

SHORT COMMUNICATION

Incidental catch of South American sea lion in a pair trawl off southern Brazil

Captura incidental de um leão-marinho-sul-americano na pesca de arrasto de parelha no sul do Brasil

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Abstract

The population of the South American sea lion, *Otaria flavescens* (Shaw, 1800), in Uruguay is declining at an annual rate of 1.6 to 2.0%. Although the reasons are still unknown, interactions with fishing activities have been identified as a major cause. The individuals that arrive along the coast of Brazil come from the breeding colonies off Uruguay after their breeding period. We report here the first record of incidental catch of South American sea lions in Brazilian waters by a pair trawl. On July 17th, 2008 a young male of South American sea lion was incidentally caught during a commercial pair trawl fishing trip along the southern Brazilian coast (32°57'S, 52°31'W), in a depth ranging from 15 to 20 m. Despite being punctual, this record is an evidence of a potential major threat to South American sea lions in southern Brazil and Uruguay, since trawl industrial fishing is a very important economic activity in South Brazil.

Keywords: Pinnipeds, *Otaria flavescens*, human impact, human-carnivore conflicts, fishery interactions.

Resumo

A população do leão-marinho-sul-americano, *Otaria flavescens* (Shaw, 1800), está diminuindo a uma taxa anual de 1,6 a 2,0% no Uruguai. Embora as razões ainda sejam desconhecidas, as interações da espécie com as atividades de pesca vêm sendo indicadas como uma das principais causas deste declínio. Os indivíduos que são encontrados na costa do Brasil são oriundos das colônias reprodutivas do Uruguai. Relatamos aqui o primeiro registro de captura incidental de um leão-marinho-sul-americano em águas brasileiras em um arrasto de parelha, e discutimos o risco potencial desta interação para com a população de origem. Em 17 de julho de 2008, um macho jovem de leão-marinho-sul-americano foi capturado acidentalmente durante uma viagem de pesca de arrasto de parelha comercial ao longo da costa do sul do Brasil (32°57'S, 52°31'W), em um intervalo de profundidade de 15 a 20 m. Apesar de ser pontual, este registro é uma evidência de grande ameaça potencial para os leões-marinhos-sul-americanos no sul do Brasil e Uruguai, uma vez que a pesca industrial de arrasto é uma importante atividade econômica na região sul do Brasil.

Palavras-chave: Pinípedes, *Otaria flavescens*, impacto antrópico, conflito entre humanos e carnívoros, interação com a pesca.

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The South American sea lion *Otaria flavescens* (Shaw, 1800) occurs along the coast of South America, from southern Brazil in the Atlantic Ocean, and northern Peru in the Pacific Ocean, to Cape Horn (Vaz-Ferreira, 1982; Crespo *et al.*, 2012). Along the Atlantic coast, there are breeding colonies in Uruguay and Argentina (Crespo *et al.*, 2012). There are no breeding colonies of South American sea lions in Brazil, but many specimens are found there throughout the year, grouped in specific places to rest (Refúgio de Vida Silvestre da Ilha dos Lobos, Torres – 29°20'S, 49°43'W and Refúgio de Vida Silvestre Molhe Leste, São José do Norte – 32°11'S, 52°04'W), or swimming in coastal waters with high abundance in winter and spring months (Rosas *et al.*, 1994; Kinas *et al.*, 2005). Since many specimens perform seasonal movements away from their reproductive colonies in search for other feeding grounds, it is suggested that individuals in Brazil come from the breeding colonies off Uruguay after their breeding period (Rosas *et al.*, 1994; Pinedo, 1990).

The South American sea lion is classified as Least Concern on the IUCN Red List (IUCN, 2013). However, there are evidences suggesting that the Uruguayan population is declining at an annual rate of 1.6 to 2.0%. Estimates of the total number of remaining individuals range from 12,000 to 13,000 (Páez, 2005; Crespo *et al.*, 2012). Therefore, the species is listed for conservation priority in Uruguay (Soutullo *et al.*, 2009). Although the reasons for this population decline are still unknown, the interactions with fishing activities have been identified as a major cause of threat to the conservation of South American sea lions (IUCN, 2013; Crespo *et al.*, 2012).

Records of 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 An-

tezana, 2003) and Argentina (Seco Pon *et al.*, 2013); and for trawling fisheries in Argentina (Crespo *et al.*, 1997; Dans *et al.*, 2003) and Chile (Reyes *et al.*, 2013). Thus, this paper presents the first record of incidental catch of the South American sea lions in Brazilian waters and by a pair trawl fishery. We discuss the potential risk of this interaction for the population equilibrium in southern Brazil and Uruguay.

