, unable to return to water through her own ability (GERACI; LOUNSBURY, 2005; UNEP, 2008). It can be categorized as dead or alive, depending on the state of the animal when it is initially observed as single or in mass (GERACI; LOUNSBURY, 1993; HETZEL; LODI, 1993). A pair (mother and baby - in the case of mammals) is considered a single stranding, while the simultaneous stranding of two or more animals is defined as mass stranding (UNEP, 2008; WIBOWO; DHARMADI, 2014).

Animal data collected stranded provide the best and, often, the only information available on the natural history of many animal species (Bossart, 2009; BOGOMOLNI et al., 2010). Stranding records can indicate seasonal trends in the occurrence of certain species, the occurrence of stranding concentrations in certain areas (READ; MURRAY, 2000) and / or stranding associated with cyclical natural phenomena. The spatial and temporal trends in mortality of marine animals such as those caused by unusual mortality events and / or interactions with the more varied human activities can also be monitored from stranding records (BOGOMOLNI et al, 2010; Swingle et al., 2013).

Due in part, the observation of difficulty in the environment where they live, data on marine mammals are still unknown with respect to their habits and the behavior, which makes the studies on these animals stranded an important source of information (BOGOMOLNI et al., 2010). Significant historical and current data on seasonal and spatial patterns of occurrence and mortality, diet, age structure, sexual proportion, population genetic variability, diet, interannual variations associated with climatic and / or anthropogenic events, causes of mortality, displacement and other aspects of natural history about marine mammals was acquired through the investigation of stranded animals, because strandings provide exclusive access to species that are evasive (COLEGROVE ; GREIG; GULLAND , 2005; BOGOMOLNI et al., 2010).

A well-organized and maintained database of strandings of marine animals can be an invaluable tool in understanding not only bottlenecks, but also changes in the marine environment (ARAGONES et al., 2010). A database that details the records of strandings of marine animals is a valuable resource for collecting information on occurrence, distribution, potential abundance, and human and oceanic health (BOSSART, 2009).

Strandings of marine animals occur all over the world. Although not exist global statistics on such events (ARAGONES et al., 2010), several countries (like the United States, Canada, Brazil, Peru, United Kingdom, Italy, Ireland, Australia, the Philippines, among others) have established formal monitoring programs (SWINGLE et al., 2013; VIANNA et al., 2016). In 1972 was established in the United States a National Register Network of stranding of marine animals, composed of six regional centers, whose data is stored in a central database (ARAGONES et al., 2010; Swingle et al., 2013).

In 1991, the Rio Grande do Sul Aquatic Mammals Study Group (GEMARS) was founded, a non-governmental, non-profit organization that aims to develop scientific research and environmental

education programs related to conservation of aquatic mammal species, as well as their natural environments. (GERMARS, s.d.).

In 1999, governmental and non-governmental research institutions that work with aquatic mammals in the Northeast proposed the creation of the Stranding and Information Network for Aquatic Mammals in Brazil - REMAB (MEDEIROS, 2006). The network would be composed of four regional networks (North, Northeast, South and Southeast). However, until 2006, the only officially established regional networks were the Northeast (REMANE) and South (REMASUL) (LIMA; CÉSAR, 2005). In 2011, the ICMBIO through Ordinance n<sup>o</sup> 43/2011 (ICMBIO, 2011), officially established the REMAB and its four regional networks: REMANOR (covering North and Central - West); REMANE (Northeast region); REMASE (Southeast region); and REMASUL (South region). With operations throughout the national territory. The Network aims at optimizing and monitoring the service to strandings and the Catch them in fishing gear, as well as developing researchs and store information in the bank 's national data on aquatic mammals. It aims to enable the exchange of information between institutions working with marine mammals in Brazil (ICMBIO, 2011).

The Center for Earth Technological Sciences and the Sea ( CTTMar ) the University of Vale do Itajaí ( UNIVALI ) , in Santa Catarina since 2002 , has been developing the Support System Monitoring of Marine Mammals ( SIMMAM ) , a geographic information system that collects and stores georeferenced data on sightings, incidental captures and strandings of aquatic mammals (KARAM and BRITTO, 2009). Medeiros (2006) reviews the literature on the studies with strandings of marine mammals in Brazil, inventorying cetacean strandings records occurred in 1984 to 2005 in the coast of Rio Grande do Norte. He Points out that the scientific surveys have also been used to assess the distribution, the abundance and the diversity of cetaceans in Brazilian coast.

Vianna et al. (2016) reviewed, in the last 32 years, the records of strandings of marine mammals that occurred in the south of the state of Santa Catarina. Report that were obtained 460 records of 17 species of toothed and of baleen whales. Mark, still, in the south of Brazil, in the state of Santa Catarina, inventories of biodiversity marine mammals began to appear on the 1980's with the recovery of animals stranded along 670 km of coastline, citing as the main studies by Simões-Lopes and Ximenez (1993), Simões-Lopes (1995) and Cherem et al. (2004).

The objective of this study, therefore, is to collect information on strandings of marine animals in the south of Santa Catarina in a span of 13 years, verifying the composition of stranded marine Mammal species and their abundance.

