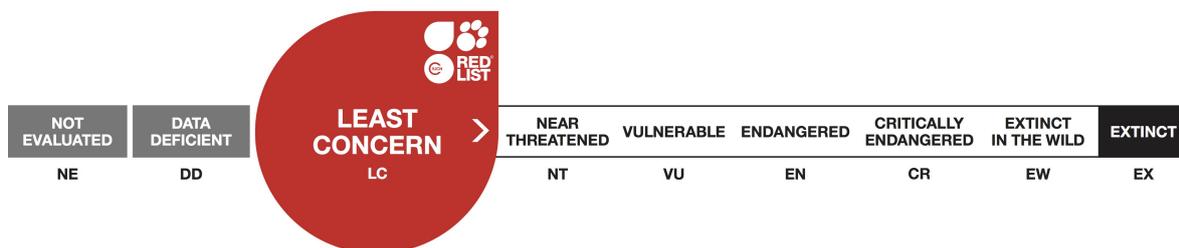


## *Otaria byronia*, South American Sea Lion

Assessment by: Cárdenas-Alayza, S., Crespo, E. & Oliveira, L.



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**Citation:** Cárdenas-Alayza, S., Crespo, E. & Oliveira, L. 2016. *Otaria byronia*. *The IUCN Red List of Threatened Species 2016*: e.T41665A61948292. <http://dx.doi.org/10.2305/IUCN.UK.2016-1.RLTS.T41665A61948292.en>

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## Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Mammalia	Carnivora	Otariidae

**Taxon Name:** *Otaria byronia* (de Blainville, 1820)

### Synonym(s):

- *Otaria flavescens* (Shaw, 1800)
- *Phoca byronia* de Blainville, 1820
- *Phoca flavescens* Shaw, 1800

### Common Name(s):

- English: South American Sea Lion, Southern Sea Lion

### Taxonomic Source(s):

Brunner, S. 2004. Fur seals and sea lions (Otariidae): identification of species and taxonomic review. *Systematics and Biodiversity* 1: 339-439.

### Taxonomic Notes:

The South American Sea Lion has been referred to by the scientific names *Otaria byronia* (following Blainville 1820) and *O. flavescens* (following Shaw 1800). Rice (1998) concluded that *O. flavescens* has priority. More recently, Berta and Churchill (2012) noted that the specific name for this taxa is controversial, but concluded that *O. byronia* is “the earliest available name applicable with certainty.” *O. byronia* is the name approved by the Society for Marine Mammalogy (Committee on Taxonomy 2014) and will be used in the document. However, *O. flavescens* is still in use, particularly by South American scientists.

Szapkievich *et al.* (1999) conducted the first genetic study on the species, analyzing 10 protein loci in 70 South American Sea Lion pups from two rookeries 1,300 km apart (Isla de Lobos, Uruguay and Peninsula Valdés, Argentina). They found only a small genetic distance between the rookeries, suggesting that they belong to the same population in which gene flow is currently occurring. Túnez *et al.* (2007) studied the population structure of South American Sea Lions by analyzing mtDNA from a few colonies along the Atlantic coast, and comparing their results with five sequences previously published from Peruvian populations (Wynen *et al.* 2001). They found no haplotypes shared between the Atlantic and Peruvian colonies. The South Atlantic population from Uruguay to southern Patagonia was studied by means of mtDNA (Túnez *et al.* 2007, 2010; Feijóo *et al.* 2011) and microsatellites (Feijóo *et al.* 2011). While mitochondrial markers showed geographically structured sub-populations, the nuclear loci showed a lack of geographical structure. These opposite patterns in genetic structure can be explained by female philopatry and high male dispersion (Feijóo *et al.* 2011). On the Chilean coast, Weinberger (2013) using eight microsatellite loci showed the existence of two genetic clusters separated at approximately 41° S, supporting the existence of two sub-populations or management units.

Gehara (2009) and Túnez *et al.* (2007) concluded there is significant genetic differentiation between South American Sea Lions in the Atlantic and Pacific oceans, suggesting complete and prolonged isolation and distinct evolutionarily significant units (ESUs). This was based on 10 microsatellite loci and

mtDNA sequences from 4 areas (Uruguay, Argentina, Chile, and Peru). However, the rookeries of southern South America need to be sampled and analyzed in order to establish the limit of gene flow between the two ocean basins (Oliveira pers. comm.).

## Assessment Information

**Red List Category & Criteria:** Least Concern [ver 3.1](#)

**Year Published:** 2016

**Date Assessed:** November 2, 2015

### Justification:

South American Sea Lion numbers are high in most of their range and trends are positive for some of the most important local populations. In Peru, Sea Lions continue to recover from the strong El Niño event of 1997/98 and could decline dramatically again with the next ENSO. Uruguayan populations are in decline for reasons that are not well known. The total size of the population is estimated at approximately 425,000. Thus, globally the South American Sea Lion does not meet any IUCN criteria for a threatened listing and should remain classified as Least Concern.