The fishing area is located in the southwestern Atlantic and includes the demersal zone of the continental slope of southern Brazil, between 32°01' and 33°45'S (Figure 1). The oceanographic conditions in the region are governed by the western branch of the South Atlantic anticyclone system of currents, consisting of the southward Brazil Current (>20°C; >36 UPS) and the northward Malvinas Current (4–15°C; >33–34 UPS) (García, 1997). The encounter of these two water masses is the west end of

the Subtropical Convergence of the South Atlantic, and their mixture results in the formation of the Central South Atlantic Water, a Subtropical mass of water (10–20°C; 35–36 UPS) (García, 1997) that flows to the east as part of the southern branch of the anticyclone (Reid *et al.*, 1977; Evans and Signorini, 1985). All this complex hydrological system makes the fishing area a particular region subject to cyclical environmental variations that play important role in the life cycle of the nektonic species.

A commercial pair trawl fishing trip in southern Brazil was monitored aboard in July 2008. During fishing operations, the two 21 m long boats were 250 m apart, towing a 100 m long net with the mouth approximately 50 m wide and 3 m high. The crew was composed of six fishermen. Only one observer was aboard. Trawls lasted exactly five hours and were conducted continuously during the twelve days of the fishing trip. The fishing depth ranged from 15

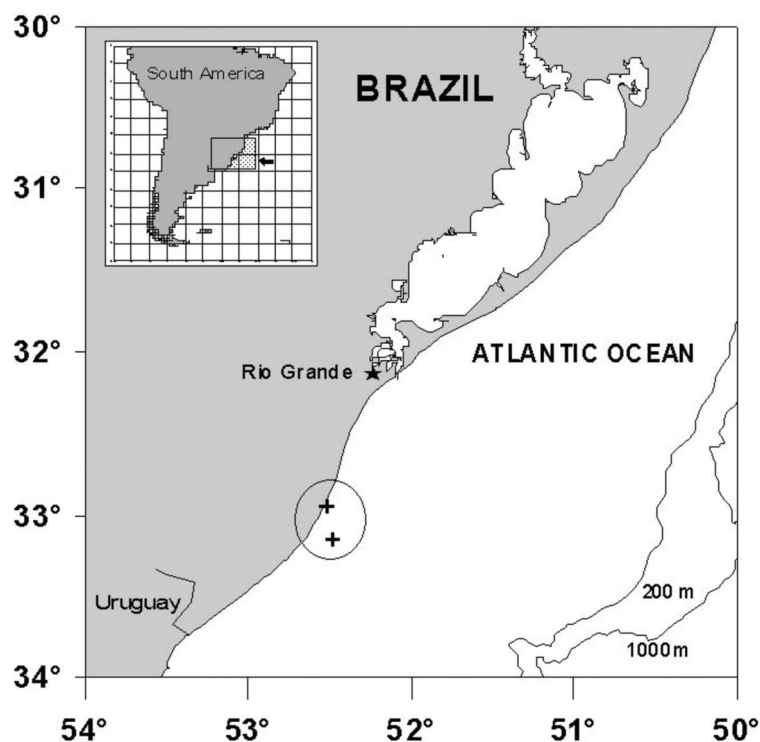


Figure 1. Fishing area in southern Brazil and location of the beginning and end of the pair trawl set in which one specimen of the South American sea lion *Otaria flavescens* was caught.

to 35 m. Technical details about the trawl fisheries in southern Brazil are found in Klippel *et al.* (2005).

On July 17th, 2008, a South American sea lion was incidentally caught during an afternoon haul (2:00 p.m. - 7:00 p.m.), carried out between 32°57'S, 52°31'W and 33°09'S, 52°29'W, in a depth range of 15 to 20m (Figure 1) and about 1.2 to 7.5 NM from the coast. The specimen was a young male, with estimated age around 4 to 5 years old, according to the external features (Figure 2). The animal was discarded at sea. At the time of capture, the fishermen said that deaths are rare, and that when incidental catches occur, the animals usually return to the sea by themselves. This statement was corroborated by a video recorded by a fisherman in 2012, to which we had access.

In almost 90% of the fishing sets, sea lions were seen following the boats, and feeding on discarded fish or protruding from the codend at the moment of the fishing gear retrieval (Figure 3).