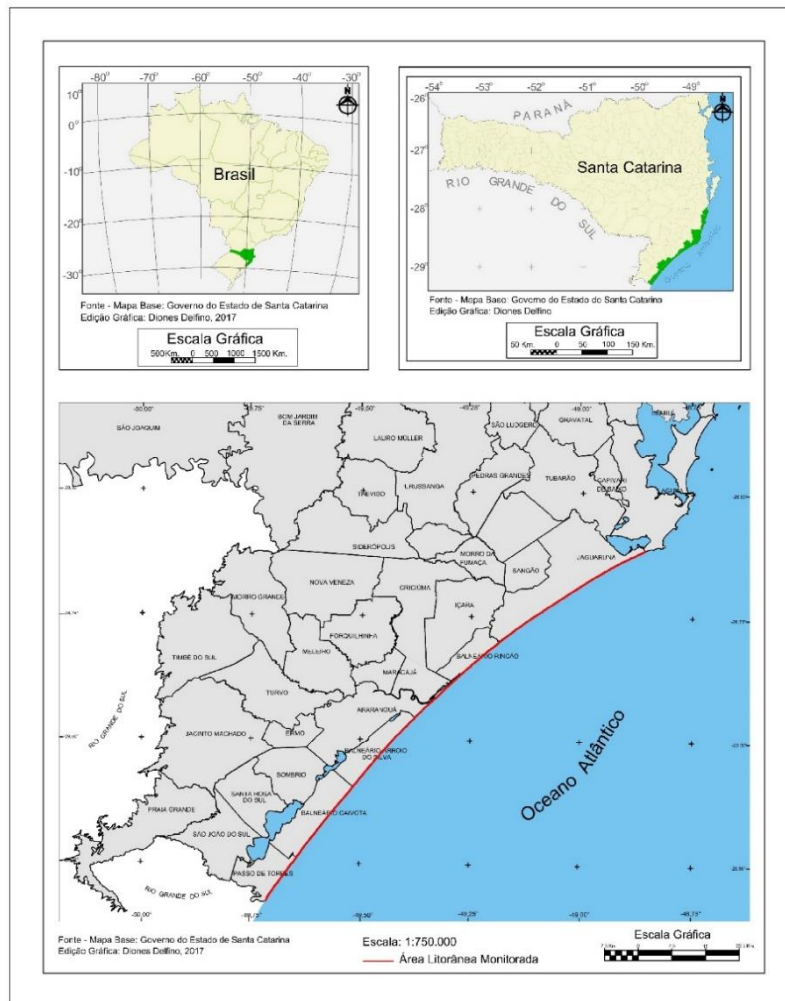
## **2 MATERIAL AND METHODS**

The study was carried out on the southern coast of Santa Catarina, comprising approximately 120 km of open sea beaches, distributed between Barra do Camacho, the municipality of Jaguaruna (28°36'56 "S and 48°51'30" O) and the mouth of the river Mampituba , in the municipality of Passo de Torres (29°20'26 "S and 49°43'22" O) (Figure 1).

The studied area covers the extension of the southern coast of Santa Catarina, in which the Museum of Zoology Professor Morgana Cirimbelli Gaidzinski, from the University of the Extreme South of Santa

Catarina (UNESC), has been working in the registration and rescue of stranded marine animal carcasses since 2003, through two different methodologies: activation by third parties and systematic monitoring. The data collected were stored in an *Excel* spreadsheet and are part of the collection of this museum, using the data collected until the year 2016 in this study.

Figure 1 - Location of the study area between the municipalities of Jaguaruna (28°36'56 "S and 48°51'30" O) and Passo de Torres (29°20'26 "S and 49°43'22" O), in Santa Catarina, Brazil



Source: SANTA CATARINA. Government of the State of Santa Catarina. Base Map. Edition: Gráfica Diones Delfino, 2017.

Triggers by third parties have taken place since 2003 and have been serviced continuously. They consist of contacts with the Museum made by third parties such as: fishermen, residents of the riverside and beach communities, Military Police and Environmental Military Police, municipal secretariats for the Environment and municipal foundations for the Environment.

The systematic monitoring, on a monthly basis, originated from the demand for the drives by third parties and started in July 2009. It was performed by a variable group of three to four researchers, always with the presence of the author of the research. The section was covered by a 4 x 2 car, with a speed of approximately 20 km / h. When a strand was found, the research team stopped and the following data were recorded: date and time of registration, municipality, geographic coordinate of the event (obtained from GPS),

identification of the animal in the field (when possible), condition assessment animal's life span (whether alive or dead, debilitated or just resting) and photographic record. In the case of live animals with apparent lesions or very weak, it was informed to the Military Environmental Police and or to the APA administration of Baleia Franca when the event had occurred in its area of coverage.

It was held biometrics (relevant to each monitored group), in order to provide data for the age of the animal identification (young or adult) and to identify the health condition evaluated visually (good, lean animal, very lean animal and cachectic animal).

Taxonomic identification took place with the help of specialized guides (PINEDO; ROSAS; MARMONTEL, 1992; HETZEL; LOD I, 1993). The nomenclature of the registered specimens followed the taxonomic proposition adopted by Paglia et al. (2012).

Wealth was analyzed based on the records obtained by means of both drives and systematic sampling, while the parameters of abundance (absolute and relative), frequency (absolute and relative) and constancy of occurrence were analyzed only with based on systematic sampling campaigns, considering each campaign as a sampling unit, regardless of the number of hours dedicated or kilometers traveled in each one.

The frequency of the *taxa* was calculated as follows:

$FA_t = 100 \cdot U_t/U$	$FR_t = 100 \times FA_t / \sum_{j=1}^s FA_j$
--------------------------	--

Where:

$FA_t$  = absolute frequency of taxon t

$U_t$  = number of sample units in which the taxon t occurred

$U_T$  = total number of sample units

$FR_t$  = relative frequency of taxon t

$\sum_{j=1}^s FA_j$  = sum of the absolute frequency of all species

The abundance of *taxa* was calculated as follows:

Where:

$AA_t$  = Absolute abundance of taxon t

$N_t$  = number the total number of specimens of taxon t

$N_T$  = total number of specimens from all taxa

$AR_t$  = relative abundance of taxon t

$\sum_{j=1}^s AA_j$  = sum of the absolute abundance of all species



The constancy of occurrence was assessed by the Constancy of Occurrence Index, adapted from Dajoz (2006), according to which species were classified as abundant ( $FA \geq 50\%$ ), common ( $25 \leq FA \leq 49.9\%$ ) and rare ( $FA \leq 24.9\%$ ).

The conservation *status* of the registered species followed the lists of species threatened with extinction worldwide at *The International Union for Conservation of Nature - The IUCN Red List of Threatened Species* (IUCN, 2018), at the national level by the Ministry of Environment of Brazil (MMA, sd) and at the state level of the State Environmental Council (CONSEMA, 2011).

Table 1 - Rate, form of registration (triggered or systematic), condition (M = dead, V = alive), number of live specimens, dead and total number of registered marine Mammals stranded on the southern coast of Santa Catarina from 2003 to 2016

Source: From the Author.

Rate	Register Form			Total		Grand Total
	Acionamento	Systematic		V	M	
	M	V	M			
<b>MAMMALIA</b>						
<b>Cetacea</b>						
Cetacea N.I	1				1	1
<b>Balaenidae</b>						
<i>Eubalaena australis</i> (Desmoulins, 1822)	2	3	2	3	4	7
<b>Balaenopteridae</b>						
<i>Balaenoptera acutorostrata</i> Lacépède, 1804	1				1	1
<i>Balaenoptera edeni</i> Anderson, 1879	1				1	1
<i>Balaenoptera physalus</i> Linnaeus, 1758	1				1	1
<b>Delphinidae</b>						
Delphinidae N.I.			4		4	4
<i>Globicephala melas</i> (Traill, 1809)	1				1	1
<i>Orcinus orca</i> (Linnaeus, 1758)	1				1	1
<i>Stenella coeruleoalba</i> (Meyen, 1833)	2	1	1	1	3	4
<i>Stenella frontalis</i> (G. Cuvier, 1829)	1				1	1
<i>Tursiops truncatus</i> (Montagu, 1821)	7		3		10	10
<b>Kogiidae</b>						
<i>Kogia breviceps</i> (Blainville, 1838)	1				1	1
<b>Pontoporiidae</b>						
<i>Pontoporia blainvillei</i> (Gervais & d'Orbigny, 1844)	5		25		30	30
<b>Carnivora</b>						
<b>Otariidae</b>						
<i>Arctocephalus australis</i> (Zimmermann, 1783)	17	22	125	22	142	164
<i>Arctocephalus gazella</i> (Peters, 1875)			1		1	1
<i>Arctocephalus tropicalis</i> (J.E. Gray, 1872)		7	32	7	32	39
<i>Arctocephalus</i> sp.	1	29	25	29	26	55
<i>Otaria flavescens</i> (Shaw, 1800)	9		13		22	22
<b>Total Geral</b>	<b>51</b>	<b>62</b>	<b>231</b>	<b>62</b>	<b>282</b>	<b>344</b>