### Previously Published Red List Assessments

2014 – Least Concern (LC)

<http://dx.doi.org/10.2305/IUCN.UK.2014-2.RLTS.T41665A61943000.en>

2008 – Least Concern (LC)

1996 – Lower Risk/least concern (LR/lc)

## Geographic Range

### Range Description:

South American Sea Lions are widely distributed, occurring more or less continuously from northern Peru south to Cape Horn, and north up the east coast of the continent to southern Brazil (Vaz-Ferreira 1982, Crespo 1988, Crespo *et al.* 2012). They also occur in the Falkland (Malvinas) Islands. The northernmost breeding location on the Pacific side is Zorritos, Peru (03°40'S; Crespo *et al.* 2012), although some individuals have been found in Ecuador and Colombia (Félix *et al.* 1994, Capella *et al.* 2002). On the Atlantic side they can be found from Tierra del Fuego to the coastal island Ilha dos Lobos in Torres in southern Brazil (29°20'S); but individuals have been seen as far north as Rio de Janeiro (Vaz-Ferreira 1982, Pinedo 1990, Rosas *et al.* 1993). No breeding colonies occur in Brazil, so individuals there come from the breeding colonies in Uruguay after their breeding period (Rosas *et al.* 1994, Pinedo 1990, Oliveira 2013). Therefore, the northernmost breeding rookery in the Atlantic is on the Uruguayan coast at Isla Verde and Isla La Coronilla (33°56'S 53°29'W), east of Cabo Polonio (34°24'S) (Vaz-Ferreira 1975). On the Atlantic coast, the species shows a patchy distribution of breeding activity that has not varied in the last 60 years (Túnez *et al.* 2008). Breeding colonies aggregate in three areas, the Uruguayan coast, north-central Patagonia, and southern Tierra del Fuego. Breeding activity is absent, or nearly absent, in two large segments of coast, the coast of Buenos Aires Province and southern Patagonia (Túnez *et al.* 2008). The lack of breeding colonies in Buenos Aires Province appears to be related to the large scale pattern of human settlement occurred at the end of the 19th century. In contrast, the low number of

breeding colonies in southern Patagonia is probably due to the effect of extreme variations in tidal range that produce great fluctuations in the coastline location making it difficult for the Sea Lions to access the water (primarily an issue during the breeding season). In north-central Patagonia, the segment of coast with the highest number of Sea Lions is in Argentina. The distribution of colonies there is associated with availability of islands and is negatively correlated with places where anthropogenic disturbance is high. At the local scale, breeding colonies are positively associated with slightly sloping coasts and negatively associated with rocky beaches (Túnez *et al.* 2008).

South American Sea Lions are primarily a neritic species, found in waters over the continental shelf and slope. Males can travel more than 320 km from the coast (Campagna *et al.* 2001, Crespo *et al.* 2007, Hückstädt *et al.* 2014) as well along the Argentine coast Giardino *et al.* (2014), suggesting that they have a main role in the gene flow among colonies. This species ventures into fresh water and can be found around tidewater glaciers and in rivers (Schlatter 1976). Vagrants have been found as far north as 13°S, near Bahia, Brazil and in Ecuadorian and Colombian waters (Félix *et al.* 1994, Capella *et al.* 2002).

**Country Occurrence:**

**Native:** Argentina; Brazil; Chile; Falkland Islands (Malvinas); Peru; Uruguay

**Vagrant:** Colombia; Ecuador

**FAO Marine Fishing Areas:**

**Native:** Atlantic - southwest, Pacific - southeast

## Population

The South American Sea Lion is the most abundant marine mammal occurring along the southern part of South America (Cappozzo 2002). The population of the coast of Uruguay consists of two main reproductive colonies, Isla Lobos (35°01'S) and Cabo Polonio (34°24'S), and is estimated to be about 12,000-13,000 individuals (1,200-2,675 pups born per year; Páez 2006, Pedraza *et al.* 2012, Franco-Trecu 2015). On the northern coast of Argentina, there are only four haulouts (about 2,500 individuals), while the Patagonian region has both reproductive and non-reproductive colonies (about 120,700 individuals). An additional 7,500 animals are found in the Falkland Islands (Crespo *et al.* 2012). Baylis *et al.* (2015) reported a minimum estimate of 4,443 pups born at the Falklands in 2014. The Chilean population is estimated to be approximately 197,000 animals (Venegas *et al.* 2001, Bartheld *et al.* 2008, Sepúlveda *et al.* 2011, Oliva *et al.* 2012, Contreras *et al.* 2014). There are at least 105,000 individuals in Peru (IMARPE 2013), and no more than 200 on the Brazilian coast (Sanfelice *et al.* 1999, Pavanato *et al.* 2013). Therefore, the total global population is approximated to be at least 445,000 individuals.