It is estimated that 115 sea lions die each year off southern Brazil (Kinas *et al.*, 2005). However, there is no information about the proportion of mortality caused by fishery interactions. Machado *et al.* (2015) monitored 484 gillnet fishing operations in this area, between 1991 and 2012, and did not record any single incidental capture of sea lions, although fishermen stated that incidental catches may eventually occur. On the other hand, in this region it is common to find animals stranded with evidence of aggressions that may have caused the death. This kind of injuries has been attributed to fishermen (Rosas *et al.*, 1994).

During the 1990s the annual incidental catches of South American sea lions in bottom trawling nets off Patagonia, Argentina, were estimated between 175 and 602 individuals, which represented around 1-2% of the local population (Crespo *et al.*, 1997; Dans *et al.*, 2003). An-

other estimate in Argentina is that 74 South American sea lions were caught per year in the 2000s in San Matías Gulf (Crespo *et al.*, 2012). Along the central-southern coast

of Chile (37° to 40°S), Reyes *et al.* (2013) observed a relative high level of incidental catches of South American sea lions by industrial trawling vessels, of about 1.2 specimens per



Figure 2. Young male of the South American sea lion *Otaria flavescens* incidentally caught by pair trawlers in southern Brazil.



Figure 3. Young males of the South American sea lion *Otaria flavescens* trying to feed on the fishes caught by the trawling nets in southern Brazil.

fishing operation. From this total, 14.6% of South American sea lions were already dead. In Uruguay, the annual mortality of sea lions due to incidental catches in trawling fisheries was estimated in 50 individuals per year, which represents approximately 0.42% of the local population (Szephegyi *et al.*, 2010).

The absence of information about incidental catches in Brazil is probably due to the relatively low population density of South American sea lions in this country compared to the above mentioned countries. However, the lack of onboard scientific observers in most of the coastal fishing operations may also be considered. Thus, despite being punctual, the record reported here is an evidence of a potential major threat to South American sea lions in southern Brazil, since trawl industrial fishing is a very important economic activity in this region (Klippel *et al.*, 2005).

Incidental catches combined with mortality caused by fishermen aggressions (Rosas *et al.*, 1994) are cause for great concern, because most of the South American sea lions sighted in Brazil belong to the same population of the Uruguayan breeding colonies (Pinedo, 1990), which is declining (Páez, 2005; Crespo *et al.*, 2012). Although the reasons for this population decline are still unknown, it is suspected that it could be related to interactions with fishing activities (Riet-Saprizza *et al.*, 2013). In this sense, catches of sea lions and their interactions with fisheries in Brazil could contribute to the population decline of the species in Uruguay. Currently, there are about 80 trawlers operating in the state of Rio Grande do Sul, performing around 500 annual fishing trips (CEPERG, 2012). Added to this effort, vessels coming from the state of Santa Catarina also conduct fishing activities off Rio Grande do Sul (Sunye and Morisson, 2006). In this context, monitoring the fleet of commercial trawl fishing in southern Brazil is extremely neces-

sary in order to quantify the impact of this activity on the local population of South American sea lions.

Acknowledgements

The authors would like to thank Mr. Janguinha and all of his crew of the Pair Trawl Fishing boats Primavera VII and VIII, for permission to embark and for their generous collaboration and teachings at sea. We also thank the Editor in Chief of this journal, Ana Maria Leal Zanchet, and the anonymous referees for comments and suggestions that improve this manuscript. The Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) provided a scholar Master's grant (PROSUP) to RM.