### 3 RESULTS

Were recorded 344 stranding mammals, among which 18.02% (n = 62) were alive and 81.98% (n = 282) were dead (Table 1). The records made through the drives represented 14.83 % (n = 51), and those made through systematic samplings 85.17 % (n = 293) of the total registered stranding universe. One hundred percent of the animals recorded by means of drives were dead while those recorded by means of sampling systematic 21.16% (n = 62) were alive and 78.84% (n = 231) were dead (Table 1).



Table 2 - Summary of the taxonomic composition of records by actuation (A), systematic s (S) and total (T) of stranded marine Mammals on the southern coast of Santa Catina from 2003 to 2016.

Register Composition	Mammalia			Grand Total
	A	S	T	
Classe				9
N.I				
Order	1		1	15
Family		4	4	4
Genre	1	54	55	55
Orders	2	2	2	7
Families	6	4	6	16
Genres	10	6	10	28
Especies	13	8	15	37
Live Specimens		62	62	93
Dead Specimens	51	231	282	3781
<b>Total of Registers</b>	<b>51</b>	<b>293</b>	<b>344</b>	<b>3874</b>

Source: From the Author.

Note: Where applicable NI = not identified. The blank cells indicate values equal to zero.

F pray registered 344 strandings (62 living and 282 dead) belonging to 15 species, 10 genera, six families and two orders. Fifty-five specimens (29 alive and 26 dead) were identified only at the gender level (*Arctocephalus* sp.); four, at the family level (Delphinidae); and one, at the order level (Cetacea) (Tables 1 and 2).

Table 3 - Frequency of occurrence (FO), absolute frequency (FA), relative frequency (FR), absolute abundance (AA), relative abundance (AR) and constancy index of occurrence (ICO) of marine mammals recorded on the south coast of Santa Catarina in the period from 2003 to 2016.

Rate	Parameters					
	FO	FA	FR	AA	AR	ICO
<b>MAMMALIA</b>						
<b>Cetacea</b>						
<b>Balaenidae</b>						
<i>Eubalaena australis</i> (Desmoulins, 1822)	4	8,89	1,63	5	0,13	R
<b>Delphinidae</b>						
Delphinidae N.I	4	8,89	1,63	4	0,11	R
<i>Stenella coeruleoalba</i> (Meyen, 1833)	2	4,44	0,81	2	0,05	R
<i>Tursiops truncatus</i> (Montagu, 1821)	3	6,67	1,22	3	0,08	R
<b>Pontoporiidae</b>						
<i>Pontoporia blainvillei</i> (Gervais & d’Orbigny, 1844)	17	37,78	6,91	25	0,67	C

Source: From the Author.

Note: Where there is A = abundant, C = common and R = rare.

With reference to the conservation *status* of the Mammalia Class (Table 4), most (eight species) are, in the world, in the category that requires less concern (LC). Five are found in the category of deficient data (DD), one (*P. blainvillei*) in the vulnerable category and one (*B. physalus*) in the category threatened with extinction. *Ebalaena australis* appears, respectively, as threatened with extinction at the national level (MMA, sd) and as vulnerable at the state level (CONSEMA, 2011). *B. physalus* is threatened with extinction at the national level and *P. blainvillei* figure as critically endangered, at the national level, and vulnerable, at the state level.

Table 4 - Conservation status, according to IUCN (2018), MMA (sd) and C ONSEMA (2011), of marine mammal species recorded on the southern coast of Santa Catina from 2003 to 2016.

Rate	Conservation Status		
	IUCN	MMA	CONSEMA
<b>MAMMALIA</b>			
<b>Cetacea</b>			
<b>Balaenidae</b>			
<i>Eubalaena australis</i> (Desmoulins, 1822)	LC	EN	VU
<b>Balaenopteridae</b>			
<i>Balaenoptera acutorostrata</i> Lacépède, 1804	LC		
<i>Balaenoptera edeni</i> Anderson, 1879	DD		
<i>Balaenoptera physalus</i> Linnaeus, 1758	EN	EN	
<b>Delphinidae</b>			
<i>Globicephala melas</i> (Traill, 1809)	DD		
<i>Orcinus orca</i> (Linnaeus, 1758)	DD		
<i>Stenella coeruleoalba</i> (Meyen, 1833)	LC		
<i>Stenella frontalis</i> (G. Cuvier, 1829)	DD		
<i>Tursiops truncatus</i> (Montagu, 1821)	LC		
<b>Kogiidae</b>			
<i>Kogia breviceps</i> (Blainville, 1838)	DD		
<b>Pontoporiidae</b>			
<i>Pontoporia blainvillei</i> (Gervais & d'Orbigny, 1844)	VU	CR	VU
<b>Carnivora</b>			
<b>Otariidae</b>			
<i>Arctocephalus australis</i> (Zimmermann, 1783)	LC		
<i>Arctocephalus gazella</i> (Peters, 1875)	LC		
<i>Arctocephalus tropicalis</i> (J.E. Gray, 1872)	LC		
<i>Otaria flavescens</i> (Shaw, 1800)	LC		

Source: From the Author.

Where there is CR = critically endangered; EN = threatened with extinction; VU = vulnerable; NT = almost threatened; LC = less concern; DD = data deficient. Blanks indicate that the conservation *status* of the species has not been assessed at the national or state level.

## 5 DISCUSSION

Strandings of marine animals have origin in various causes, but fundamentally the reasons for the occurrence are more related to the opinion of those who report them than the established facts (CORDES, 1982). The relationship of the observer with this phenomenon, in our study, directly influenced the sampling effort, as well as the results.

Marine mammals and turtles, in general, tend to draw more public attention than the birds, especially the fact of being exposed for longer on beaches prior to decomposition, because of their rarity or requires human action for the proper final disposal of the carcasses. These facts influence directly the drives and therefore the data obtained in this study.