South American Sea Lion numbers are increasing in northern Patagonia, in the Rio Negro (41°03'S) and northern Chubut (43°34'S) provinces, at 5.7-6% per year (Dans *et al.* 2003a, Grandi 2010). In central Patagonia, in the central (43°57'S) and southern Chubut (45°23'S) province, they are also increasing at 6% annually (Reyes *et al.* 1999, Reyes 2004). In Chile between 15°56'S and 48°40'S, the population increased from 137,000 to 197,000 in 7 years (Oliva *et al.* 2012, Contreras *et al.* 2014). The population trend in the Magallanes Region is unknown. On the other hand, abundance has been decreasing in Uruguay. Negative trends for all sex and age classes of the breeding population were reported by Páez (2006) as -1.4% per year for adult males, -2.1% for adult females, and -4.5% for pups. Results from population modeling by Páez (2006) showed a 2% per year decline for total population size and a 3% decline in birth rates. This coincides with recent findings from Franco-Trecu (2015) that estimated a -2% (CI -1.1% to -2.5%) decline in pup production using pup count data from 1956-2013. Although the reasons for the population decline in Uruguay are still unknown, it is suspected that it could be related to interactions with fishing activities (Crespo *et al.* 2012, Riet-Sapriza *et al.* 2013) and with the long-term effect of harvest (Franco-Trecu 2015). The cumulative effects of population extractions, including pup harvesting (~50,000) and zoo and aquaria sales (144 young males and 285 young females), not only reduced the local population size, but also could have disrupted its social structure to the point where Allee effects could be limiting the post-harvesting population recovery at Isla de Lobos (Franco-Trecu *et al.* 2015). In southern Patagonia, in the Santa Cruz (46°01'S) and Tierra del Fuego (54°88'S) Provinces, the trend is unknown because data are insufficient to estimate a rate of change (Schiavini *et al.* 2004); however, the current numbers are clearly less than the estimates reported in the late 1940s. Sealing activities, performed mainly at northern Patagonia and at Tierra del Fuego, are likely responsible for the depletion (Schiavini *et al.* 2004). At the Falkland Islands there was a 95% decline in the population from >380,000 animals to <30,000 (from 80,555 pups in the mid 1930s to 5,506 pups in 1965; Hamilton 1939, Strange 1979). The number of pups estimated in 2014 for the Falkland Islands was 6% of the number estimated in 1930s (Baylis *et al.* 2015). Different hypotheses have been proposed to explain the decline, include commercial sealing and environmental change (Strange 1979, Thompson *et al.* 2002, Baylis *et al.* 2015). However, the trend has been positive since 1990; with an 8.5% annual increase from 1990 to 1995, and a 3.8% annual increase between 1995 and 2003 (Crespo *et al.* 2012).

South American Sea Lion population trends along the Chilean coast are not homogenous. In northern Chile the populations are increasing (Barthled *et al.* 2008, Oliva *et al.* 2012) whereas the trend is

unknown for central and southern Chile (Sepúlveda *et al.* 2011).

Due to the 1997-98 El Niño Southern Oscillation (ENSO), the Peruvian population of South American Sea Lions declined from about 144,087 animals in December 1997 to 27,991 in December 1998, a reduction of 81% (Arias-Schreiber and Rivas 1998, Arias-Schreiber 1998). This was probably due to a combined effect of mortality and dispersal from historically surveyed breeding and haul out sites. After this dramatic reduction, there was a recovery of 76.3%, with an estimated 118,220 individuals by 2006 (IMARPE 2006). The recovery of the population of Sea Lions on the coast of Peru is due to improved reproductive levels as a consequence of an increase in food availability as well as migration from the colonies in northern Chile (Oliveira *et al.* 2012). However, the stronger and more frequent ENSOs that appear to be occurring along the Peruvian coast may put the population in Peru at greater risk (Soto *et al.* 2004).

The majority of subpopulations in the southwestern Atlantic Ocean are increasing, although the trends are not homogeneous. However, in contrast to what is observed on the Peruvian Pacific coast, the population sizes do not show large inter-annual fluctuations (Crespo *et al.* 2012). In Chile, the population is increasing steadily (Oliva pers. comm).

**Current Population Trend:** Stable

## **Habitat and Ecology (see Appendix for additional information)**

South American Sea Lions are stocky, heavy-bodied otariids that are strongly sexually dimorphic (Cappozzo 2002). Adult males reach 2.1-2.6 m in length and weights of 300-350 kg; females reach 1.5-2 m and 170 kg (Grandi *et al.* 2012a, Rosas *et al.* 1993, Cappozzo and Perrin 2009, Riet-Sapriza *et al.* 2013). At birth, pups weigh 11-15 kg and are 75-85 cm long. Pups are born black above and paler below, often with grayish-orange tones on the undersides. They undergo their first molt 1-2 months after birth, becoming dark brown. This color fades during the rest of the first year to a pale tan to light brown, with paler areas on the face (Vaz-Ferreira 1975).

Sexual maturity is attained at 4-5 years for females and 4-7 years for males, but males cannot hold and defend a territory and maintain a harem until they reach 9-11 years old (Grandi *et al.* 2012a, Vaz-Ferreira 1982). Gestation lasts about one year. Longevity is considered to be about 20 years. Mortality rates for adults are unknown (Reijnders *et al.* 1993). Pup mortality estimated for some Peruvian colonies ranged from 13% before ENSO events to 100% during ENSO, and was negatively correlated with prey availability (Soto *et al.* 2004).

