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Short Communication

Evidence of copulation in an anthropogenic colony of the South American sea lion, *Otaria byronia* (De Blainville, 1820) in Río Valdivia, Valdivia, Chile

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ABSTRACT. In Chile, the South American sea lion *Otaria byronia* forms colonies on exposed rocky coasts. Since the mid-1970s, a group of individuals has become established around the Valdivia fish market (VFM) (ca. 39°S), southern Chile, where they regularly obtain food from fish discards provided by the fish market's sellers. Given their regular presence in the area and the lack of breeding activity, this group has been considered a non-breeding aggregation. From 2019 to 2025, researchers conducted 168 bimonthly censuses around the VFM as part of a long-term monitoring program; however, no mating events were recorded during those censuses. In December 2025, outside of census days, a copulatory event was observed in front of the VFM, indicating previously unreported reproductive behavior within this anthropogenic colony. Additionally, in April 2022, a dead pup was recorded within the Cruces River wetland, nearly 25 km north of the VFM. Together, these two reproductive-related records suggest that this anthropogenic colony may be transitioning toward a breeding structure.

Keywords: South American sea lions (*Otaria byronia*); anthropogenic colony; copulatory activity; Valdivia fish market; southern Chile

The South American sea lion, *Otaria byronia* (Carnivora, Otariidae), is widely distributed along the southern coast of South America. In the Pacific Ocean, the northernmost confirmed breeding site is located at Zorritos, Perú (03°40′S), although small colonies have also been reported in Ecuador (Felix 2002). South of this northern limit, *O. byronia* breeding sites occur along the Pacific coast down to Cape Horn. In the Atlantic Ocean, breeding sites occur from southeast Brazil (ca. 23°S) to the southern end of Argentina, including the Falkland/Malvinas Islands (Aguayo & Maturana 1973, Vaz-Ferreira 1975, King 1983, Sepúlveda et al. 2009, Crespo et al. 2021). *O. byronia* mainly occupies rocky shore headlands exposed to breaking waves, but it is also commonly found in fjords and channels, as well as on sandy beaches (Oliva et al. 2020). Individuals of this species exhibit pronounced sexual dimorphism: adult males reach 2.1-2.6 m in length and weigh 300-350 kg, whereas adult females measure 1.5-2.0 m and weigh 150-170 kg (Scheffer, 1958, Cárdenas-Alaysa et al. 2016). Males develop a fully formed mane and have a markedly more robust neck and head, while females lack a mane. The reproductive period extends from December to February (Acevedo et al. 2003, Sepúlveda et al. 2021). During this period, most animals (mainly adult males and females) concentrate in breeding colonies where females give birth to pups (Carrara 1952), whereas the rest (mainly subadult males and juveniles) aggregate in non-breeding colonies (Oliva et al. 2020). The last

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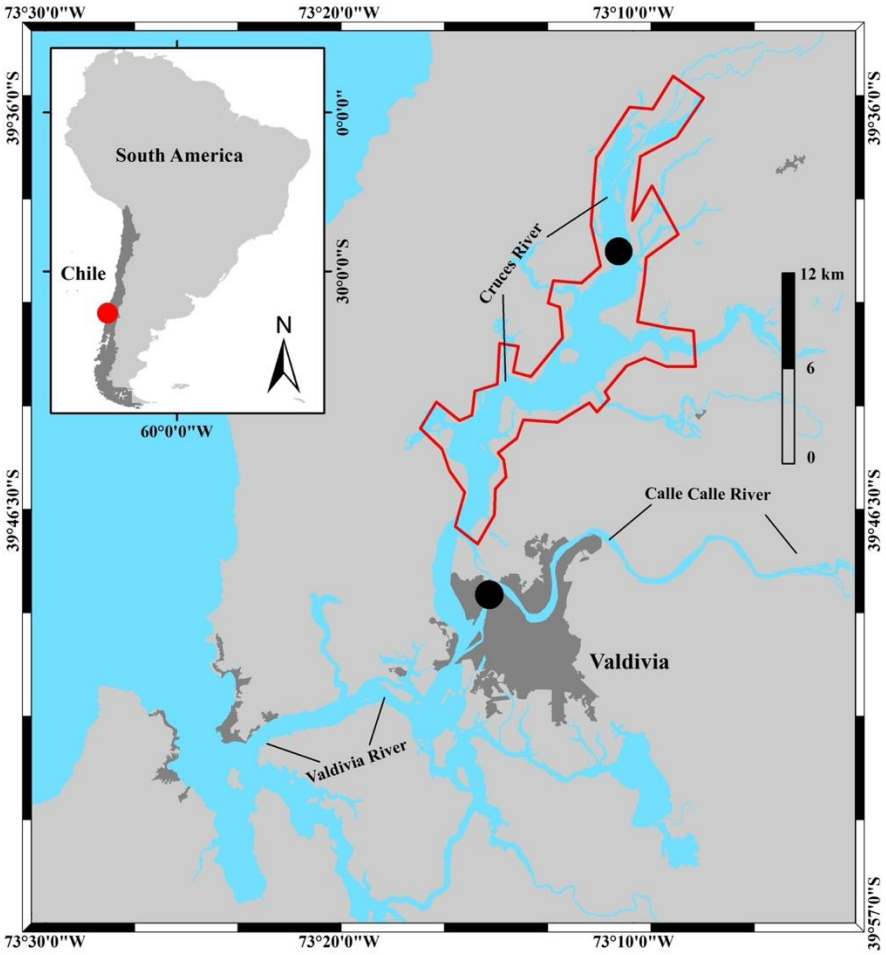