The species *A. australis*, which is widely distributed in South America, has reproductive colonies from Uruguay to Tierra del Fuego, still in the Atlantic, and from southern Chile to Peru, in the Pacific Ocean (BONNER, 1994). Simões-Lopes (1995) reports the regular occurrence of the species for Santa Catarina in the winter and spring months, a fact also corroborated in the present study, although the seasonal data on the occurrence of species have not been presented and discussed.

Pinedo (1994) found 1.085 dead specimens along the coast of the Rio Grande do Sul, in southern Brazil, between 1976 and 1987. This shows that the anthropic pressure generated by overfishing and degradation the coastal environment through pollution of human molestation and the accidental capture in fishing nets, ends up creating one set of factors that increase the rates of mortality of marine mammals, impacting the population.

In a study on the coast south-central Rio Grande south by Ferreira, Muelbert and Secchi (2010), which were analyzed 690 fishing sets, Deployed the s 23 vessels, resulting at 136 incidental catches and 348 strandings *P. Blai n villei* between January 2002 and December 2003. The authors point out that one of the motors bringing the stranding of the species is related to the incidental fishing. Although Brazilian law prohibits the use of fixed gillnets along the coast of Santa Catarina (Portaria IBAMA 54/1999), this practice is still widely used, representing one of the greatest threats to the conservation of *P. blainvillei* in its distribution (CREMER et al., 2013).

According to the studies of Ferreira, Muelbert and Secchi (2010), most carcasses *P. blainvillei* caught accidentally in fishing nets on the beach no beaches because predation by scavengers, such as sharks, can cause the s individuals even come to coast to run aground. The other factor reported for the PMP-Base Laguna is the animal's body by cutting off fishermen know that the porpoise is an animal which has major threat to fishing. The reasons for not occurrence the stranding on the beach are many, from human consumption, bait for shark fishing, production of oil and amulets (DESVAUX, 2013). Mourão, Pinheiro and Lucena (2007) reported the use as bait in longline fishing. Emin- Lima et al. (2010), Loch, Marmontel and Simões-Lopes (2009) reported the use as bait d the tucuxi species (*Sotalia fluviatilis*) and *S. guianensis* . Other factors contribute to the stranding and the death of

the species, as heavy infections caused by the parasite *Hadwenius pontoporiae*, observed in the intestines of 53 individuals of *P. blainvillei*, captured incidentally in massive networks in southern Brazil (ANDRADE; PINEDO; PEREIRA JUNIOR, 1998).

Joint studies carried out since 2011 by the Center for Coastal, Limnological and Marine Studies (CECLIMAR) of the Federal University of Rio Grande do Sul (UFRGS) and the Veterinary Pathology Sector (SPV) of UFRGS on the *cause of death* of pinnipeds found dead on the north coast and central of Rio Grande do Sul (AMORIM; SONNE, 2017) reveal that in 96 necropsied specimens three cases of tuberculosis caused by *Mycobacterium pinnipedii* (two cases in *O. flavescens* and one in *A. australis*) were diagnosed, two cases of interaction of *The . flavescens* with a firearm and 25 cases of multiple trauma caused by dog attacks (22 cases in *A. australis* and three in *A. tropicali*).

Please note that this study did not aim to check the occurrence of parasites, neither the animal interaction recorded human activities.

Severe anthropic interactions with firearms are not restricted to the state of Rio Grande do Sul. In 2016, Oliveira et al. (2017) evaluated the occurrence of anthropogenic interaction by firearms in two individuals adult males of *O. flavescens* found dead in April and in May 2016 in the south coast of Santa Catarina. The individuals were necropsied. The maceration of the skull of the first individual revealed the occurrence of lead adhered to the left side of the maxillary bone and a 22-caliber projectile housed in the distal region of the horizontal branch of the mandible. The second animal, on the other hand, had mild multifocal ulcerative dermatitis in the skull region. At the end of the post-maceration, five loose lead spheres were removed from the contents and the skeleton analysis revealed impregnation with lead in the skull, in addition to a complete transverse fracture of the left tibia (OLIVEIRA et al., 2017).

The sea lions have the habit of moving in search of food in the winter. For the state of Rio Grande do Sul, there are areas that present a large number of occurrences of these animals (PINEDO; ROSAS; MARMONTEL, 1992). For Santa Catarina, it is cited for Florianópolis by Cimardi and Brettas (1996), Palhoça by Ximenez, Simões-Lopes and Praderi (1987) and Paulo Lopes by Simões-Lopes (1995). In Brazil, there is no presence of reproductive areas for *A. australis*, however REVIS Ilhas dos Lobos includes these animals either for rest or for food. It is also important to report that some specimens of these animals arrive to the beaches from Uruguay (PINEDO; ROSAS; MARMONTEL, 1992). Pont et al. (2015), in an interview with local fishermen (REVIEW), reports that the fishermen could identify properly to *A. australis* "muffin" and who believe that seals do not attack fishing nets. In fact, the interactions of *A. australis* with fishing are rare along the coasts of South America with respect to publications to date. The species is cited for Florianópolis, Garopaba, Içara, Imbituba, Itajaí, Jaguaruna, Laguna, Palhoça, Porto Belo and Sombrio by Simões-Lopes (1995). For the species *A. tropicalis* there is no evidence to suggest resting places for it in Brazil. The evidenced records can occur due to strong currents, which are subjected to during migration in search of food. They were cited for Araranguá, Florianópolis, Itapoá, Laguna, Navegantes and Palhoça by several authors such as Cimardi and Brettas (1996), Simões-Lopes (1995) and Ximenez, Simões-Lopes and Praderi (1987).

A global review of the incipient capture of pinnipeds in 1991 concluded that the incidental mortality in passive equipment contributed to the fall of the populations of several species (REEVES; MCCLELLAN;

WERNER, 2013). Some studies have reported the occurrence of pinnipeds in southern Brazil, in association with the Falkland / Malvinas current during the winter. This current, originating from a branch of Antarctica, a circumpolar current, penetrates the Brazilian continental shelf more intensely (MOURA; SICILIANO, 2007). It facilitates the movement of pinnipeds from their breeding areas to the south of Brazil, where entanglement in fishing gear seems to be occurring with Antarctic seals of the species *A. gazella* (CROXALL; RODWELL; BOYD, 1990). Similar facts are reported for Australian seals *A. pusillus* (PEMBERTON; BROTHERS; KIRKWOOD, 1992; JONES, 1995).