References

- CEPERG. 2012. Desembarque de pesca no Rio Grande do Sul: 2011. Available at: <http://www4.icmbio.gov.br/ceperg/paginas/menu.php?id=8>. Accessed on: 13/11/2013.
- CRESPO, E.A.; PEDRAZA, S.N.; DANS, S.L.; KOEN-ALONSO, M.; REYES, L.M.; GARCÍA, N.; COSCARELLA, M. 1997. Direct and indirect effects of the high seas fisheries on the marine mammal populations in the northern and central Patagonian coast. *Journal of Northwest Atlantic Fishery Science*, **22**:189-207. <http://dx.doi.org/10.2960/J.v22.a15>
- CRESPO, E.A.; OLIVA, D.; DANS, S.L.; SEPÚLVEDA, M. 2012. *Current status of the South American sea lion along the distribution range*. Valparaíso, Universidad de Valparaíso Press, 114 p.
- DANS, S.L.; KOEN-ALONSO, M.; CRESPO, E.A.; PEDRAZA, S.N.; GARCÍA, N. 2003. Interactions between marine mammals and high seas fisheries in Patagonia: an integrated approach. In: N. GALES; M. HINDELL; R. KIRKWOOD (org.), *Marine Mammals: Fisheries Tourism and Management Issues*. Collingwood, CSIRO, p. 88-103.
- EVANS, D.L.; SIGNORINI, S.R. 1985. Vertical structure of the Brazil Current. *Nature* **135**: 48-50. <http://dx.doi.org/10.1038/315048a0>
- FRANCO-TRECU, V.; COSTA, P.; ABUD, C.; DIMITRIADIS, C.; LAPORTA, P.; PASSADORE, C.; SZEPHEGYI, M. 2009. By-catch of franciscana *Pontoporia blainvillei* in Uruguayan artisanal gillnet fisheries: an evaluation after a twelve-year gap in data collection. *The Latin American Journal of Aquatic Mammals*, **7**(1-2):11-22. <http://dx.doi.org/10.5597/lajam00129>
- GARCÍA, C.A.E. 1997. Physical Oceanogra-

- phy. In: U. SEELIGER; C. ODEBRECHET; J.P. CASTELLO (org.), *Subtropical Convergence Environments. The Coast and Sea in the Southwestern Atlantic*. Heidelberg, Springer, p. 94-96.
- HÜCKSTÄDT, L.A.; ANTEZANA, T. 2003. Behavior of the southern sea lion (*Otaria flavescens*) and consumption of the catch during purse-seining for jack mackerel (*Trachurus symmetricus*) off central Chile. *ICES Journal of Marine Science*, **60**(5):1003-1011. [http://dx.doi.org/10.1016/S1054-3139\(03\)00100-0](http://dx.doi.org/10.1016/S1054-3139(03)00100-0)
- IUCN. 2013. IUCN Red List of Threatened Species. 2013. Available at: <http://www.iucnredlist.org/details/41665/0>. Accessed on: 13/11/2013
- KINAS, P.G.; SILVA, K.G.; ESTIMA, S.G.; MONTEIRO, D. 2005. Generalized linear models applied to stranding data of South American sea lions (*Otaria flavescens*) and South American fur seals (*Arctocephalus australis*) in southern Brazil. *The Latin American Journal of Aquatic Mammals*, **4**(1):7-14. <http://dx.doi.org/10.5597/lajam00065>
- KLIPPEL, S.; VOOREN, C.M.; LAMÓNACA, F.; PERES, M.B. 2005. A pesca industrial no sul do Brasil. In: C.M. VOOREN; S. KLIPPEL (org.). *Ações para a conservação de tubarões e raias no sul do Brasil*. Porto Alegre, Igaré, p. 135-177.
- MACHADO, R.; OTT, P.H.; MORENO, I.B.; DANILEWICZ, D.; TAVARES, M.; CRESPO, H.A.; SICILIANO, S.; OLIVEIRA, L.R. 2015. Operational interactions between South American sea lions and gillnet fishing in southern Brazil. *Aquatic Conservation: Marine and Freshwater Ecosystems*. Available at: <http://onlinelibrary.wiley.com/doi/10.1002/aqc.2554/abstract>. Accessed on: 23/02/2015.
- MAJLUF, P.; BABCOCK, E.A.; RIVEROS, J.C.; SCHREIBER, M.A.; ALDERETE, W. 2002. Catch and bycatch of sea birds and marine mammals in the small-scale fishery of Punta San Juan, Peru. *Conservation Biology*, **16**(5):1333-1343. <http://dx.doi.org/10.1046/j.1523-1739.2002.00564.x>
- PÁEZ, H. 2005. Situación de la administración del recurso lobos y leones marinos en Uruguay. In: R. MENAFRA; L.R. GALLGO; F. SCARBINA; D. CONDE (org.), *Bases para la conservación y el manejo de la costa uruguaya*. Montevideo, Vida Silvestre Uruguay, p. 557-581.
- PINEDO, M. C. 1990. Ocorrência de Pinípedes na costa brasileira. *Garcia de Orla, Série Zoológica*, **15**(2):37-48.
- REYES, P.; HUCKE-GAETE, R.; TORRES-FLOREZ, J.P. 2013. First observation of operational interactions between bottom-trawling fisheries and South American sea lion, *Otaria flavescens* in south-central Chile. *Journal of the Marine Biological Association of the United Kingdom*, **93**(2):1-6. <http://dx.doi.org/10.1017/S0025315412001282>
- REID, J.L.; NOWLIN, W.D.JR.; PATZERT, W.C. 1977. On the characteristics and circulation of the southern Atlantic Ocean. *Journal of Physical Oceanography*, **7**(1):62-91. <http://dx.doi.org/10.1029/JOP701i01p0062>

