Chapter 14
Marine Mammals: Is the Bahía Blanca Estuary and Its Area of Influence Important for Their Conservation?

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14.1 Role of Marine Mammals in Marine Ecosystems

Marine mammals include around 134 extant species that are primarily dwelling or dependent on the ocean for food. This group comprises three mammalian orders: Sirenia, 4 species (manatees and dugongs); Carnivora, 41 species (polar bears, sea otters, and pinnipeds: sea lions and fur seals, true seals, and walruses); and Cetacea, 89 species (baleen whales and toothed whales such as dolphins) (Berta et al. 2015). Marine mammals are not uniformly distributed among the oceanographic areas. Some of them inhabit deep water, marine shelf areas, and areas of open ocean, and few species live in freshwater. They live in several habitats and ecosystems from the Arctic to the Antarctic. Only in the Argentine Sea, 50 species of marine mammals have been cited so far, some of them are very frequent and well known, while others are little known and of circumstantial presence (Bastida and Rodríguez 2009).

Marine mammals are considered as top or apex predators whose food habits are in many cases specialized, feeding on krill, fish, or even birds and mammals.

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They are foremost consumers at most trophic levels, from primary producers to predatory fish and even to other marine mammals. Because of their large body size and abundance, they are thought to have a great influence on the structure and function of some marine communities. In addition, as top predators, they can serve as key indicator species of marine ecosystem dynamics through changes in their abundance, behavior, and health. Consequently, marine mammals could have five main functions: as consumers, as preys, as vectors of nutrient and material flux, as a particular and new "habitat," and as environmental sentinels (Roman et al. 2014).

14.1.1 Marine Mammals as Consumers

Mammals may function as keystone species in some marine communities. As a result, a serious depletion in their numbers can cause major changes in species status, starting a chain of extinctions through the food web. Croll et al. (2006) estimated that 65% (range 53–86%) of the North Pacific Ocean's primary production was required to sustain the large whale populations prior to commercial whaling. The total metabolic rate of a whale is high, as an endotherm, but because of its immense size, it has a low mass-specific metabolic rate, relative to smaller animals. The amount of food required to sustain 1 blue whale (*Balaenoptera musculus*) could support 7 smaller minke whales (*Balaenoptera acutorostrata*) or 1500 penguins, but their collective biomass reach just 50% or 8% of the biomass of a blue whale, respectively, because of the relatively higher metabolic rates of these smaller animals (Roman et al. 2014).

If primary production is held constant, reducing whale populations lowers the potential for marine ecosystems to retain carbon, both in living biomass and in carcasses that sink to the ocean floor (Pershing et al. 2010). After whale biomass was removed from the Antarctic system (approximately 84%), it is estimated that 150 million tons of krill go uneaten each year. Crabeater seals (*Lobodon carcinophaga*), Antarctic fur seals (*Arctocephalus gazella*), leopard seals (*Hydrurga leptonyx*), and penguins, all krill-eating predators, began to increase, thus moving the Antarctic marine ecosystem to new equilibrium levels. These species directly benefited from the removal of whales and may now be hindering the recovery of whale stocks (Trites et al. 1997).

In addition, pinnipeds can affect their ecosystem, influencing the benthic fauna and community structure. Estes et al. (1998) explain the effect of the abundance of sea otters (*Enhydra lutris*) on the structure of kelp communities, and Anderson (1995) suggested that the overhunting of local sea otter populations could have led to the extinction of Steller's sea cows (*Hydrodamalis gigas*). How are related sea otters and Steller's sea cows? Sea otters feed on sea urchins, keeping their number low, which is essential for the maintenance of the dense kelp beds that, in turn, are the main food source for sea cows.

In British Columbia the annual diet of harbor seals (*Phoca vitulina*) contains about 4% of salmon and 43% of hake. Contrary to expectations, the harbor seals may be benefiting salmon because they affect the abundance of hake, which is one of the largest predators of young salmons (Trites 1997).

14.1.2 Marine Mammals as Prey

Cetaceans and pinnipeds are also eaten by several species. White sharks (*Carcharodon carcharias*) have been observed killing and feeding on small odontocetes and scavenging on carcasses of large cetaceans (Cockcroft et al. 1989). Shark predation attempts on large marine animals are rare, but recent studies suggest that they may occur more often than previously thought (Bornatowski et al. 2012). There are several reports of killer whales (*Orcinus orca*) attacking greater whales. In Península Valdés (Patagonia), the stranding behavior of orcas to capture both, sea lions (*Otaria flavescens*) and elephant seals (*Mirounga leonina*), is known worldwide. Also in Patagonia, killer whales were observed feeding on dusky dolphins (*Lagenorhynchus obscurus*) and chasing common dolphins (*Delphinus delphis*) (Coscarella et al. 2015), while in Brazil and in Península Valdés, they were observed attacking Southern right whale (*Eubalaena australis*) calves (Bastida and Rodríguez 2009; Ott et al. 2017).

In Antarctica, groups of killer whales cause a wave to make the seal pups fall from the floating ice and thus feed on them. In the Buenos Aires Province, killer whales have been observed attacking franciscanas (*Pontoporia blainvillei*), bottlenose dolphins (*Tursiops truncatus*), and fur seals (*Arctocephalus australis*) (Bastida and Rodríguez 2009). Other indirect evidence that whales are victims of predation are the high frequency of rake mark scars found on their flukes (Reeves et al. 2006).

Opportunistic terrestrial predators of pinnipeds (especially pups) include wolves, dogs, foxes, jackals, hyenas, and pumas, in addition to some birds that feed on pinniped pups (Weller 2018). At least five species of pinnipeds have been documented to feed on other pinniped species (Harcourt 1993). The strong tendency of pinnipeds to haul out on ice or islands limits the impact of terrestrial predators on these populations. The main prey of polar bears (*Ursus maritimus*) throughout their range is the ringed seal (*Pusa hispida*). Polar bears hunt ringed seals on both fjord and open sea ice. Other marine predators that can have serious effects on some pinniped populations include adult male sea lions and leopard seals, killer whales, and several species of large sharks. Stomach content analyses indicate that white sharks prefer pinnipeds or whales to other prey such as birds or sea otters. This selective preference for marine mammals with extensive lipid stores may be necessary to meet their elevated muscle temperatures and high growth rates in the cold waters where their attacks on pinnipeds are concentrated (Ainley et al. 1985).

14.1.3 Marine Mammals as Vectors of Nutrient and Material Flux

Whales facilitate nutrient transfer by releasing fecal plumes near the surface after feeding at depth, so nutrients are moved from highly productive to less productive areas. During urine and fecal plume production, nitrogen and iron is released, indirectly increasing prey productivity and abundance. These plumes enhance phytoplankton blooms and carbon sequestration (Lavery et al. 2010). Furthermore, during whale migration nutrients transfer through urea and placentas from areas of high to low productivity. Whale carcasses sequester carbon to the deep sea, where they provide a massive pulse of organic enrichment as well as habitat and food for many endemic species, including chemosynthetic bacteria and invertebrate hosts (Roman et al. 2014). Similarly, the excrement of pinnipeds contributes to the turnover and recycle nutrients, mainly in large colonies (Trites 1997). When foraging, whales and pinnipeds can locally influence the ocean physical environment. Through diving and surfacing, whales can enhance the upward transport of nutrient-rich deep waters, as they pass through density gradients during feeding sessions (Dewar et al. 2006). Humpback whales (*Megaptera novaeangliae*) intentionally disturb sandy bottoms and shell-hash beds (a mix of mud, sand, and broken shells) to flush sand lance, a prey, from their burrows (Hain et al. 1995), contributing mechanical energy to the ocean. In addition, under certain conditions, the bubble nets that humpback whales make to catch schools of small fish, along with bottom disturbance, play an important role in the flux of materials, since these activities also can break the thermocline, facilitating the transport of nutrients from colder to warmer layers in the ocean. Stranded whales can subsidize terrestrial food webs (Chap. 15 in this book).