In a study conducted in the United States, a young of the species *K. breviceps* encalhed living in Texas was rescued and after 11 days come to death (Tarpley; Marwitz, 1993). After the autopsy, the first two compartments of the stomach were completely occluded by plastic debris. Another five cases of cetaceans that had ingested plastic, including *O. orca*, were reported by Coleman and Wehle (1984) and Baird and Hooker (2000). The genre *Kogia* comprises only two existing species, *Kogia sima* and *Kogia breviceps*, and represents one of the least known groups of cetaceans in the global ocean; its stranding can help in the recognition of epidemiological aspects associated with the mortality of organisms found on the beach (MOURA et al., 2016). *K. sima* prefers warm waters, while *K. breviceps* seems to prefer temperate and productive waters like those in southern Brazil (MOURA et al., 2016). Wind speed results are also an important factor in predicting *Kogia* strandings on the Brazilian coast.

*Tusiops truncatus*, which also has worldwide distribution occurs from the North East to the Rio Grande do Sul and is usually observed near the coast, river mouths and estuaries (PINEDO; ROSES; Marmontel, 1992; HETZEL; LODI, 1993). The species has been referred to by Araranguá and Laguna Simoes-Lopes (1991), Florianópolis Içara, Paul Port Belo by Lopes and Simoes-L options and X imenez (1993) and Jimenez, Simoes-Lopes and Praderi (1987). Still in Laguna, the species suffers an intense negative interaction with fishing (BORGES et al., 2007; SCHIAVON, 2007).

According to Pont et al. (2015), reports of fishermen point out that the dolphins nose bottlenose not have negative interactions with fishing, on the contrary, they help, causing the harassment of fishermen towards these Animas is more attenuated. With the *O. flavescens* species, the fishermen's feeling was not at all friendly. They showed extremely negative compared to sea lions, reporting the losses caused by them, which in turn translates into damage to networks. Faced with this perspective, the interaction with the lions is sharply negative and ends up explaining found animals (stranding) with traces and marks s ammunition. Both *S. coeruleoalba* and *D. delphis* are pelagic species and most likely their occurrences on the coast are associated with marine currents or the search for greater safety due to the state of poor physical conditions (ROSAS et al., 2010). This fact ends up explaining the low occurrence of these species.

The distribution of the species *E. australis* is often related to calm and shallow waters, mainly in the breeding season (KARAM; BRITTO, 2009). For Brazil, the species has a preference for South-Brazilian waters only from sightings in the Abrolhos bank and Bahia coast (GROCH, 2005). The species has a higher concentration in coastal waters of the Rio Grande do Sul and of Santa Catarina (SICILIANO et al., 2006). The frequency of occurrence exacerbated during the months of August and September in the waters of the coast of Santa Catarina, together with the presence of young, leads to the conclusion that the area is used as a nursery (SIMÕES-LOPES; XIMENEZ, 1993; KARAM; BRITTO, 2009).

With more updated studies, it is understood and affirmed with certainty that the Santa Catarina coast is one of the most important reproductive areas of the Atlantic for *E. australis*. The weighing Imbituba not contemplate the study area, the beach Ribanceira was considered a satisfactory area for the animals, with a greater number observed in that spot, which could be considered the favorite of mothers in the process giving birth and giving the first care to the offspring (DANILEWICZ et al., 2017). The stranding volume can explain better how to a volume of considerable species on the Brazilian south coast Greig et al. (2001) recorded the occurrence of 24 stranding events of *Eubalaena australis* along the southern coast of Brazil between the years 1977 and 1995, based on bibliographic records.

Regarding the species *B. physalus*, this cetacean migrates from the poles to Ecuador (PINEDO; ROSAS; MARMONTEL, 1992), suggesting that despite occurring throughout the Brazilian coast, its records are occasional. There are no studies showing the use of the area for feeding or reproduction by this species. It is noteworthy that the occurrence of the species is described for São Paulo (VIVO et al., 2011). The species *B. acutorostrata* is cosmopolitan, but has few records for the state of Santa Catarina, being mentioned for Balneário Rincão by Baldas and Castello (1986), in Balneário Gaivota by Simões-Lopes and Ximenez (1993) and Zerbini et al. (1996). Es is the kind usually approach the coast between bays and estuaries (LEAHERWOOD; REEVES, 1983).

Menezes (2005) made an important review of the literature on strandings of marine mammals when reporting the events of strandings of cetaceans that occurred between 1993 and 2004 on the coast of Rio Grande do Sul. with a sampling effort of 33,201.4 km, it registered 969 strandings of *Pontoporia blainvillei*, 73 of *Tursiops truncatus* and 143 of other species of cetaceans.

Ferreira, Muelbert and Secchi (2010) stands out in the meaning of ecological data on long-term and the importance of integrating sets of oceanographic and climatic data Similar to identify the ecosystem level standards. Integrated ecological investigations that involve regular surveys of cetaceans in the region provide a means by which changes in the abundance and distribution of cetaceans could be investigated. At another level, the results presented here can help to predict periods of increase in the number of stranding events. They can also provide an important guide to potentially disturbing activities (for example, those involving seismic or sonar operations) to be scheduled for other periods when the patterns of organisms and their responses are known.

As is observed in discussions presented previously the stranding records contribute to the knowledge of the migratory range and, therefore, the distribution of various species, and can also indicate changes in mortality patterns or the age structure of a population (GULLAND; HALL, 2007; COLEGROVE; GREIG; GULLAND, 2005; BOGOMOLNI et al., 2010). In addition, marine mammals are recognized as sentinel species (BOGOMOLNI et al., 2010; PANGALLO et al., 2008; BOSSART, 2009). Data analysis and the samples collected cetacean and pinniped stranded also provides information on ocean health (Gulland; HALL, 2007; Colegrove; GREIG; Gulland, 2005; BOGOMOLNI et al., 2010).

## **6 FINAL CONSIDERATIONS**

The study contemplated an area little studied regarding a class, considering the number of mammals found, which showed high diversity and high wealth. The hydrographic basins that cover the study area, as well



as the resurgence currents, provide a wealth of microhabitats, niches and elements that support the migration and occurrence of marine animals. In this context, the area deserves attention, mainly due to the rare occurrences and unpublished records, such as *Balaenoptera physalus*, *Kogia breviceps* and *Arctocephalus gazella*.

Getting to know the stranded species and their abundances-based decision making in the project's conservation, as well as open space for the development of other studies that address in other aspects, such as diet, the distribution and the *cause of death* of the species stranded and so complements the study started here. That way, it is possible to achieve a higher level in the conservation of the class Mammalia and passing the coast of the Extreme South of Santa Catarina.