Breeding takes place during the austral summer, starting in mid-December. The start of the breeding season varies somewhat by location and latitude, with longer seasons occurring at low latitudes and shorter seasons occurring further south at high latitudes (Campagna 1985, Soto 1999). At most breeding sites, both sexes arrive in mid-December, with peak numbers of males and females ashore during the second half of January. Females give birth to a single pup, 2-3 days after their arrival at the rookeries, and remain onshore to nurse for approximately 7 days. Pups are born from mid-December to early February, with a peak in mid-January, coinciding with the timing of peak numbers of females ashore. Estrous occurs 6 days after parturition, and females make their first foraging trip 2-3 days after estrous. From this point on, a cycle of foraging and pup attendance starts and lasts until pups are weaned at 8-10 months old (Ponce de León and Pin 2006, Vaz-Ferreira 1982). As is the case for many Sea Lions, it is not

unusual for females to continue to care for a yearling while they are nursing a new pup, as lactation can be extended up to three years although that is rarely observed (Campagna and Le Boeuf 1988a, Soto 1999). In Chile, pups gather in large pods on the rookeries while waiting for their mothers to return from 1-4 day long foraging trips. Females usually stay ashore for 1-2 days between trips (Muñoz *et al.* 2011). In Uruguay, trips have an average duration of  $1.5 \pm 0.9$  days and visits ashore are  $1.1 \pm 0.8$  days (Riet-Sapriza *et al.* 2013).

South American Sea Lions are a highly polygynous species. Social groups are composed by a dominant male and 4-10 adult females, although some solitary couples are found. This variation in female numbers depends on the various strategies employed by males and females during the breeding season that are related to colony substrate, thermoregulatory requirements imposed by weather conditions at the site, or avoidance of male harassment (Vaz-Ferreira 1982; Campagna and Le Boeuf 1988b; Cassini 1999, 2000; Cappozzo *et al.* 2008; Franco-Trecu *et al.* 2015). In Argentina, adult males tend to establish territories through vocalizing, posturing, and fighting when rookeries provide shade, have tidal pools that can be used for cooling, or funnel interior areas through narrow beaches between rocks or ledges to the sea. At more homogeneous locations with long shorelines, the male strategy focuses on identifying, defending, and controlling individual females in estrous, wherever they are found. Bulls actively and aggressively work to keep estrous females close to them by grabbing, dragging, and throwing them back inland, away from the shoreline (Campagna and Le Boeuf 1988b). On the Peruvian coast a lek-like mating system has been described in which males maintain positions along the shoreline where females pass each day (Soto and Trites 2011). According to these authors, the daily movements of females toward the water accentuate the difficulty for males to monopolize females and thus males are not able to defend females. In Uruguay, researchers combining behavioural and molecular data found that the reproductive behaviour actually involves the coexistence of two types of polygyny each occurring in different parts of the same rookery (Isvaran 2005, Taborsky *et al.* 2008). On one hand, males at the tide line monopolize relatively stable groups of females (female-defense polygyny) within floating territories (i.e., a territory that changes position over time) whose locations change with the tidal variation at the study site (Wilson 1975, Alcock *et al.* 1978, Barrows 1983). On the other, males at the internal pools defend fixed territories (defined as territory having a stable location during the tenure by its holder (Dewsbury 1978) and established a resource-defense polygyny (Emlen and Oring 1977).

At sea, South American Sea Lions frequently raft alone or in small to large groups. They have been reported in association with feeding cetaceans and seabirds (Duffy 1983). On the Atlantic coast most lactating females have been described as benthic divers and forage in shallow water within the continental shelf. Mean depth of dives at Isla Lobos, Uruguay, were 15-25 m and they lasted 1.0-2.5 minutes (Riet-Sapriza *et al.* 2013), and females from northern Patagonian rookeries made dives in the range of 2-30 m lasting < 4 minutes (Campagna *et al.* 2001). However, high levels of variability in foraging patterns have been found, as some lactating females from northern Patagonia and the Falkland Islands also behave as pelagic predators (Werner and Campagna 1995, Thompson *et al.* 1998, Campagna *et al.* 2001). The deepest dives recorded for female South American Sea Lions (>60 m) off Patagonia, Argentina, are similar to the depth of the shelf in that area (Campagna *et al.* 2001). Other deep dives of 100 m have been recently recorded in individuals off the coast of Argentina by Drago, Crespo and Franco-Trecu (unpublished data).

Adult male South American Sea Lions have been observed to reach distances of more than 300 km from the coast, both in Argentinean and Chilean waters (Campagna *et al.* 2001, Hückstädt and Krautz 2004).

Juvenile Sea Lions in central Chile rarely ventured into offshore waters, reaching a mean distance from the coastline of 20 km, with a maximum of only 80 km. They show a clear pattern of epipelagic foraging, with dives usually shallower than 20 m, but sometimes reaching depths of 240 m (Hückstädt *et al.* 2014). ). In southern Chile a mesopelagic foraging behavior has been described, with mean dive depths of 100-120 m lasting 2.0-2.5 minutes, with a maximum depth of 320 m and duration of 5 minutes (Sepúlveda *et al.* in preparation). Hückstädt and Krautz (2004) observed Southern Sea Lions in the Pacific Ocean in association with a fleet fishing for Jack Mackerel (*Trachurus symmetricus*) outside the continental shelf, suggesting different behavior than that observed in the Atlantic Ocean, where the diving pattern is likely related to the depth of the continental shelf (Werner and Campagna 1995, Thompson *et al.* 1998, Campagna *et al.* 2001, Riet-Sapiriza *et al.* 2013).