14.1.4 Marine Mammals as a Particular and New "Habitat"

The ocean floor is rich on detritus due to the contribution made by the carcasses of the great whales that fall from the surface. Dead whales contribute with proteins and lipids, yielding massive pulses of organic enrichment to a realm that is often nutrient and energy impoverished. Only one gray whale (*Eschrichtius robustus*) of 40 tons, provides nearly 2 million g carbon, equivalent to more than 2000 years of the background carbon flux for an area equivalent to the carcass surface (Smith 2006). Whale falls influence deep-sea environments, by altering local food availability, providing habitat structure, and supporting diverse biotic assemblages (Lundsten et al. 2010). Dead bodies of marine mammals undergo ecological succession from a stage dominated by mobile scavengers that actively consume the soft tissues, passing through the enrichment-opportunist stage and getting to a sulphophilic stage where chemosynthetic bacteria dominate (Smith 2006; Lundsten et al. 2010; Amon et al. 2013). The persistent food-rich conditions and widespread occurrence of whale carcasses has led to ecological and evolutionary opportunities on the deep-sea floor, in a manner similar to that of hydrothermal vents and cold seeps (Smith 2006). In the North Pacific, more than 60 macrofaunal species have been associated with one single whale fall. Regarding whale carcasses stranded on coastlines, after death, it is a mechanism for transporting marine biomass to the sea–land interface. Although the number of stranded whales is small as compared with those that sink (Smith 2006), carcasses can attract and nourish many terrestrial consumers.

14.1.5 Marine Mammals as Sentinels

As marine mammals have long lives and move over great distances, they can register ecological variation across large spatial and long temporal scales. Thus, they can be considered sentinels of marine ecosystem change. Selecting the appropriate marine mammal species to use as sentinel of change depends on the ecological alteration of concern (Moore 2008, 2018). Apex predators as whales, seals, and sea lions can indicate environmental changes and degradation. For example, if we want to know broad scale shifts in ecosystems, migratory mysticete whales may be investigated, whereas polar cetaceans are more useful for assessing the effects of rapid changes in sea ice conditions and its impacts on food webs in these strongly seasonal ecosystems. On the other hand, coastal dolphins are good indicators of pollutant or disease vectors in nearshore habitat (Moore 2008).

Harwood (2001) says that critical habitat for marine mammals can be defined in terms of the ecological units that provide safe areas to breed and forage. The layer of blubber for insulation that marine mammals have is suitable for the accumulation of lipophilic pollutants. The information obtained from this layer is useful for indicating the prevalence and persistence of pollutants in marine ecosystems (Gil et al. 2006; Panebianco et al. 2012; Perez-Venegas et al. 2018; Muñoz-Arnanz et al. 2019). In addition, profiles of stable carbon isotopes and fatty acids in blubber can be used to infer the diet of marine mammals, thereby providing evidence of changes in food webs within marine ecosystem (Budge et al. 2008; de Castro et al. 2016).

Changes in individual body condition can demonstrate shifts in the prey base and food web structure as well as alterations in pathogen transmission. Indeed, to explore variability of ecosystem productivity and health, it seems essential to incorporate the biology and ecology of marine mammals and other apex predators in multidiscipline programs of research (Moore 2008). An understanding of the role of marine mammals in marine ecosystems is important because it provides a context within which to evaluate the potential impact of their predation on prey populations and community structure, and the impact of variation in prey populations, due to harvesting by humans, and environmental change on the dynamics of marine mammals. Mammals may function as keystone species in some marine communities such as in the famous example about the effect of the abundance of sea otters (*Enhydra lutris*) on the structure of kelp communities (Estes et al. 1998).

Indeed, marine mammals can guide human stewardship activities, reflect the ocean's role in climate interactions across regions, demonstrate ecosystem vulnerabilities and health, and thereby lead to ways to enhance human health (Moore 2008). Moreover, as charismatic megafauna, marine mammals capture the attention and concern of the public. This capability provides clear opportunities for education and outreach on oceanic and environmental themes.

14.2 Marine Mammal in the Bahía Blanca Estuary

Stranded marine mammals allow researchers to gather valuable information about many elusive species. They offer a unique opportunity to learn about a species' life history, population structure, occurrence, disease prevalence, and anthropogenic causes of mortality and to understand fossil assemblages. It is important to consider that stranded animals are not a random sample of the free-living population as most of them are unhealthy specimens. On the other hand, the stranding range detection is a dependent variable of the human effort and the possibilities of access to coastal sites. Beyond the health status of animals, stranding episodes may also reflect changes in environmental conditions and diverse human activities, shipping traffic collisions, oil exploration, etc. (Leeney et al. 2008). Cetaceans may strand alive for different reasons including behavioral tendencies of particular species to follow a leader, disorientation caused by geographical anomalies in the earth's magnetic field and acoustical "dead zones," coastal areas where echolocation signals are distorted, anthropogenic factors such as bycatch in fisheries or contaminants, and infectious diseases (Peltier et al. 2013). Pinnipeds seem to be particularly susceptible to entanglement in marine debris, perhaps because of their exploratory nature. Entanglement lesions could develop into infected chronic wounds and the entangled pinnipeds may live for months or years with a plastic line, or net, cutting into their skin and muscle tissues (Butterworth 2016). Interaction with fisheries is another source of animal death or injury. Impacts may be direct consequence of bycatch or shooting by fishermen, as well as indirect competition for fish resources and fisheries-induced changes to ecosystems that cause nutritional stress among pinnipeds (Kovacs et al. 2012).

The increase of global concern regarding the status of marine mammals promoted government programs for facilitating the public record of stranding episodes and fostered investigations into the causes of mortality. In some places, there is a long history of systematic records, for example, in the UK after the ASCOBANS (Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas) signature in 1993, a stranding reporting scheme was established along with a research program to investigate death causes. One of the longest-term stranding projects is the one carried out by Leeney et al. (2008) that covers a record period of 96 years on the Cornwall coast (UK) and islands of Sicily (Italy). In Argentina there are some initiatives like Museo Acatushún in Tierra del Fuego, LAMAMA Lab in Puerto Madryn, Marine Mammal Lab at Mar del Plata University, Fundación Mundo Marino in San Clemente del Tuyú, Fundación Aquamarina in Pinamar and FRAAM (Marine Animal Rescue and Assistance Foundation) in Bahía Blanca

Estuary. All these research groups record systematic data on stranding marine mammals.

We made a list of marine mammals that could potentially be present in Bahía Blanca Estuary and surroundings, following Bastida and Rodríguez (2009) and the recently submitted Red List of Threatened Species for Argentina (SADSN-SAREM 2019). The information about some marine mammals is scarce and incomplete, but approximately 37 species have their distribution range within the area, 29 cetaceans and 8 pinnipeds (Table 14.1). According to the IUCN Red List of Threatened Species (IUCN, International Union for the Conservation of Nature) and Red List of Threatened Species for Argentina (SADSN-SAREM 2019), almost 39% of the species are "Data Deficient." Some Data Deficient species may be well studied and its biology be well known, but still lack appropriate data on its abundance and/or distribution. All the pinnipeds in the area are considered Least Concern. Among the cetaceans of possible occurrence in Bahía Blanca Estuary, 17% of the species belong to the threatened categories ("Endangered" or "Vulnerable"); any taxon in those categories faces a high or very high risk of extinction in the wild. Finally, the remaining marine mammal species belong to the "Data Deficient" (38%) or "Least Concern" categories (22%). This last category is implying that the population exist or spreads through its entire range. We also analyzed local information from two sources Fidalgo (2004) and FRAAM marine mammal database. Fidalgo (2004) reported 10 different marine mammal species from sightings, entanglements or stranding episodes, and other 6 species from records than needed confirmation (Table 14.1).