## REFERENCES

- AMORIM, D. B; SONNE, L. Pinniped death in southern Brazil: study of the cause of death of arctocephalus australis, arctocephalus tropicalis and otaria flavescens in Rio Grande do Sul, Brazil. In: NATIONAL MEETING ON CONSERVATION AND RESEARCH OF AQUATIC MAMMALS, 8., 2017, Natal. **Abstracts ...** Natal: Encopemaq, 2017, p. 2017.
- ANDRADE, ALV; PINEDO, MC; PEREIRA JUNIOR, J. Parasites: bioindicators of the habitats of aquatic mammals. In: WORKING MEETING OF SPECIALISTS IN AQUATIC MAMMALS IN SOUTH AMERICA, 8., Recife, 1998. **Anais ...** Recife: [ sn .], 1998, p. 25-29.
- ARAGONES, LV et al. The Philippine marine mammal strandings from 1998 to 2009: animals in the Philippines in Peril? **Aquatic Mammals**, v. 36, n. 3, p. 219-233, 2010.
- BAIRD, R. W; HOOKER, SK Ingestion of plastic and unusual prey by a juvenile harbor porpoise. **Marine Pollution Bulletin**, Vol. 40, n. 8, p. 719-720, 2000.
- BALDAS, MI; CASTELLO, HP.  
About el hallazgo of ejemplares juveniles of Ballena minke, *Balaenoptera acutorostrata*, en el estuary del Rio de la Plata y sur de Brazil. In: REUNIÓN OF WORK OF SPECIALISTS IN AMERICA DEL SUR, 1., Buenos Aires, 1986. **Proceedings ...** Buenos Aires: [ sn .], 1986, p. 1-13.
- BALLANCE, L. Seabird taxonomy. **Marine Tetrapods Lecture**, Week 2, 2013.
- BOGOMOLNI, A. et al. **Gulf of Maine Seals: populations, problems and priorities**. Woods Hole, USA: The Woods Hole Oceanographic Institution MA, 2010.
- BONNER, WN et al. Predatory interactions between Antarctic fur seals, macaroni penguins and giant petrels. **British Antarctic Survey Bulletin**, v. 56, p. 75-79, 1982.
- BORGES, JCG et al. Motorized vessels: a threat to marine manatees (*Trichechus manatus*) in Brazil. **Biota Neotropica** , v. 7, n. 3, p. 199-204, out. 2007.
- BOSSART, GD Marine mammals as sentinels for oceans and human health. **One Health Newsletter**, Vol. 2, n. 4, p. 3-6, 2009.
- BRAZIL. Ministry of the Environment. Law No. 9,605, of February 12, 1998. Provides for criminal and administrative sanctions derived from conduct and activities that are harmful to the environment, and provides other measures. **Official Gazette [of] the Federative Republic of Brazil**. Brasília, DF, February 13, 1998, rectified on February 17, 1998 .



CECLIMAR / UFRGS / UERGS. **Penguin mortality on the coast of RS**. Published in 2014. Available at: <http://www.ufrgs.br/ceclimar> . Accessed on: 12 nov. 2017.

CHEREM, JJ et al. List of mammals in the state of Santa Catarina, southern Brazil. **Neotropical Mastozoology** , Mendoza, vol. 11, n. 2, p. 151-184, 2004. Available at: < [http://www.scielo.org.ar/scielo.php?Script=sci\\_arttext&pid=S0327-93832004000200002](http://www.scielo.org.ar/scielo.php?Script=sci_arttext&pid=S0327-93832004000200002) >. Accessed on 12 nov. 2017.

CIMARDI, AV; BRETTAS, EP **Mammals of Santa Catarina**. [ S1 ]: Fatma, 1996.

COLEGROVE, KM; GREIG, DJ; GULLAND, FMD Causes of live strandings of Northern Elephant Seals (*Mirounga agustirostris*) and Pacific Harbor Seals (*Phoca vitulina*) along the Central California Coast, 1992-2001. **Aquatic Mammals**, v. 31, n. 1, p. 1-10, 2005.

COLEMAN, FC; WEHLE, DHS Plastic pollution: a global ocean problem. **Parks**, vol. 9, n. 1, p. 9-12, 1984.

STATE COUNCIL OF THE ENVIRONMENT OF SANTA CATARINA - CONSEMA. CONSEMA Resolution No. 002, of December 6, 2011. Recognizes the Official List of Endangered Species of Fauna in the State of Santa Catarina and takes other measures. **Daily Journal**, SC, No. 19,237, 20 ten. 2011, p. 2-8.

CORDES, DO The causes of whale strandings . **New Zealand Veterinary Journal**, Vol. 30, n. 3, p. 21-24, 1982.

CREMER, MJ et al. Franciscana strandings on the north coast of Santa Catarina State and insights into birth period. **Biotemas**, v. 26, n. 4, p. 133-139, 2013.

CROXALL, JP; RODWELL, S.; BOYD, IL Entanglement in man - made debris of Antarctic fur seals at Bird Island, South Georgia. **Marine Mammal Science**, Vol. 6, n. 3, p. 221-233, 1990.

DAJOZ, R. **Principles of ecology**. 7. ed. Porto Alegre: Artmed, 2006. 519 p.

DANILEWICZ, D. et al. Southern right whales (*Eubalaena australis*) off Torres, Brazil: group characteristics, movements, and insights into the role of the Brazilian-Uruguayan wintering ground. **Mammalia**, v. 81, n. 3, p. 225-234, 2017.

DESVAUX, JAS **Accidental capture of Toninha, *Pontoporia blainvillei* (Cetacea: Pontoporiidae) and gray dolphin, *Sotalia guianensis* (Cetacea : Delphinidae) in fishing nets in the Cananéia estuarine lagoon complex, south coast of the state of São Paulo** . 2013. Dissertation (Master in Zoology) - Federal University of Paraná, Paraná, 2013.

EMIN-LIMA, R. et al. Note on the group size and behavior of Guyana dolphins (*Sotalia guianensis*) (Cetacea: Delphinidae) in Marapanim Bay, Pará,

Brazil. **Latin American Journal of Aquatic Mammals**, Vol. 8, n. 1-2, p. 167-170, 2010.

FERREIRA, E. C; MUELBERT, MM C; SECCHI, ER Spatio-temporal distribution of accidental catches of porpoises (*Pontoporia blainvillei*) in gillnets and strandings along the south coast of Rio Grande do Sul, FURG, Brazil. **Atlântica** , Rio Grande, vol. 32, n. 2, p. 183-197, 2010.

GERACI, JR; LOUNSBURY, VJ **Marine mammals ashore: a field guide for strandings** . 2. ed. Baltimore: National Aquarium in Baltimore, 2005. 371 p.

GERACI, JR; LOUNSBURY, VJ **Marine mammals ashore: a field guide for strandings** . Galveston, Texas: Texas A&M University, 1993. 305 p.

GREIG, AB et al. Stranding events of southern right whales, *Eubalaena australis*, in southern Brazil. **J. Cetacean Res. Manage.**, England, n. 2, p.157-160, 2001.