South American Sea Lions are considered non-migratory, although many individuals make seasonal movements away from rookeries during the non-breeding season (Rosas *et al.* 1994), and some southerly locations such as the Falkland Islands are largely abandoned during the winter. Although there are no breeding colonies in Brazil, many Sea Lions are found there throughout the year, grouped in specific places to rest (Refúgio de Vida Silvestre da Ilha dos Lobos, Torres – 29°20'S and Refúgio de Vida Silvestre Molhe Leste, São José do Norte – 32°11'S), or swimming in coastal waters in winter and spring months. Since many Sea Lions make seasonal movements away from their reproductive colonies in search of feeding grounds, it has been suggested that individuals in Brazil come from the breeding colonies off Uruguay after their breeding period (Rosas *et al.* 1994, Pinedo 1990). Among the continental and island colonies of the Argentine coast there is evidence of seasonal movements (Lewis and Ximénez 1983; Giardino *et al.* 2008, 2009). Animals that reproduce at Península Valdés (northern Argentine Patagonia) move to Uruguay and vice versa (Szapkievich *et al.* 1999).

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. Forty-one prey species (including fishes, cephalopods, crustaceans, gastropods, polychetes, sponges, and tunicates) were identified in stomach contents of individuals found dead on beaches and from animals recovered in incidental catch of the fisheries of the Patagonian continental shelf (Koen Alonso *et al.* 2000). The most important items were Argentine Hake (*Merluccius hubbsi*), Red Octopus (*Enteroctopus megalocyathus*), Argentine Shortfin Squid (*Illex argentinus*), Raneya (*Raneya brasiliensis*), Patagonian Squid (*Loligo gahi*) and Argentine Anchovy (*Engraulis anchoita*). Differences in diet were found between sexes. Females fed mostly on coastal and benthic species, like Red Octopus and Argentine Shortfin, whereas males fed mostly on demersal-pelagic species, such as Argentine Hake and Patagonian Squid (Crespo *et al.* 1997, Koen Alonso *et al.* 2000). As expected from differences in body mass, Sea Lion males from northern Patagonia had been reported to exploit benthic and deeper foraging grounds than females (Campagna *et al.* 2001, Drago *et al.* 2009), although differences in foraging habits between the sexes are not constant over time (Drago *et al.* 2009). In Uruguay, carbon and nitrogen stable isotope values of skin and bone were used to infer the trophic relationships between the sexes during the pre-breeding period and year round. The study revealed that male and female Sea Lions used a variety of foraging strategies throughout the year and that no differences existed between the sexes. However, the diversity of foraging strategies was strongly reduced in both sexes during the pre-breeding period, when all individuals increased their consumption of pelagic prey over benthic prey, and isotopic niche space of males and females did not overlap at all (Drago *et al.* 2015). These results indicate that sexual foraging segregation only takes place during the pre-breeding season, when crowding in the areas surrounding the breeding rookeries increases and per-capita

resource availability declines. At Isla de Lobos, Uruguay, the most abundant prey species during summer are cephalopods (Family Omastrephidae) and Striped Weakfish (*Cynoscion guatucupa*). However, the principal contribution by biomass is accounted by Whitemouth Croaker (*Micropogonias furnieri*), Large Head Hairtail (*Trichiurus lepturus*), Brazilian Codling (*Urophycis brasiliensis*), and Argentine Croaker (*Umbrina canosai*) (Riet-Sapiriza *et al.* 2013). In Peru, Sea Lions prey mostly on Anchoveta (*Engraulis ringens*), Mote Sculpin (*Normanichthys crockeri*), Lumptail Searobin (*Prionotus stephanophrys*), Peruvian Hake (*Merluccius gayi*), Red Squat Lobster (*Pleuroncodes monodon*), and cephalopods (Fam. Loliginidae) (Paredes and Arias Schreiber 1999).

In Chile, temporal and spatial diet plasticity was found by Muñoz *et al.* (2011). In northern Chile the main prey species for South American Sea Lions are Anchovy, Patagonia Squid (*Loligo gahi*), Cabinza Grunt (*Isacia conceptionis*), and Corvina (*Cilus gilberti*). In central Chile the main prey are South Pacific Hake (*Merluccius gayi gayi*), Snoek (*Thyrsites atun*), and Araucanian Herring (*Strangomera bentinckii*), whereas in southern Chile the main species were the Chilean Jack Mackerel (*Trachurus murphyi*) and Snoek. In southern Chile farmed-raised salmonids are also important in the diet, suggesting that South American Sea Lions are capable of modifying their dietary habits in response to variation in abundance and/or accessibility of prey (Muñoz *et al.* 2011, Sepúlveda *et al.* 2015).