FRAAM marine mammals' database has records that come mostly from stranded animals both alive and dead, or that arrived to the coast in poor health conditions. These records span from 2004 to 2019 in the geographical area from Balneario Marisol to Bahía San Blas. FRAAM recorded 71 marine mammals, most of them pinnipeds (79%), particularly belonging to the Otariidae family (sea lions and fur seals) (75%) (Fig. 14.1). Four species of pinnipeds were registered in the area, but the South American sea lion (*Otaria flavescens*, see species data sheet a) and the South American fur seal (*Arctocephalus australis*, see species data sheet b) were the most frequent (Fig. 14.1). In addition, *O. flavescens* has an historic assessment in the area near Punta Lobos, on the Trinidad Island, in the Bahía Blanca Estuary (see box text in this chapter). Currently the colony is still active, although no studies have been reported recently. The presence of *A. australis* is expected due to the current population growth (Crespo et al. 2015; Mandiola 2015). SADSN-SAREM (2019) has listed both species as "Least Concern" and their main conservation problem is their interaction with anthropic activities (Romero et al. 2011; Mandiola et al. 2017). Most individuals were juvenile and subadult animals in good health condition, that leave the water to rest or because they were molting. Another pinniped recorded in Bahía Blanca Estuary was the Southern elephant seal (*Mirounga leonina*), which was registered three times, always as solitary subadult specimens. The presence of this species has also been increasing in other coastal areas of the Buenos Aires Province and in the harbor colonies of Mar del Plata and Necochea (Bastida and Rodríguez 2009; Group of Biology, Ecology and Conservation of Marine

Table 14.1 List of potential species of marine mammals surrounding the Bahía Blanca Estuary based on the information of Bastida and Rodríguez (2009) and SADSN-SAREM (2019), national conservation status and Fidalgo (2004)

Order	Group	Family	Common Name	Scientific Name	Cat. SAREM	FRAAM data	Fidalgo (2004)
Carnivora	Pinnipeds	Otariidae (sea lions and fur seals)	South American sea lion	*Otaria flavescens*	LC	P	P
			South American fur seal	*Arctocephalus australis*	LC	P	P
			Antarctic fur seal	*Arctocephalus gazella*	LC	P	
			Subantarctic fur seal	*Arctocephalus tropicalis*	LC		
		Phocidae (true seals)	Southern elephant seal	*Mirounga leonina*	LC	P	
			Weddell seal	*Leptonychotes weddellii*	LC		
			Crabeater seal	*Lobodon carcinophaga*	LC		
			Leopard seal	*Hydrurga leptonyx*	LC		
Cetacea	Mysticeti (baleen whales)	Balaenidae	Southern right whale	*Eubalaena australis*	LC	P	P
		Neobalaenidae	Pygmy right whale	*Caperea marginata*	DD		
		Balaenopteridae	Blue whale	*Balaenoptera musculus*	EN		
			Fin whale	*Balaenoptera physalus*	EN		
			Sei whale	*Balaenoptera borealis*	EN	P	
			Bryde's whale	*Balaenoptera edeni*	DD		
			Antarctic minke whale	*Balaenoptera bonaerensis*	DD		P
			Dwarf minke whale	*Balaenoptera acutorostrata*	DD		
			Humpback whale	*Megaptera novaeangliae*	LC	P	
	Odontoceti (toothed whales)	Physeteridae	Sperm whale	*Physeter macrocephalus*	VU		NC
		Kogiidae	Pygmy sperm whale	*Kogia breviceps*	DD		

Order	Group	Family	Common Name	Scientific Name	Cat. SAREM	FRAAM data	Fidalgo (2004)
			Dwarf sperm whale	*Kogia sima*	NA	P	
		Pontoporiidae	La Plata river dolphin	*Pontoporia blainvillei*	VU	P	P
		Delphinidae	Common dolphin	*Delphinus delphis*	LC		P
			Lahille's bottlenose dolphin	*Tursiops truncatus gephyreus*	VU	P	P
			Southern right whale dolphin	*Lissodelphis peronii*	DD		
			Dusky dolphin	*Lagenorhynchus obscurus*	LC		NC
			Risso's dolphin	*Grampus griseus*	LC		
			Killer whale	*Orcinus orca*	LC		P
			False killer whale	*Pseudorca crassidens*	DD		P
			Long-finned pilot whale	*Globicephala melas*	LC		P
		Phocoenidae	Burmeister's porpoise	*Phocoena spinipinnis*	DD		P
			Spectacled porpoise	*Phocoena dioptrica*	LC		NC
		Ziphiidae	Cuvier's beaked whale	*Ziphius cavirostris*	DD		P
			Southern bottlenose whale	*Hyperoodon planifrons*	DD		
			Arnoux's beaked whale	*Berardius arnuxii*	DD		
			Gray's beaked whale	*Mesoplodon grayi*	DD	P	NC
			Héctor's beaked whale	*Mesoplodon hectori*	DD		
			Strap-toothed whale	*Mesoplodon layardii*	DD		P

Ref:* discrepancies between Bastida and Rodríguez (2009) and SADSN-SAREM (2019). Categories of conservations status *DD* data deficient, *LC* Least Concern, *VU* vulnerable, *NA* without application, *P* presence, *NC* need confirmation

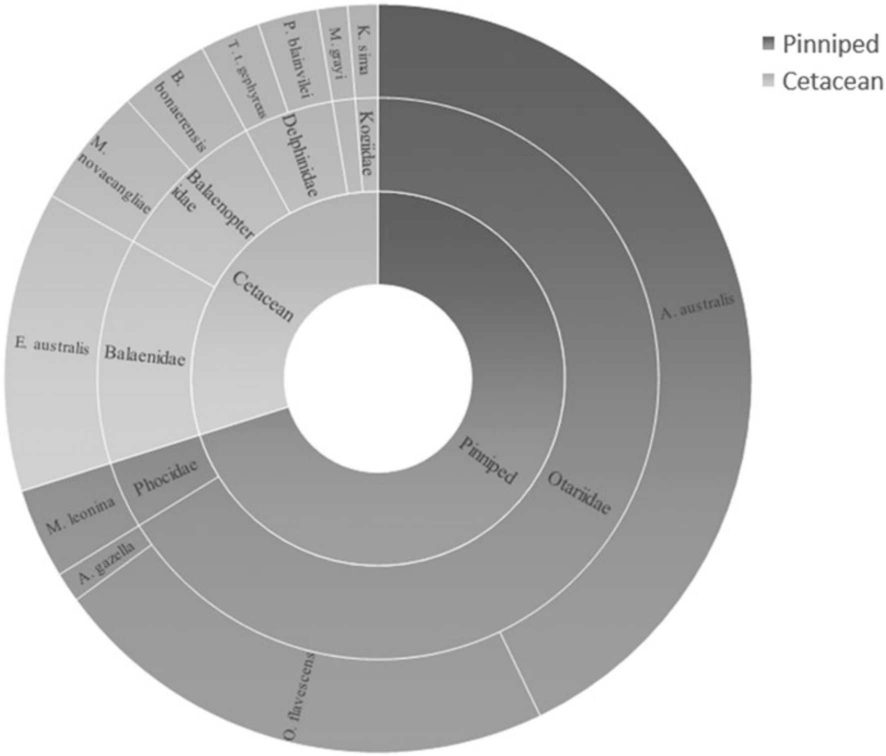

Fig. 14.1 Marine mammals recorded in Bahía Blanca Estuary and surrounding areas by the environmental non-governmental organization Marine Animals Assistance and Rescue Foundation (FRAAM)

Mammals, UNMdP, unpublished data). One young Antarctic fur seal (*Arctocephalus gazella*) has also been recorded as a wandering species with occasional records in Argentine coasts.

The cause of stranding was determined based on a combination of results from clinical examinations or gross necropsy. Animals, that were sick or injured and possibly admitted for rehabilitation, were provided supportive treatment and released afterwards if their condition improved (see Sect. 4 in this chapter). Dead individuals represented 27% of all pinnipeds, and from those alive, 66% were released after a short period of rehabilitation. Similar number of cases was registered in each year, decreasing slightly in autumn.

One of the toothed whales (Odontoceti) more frequently recorded was the small dolphin *Pontoporia blainvillei*, (see species data sheet c) mostly adult and subadult females, followed by males and less frequently newborns. Most of them were found with skin injuries related to entanglement. In the last 10 years, the information on the biology and ecology of this dolphin in Argentina has increased exponentially;

however, updated information about main population parameters, such as mortality, abundance, and population trends, is missing for a more accurate assessment (Denuncio et al. 2019). The annual incidental mortality of this species in Argentina reaches levels between 3.5% and 5.6%, far exceeding the 2% suggested as maximum sustainable level by the International Whaling Commission (Crespo et al. 2010). Nowadays this dolphin is considered as Vulnerable according to the last Red List of Threatened Species for Argentina (Denuncio et al. 2019).

Lahille's bottlenose dolphins (*Tursiops truncatus gephyreus*, see species data sheet d), is another frequent Odontoceti species registered by fishermen or people that use the estuary in a recreational way, but individuals do not show a stranding occurrence higher than other cetaceans. According to the last categorization, *T. t. gephyreus* is considered an endangered species (EN) (Vermeulen et al. 2019). Bottlenose dolphins coming from San Antonio Bay, Río Negro, are genetically isolated from those in Uruguay and southern Brazil and were identified as an evolutionarily significant unit within the Southwestern Atlantic (Fruet et al. 2014). Information on bottlenose dolphins in the country is dispersed in time and space (Vermeulen et al. 2018), but the Argentine population of bottlenose dolphins may have decreased at an estimated rate of 20% in two generations, and there may be less than 250 dolphins alive (Vermeulen et al. 2019).