GROCH, KR **Population biology and behavioral ecology of the southern right whale, *Eubalaena australis* (Desmoulins, 1822), CETACEA, MYSTICETI, on the southern coast of Brazil** . 2005. 169 f. Thesis (Doctorate in Animal Biology) - Federal University of Rio Grande do Sul, Porto Alegre, 2005.

GROUP OF STUDIES OF AQUATIC MAMMALS FROM RIO GRANDE DO SUL -

GERMARS. **Germars** . No publication date. Available at: < [http://www.gemars.org.br/?Page\\_id=162](http://www.gemars.org.br/?Page_id=162) >. Accessed on: 18 May 2017.

GULLAND, FMD; HALL, AJ **Is marine mammal health deteriorating?**. Trends in the global reporting of marine mammal disease, v. 4, n. 2, p. 135-150, Jun. 2007.

HETZEL, B .; LODI, L. **Whales, porpoises and dolphins: identification guide for Brazil**. Daniela Weil coloring book . Rio de Janeiro: Editora Nova Fronteira, 1993 .

BRAZILIAN INSTITUTE OF THE ENVIRONMENT AND RENEWABLE NATURAL RESOURCES - IBAMA. **Ibama / SC Ordinance No. 54-n** , of June 9, 1999. Brasília, DF: IBAMA, July 9. 1999.

CHICO MENDES INSTITUTE FOR BIODIVERSITY CONSERVATION - ICMBIO. ICMBIO

Ordinance No. 43, of June 29, 2011. Creates, within the scope of the Chico Mendes Institute, the Stranding and Information Network for Aquatic Mammals of Brazil (REMAB). **Official Gazette of the Union**. Brasília, DF, June 30, 2011. Section 1, p. 79. Available

at: [http://www.icmbio.gov.br/cepsul/images/stories/legislacao/Portaria/2011/p\\_icmbio\\_43\\_2011\\_redeencalhe.pdf](http://www.icmbio.gov.br/cepsul/images/stories/legislacao/Portaria/2011/p_icmbio_43_2011_redeencalhe.pdf) . Accessed on : 18 mar. 2017.

INTERNATIONAL UNION FOR CONSERVATION OF NATURE. NATURAL

RESOURCES. SPECIES SURVIVAL COMMISSION. **IUCN red list categories** . IUCN, 2018.

JEFFERSON, TA; WEBBER, MA; PITMAN, RL **Introduction: Marine Mammals of the World**. [ SI ]: Academic Press, 2008.

KARAM and BRITTO, M. de. **Marine mammals, seismic prospecting activity and the use of the marine mammal monitoring system - SIMMAM** . 2009. 118 f. Dissertation (Master in Environmental Science and Technology) - University of Vale do Itajaí, Itajaí, 2009.

KRÜGER, L .; PETRY, MV On the Relation of Antarctic and Subantarctic Seabirds with Abiotic Variables of South and Southeast Brazil . **Oecologia Australis** , v. 15, p. 51-58, 2011.

L I F A , R . P . ; C i s S T h e R , F . B . T h e i m p a r t â n c i a d e c r i a ç ã o D e s r a n d d a n d s a n d n c a l h a n d s m a m t f a n d R a a r e t h e Q u a l i t y w i l l t i c o s n o B r a s i l . I n : B R A Z I L I A N I N S T I T U T E O F T H E E N V I R O N M E N T A N D R E N E W A B L E N A T U R A L R E S O U R C E S - I B A M A . **Conduct protocol for strandings of aquatic mammals: Network of strandings of aquatic mammals in the Northeast**. Recife: IBAMA, 2005, p.11-16.

LOCH, C .; MARMONTEL, M .; SIMÕES-LOPES, PC Conflicts with fisheries and intentional killing of freshwater dolphins (Cetacea: Odontoceti) in the Western Brazilian Amazon. **Biodiversity and Conservation** , v. 18, n. 14, p. 3979-3988, 2009.

MEDEIROS, PI A P. **Strandings of cetaceans from 1984 to 2005 on the coast of Rio Grande do Norte, Brazil**. 2006. 57 f. Dissertation (Master in Aquatic Bioecology ) - Federal University of Rio Grande do Norte, Natal, 2006.

MENEZES, RB **Strandings of cetaceans (order cetacea ), between 1993 and 2004, on the coast of Rio Grande do Sul - RS** . 2005. 59 f. Monograph (Specialization in Oceanology) - Federal University of Rio Grande Foundation, Rio Grande, 2005.

MINISTRY OF THE ENVIRONMENT - MMA. National Center for Research and Conservation of Wild Birds. **National project for monitoring the Magellanic Penguin ( Spheniscus magellanicus )**. Brasilia. ICMBio , 2010. 36 p.

MINISTRY OF THE ENVIRONMENT - MMA. **National List of Species of the Brazilian Fauna Threatened and Extinction** . No Publication Date . [ *online* ] Available

at: [www.mma.gov.br/biodiversidade/especies-ameacadas-de-extincao/fauna-ameacada](http://www.mma.gov.br/biodiversidade/especies-ameacadas-de-extincao/fauna-ameacada) . Accessed on: 17 mar. 2017.

MINISTRY OF THE ENVIRONMENT - MMA. **National Biodiversity Program - PRONABIO**. Brasília: MMA, 1999.

MINISTRY OF THE ENVIRONMENT - MMA. **Executive Summary of the Red Book of Endangered Brazilian Fauna**. Brasília: Ministry of the Environment, 2016. 76 p. Available

at: [http://www.icmbio.gov.br/portal/images/stories/comunicacao/publicacoes/publicacoes-diversas/dcom\\_sumario\\_executivo\\_livro\\_vermelho\\_e\\_d\\_2016.pdf](http://www.icmbio.gov.br/portal/images/stories/comunicacao/publicacoes/publicacoes-diversas/dcom_sumario_executivo_livro_vermelho_e_d_2016.pdf) . Accessed on: 10 jun. 2017.

MOURA, JF et al. Stranding events of Kogia whales along the Brazilian coast. **PloS one** , v. 11, n. 1, p. e0146108, 2016.

MOURA, JF; SICILIANO, S. Straggler subantarctic fur seal (*Arctocephalus tropicalis*) on the coast of Rio de Janeiro State, Brazil. **Latin American Journal of Aquatic Mammals** , Vol. 6, n. 1, p. 103-107, 2007.

MOURÃO, KRM; PINHEIRO, LA; LUCENA, F. Social organization and technical aspects of fishing in the municipality of Vigia-PA . **Bulletin of the hydrobiology laboratory** , v. 20, n. 1, p. 39-52, 2007.

OLIVEIRA, DE et al. Evidence of anthropic interaction by a firearm in a sea lion, *otaria flavescens* ( shaw , 1800) in the southern region of Santa Catarina, Brazil: Case reports. In: NATIONAL MEETING ON CONSERVATION AND RESEARCH OF AQUATIC MAMMALS, 8., 2017, Natal. **Summary ...** Christmas: Encopemaq , 2017, p. 40.