Diet and maternal care patterns reflect inter-annual fluctuations in food availability. In the unpredictable Peruvian upwelling ecosystem, females appeared to adjust their diets and maternal attendance patterns in response to annual changes in the abundance and distribution of prey (Soto *et al.* 2006). Short times onshore nursing and prolonged times at sea foraging are observed in Peru during ENSO events when prey are not abundant near the rookeries. As a result, the fasting ability of pups may be exceeded causing high mortality due to starvation (Soto *et al.* 2004, 2006). A larger diversity of prey species (particularly of demersal fishes) is consumed during ENSO, when Anchovy and Squat Lobster are less available. These observations suggest that South American Sea Lions may be good indicators of relative changes in the distribution and abundance of marine resources.

A small percentage of sub-adult and adult male South American Sea Lions regularly attack and kill South American Fur Seal (*Arctocephalus australis*) pups in Peru (Harcourt 1993), Argentina (Campagna *et al.* 1988b), and in Uruguay (Franco-Trecu, pers. comm). In Peru, attacks occurred more frequently in the nonbreeding season, when Fur Seal males are not actively defending the breeding colony (Harcourt 1993). Adult or sub-adult male Sea Lions hunt alone and focus their attacks on Fur Seal pups and juveniles up to two years of age that are consumed when caught. Sub-adult males also attack, but tend to abduct Fur Seals to serve as female Sea Lion substitutes, herding them and attempting to mate with them, usually killing them in the process. Sub-adults never consumed the pups they abducted (Harcourt 1991, 1992, 1993). Sea lions directly increase pup mortality when they take and kill young Fur Seal pups. These actions also indirectly increase mortality by creating disturbances on the beaches. When Sea Lions enter a beach with Fur Seals severe localized disturbances occur, animals in the immediate vicinity will stampede, and separations of mother-pup pairs are frequent. Pups may be crushed by older animals, or by rocks dislodged by the stampede. Although rare, Sea Lions will also kill adult female Fur Seals, and if the female has a pup it will then die of starvation (Harcourt 1992). Sea Lions have been observed killing young Southern Elephant Seals (*Mirounga leonina*) at the Falkland Islands. They are also known to take several species of Penguins, but the importance of Penguins in the diet is unknown (Boswall 1972, Strange 1982, Raya Rey *et al.* 2012). Sea Lions have also been recorded preying on Sea Turtles in Peru and northern Chile (Hückstädt pers. comm., Cárdenas-Alayza unpublished data).

Predators of South American Sea Lions include Killer Whales (*Orcinus orca*) (Grandi *et al.* 2012b), Sharks (Crespi Abril *et al.* 2004), and possibly Leopard Seals (*Hydrurga leptonyx*) and Puma (*Puma concolor*). Puma tracks have been observed on a rookery in Patagonia and remains of Sea Lions have been found in a cave used by a Puma in the area. At the well known rookery of Punta Norte at Península Valdés, Killer Whales are known to surf in on waves partially beaching themselves while grabbing predominantly young Sea Lions off the shoreline.

**Systems:** Terrestrial, Marine

## Use and Trade

South American Sea Lions were hunted by native people of South America for thousands of years and have been taken by Europeans as early as the 16th century for food, oil, and hides (Rodriguez and Bastida 1998, Saporiti *et al.* 2014, Zenteno *et al.* 2015). Significant commercial harvests occurred in several countries and Sea Lion numbers were drastically reduced over the last several hundred years (Majluf and Trillmich 1981, Drago *et al.* 2009, Grandi *et al.* 2015). Commercial harvesting is currently not allowed, however, illegal kills are still being conducted (Cárdenas-Alayza unpublished data).

## Threats (see Appendix for additional information)

During the second half of the 19th century humans rapidly colonized coastal zones, and by the turn of the century South American Sea Lion rookeries had disappeared from parts of their range. Dramatic declines were not only due to spatial competition with humans, but also to the direct effect of over-exploitation in areas of the southwestern Atlantic (Crespo *et al.* 1997, 2012; Grandi *et al.* 2015).

The growing use of coastal waters for fishing and aquaculture activities have increased the potential for interaction between marine mammals and industries related to fishing (Bjørge *et al.* 2002). For South American Sea Lions the conflicts occur in all the areas in which colonies of the species are near fishing zones, since there is generally an overlap in the resources and/or the areas used by Sea Lions and fisheries (Aguayo and Maturana 1973, George-Nascimento *et al.* 1985, Sielfeld *et al.* 1997, Koen Alonso *et al.* 2000). Interactions occur regularly with fisheries that use a variety of fishing gear and target coastal and pelagic species (Campagna *et al.* 2001, Corcuera *et al.* 1994, Crespo *et al.* 1994, Hückstädt and Antezana 2003, Sepulveda *et al.* 2007, Riet-Sapriza *et al.* 2012, Reyes *et al.* 2013, Machado *et al.* 2015a). The interactions with fishing activities are not only at the direct level but are also assumed to occur at an indirect level, due to competition for the fish resources.