In addition, killer whales (*Orcinus orca*) are frequently seen alive in the area, mainly during the southern summer. Other toothed whales occasionally found stranded and dead in the Bahía Blanca Estuary belong to the Ziphiidae and Kogiidae families, both of them of pelagic habits.

Baleen whales (Mysticeti) have been also recorded in the area. The first humpback whale (*Megaptera novaeangliae*) was recorded in 2011 (Angeletti et al. 2014), followed by two whales in 2018 and one in 2019. Humpback whales move annually from their main breeding grounds in Abrolhos (Brazil) to their temperate and polar summer feeding areas (Jefferson et al. 2015; Andriolo et al. 2010). Thus, Buenos Aires Province is in the middle of their journey. Estimations performed in the Abrolhos archipelago showed that population densities of humpback whales were increasing at a rate of approximately 7.4% per year and whales were re-occupying old distribution areas (Zerbini et al. 2004; Andriolo et al. 2010). Another baleen whale very common in the area is the Southern right whale (*Eubalaena australis*) observed from April to October. Their records in Buenos Aires Province have increased gradually since 1970 (Mandiola et al. 2020).

The Bahía Blanca Estuary is located between two main reproductive areas (Península Valdés Argentina and Santa Catarina-Brazil) of the Southern right whale, so this site, like the entire Buenos Aires coast, is considered as transit area. Whales recorded in autumn and winter season could be individuals travelling from their southern feeding areas to the breeding areas of southern Brazil (Mandiola et al. 2020). Nevertheless, recent satellite-tracking studies from Golfo San Matías and Península Valdés show variable individual movement patterns. Most tracked whales made coastal and offshore migrations to feeding grounds after the breeding season with no clear displacement pattern (Zerbini et al. 2016, 2018).

Most of the right whale records in the Bahía Blanca Estuary correspond to live whales' sightings. Only one Southern right whale was recorded stranded in the area with clear scars of vessel collision.

Antarctic minke whales (*Balaenoptera bonaerensis*) were also recorded three times; the first specimen was a calf which died after a short time, another was found alive and released (in 2006), and the last one in 2007 was found dead ashore.

Table 14.1 and Fig. 14.1 summarize all marine mammals recorded in the area. Considering the previous information, basic information about the four species most likely to be observed in Bahía Blanca Estuary is presented:

- South American sea lion – *Otaria flavescens* (Shaw, 1800)
- South American fur seal – *Arctocephalus australis* (Zimmerman, 1783)
- La Plata River dolphin – *Pontoporia blainvillei* (Gervais and d' Orbigny, 1844)
- Lahille's bottlenose dolphin – *Tursiops truncatus gephyreus* (Montagu, 1821)

14.2.1 South American Sea Lion **Otaria flavescens** *(Shaw, 1800)*

Common name: Lobo marino de un pelo Sudamericano, León marino (Spanish), South American sea lion (English)

14.2.1.1 Description

Medium to large size, adult males between 2.1–2.8 m in length and weight around 300–350 kg (Fig. 14.2); females between 1.5–2 m and 170 kg (Bastida and Rodríguez 2009). It is clearly different from other sea lions because adult males have an aspect more similar to a lion, and because it is the largest Otariidae species in the region. They exhibit strong sexual dimorphism, adult males have their neck and chest region covered with longer, thicker, coarser guard hairs, which can give the impression of a mane. Females lack mane, and their body is more stylized. The color is highly variable, ranging from reddish brown lighter to yellowish tones, especially in females (Bastida and Rodríguez 2009). At birth, pups weigh 10–15 kg and are 75–85 cm long. Pups are born black above and paler below. They undergo their first molt 1–2 months after birth, becoming dark brown. The pelage has a single hair layer (Jefferson et al. 2015). The ears are small, and their canine teeth are very large and strong.

Fig. 14.2 South American sea lion, *Otaria flavescens*, male assessment in Trinidad Island (Bahía Blanca Estuary). (Photo by Gisela Giardino)

14.2.1.2 Distribution and Habitat

The South American sea lion is the most abundant marine mammal occurring along the southern part of South America and it is distributed along the Atlantic and Pacific coast of South American. On the northern coast of Argentina, there are only four haulouts (about 2500 individuals) formed only by males, while the Patagonian region has both reproductive and non-reproductive colonies (about 120,700 individuals). An additional 7500 animals are found in the Malvinas-Falkland Islands (Dans et al. 2012). Although *Otaria flavescens* is considered as not migratory species and it remains somewhat concentrated on the coastal zone all around the year, males are able to travel hundreds of kilometers for breed (Giardino et al. 2016). Some sea lions habit of coming up the rivers, as in the case of Rio Negro basins (Bastida and Rodríguez 2009).

The coastal islands of Uruguay historically represented a major portion of its population in the Atlantic Ocean, but this site has shown a decline of about 2% per year during the last few decades, with actual numbers of about 10,000 animals (Páez 1996; Ponce de León 2000). South American sea lion haulout areas include sandy beaches, flat surfaced slab of rocks, flat bases of cliff, and places with big boulders (Vaz Ferreira 1981). Some individuals used to rest inside harbors, like in Rio Grande do Sul (Brazil) (Rosas et al. 1994; Pavanato et al. 2013), in Mar del Plata, and Puerto Quequén harbors in the northern coast of Argentina (Buenos Aires Province). Sea lions that settled in port areas may lead to negative human interaction if there are no policies of management (Giardino 2014).

14.2.1.3 Behavior

Terrestrial walking is performed by using all four flippers, while swimming is fundamentally powered by the forelimbs. Their breeding colonies are occupied from middle of December by small number of adult males that take positions and delimit territories through vocalizing, posturing, and fighting, prior to the arrival of females several days later. The Southern sea lion is a highly polygynous species. Only one dominant male can hold 4–10 adult females (harem) although some solitary couples are found disperse (Campagna 1985; Campagna and Le Boeuf 1988). Once the breeding season ends, sea lions change their distribution into haulouts of different age composition, location, and stability throughout the rest of the year (Lewis and Ximenez 1983). Mother–pup pairs maintain their social bonds ashore until weaning in late austral spring and remain close to the natal area (Grandi et al. 2008), whereas males do not provide parental care, have prolonged sexual maturation, and young males are excluded from breeding opportunities; therefore they tend to disperse farther away from the breeding grounds. Male sea lions from Buenos Aires Province travel to Patagonia and Uruguay during the austral summer in order to mate (Giardino et al. 2016) contributing to around 18% of the gene stock of this species in the breeding area (Giardino et al. 2017). At sea, South American sea lions frequently raft alone or in small to large groups. They have been also reported in association with feeding cetaceans and seabirds. On the Atlantic coast, most lactating females have been described as benthic divers and forage in shallow water within the continental shelf (Campagna et al. 2001; Rodríguez et al. 2013). As generalist feeders, South American sea lions take a wide variety of prey that varies by location. Their diet includes many species of benthic and pelagic fishes and invertebrates, some of them of commercial value (Koen Alonso et al. 2000; Bustos et al. 2012). Several authors recommended avoiding the physical contact with this species, as they are, like other wild animals, possible disease vectors (Bernardelli et al. 1996; Beron Vera et al. 2004; Kiers et al. 2008; Bastida et al. 2011; Arbiza et al. 2012; Bos et al. 2014; Timi et al. 2014; Dans et al. 2017).

14.2.1.4 Threats and Conservation Status

South American sea lion numbers are increasing in Argentina, and in Buenos Aires Province, the population grew in recent years (Giardino et al. 2017). The interaction with different anthropic activities is the main conservation problem such as competition with artisanal and industrial fisheries (Romero et al. 2011; Mandiola et al. 2017). Moreover, they interact negatively with aquaculture in open sea, due to the entanglement, use of space, chemical and acoustic contamination, industrial waste, and vessel traffic (Romero et al. 2019).

The Red List IUCN and SADSN-SAREM categorization of *Otaria flavescens* is Least Concern (Cardenas-Alayza et al. 2016; Romero et al. 2019).