Figure 1. Location of Valdivia (red dot) in south-central Chile: the upper black circle indicates the location of the site where the dead sea lion pup was found (Santa María State, nearly 25 km north of Valdivia), the lower black circle indicates the location of the Valdivia fish market, and the red dashed line encloses the Río Cruces wetland.

authors also incorporated the term anthropogenic colony, which correspond to those aggregations of juveniles, subadults and adult males established on human-built structures such as fish markets, docks, or aquaculture facilities.

Since the mid 1970's (Schlatter 1976), a group of individuals of *O. byronia* became established around the Valdivia fish market (VFM) (southern Chile; Fig. 1). Although a definitive explanation has not been found for the arrival of those sea lions, it is widely accepted that those animals have stayed around the VFM, because they are trophically subsidized by fish sellers which throw the fish discards to the sea lions after filleting fishes for selling (Fig. 2). Although it was assumed that the individuals settled around the VFM was a non-breeding settlement composed exclusively by adult and subadult males and juveniles (Root-Bernstein et al. 2012, Sepúlveda et al. 2015, Oliva et al 2020), subsequent direct observations and examination of photos (from 2022 onwards) have revealed the presence of females during snapshot censuses at this sea lion anthropogenic colony (Oliva, *comm. pers.*).

From January 2019 to December 2025, researchers conducted 168 bimonthly sea lion censuses at and around the VFM. These censuses were part of an environmental monitoring program currently carried out at the Río Cruces wetland (the first Ramsar site in Chile; Fig. 1) and adjacent areas. The interannual variability in the mean annual number of sea lions -including adults, subadults, and juveniles- is shown (Fig. 3a). The adult males were the largest sea lions with developed manes; the subadults were smaller individuals than those males and included individuals with incipient manes as well as those showing no signs