org/10.1175/1520-0485(1977)007<0062:OTCA
CO>2.0.CO;2

RIET-SAPRIZA, F.G.; COSTA, D.P.; FRANCO-TRECU, V.; MARÍN, Y.; CHOCCA, J.; GONZÁLEZ, B.; BEATHYATE, G.; CHILVERS, B.L.; HÜCKSTADT, L.A. 2013. Foraging behaviour of lactating South American sea lions (*Otaria flavescens*) and spatial-temporal resource overlap with the Uruguayan fisheries. *Deep-Sea Research Part II*, **88-89**:106-119. <http://dx.doi.org/10.1016/j.dsr2.2012.09.005>

ROSAS, F.C.W.; PINEDO, M.C.; MARMONTEL, M.; HAIMOVICI, M. 1994. Seasonal movements of the South American sea lion (*Otaria flavescens*, Shaw) off the Rio Grande do Sul coast, Brazil. *Mammalia*, **58**(1):51-59. <http://dx.doi.org/10.1515/mamm.1994.58.1.51>

SECO PON, P.S.; COPELLO, S.; MORETINI, A.; LÉRTORA, H.P.; BUENA, I.; BASTIDA, J.; MAUCO, L.; FAVERO, M. 2013. Seabird and marine-mammal attendance and by-catch in semi-industrial trawl fisheries in near-shore waters of northern Argentinian. *Ma-*

rine and Freshwater Research, **64**(3):237-248. <http://dx.doi.org/10.1071/MF12312>

SEPÚLVEDA M.; PÉREZ M.J.; SIELFELD W.; OLIVA D.; DURÁN L.R.; RODRÍGUEZ L.; ARAOS V.; BUSCAGLIA M. 2007. Operational interactions between South American sea lions *Otaria flavescens* and artisanal (small-scale) fishing in Chile: results from interview surveys and on-board observations. *Fisheries Research*, **83**(2-3):332-340. <http://dx.doi.org/10.1016/j.fishres.2006.10.009>

SOUTULLO, A.; ALONSO, E.; ARRIETA, D.; BEYHAUT, R.; CARREIRA, S.; CLAVIJO, C.; CRAVINO, J.; DELFINO, L.; FABIANO, G.; FAGUNDEZ, C.; HARETCHE, F.; MARCHESI, E.; PASSADORE, C.; RIVAS, M.; SCARABINO, F.; SOSA, B.; VIDAL, N. 2009. Especies prioritarias para la conservación en Uruguay 2009. *Serie documentos de trabajo N° 16*. Montevideo, p. 93.

SUNYE, P.S.; MORISSON, T.C. 2006. Diagnóstico da pesca no litoral do Estado de Santa Catarina. In: V.J. ISAAC; A.S. MARTINS; M.

HAIMOVICI; J.M. ANDRIGUETTO FILHO (org.), *A pesca marinha e estuarina do Brasil no início do século XXI: recursos tecnológicos, aspectos socioeconômicos e institucionais*. Belém, Universitária UFPA, p. 141-156.

SZEPHEGYI M.N.; FRANCO-TRECU, V.; DOÑO, F.; REYES, F.; FORSELLEDO, R.; CRESPO, E.A. 2010. Primer relevamiento sistemático de captura incidental de mamíferos marinos en la flota de arrastre de fondo costero de Uruguay. In: XIV Reunión de Trabajo de Expertos en Mamíferos Acuáticos de América del Sur y 8° Congreso de la Sociedad Latinoamericana de Especialistas en Mamíferos Acuáticos (SOLAMAC), Florianópolis, 2010. *Anales...* **1**:103.

VAZ-FERREIRA, R. 1982. *Otaria flavescens* (Shaw), South American sea lion. In *Mammals of the seas: small cetaceans, seals, sirenians and otters*. *FAO Fisheries Series*, **4**(5):477-495.

Submitted on March 16, 2014
Accepted on October 27, 2014