14.2.2 South American Fur Seal **Arctocephalus australis** *(Zimmerman, 1783)*

Common name: Lobo marino de dos pelos Sudamericano, lobo fino austral (Spanish), South American fur seal (English)

14.2.2.1 Description

Medium size fur seal; male lengths between 1.80 and 2 m. and weight between 150 and 200 kg.; females between 1.20 and 1.40 m and weight between 50 and 60 kg. The snout has quite a pointed shape, thin and long ears pinnae, and very long and light-colored vibrissae (Fig. 14.3). Relative long forelimbs with poorly developed nails. Short and dense fur with a double hair layer, dark grayish brown in the back of body and a lighter-colored belly. This species shows sexually dimorphic; adult males are about 1.3 times the length and 3.3 times the weight of females. The canine teeth of adult males are larger and thicker than females. As their Spanish name says, they have two types of hair, one very dense inner layer with soft, fine, and short hair cover by another thicker and longer called guard hair (Bastida and Rodríguez 2009). This species could be confused, in our area, with Antarctic and Subantarctic fur seals. Adult male Antarctic fur seals are the same size and almost same color of

Fig. 14.3 South American fur seal, *Arctocephalus australis*, recorded in Bahía Blanca Estuary. (Photo by Victoria Massola)

Southern fur seal but have a shorter muzzle and proportionately longer fore- and hind flippers. Subantarctic fur seals, on the other hand, are unique with a pale blond face and neck (Jefferson et al. 2015).

14.2.2.2 Distribution and Habitat

South American fur seal has two recognized subspecies, the South American and Peruvian subspecies. The South American subspecies is distributed along all Patagonian Sea, from western South Atlantic (southern Brazil) to eastern South Pacific (southern Chile) coasts. For their distribution at sea, this species inhabit both the coastal zone and the entire Patagonian platform, reaching the edge of the slope (Mandiola et al. 2015; Baylis et al. 2018a, b). On the Atlantic side, haulouts can be found along the coasts of Rio Grande do Sul in Brazil (Muelbert and Oliveira 2006), although the breeding colonies goes from Islas del Castillo, Uruguay, continue to Tierra del Fuego-Isla de los Estados (Túnez et al. 2008; Crespo et al. 2015). They used to travel long distance (Mandiola et al. 2015; Baylis et al. 2018b).

14.2.2.3 Behavior

Males are polygynous and territorial (between 2 and 13 females for each male). Their fights can result in serious wounds and scars. Individual bulls can occupy territories for up to 60 days until most of the females are mated (Cappozzo 1995). After mating, female begins to make foraging trips punctuated by time attending the pup ashore (Pavés and Schlatter 2008). Only a few adult males achieve mating while a large proportion is excluded to peripheral or male exclusive areas. Pupping peaks take place in middle of November to middle of December, and mating occurs 1–6 days after the female gives birth (Franco-Trecu 2005; Pavés and Schlatter 2008). Colonies are generally found along rocky coasts, on edges above the shoreline or in boulder-strewn areas. The Southern fur seal food habits vary according to prey availability; it is an opportunist generalist predator, which feeds mainly on pelagic and demersal preys, both coastal and continental shelf species. They eat mainly on prawn, shrimp, squids, and several fish, as croakers, anchovy, and mackerel in Buenos Aires waters (Bastida and Rodríguez 2009; Pérez Salles 2015). Studies on stable isotopes from Patagonia showed that juvenile fur seal feed more pelagically than subadults and adults (Vales et al. 2015).

Dassis et al. (2012) observed that the most frequent behavior, recorded in Mar del Plata, was passive flotation, followed by prolonged coastal dives. This behavior is strongly influenced by the sea state, since when the sea is more “choppy,” fur seals tend to concentrate while when the sea is calm, they tend to disperse. In addition, the wind direction and the surface current affect their behavior. This fact could be a strategy to maintain certain areas with food availability, and for forage energy optimization.

14.2.2.4 Threats and Conservation Status

Among its natural predators are the killer whale, *Orcinus orca* (Bastida et al. 2007), and the cat shark, *Notorynchus cepadianus* (Crespi-Abril et al. 2003). There is a large overlap between the areas used by fur seal and fisheries on the Patagonian platform (Mandiola et al. 2015; Baylis et al. 2018b), although operational interactions are sporadic (Crespo et al. 1997; Mandiola 2015). Actually, individuals have been observed feeding during trawling fishing maneuvers in Buenos Aires waters (Mandiola et al. 2017). The limited number of breeding areas could make this species particularly vulnerable to the effects of epidemics and several human activities that could have bad consequences on the population (Cardenas-Alayza et al. 2016). The intake of marine litter (mainly plastics derived from fishing activity and remains of bags) has been recorded in juvenile fur seal stranded on the Buenos Aires coast, although no lesions were observed in the digestive tract (Denuncio et al. 2017). In addition, the oil activity carried out on the Patagonian platform (transport route of oil ships, exploration and exploitation areas) is always a risk.

Arctocephalus australis is categorized as Least Concern by the IUCN Red List and SADSN-SAREM (Cardenas-Alayza et al. 2016; Vales et al. 2019). Listed in Appendix II of CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora).

14.2.3 La Plata River Dolphin or Franciscana **Pontoporia blainvillei** *(Gervais and d' Orbigny, 1844)*

Common name: Franciscana, Delfín del Plata (Spanish) Franciscana, La Plata River dolphin (English)

14.2.3.1 Description

Small-sized dolphin (128–175 cm) that weigh between 35 and 55 kg. Quickly distinguishes itself from the rest of the dolphins due to their extremely long and narrow beak (about 12–15% of total length in adults). The long beak is lined with 50–62 fine, pointed teeth per row, more than in nearly any other species of cetacean. The forehead is steep and rounded with flexible neck. The flippers are broad and spatulate, sometimes with an undulating trailing edge; meanwhile dorsal fin is relatively rounded and small. Newborns have proportionately larger flippers, dorsal fins, and flukes. The body color is uniform yellowish brown, in some cases lighter on the belly, which serves to camouflage itself in the murky water where it lives (Bastida and Rodríguez 2009; Jefferson et al. 2015). The species has a slightly inverted sexual dimorphism, with females being larger than males (Kasuya and Brownell 1979; Botta et al. 2010; Panebianco et al. 2012) (Fig. 14.4).

Fig. 14.4 La Plata River Dolphin (Franciscana dolphin) *Pontoporia blainvillei*. (Photo by Ricardo Bastida)

14.2.3.2 Distribution and Habitat

The Franciscana Dolphin is found only along the east coast of South America (Brazil, Uruguay, and Argentina), from Golfo San Matías, central Argentina (42°35′S), to Espirito Santo, southeastern Brazil (18°25′S) (Bastida and Rodríguez 2009; Jefferson et al. 2015). They live mainly in coastal marine waters with a maximum distribution to the isobath of 50 m, and it is possible to see them swimming behind the surfing zone (Bastida et al. 2000; Crespo et al. 2010). On the Argentine coast, abundance was estimated by aerial censuses in the marine area in almost 15,000 animals with a greater density in the northern coastal area of the Province of Buenos Aires, from Cabo San Antonio to Claromecó (Crespo et al. 2010). In this region, the highest concentration of dolphins was found between the coastline and the 30 m deep isobath. Secchi et al. (2003) proposed to divide the distribution area into four population management units (Franciscana Management Areas, FMAs). The FMA IV represents the coastal waters of Argentina, including the Buenos Aires Province, Río Negro, and Chubut. However, the arguments presented for this subdivision are not rigid and are subject to change, as more and better information will be recorded (Secchi et al. 2003). Subsequent studies, based on new genetic analyses, have suggested at least seven management units should be considered (Mendez et al. 2008; Cunha et al. 2014; Gariboldi et al. 2016). Studies performed in northern Buenos Aires Province revealed that in the Samborombón Bay, there would be a genetically isolated population and suggest that at least there are two populations only in Buenos Aires coast (Mendez et al. 2008, 2010). Recent studies suggest that there could be between three and five subpopulations in Argentina (Cunha et al. 2014; Gariboldi et al. 2016).