PANGALLO, K. et al. Expanding the range of halogenated 1'-methyl,2'-bipyrroles (MBPs) using GC / ECNI-MS and GC × GC / TOF-MS. **Chemosphere** , n. 71, p. 1557-1565, 2008.

PEMBERTON, D .; BROTHERS, NP; KIRKWOOD, R. Entanglement of Australian fur seals in man-made debris in Tasmanian waters. **Wildlife Research** , Vol. 19, n. 2, p. 151-159, 1992.

PETRY, MV et al. Survey and diet of *Macronectes giganteus* along the coast of Rio Grande do Sul, Brazil. **Rev. Bras. Ornith** , v. 18, n. 3, p. 237-239, 2010.

PINEDO, MC Impact of incidental fishery mortality on the age structure of *Pontoporia blainvillei* in southern Brazil and Uruguay. **Reports of the International Whaling Commission** , v. 15, p. 261-264, 1994.

PINEDO, MC Mortality

of *Pontoporia blainvillei*, *Tursiops gephyreus*, *Otaria flavescens* and *Arctocephalus australis* on the coast of Rio Grande do Sul, Brazil, 1976-1983. **Proceedings of the 1st Meeting of Experts' Work on Aquatic Mammals of América del Sud**, v. 25, p. 187-199, 1986.

PINEDO, MC; ROSAS, FCW; MARMONTEL, M. **Cetaceans and pinnipeds from Brazil: a review of the records and a guide for species identification**. Manaus: UNEP, 1992.

PONT, AC et al. The human dimension of the conflict between fishermen and South American sea lions in southern Brazil. **Hydrobiology**, v. 770, n. 1, p. 89-104, 2016.

POUGH, FH; JANIS, CM; HEISER, JB **The life of vertebrates**. 3. ed. Coord. Editorial Ana Maria de Souza. São Paulo: Atheneu Editora, 2003.

PRADERI, R.; PINEDO, MC; CRESPO, EA Conservation and management of *Pontoporia blainvillei* in Uruguay, Brazil and Argentina. Biology and conservation of the river dolphins. **Occas. pap. IUCN SSC**, v. 3, p. 52-56, 1989.

PYLE, P. Biological and Ecological Niches of the Gulf of the Farallones : Seabirds. In: HERMAN, KA et al. (Eds.). **Beyond the Golden Gate: oceanography, geology, biology and environmental issues in the Gulf of the Farallones**. USGS Circular 1198. [SI: sn.], 2001, p. 44-48.

READ, AJ; MURRAY, K. **Gross evidence of human-induced mortality in small cetaceans**. US Dep. Commer., NOAA Tech. Memo. NMFS-OPR-15. 2000. 21 p.

REEVES, RR; MCCLELLAN, K; WERNER, TB Marine mammal bycatch in gillnet and other entangling net fisheries, 1990 to 2011. **Endangered Species Research**, v. 20, n. 1, p. 71-97, 2013.

ROSAS, FCW et al. Natural history of dolphins of the genus *Sotalia*. **Latin American Journal of Aquatic Mammals**, Vol. 8, n. 1-2, p. 57-68, 2010.

SANTA CATARINA. Government of the State of Santa Catarina. **Base Map**. Edition: Gráfica Diones Delfino, 2017.

SCHIAVON, DD **The porpoise, *Pontoporia blainvillei* (Mammalia : Cetacea), on the north coast of Rio Grande do Sul: accidental mortality in fishing nets, population abundance and perspectives for the conservation of the species**. 2007. 98 f. Thesis (PhD in Bioscience - Zoology) - Pontifical Catholic University of Rio Grande do Sul, Porto Alegre, 2007.

SICILIANO, S. et al. **Whales, porpoises and dolphins in the Campos Basin**. Rio de Janeiro: ENSP / FIOCRUZ, 2006.

SICILIANO, S.; ALVES, VC; HACON, S. Birds and marine mammals as ecological sentinels for environmental health: a review of Brazilian knowledge. **Collective health notebooks**, vol. 13, n. 4, p. 927-946, 2005.

SIMÕES-LOPES, PC Interaction of coastal populations of *Tursiops truncatus* (Cetacea, Delphinidae) with the mullet artisanal fisheries in Southern Brazil. **Biotemas**, v. 4, n. 2, p. 83-94, 1991.

SIMÕES-LOPES, PC; XIMENEZ, A. Annotated list of the cetaceans of Santa Catarina coastal waters, southern Brazil. **Biotemas**, v. 6, n. 1, p. 67-92, 1993.

SWINGLE, WM et al. Marine Mammal and Sea Turtle Stranding Response 2012 Grant Report. Final Report to the Virginia Coastal Zone Management Program, NOAA CZM Grant # NA11NOS4190122, Task 49. **VAQF Scientific Report 2013-01**. Virginia Beach, VA, 2013. 35 p.

TARPLEY, RJ; MARWITZ, S. Plastic debris ingestion by cetaceans along the Texas coast: two case reports. **Aquatic Mammals** , v. 19, n. 2, p. 93-98, 1993.

UNITED NATION ENVIRONMENTAL PROGRAM - UNEP. **UN Declares War on Ocean**

**Plastic**. [ Sl .]: Press Release, 2008. Available at: < <http://web.unep.org/newscentre/un-declares-war-oceanplastic> >. Accessed on : 05 mar. 2018.

VIANNA, T. dos S. et al. Review of thirty-two years of toothed whale strandings in Santa Catarina, southern Brazil (Cetacea: Odontoceti). **Zoology**, vol. 33, n. 5, p. 1-11, Oct. 2016. DOI: 10.1590 / S1984-4689zool-20160089.

VIVO, M. de et al. Checklist of mammals from São Paulo State, Brazil. **Biota Neotropica** , v. 11, p. 111-131, 2011.

WIBOWO, F .; DHARMADI, K. **Beach of Marine Megafauna in Marine Debris** . [ Sl ]: Springer New York, 2014, p. 99-139.

XIMENEZ, A .; SIMÕES-LOPES, PC; PRADERI, R. Notes on marine mammals from Santa Catarina and Rio Grande do Sul (PINNIPEDIA-CETACEA). In: WORKING MEETING OF SPECIALISTS IN AQUATIC MAMMALS IN SOUTH AMERICA, 2., 1987. **Anais ...** Rio de Janeiro: **FBCN**, 1987 , p. 4-8 . \_

ZERBINI, AN et al. The dwarf form of the minke whale, *Balaenoptera acutorostrata* Lacépède , 1804, in Brazil. **Report-International Whaling Commission** , v. 46, p. 333-340, 1996.