Catches of South American Sea Lions by fishing activities are reported for gillnet fisheries in Peru (Majluf *et al.* 2002), Chile (Sepúlveda *et al.* 2007), and Uruguay (Franco-Trecu *et al.* 2009); for purse seine fisheries in Chile (Hückstädt and Antezana 2003) and Argentina (Seco Pon *et al.* 2013); and for trawl fisheries in Argentina (Crespo *et al.* 1997, Dans *et al.* 2003b), Chile (Reyes *et al.* 2013), Uruguay (Szephegyi *et al.* 2010), and Brazil (Machado *et al.* 2015b). During the 1990s, the annual incidental catch of Sea Lions in bottom trawl nets off Patagonia, Argentina, was estimated as 175-602, which represented about 1-2% of the local population (Crespo *et al.* 1997, Dans *et al.* 2003a). Crespo *et al.* (2012) estimated that in the 2000s 74 South American Sea Lions were caught per year in San Matías Gulf in Argentina. Along the central-southern coast of Chile, Reyes *et al.* (2013) observed a relatively high level of incidental catches of Sea Lions by industrial trawl vessels, with about 1.2 animals taken per

fishing operation. Of those caught, 14.6% were dead when brought aboard. In Uruguay, the annual mortality of Sea Lions due to incidental catches in trawl fisheries was estimated at 36-107 per year, which represents approximately 0.3-0.9% of the local population (Franco-Trecu *et al.* in prep). In Brazil, 21.4% of dead stranded Sea Lions (n=15) had marks caused by fishery interaction in an analysis covering 1991-2011 (Machado *et al.* 2012).

A longstanding competition for fish has existed in Chile between South American Sea Lions and small-scale fisheries. According to fishermen, Sea Lions prey on fish caught in their fishing gear, often causing damage, and they feel that the only solution to their conflict would be the approval of harvest quotas for Sea Lions. However, a study of the operational interactions suggests that Sea Lions do not produce a significant effect on variations in the catch per unit effort by artisanal fishermen (Sepúlveda *et al.* 2007). Interactions between Sea Lions and Salmon farms in southern Chile are common, and some animals are illegally killed to protect the farming operations. Besides killing fish, Sea Lions sometimes rip the nets, liberating some or all of the Salmon in the cage with consequent ecological, economic, and social problems (Sepúlveda *et al.* 2013). Anti-predator nets, the only protection system currently being used, result in significant reductions in Sea Lion attacks (Sepúlveda and Oliva 2005, Vilata *et al.* 2010). In Peru, results from necropsies on mortality events of dozens of adult male and sub-adult male Sea Lions showed that the cause of mortality was related to poisoning from carbamates. Fishing gear was also found in stomachs of dead animals (IMARPE 2013).

## **Conservation Actions (see Appendix for additional information)**

South American Sea Lions are protected and managed by laws in most of the countries where they occur. Sea lions have also been afforded protection by the establishment of numerous reserves and protected areas at rookeries and haul out sites, especially in Argentina. However, enforcement of protective regulations is weak in most of the distribution range, particularly in the most isolated areas and at sea. In Peru it is illegal to poach, export, or transport South American Sea Lions for commercial purposes (Decreto Supremo No. 013-99-AG). After the population decline that followed the 1997-1998 ENSO led to the South American Fur Seals being categorized as in danger of extinction in Peru (Decreto Supremo No. 034-2004-AG), Sea Lions in Peru were re-categorized as Vulnerable (Decreto Supremo No. 004-2014-MINAGRI). In Chile, the South American Sea Lion is the only marine mammal species that is considered a productive resource and thus is suitable for exploitation. Since 2004 and for five years there has been a moratorium that could be lifted if the interaction with fisheries is shown to be detrimental to the fisheries. In 2006, for the first time, a Sea Lion harvest quota was established for the aboriginal populations of the Magallanes region, thus helping with the conservation of their traditions. Finally, in 2008 the capture of live Sea Lions was authorized for exhibitions, as well as the capture of animals dangerous to human health (Oliva *et al.* 2008). The moratorium has been renewed since 2004 and exploitation is currently banned in Chile. In Uruguay, the South American Sea Lion was declared a priority species for conservation by the SNAP (National System of Protected Areas) and was named as a focal object of conservation in the Marine Protected Area of Cabo Polonio. Since 2011, a community-based participatory research program (POPA) is being developed where the use of pound nets is evaluated to mitigate the interaction between Sea Lions and artisanal fishing in Piriápolis (Bentancour *et al.* 2014). In Brazil, all the pinniped species have been under protection since 1986 by law (Portaria SUDEPE n0 N-11, de 21-02-1986) and also by the National Action Plans for Conservation of Brazilian Aquatic Mammals (IBAMA 2001, Rocha-Campos *et al.* 2011). South American Sea Lions have also been afforded protection by the establishment of numerous reserves and marine protected areas (MPAs), including privately owned sites.

Engel *et al.* (2014) suggested that the participation of fishermen will be essential to develop real strategies for sustainable tourism and for the future management plan of any marine protected area (MPA) with South American Sea Lions. According to the authors the future management plans should include: (1) environmental education that highlights the ecological importance of the MPA; (2) campaigns that highlight the potential sustainable use of the area for ecotourism; and (3) transforming the Sea Lion to a flagship species of the region. Finally, it is important that all these strategies be targeted to all groups (e.g., tourists, local children, and politicians), and not only for the fishing community.