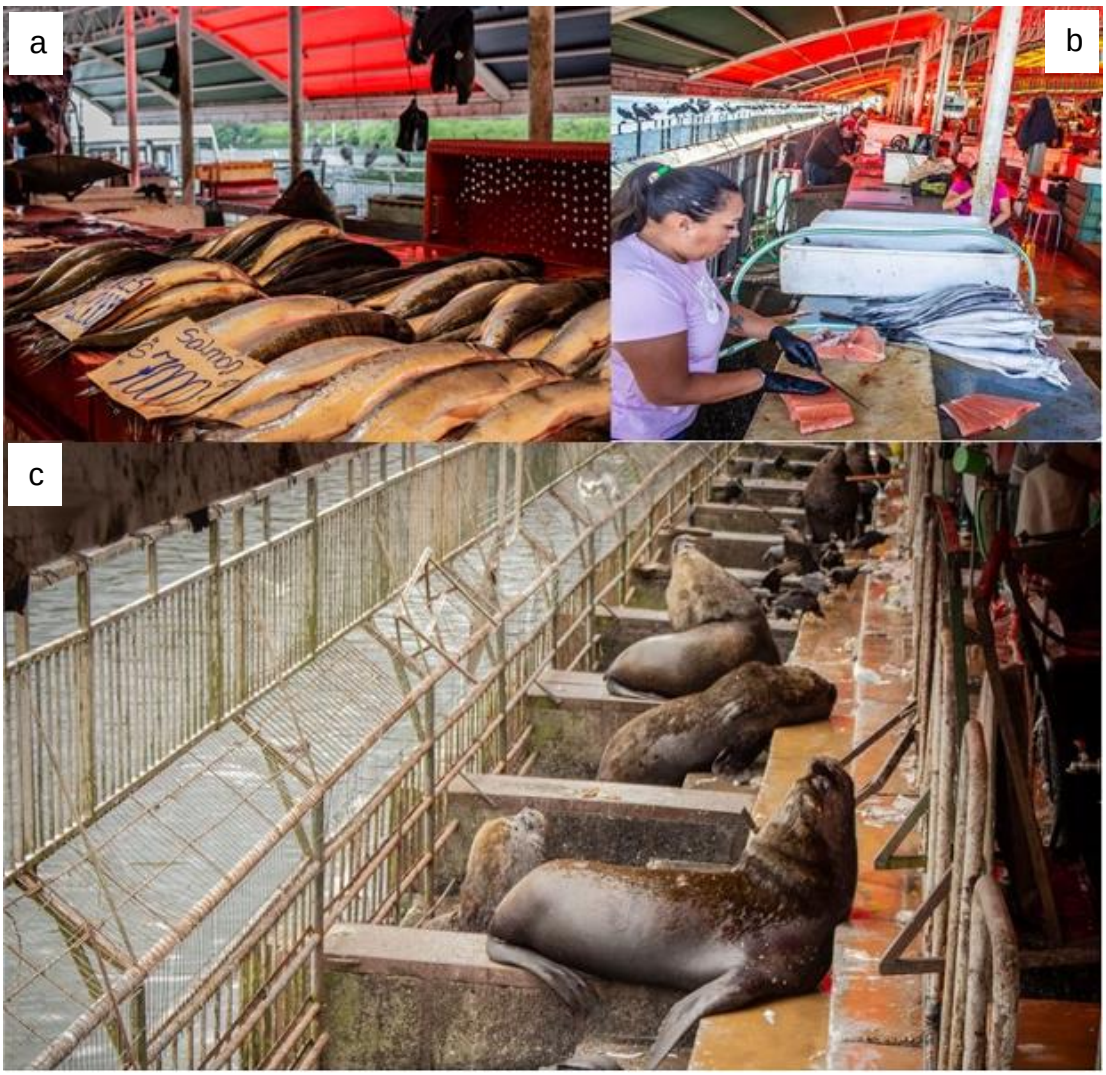


Figure 2. a) A fish stall in the Valdivia fish market, b) a fish seller filleting salmon, c) sea lions waiting for fish discards (source of photos: Felipe Leiva, Valdivia).

of a mane (likely females); meanwhile, the juveniles were the smallest individuals and had pointed heads in contrast to adults and subadults with more robust heads. From 2019 to 2020, the mean annual abundance of sea lions (all age classes included) increased from about 17 to 28 ind. Between 2020 and 2024, the mean number declined to nearly 22 ind (Fig. 3a); finally, from 2024 to 2025, the annual mean number of sea lions (all age classes included) reached a value close to 32 ind (Fig. 3a). The mean number of sea lions was similar across seasons, ranging from 23 in summer and autumn, to 25 in winter and spring (Fig. 3b). Results of ANOVA and the *a posteriori* Tukey's test showed that those mean abundances were significantly lower ($P < 0.05$) during 2019 (Table 1). In contrast, no significant differences ($P > 0.05$) were detected among the remaining years (Table 1). Likewise, no significant differences were found when comparing seasonal sea lion abundances (Table 1). During those 168 censuses, we did not observe a mating event. However, during the morning of December 26, 2025, one of the coauthors (F. Navarro) observed a juvenile female and a male copulating. This opportunistic observation was made outside the routine sea lion monitoring censuses at the VFM.