14.2.3.3 Behavior

Franciscanas feed mainly on bottom dwelling fish of the family Sciaenidae (Rodríguez et al. 2002; Denuncio et al. 2017), but crustacean and mollusks are also important. They feed mostly near the bottom and appear to be opportunistic, with at least 58 fish species, six cephalopod species, and six crustacean species known from the diet. They show cooperative feeding and foraging, and on average, they dedicated three quarters of their time searching for their preys. This dolphin lives in small groups up to 15 individuals with an average of two to five (Bastida and Rodríguez 2009). There is no evidence of large seasonal movements and little is known about daily displacement (Bordino et al. 1999; Bordino 2002). Bordino et al. (2008), using satellite telemetry, showed that this species has a relatively small home range (150 km^2–345 km^2) which barely exceeds 20 linear km to its maximum extent. In spite of its difficulty to be seen in open sea due to their color, behaviors, and small size, it is possible to see groups during the summer along the entire coast of Buenos Aires Province.

Franciscana's breeding season begin in late spring and summer, and newborn calves are recorded between the end of October and early April in Bahía Samborombón and Bahía Anegada with a gestation period between 10 and 11 months (Bordino et al. 1999). Killer whale (*Orcinus orca*) are known natural predators and some sharks have attacked franciscanas trapped in fishing nets. They are seldom observed close to motor boats, suggesting that they are scared and avoid them (Bastida and Rodríguez 2009). They produce high-frequency narrow-band echolocation clicks with a maximum frequency recorded 139 kHz and a bandwidth of 19 kHz (Melcón et al. 2012) with lower frequencies in calves (Melcón et al. 2016).

14.2.3.4 Threats and Conservation Status

The main problem this species is facing is incidental mortality in gillnet fisheries. Every year between 2000 and 3000 dolphins die in coastal fisheries in Brazil, Uruguay, and Argentina (Bastida and Rodríguez 2009). Only in Buenos Aires coast, about 500–650 dolphins are entangled every year (Denuncio et al. 2019). Other threats include various forms of habitat degradation and pollution. Heavy metals and several organic chlorine compounds have been detected in individuals of different regions (Gerpe et al. 2002; Panebianco et al. 2011, 2012; Romero et al. 2018). Moreover, more than 30% of the franciscanas which were studied in the Rio de la Plata estuary and Cabo San Antonio contained plastic debris in their stomach (Denuncio et al. 2011, 2016).

The Red List of IUCN and SADSN-SAREM categorized this species as "Vulnerable" (Zerbini et al. 2017; Denuncio et al. 2019). It is the most endangered cetacean species in the Southwest Atlantic Ocean, listed in Appendix II of CITES.

14.2.4 Lahille's Bottlenose Dolphin Tursiops truncatus gephyreus *(Montagu, 1821)*

Common name: Delfin nariz de botella de Lahille, delfin Mular de Lahille (Spanish), Lahille's common bottlenose dolphin (English)

14.2.4.1 Description

Robust and large-sized dolphin (max, length 4 m). The adult weight of this South Western Atlantic subspecies ranges between 200 and 350 kg, but there are maximum records of 600 kg. At birth calves measure between 85 and 140 cm and weight between 14 and 30 kg. These general body values are much higher than those of the other subspecies, *Tursiops truncatus truncatus,* of the Caribbean region, where they behave more dynamic. Body color is uniform grey with lighter belly. Large, bulbous, and well-differentiated melon. Short and wide beak. Lower jaw slightly exceeding the upper one. Between 20 and 26 pairs of well-developed teeth in the upper jaw and between 18 and 24 pairs in the lower jaw. Developed subtriangular dorsal fin in *gephyreus* subspecies, and falcate dorsal fin in *truncatus* subspecies; in both placed at midback, well-developed typical pectoral fins with a convex anterior edge and concave posterior edge (Bastida and Rodríguez 2009) (Fig. 14.5).

14.2.4.2 Distribution and Habitat

Lahille's common bottlenose dolphin is a subspecies distributed along the coastal waters of Patagonia and Buenos Aires Province; it also inhabits coastal areas of Uruguay and southern Brazil. In Uruguay and Brazil, the subspecies *truncatus* is generally found in offshore waters of the continental shelf. Common bottlenose dolphins tend to be primarily coastal, but they can also be found in pelagic waters (Wells and Scott 1999). Individuals that primarily use inshore waters frequents estuaries, bays, lagoons, and other shallow coastal regions and occasionally can swim far up into rivers. Individuals of this ecotype tend to maintain definable, long-term multi-generational home ranges, but in some locations near the extremes of the species range, they show migratory behaviors. On the other hand, the offshore ecotype is apparently less restricted in range and movement. Some offshore dolphins are residents around oceanic islands.

14.2.4.3 Behavior

Bottlenose dolphins are commonly associated with many other cetaceans, including both large whales and other dolphin species (Wells and Scott 1999). This dolphin species consumes a wide variety of prey, mostly fish and squid (Barros and Odell

Fig. 14.5 Lahille's bottlenose dolphin, *Tursiops truncatus gephyreus*, in Bahía Blanca Estuary. (Photo by Agustina Mandiola)

1990; Barros and Wells 1998; Blanco et al. 2001; Santos et al. 2001), and sometimes squids, shrimps, and other crustacean. In Buenos Aires Province, Lahille's bottlenose dolphins' diet is mainly based in demersal fish as white mouth croaker, striped weakfish, and *Mugil* spp., among other bony fish species (Bastida and Lichtschein 1986; Mermoz 1977). Lahille's dolphins use a high variety of prey capture strategies and techniques, one of these, observed in small streams of Bahía Samborombón, is to pull mullet fish schools out of water and eat them with the dolphin body partially stranded (Bastida and Rodríguez 2009). Probably such behaviors also take place in the shallow areas of Bahía Blanca estuary. This coastal dolphin can eventually be caught by killer whales; in Argentina, cases of attack have already been reported in Bahía Samborombón and in Villa Gesell (Buenos Aires Province) (Bastida and Rodríguez 2009). Probably these attacks may also take place in the outer zone of the Bahía Blanca estuary. Bottlenose dolphins produce pulsed signals (echolocation) as well as tonal whistles. These sounds comprise a wide range of frequencies (40–130 kHz). Moreover, individual sounds known as signature whistles used in individual recognition and in maintaining group cohesion have been described. Maritime traffic seems to affect the acoustic behavior of the species (Buckstaff 2004). This vulnerable dolphin species lives in Argentina in coastal waters, from Buenos Aires Province to Northern Chubut Province. Although few records have been made as far south as the provinces of Santa Cruz and Tierra del Fuego (Goodall et al. 2011). Most behavioral studies conducted on bottlenose dolphins in Argentina (e.g., Würsig and Würsig 1979) were discontinued in the 1980s because of noted population decline and the subsequent lack of sightings (Bastida and Rodríguez 2009). One of the last remaining resident populations of the country is suggested to reside in Bahía San Antonio (Río Negro Province) (Vermeulen and Cammareri 2009). Research conducted in this area described this population as small, essentially closed, declining (Vermeulen and Bräger 2015), and highly resident to the study area, indicating this bay as the core region within the larger home range of this population (Vermeulen and Cammareri 2009).

14.2.4.4 Threats and Conservation Status

The abundance of this species is dramatically decreasing in Argentina, based on average numbers of sightings since the 1970s, even in areas with increasing or constant survey effort (Bastida and Rodríguez 2009; Vermeulen et al. 2017). For the Patagonia Sea, it is estimated that there are less than 1000 mature individuals, across at least two genetically distinct subpopulations, showing genetic evidence of population fragmentation (Fruet et al. 2014). Causes of declines in the world – and probably also in Argentina – are often related to either habitat degradation, prey depletion, or contamination (Vermeulen and Bräger 2015).

This species is categorized as "Least Concern" by the Red List IUCN (Wells et al. 2019) and "Vulnerable" by SADSN-SAREM (Vermeulen et al. 2019), listed in Appendix II of CITES. However, in a preliminary way, the Lahille's bottlenose dolphin can be considered the most threatened cetacean currently in Argentina and probably from Uruguay.

14.2.5 Importance of the Estuary for Marine Mammals

Estuaries have plenty of food and offer coastal protection and habitat for a wide variety of species, including seabirds, fish, and mammals. Moreover, estuaries are nursery areas for many fishes (Costanza et al. 1997; Martinho et al. 2007) which are common prey of marine mammals. In the Bahía Blanca Estuary, 30 fish species have been reported, where striped weakfishes (*Cynoscion guatucupa*), whitemouth croakers (*Micropogonias furnieri*), and narrownose smooth-hounds (*Mustelus schmitti*) are the most important fishing resources (Lopez Cazorla et al. 2004).