## Credits

**Assessor(s):** Cárdenas-Alayza, S., Crespo, E. & Oliveira, L.

**Reviewer(s):** Hückstädt, L.A.

**Contributor(s):** Oliva, D., Sepúlveda, M., Franco-Trecu, V. & Túnez, J.

**Facilitators(s) and Compiler(s):** Lowry, L., Ahonen, H., Pollock, C.M., Chiozza, F., Battistoni, A.

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## Citation

Cárdenas-Alayza, S., Crespo, E. & Oliveira, L. 2016. *Otaria byronia*. *The IUCN Red List of Threatened Species 2016*: e.T41665A61948292. <http://dx.doi.org/10.2305/IUCN.UK.2016->

[1.RLTS.T41665A61948292.en](http://dx.doi.org/10.2305/IUCN.UK.2016-1.RLTS.T41665A61948292.en)

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# Appendix

## Habitats

(<http://www.iucnredlist.org/technical-documents/classification-schemes>)

Habitat	Season	Suitability	Major Importance?
13. Marine Coastal/Supratidal -> 13.1. Marine Coastal/Supratidal - Sea Cliffs and Rocky Offshore Islands	Resident	Suitable	Yes
12. Marine Intertidal -> 12.6. Marine Intertidal - Tidepools	Resident	Suitable	No
12. Marine Intertidal -> 12.3. Marine Intertidal - Shingle and/or Pebble Shoreline and/or Beaches	Resident	Suitable	No
12. Marine Intertidal -> 12.2. Marine Intertidal - Sandy Shoreline and/or Beaches, Sand Bars, Spits, Etc	Resident	Suitable	No
12. Marine Intertidal -> 12.1. Marine Intertidal - Rocky Shoreline	Resident	Suitable	Yes
10. Marine Oceanic -> 10.2. Marine Oceanic - Mesopelagic (200-1000m)	Resident	Suitable	No
10. Marine Oceanic -> 10.1. Marine Oceanic - Epipelagic (0-200m)	Resident	Suitable	Yes
9. Marine Neritic -> 9.1. Marine Neritic - Pelagic	Resident	Suitable	Yes
5. Wetlands (inland) -> 5.1. Wetlands (inland) - Permanent Rivers/Streams/Creeks (includes waterfalls)	Resident	Suitable	No

## Threats

(<http://www.iucnredlist.org/technical-documents/classification-schemes>)

Threat	Timing	Scope	Severity	Impact Score
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.1. Intentional use: (subsistence/small scale) [harvest]	Ongoing	-	-	-
	Stresses:	2. Species Stresses -> 2.1. Species mortality		
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.2. Intentional use: (large scale) [harvest]	Past, unlikely to return	-	-	-
	Stresses:	2. Species Stresses -> 2.1. Species mortality		
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.4. Unintentional effects: (large scale) [harvest]	Ongoing	-	-	-
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.1. Species mortality 2. Species Stresses -> 2.2. Species disturbance		
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.5. Persecution/control	Ongoing	-	-	-
	Stresses:	2. Species Stresses -> 2.1. Species mortality		

9. Pollution -> 9.3. Agricultural & forestry effluents -> 9.3.3. Herbicides and pesticides	Ongoing	Minority (50%)	No decline	Low impact: 4
Stresses:		2. Species Stresses -> 2.1. Species mortality		

## Conservation Actions in Place

(<http://www.iucnredlist.org/technical-documents/classification-schemes>)

<b>Conservation Actions in Place</b>
In-Place Research, Monitoring and Planning
Systematic monitoring scheme: No
In-Place Land/Water Protection and Management
Conservation sites identified: Yes, over part of range
Occur in at least one PA: Yes

## Conservation Actions Needed

(<http://www.iucnredlist.org/technical-documents/classification-schemes>)

<b>Conservation Actions Needed</b>
2. Land/water management -> 2.1. Site/area management
3. Species management -> 3.1. Species management -> 3.1.1. Harvest management
5. Law & policy -> 5.4. Compliance and enforcement -> 5.4.2. National level

## Research Needed

(<http://www.iucnredlist.org/technical-documents/classification-schemes>)

<b>Research Needed</b>
1. Research -> 1.2. Population size, distribution & trends
1. Research -> 1.5. Threats
3. Monitoring -> 3.1. Population trends

## Additional Data Fields

<b>Distribution</b>
Estimated area of occupancy (AOO) (km <sup>2</sup> ): 2476672
Continuing decline in area of occupancy (AOO): No
Extreme fluctuations in area of occupancy (AOO): No
Estimated extent of occurrence (EOO) (km <sup>2</sup> ): 8689760

<b>Distribution</b>
Continuing decline in extent of occurrence (EOO): No
Extreme fluctuations in extent of occurrence (EOO): No
Continuing decline in number of locations: No
Extreme fluctuations in the number of locations: No
Upper elevation limit (m): 5
Lower depth limit (m): 320
<b>Population</b>
Number of mature individuals: 222500
Continuing decline of mature individuals: No
Extreme fluctuations: No
Population severely fragmented: No
<b>Habitats and Ecology</b>
Continuing decline in area, extent and/or quality of habitat: No
Generation Length (years): 10.6
Movement patterns: Not a Migrant
Congregatory: Congregatory (and dispersive)

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