The female was identified based on its size, slender neck, elongated head profile, absence of a mane, relatively broad pelvic region, and rounded pectoral area. The mating occurred nearly 20 m north of the VFM and lasted for nearly 3 h (from 9:00 to noon). Initially, both individuals stood upright and interacted

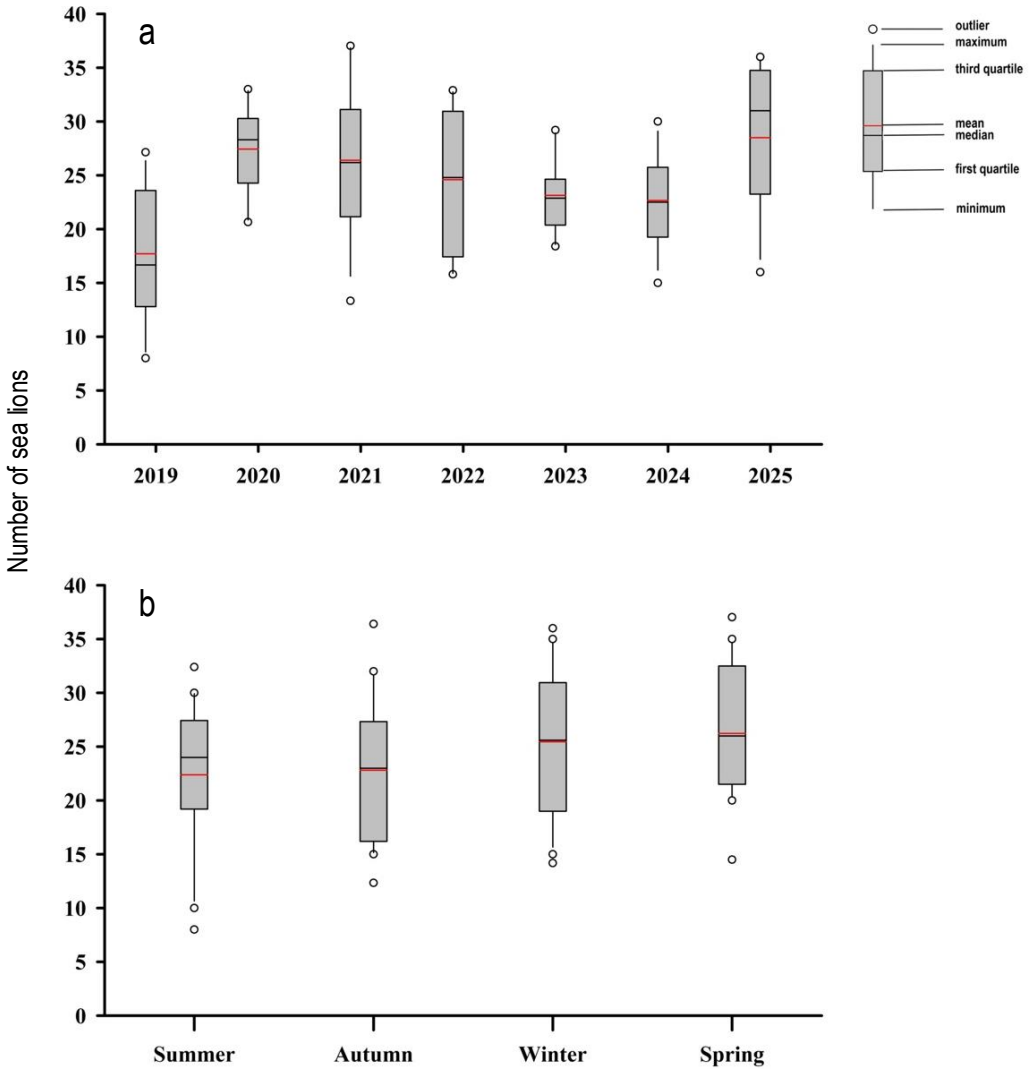


Figure 3. a) Interannual and b) interseason variability in the mean number of sea lions around the Valdivia fish market. The box plot components are shown on the right side of the figure.

with their fins, tails, and snouts (Fig. 4a). In addition, the male showed aggressive behavior toward people who approached, which caused people circulating in that sector of the riverfront to distance themselves. After nearly 1 h of that dynamic, both individuals positioned themselves horizontally; the male behind and over the female, making contact with their sexual organs through repetitive body movements. This behavior occurred twice during the observation period. After that, the female remained in a horizontal position, and the male was upright, supported by his fins over the female, and making contact with his sexual organs through constant and repetitive pelvic movements (Fig. 4b). Following this interaction, both individuals rested (Fig. 4c) at the mating site for nearly 1 h, during which the male's penis remained partially everted.