Franciscana dolphin, Lahille's bottlenose dolphin, South American sea lions, and South American fur seal, the four marine mammals most frequent in Bahía Blanca Estuary, mainly feed on whitemouth croakers and striped weakfishes of different sizes. As Failla et al. (2004) mentioned, the distribution and the accessibility of food may have been a determining factor for the establishment of franciscana dolphins. Paso-Viola et al. (2014) found that franciscana dolphins from the Bahía Blanca Estuary eat striped weakfishes 2.8–28.1 cm long (smaller than commercial size) and whitemouth croakers 4.1–7.8 cm (far smaller than commercial size). These mammals also eat horse mackerels (*Trachurus lathami*), Argentine anchovies (*Engraulis anchoita*), lantern midshipmans (*Porichthys porosissimus*), cusk-eels (*Raneya brasiliensis*), and Brazilian flatheads (*Percophis brasiliensis*). Besides fishes, they prey on invertebrates as the longfin inshore squids (*Loligo sanpaulensis*), Tehuelche octopuses (*Octopus tehuelchus*), marine shrimps (*Artemesia longinaris*), and Argentine red shrimps (*Pleoticus muelleri*).

Lahille's bottlenose dolphins from the Buenos Aires Province feed on marine and estuarine fishes such as the whitemouth croaker, striped weakfish, king weakfish (*Macrodon ancylodon*), drum (*Paralonchurus brasiliensis)*, Argentine menhaden (*Brevoortia pectinate*), Brazilian codling (*Urophycis brasiliensis*), and longfin inshore squid (*Loligo sanpaulensis*) (Bastida and Rodríguez 2009). Moreover, Vermeulen et al. (2015) had observed bottlenose dolphins feeding on silversides (Odontesthes sp.). All these species detected as prey for bottlenose dolphins are frequent fishes of the Bahía Blanca Estuary (see Chap. 11 in this book).

On the other hand, the otariids recorded in Bahía Blanca Estuary are considered generalist feeders. South American sea lions from Puerto Quequén mostly eat cusk-eels, striped weakfishes, horse mackerels, Argentine croakers (*Umbrina canosai*), flounders (*Paralichthys* sp.), and skates (Giardino 2014). South American fur seals from Buenos Aires Province eat whitemouth croakers, Argentine anchovies, king weakfishes, striped weakfishes, and squids (Pérez Salles 2015). Except for anchovies, otariids eat fishes smaller than those valuable for commercial interest, indicating that sea lions and fur seals feed mainly on juveniles (Giardino 2014; Pérez Salles 2015).

In addition, the Bahía Blanca Estuary offers a sheltered environment. It is known that relatively small communities of bottlenose dolphins, living in protected coastal environments with predictable availability of resources, often display a high degree of residency and long-term site fidelity, as Vermeulen et al. (2017) confirmed for Argentine groups. Franciscanas have low mobility, with prolonged associations (Wells et al. 2013) in small groups (Crespo et al. 1998; Failla et al. 2004). This dolphin needs turbid waters, depths ranging between 5 and 35 m, favorable conditions for feeding, and protection against natural predators (Bordino et al. 1999; Failla et al. 2004), thus the estuary is an ideal environment. Molecular analyses, carried out in franciscanas from Buenos Aires Province, allowed to recognize a reduced mobility of the species and a possibly high level of population isolation (Mendez et al. 2008, 2010). Sea lions, on the other hand, need a wintering area where they rest and feed, away from females and their puppies, thus avoiding competition for food. Thus, the Bahía Blanca Estuary provides a suitable wintering habitat for them.

There are also negative aspects that have to be considered, as the estuary accumulates large amounts of pollutants, becoming a potential threat to resident species. The Bahía Blanca Estuary has experienced a marked human population increase as well as industrial development during the past decades (Marcovecchio et al. 2008). This coastal area also supports an intensive anthropogenic activity, including five large harbors and one of the biggest industrial parks in South America comprising refineries, oil terminals, tanks for storing oil products, and multiple docks (Limbozzi and Leitao 2008; Oliva et al. 2017). Pollution, environmental contaminants, marine noise, plastic debris, offshore oil and gas activities, shipping, and commercial fisheries affect marine mammals. Individuals can die or be negatively impacted by entanglement or the ingestion of plastic litter (Reijnders et al. 2018). At local level plastic debris were detected in franciscanas (Denuncio et al. 2011) and in fur seals (Denuncio et al. 2017). In franciscanas high levels of metals, such as mercury, zinc, and cooper, were found (Gerpe et al. 2002; Panebianco et al. 2012). In addition, bottlenose dolphins, South American sea lions, and fur seals from Buenos Aires Province have mercury, zinc, cadmium, and copper in their tissues (Marcovecchio et al. 1990; Moreno et al. 1984; Marcovecchio et al. 1994). High concentration of metals and organic pollutants in the tissues of marine mammals has been associated with organ anomalies, impaired reproduction, and immune function and, as a consequence of the latter, with the occurrence of large die-offs among seals and cetacean species (Reijnders et al. 2018). However, a clear cause and effect relationship between residual levels of contaminants and observed effects has been demonstrated in only a few studies.

No less important is noise pollution. Underwater noise can interfere with key life functions of marine mammals (e.g., foraging, mating, nursing, resting, migrating) by impairing hearing sensitivity, masking acoustic signals, eliciting behavioral responses, or causing physiological stress (Erbe et al. 2018). Although in Argentina no studies regarding noise pollution in local species have been developed, worldwide disturbances of shipping traffic, military tests, and oil extraction, among others were found (Rolland et al. 2012; Tyack and Janik 2013; Fouda et al. 2018; Simonis et al. 2020). As the Bahía Blanca Estuary has a significant traffic vessel, this type of pollution also should be considered.

14.2.6 Local Activities for the Conservation of Marine Mammals

Stranding records provide valuable information about spatial distribution, seasonal movements, and factors related to mortality (Moore et al. 2018). Observations of stranded marine fauna on the beach are not new, but are more frequent nowadays. Many causes, natural or anthropogenic, or both, could lead to the stranding of live, dying, or dead animals. Natural causes include failure to thrive, predation, disease, parasites, injuries, and exposure to biotoxins. Other natural threats, such as prey distribution changes, can be driven by environmental fluctuations or overfishing (Moore et al. 2018). Directly and indirectly, humans are seriously affecting marine life. The main anthropic disturbances, among others, that cause pain, suffering, and often death include incidental entanglement, both in coastal and commercial fisheries; collision with boats, drift nets, and other fishing gear; oil spills; solid waste floating in the sea; and ocean noise pollution (Moore et al. 2018). In the last three decades, these events started to be considered by national and provincial government agencies, and different public policies were adopted. At the same time, private rehabilitation centers have emerged, for rescue, assistance, and research. These institutions have been coordinating efforts even inter-jurisdictionally, making progress in management and conservation along the extensive Atlantic coast of Argentina.

Government agencies are responsible for marine fauna. At the national level, the Ministry of Environment and Sustainable Development (SAyDS) has the competence to promote regulations and management actions for the conservation of aquatic resources. In Buenos Aires Province, the Provincial Direction of Natural Resources – Provincial Agency for Sustainable Development (OPDS) has a network that oversees the actions of collection centers, share scientific information with researchers, and promote a better knowledge of ecology, biology, and veterinary aspects necessary for the conservation of the species.

Locally, in the 1980s, Bahía Blanca Estuary was declared a Protected Provincial Natural Area; therefore, protection and conservation measures began to be taken through the legal figure as Bahía Blanca, Bahía Falsa, and Bahía Verde Multiple Use Nature Reserve. Following work began to be done at ecosystem level. A few years later, the environmental non-governmental organization Marine Animals Assistance and Rescue Foundation (FRAAM) was created. Biologists and park rangers started to work on the environmental awareness with coastal populations adjacent to the Natural Reserve area, the education continues nowadays. Through environmental education and interpretation strategies, FRAAM offers training to different social actors involved in the occasional discovery and assistance of marine fauna, such as the Argentine Naval Prefecture, park rangers, artisanal fishermen, recreational fishermen, lifeguards, and rescue center volunteers. Primary care assistance includes direct measures focused on animal health and welfare: systematic data collection, biometrics, epibionts, necropsies, parasites, and pathological, genetics, and contaminants studies.

In the last decade, work on data collection has been strengthened along the Atlantic coast of Buenos Aires Province, coordinated efforts with national, provincial, multidisciplinary academic groups of national universities, non-governmental rehabilitation centers, as well as artisanal and recreational fishermen. Altogether, they use the same protocols for each taxonomic group. All the information recorded is shared among all the organisms to the National Action Programs for the Conservation of each one of these species (e.g., PAN-Marine Mammal Conservation).

Accidental observers, in coincidence with the summer touristic season, reported most of the records. In this sense, FRAAM has an Environmental Education Program to teach school children and teachers of all levels. In addition, dissemination and information campaigns are carried out through the media, reinforced with billboards and brochures. Nowadays, social media contribute and allow direct communication with the informant. However, there is still much to do and direct intervention by the public without knowledge is discouraged. For example, it is not recommended to feed the animals, force them to return to sea, water, or try to catch them. Instead, keeping distance and giving immediate notice to the nearest beach authority helps. In addition, if possible people that discover a stranded animal should take photographs, keep dogs away, and await the arrival of the authority without putting themselves at any risk.

Not always animals on the beach are sick, injured, or in trouble. In the case of pinniped (seals and sea lions), for example, as they alternate periods of their life at sea and periods in land, they often go out to rest in places far from their settlements, simply to recover energy. Opposite, cetacean live all their life in the sea, so their stranding is not a normal condition. Cetaceans can single or mass strand and it is difficult to know the real reason behind it. However, through examinations, necropsy, and sampling of deceased animals, it is possible to understand direct and indirect threats to marine mammal populations (Moore et al. 2018). Each stranding requires logistics and participatory collaboration of different institutions and professionals. The faster an animal can be examined, the more accurate the diagnosis can be.

In the Bahía Blanca Estuary, when an animal is found alive, a first diagnosis is made on its body condition, following the corresponding sanitary protocol. Next, all possible samples and information are collected (biometrics, sex, epibionts, stage of development, geographic location, pictures, etc.). Meanwhile, authorities delimit an area to prevent disturbance from people and dogs. If the beach is full of people, authorities move the animal to a more remote place. If it is necessary due to the health condition and if the animal size allows it, it is transferred to the rehabilitation center for veterinary assistance. If the finding is a *post-mortem* animal, recommended proceeding is the same, followed by a necropsy and carcass recovery. Species found along the beach may be residents or transients. Transient species pass through out provincial limits through their lives, or even cross-national and international boundaries. For that reason, it is necessary to have coordinated work between governmental and non-governmental organizations with economic and human resources optimization.

Understanding how ecosystems function is essential; therefore, it is necessary to work in coordination, both from official organizations such as universities and non-governmental organizations, like FRAAM, for the species conservation and habitat preservation. The best way to do this is sharing methodologies, protocols, and scientific information.

Box 14.1 Bahía Blanca Estuary: A Point of Connection Between the South American Breeding Colonies of Sea Lions

South American sea lions (*Otaria flavescens*) live along the coast of South America, from Torres, southern Brazil (29° 20′ S; 49° 43′ W) in the Atlantic Ocean, to Punta Brava, Ecuador (02° 12′ S; 81° 00′ W) in the Pacific Ocean (Vaz Ferreira 1982; Bastida et al. 2007). Along the Argentine coast, there are 60 settlements, with an estimated total population of more than 200,000 individuals (Romero et al. 2019); number that is still far from historical populations (Bastida et al. 2007). The Buenos Aires coast has four rookeries, located at almost equal distances (ca. 1000 km) from two of the most important focal breeding areas of this species in the southwest Atlantic (Uruguay and Northern Patagonia). These four colonies are non-breeding rookeries, two of them located in Mar del Plata (38° 02′ S, 57° 31′ W) and in Quequén (38° 35′ S; 58° 42′ W) harbors (Fig. 1.2; Chap. 1) and the other two in Isla Trinidad (39° 13′ 59″ S; 61° 51′ 14″ W) and Banco Culebra (40° 24′ 30″ S; 61° 58′ 30″ W) (Fig. 2.1; Chap. 2).

Isla Trinidad is within the limits of the Bahía Blanca, Bahía Falsa, and Bahía Verde Multiple Use Natural Reserve. The South American sea lions and South American fur seals are commonly observed within the reserve (Petracci et al. 2010; Giardino 2014; Martín Sotelo and Victoria Massola pers. obs.). However, the area of Isla Trinidad has three large bays and an intricate network of channels and streams with extensive sandy beaches in the outermost islands. Because of the difficult access, surveys must be performed by boat or plane, and details on the fauna inhabiting Isla Trinidad is largely unknown.

The status of the haulout in Isla Trinidad is almost unknown. Its existence has been a subject of controversy, because of confusing quotes and erroneous locations in the literature published over the past few years. By 1935 one historical record mentions the killing of up to 100 sea lions per day in Isla Trinidad, by the Salvador Di Meglio and Minujin Society (Fidalgo 2004). Dr. Raúl Arámburu, during a census conducted on December 1973, quantified 900 sea lions in the area (Vaz Ferreira 1982). One of the most recent references on the status of the population remarks that this rookery shelters on average 76 South American sea lions, out of the breeding season with a maximum of 150 individuals (Petracci et al. 2010; Giardino 2014). Like Mar del Plata and Quequén rookeries, Isla Trinidad, have, predominantly, juvenile (3–5 years) and subadult (5–7 years) males (Petracci et al. 2010; Giardino 2014). Sea lions from Isla Trinidad are also connected with the other wintering grounds in the Buenos Aires coast. In April 2009, one of the sea lions bleached (Giardino et al. 2013) in Puerto Quequén, between July and December 2008, was resighted in Isla Trinidad confirming that connection (Giardino 2014).

Why estuaries are so important for sea lions? Estuaries play an important role in coastal regions. Their plant communities provide protection against the erosion of water and wind. In addition, bottom communities allow for sediment oxygenation and many species of fish and invertebrates carry out part of their life cycles in these environments. Several of these fish species are of commercial interest and are prey for apex predators such as many marine mammals and seabirds. Among the services provided, estuaries commonly act as nursery areas for fish (Bortolus 2008). Adults and juveniles of the most frequent preys of *Otaria flavescens* as the Brazilian menhaden (*Brevoortia aurea*), the whitemouth croaker (*Micropogonias furneri*), and the striped weakfish (*Cynoscion guatucupa*) (Lopez Cazorla et al. 2014; Giardino 2014) inhabit the Bahía Blanca Estuary.

Female sea lions remain close to the breeding site (Rodríguez et al. 2013; Grandi et al. 2008, 2018) nursing their calves, but males do not have any parental investment. Males tend to disperse away from their mating sites toward unisexual haulouts. Thus, male sea lions remain in remote places (as the Bahía Blanca Estuary) during most of the year in order to avoid competing with females on feeding resources (Giardino et al. 2016).

Like in the other male haulouts from Buenos Aires, sea lions from Isla Trinidad would be a functional part of the northern Patagonia and Uruguay breeding aggregations. Every year, during the austral summer, sexually and socially mature sea lions from Buenos Aires travel to the breeding grounds, returning once the breeding season is over (Giardino et al. 2016). With these movements, males maintain genetic flow between the two different genetic stocks of females (Szapkievich et al. 1999; Túnez et al. 2007, 2010; Feijoo et al. 2011; Giardino et al. 2016; de Oliveira et al. 2017). This connection is particularly important for the long-term persistence of this species (Frankham et al. 2002; Crooks and Sanjayan 2006). Furthermore, these wintering grounds are also relevant as passage, rest, feeding, training, and maturation areas.

Regarding the South American fur seal (*Arctocephalus australis*), this species is in a process of redistribution and recolonization, and it is observed with increasing frequency in the Bahía Blanca Estuary, settling on buoys close to Ingeniero White Port (Mandiola 2015). Even though there are no current studies on this fur seal in Bahía Blanca, these otariids may also be connected with Uruguayan colonies, as proven by one animal bleached in Mar del Plata and sighted afterward in Punta de Lobos, Uruguay.

Connectivity and dispersal are key factors for the long-term persistence of species, particularly in those with reduced populations or fragmented habitats (Frankham et al. 2002; Crooks and Sanjayan 2006). Based on the available information, Isla Trinidad, and in consequence the Bahía Blanca Estuary, would represent a key point of connection and should be seriously considered for regional conservation strategies.

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