The mating encounter described above between a juvenile female and an adult male of *O. byronia* in an urban area near VFM appears to be the first evidence of copulation in this species around the VFM. Thus, it confirms the fact that this urban colony also includes females (cf. Oliva et al. 2020). Moreover, during April 2022, a dead pup of a sea lion was found at the mid zone of the Río Cruces wetland (Santa María State, nearly 25 km north of the VFM, Fig. 1a), specifically beside a swimming pool located nearly 5 m above water level (Fig. 5a-b). The total length of the individual was nearly 90-100 cm (compare Fig. 5a-b with Fig. 5c). This estimated length is consistent with that of a young pup approximately 2-3 months old (Hamilton 1934, 1939), which still retains its neonatal pelage. Sea lion pups have a limited swimming capacity, which restricts their

Table 1. Summary of one-way factorial ANOVA and a *posteriori* Tukey's test, carried out to evaluate potential interannual and seasonal differences in the abundance of sea lions, as censused around the Valdivia fish market during the period 2019-2025. Sources of variation include year (2019-2025) and season (summer, autumn, winter, and spring). The *P*-value in bold is significant (<0.05). df: degrees of freedom, ss: sum of squares, ms: mean squares.

Source of variation	df	ss	ms	F	P	Tukey's *a posteriori* test
Years	6	0.402	0.067	5.448	**<0.001**	2025=2024=2023=2022=2021=2020>2019
Error	77	0.946	0.012			
Total	83	1.348				
Seasons	3	0.116	0.039	2.506	0.065	
Error	80	1.232	0.015			
Total	83	1.348				



Figure 4. a) A couple of sea lions standing upright and interacting with their fins, tails, and snouts, at the riverfront close to the Valdivia fish market, b) the male located behind and above the juvenile female during mating, c) the couple of sea lions resting side by side after mating (source of photos: Felipe Navarro, Valdivia).



Figure 5. a-b) A sea lion pup, found dead close to a swimming pool in the middle area of the Cruces River wetland (Santa María State), during April 2022, c) a 1 m scale (red and white) installed close to that swimming pool, was used to estimate the body size of that pup (see text). Source of photos: Christian Dünner, Valdivia.

movement before completing their first molt. Given that the nearest breeding colonies are located ca. 70 and 120 km north and south of the Río Cruces wetland (Lobería (38°38'54"S, 73°29'00"W) and Punta Dehui (40°15'50"S, 73°44'31"W), respectively), it is unlikely that that pup could have traveled such a distance at such an early age, which suggests that the sea lion found at Santa María State (nearly 25 km north of the VFM), was born within the Río Cruces wetland. Moreover, because females have been observed in the anthropogenic sea lion colony of Valdivia by one of the coauthors (D. Oliva), the female that gave birth to this pup likely came from the nearest sea lion colony, i.e. the VFM. If future observations confirm reproductive activity in the VFM, this result will have profound implications for the black-necked swan (*Cygnus melancoryphus*) population of the Cruces River wetland, where sea lions (primarily juveniles) began chasing and preying on these waterbirds in July 2018; this novel interaction remains present. Thus, current and future sea lion census data, together with our preliminary observations of reproductive activities in the VFM, highlight the invaluable importance of long-term monitoring programs in wetland ecosystems. These programs are designed not only to meet the requirements of environmental authorities, but also to better understand the structure and functioning of wetlands and assess how they are affected by human activities.

Credit author contribution

E. Jaramillo: design of the study, conceptualization, design of graphic material, writing of original draft, acquisition of funds, reviews and editing; D. Oliva and M. Sepúlveda: review of original draft; F. Navarro: conduction of sea lion censuses and systematization of

field data; C. Barrales: graph creation and statistical analyses.

Conflict of interest

All the authors have read and accepted the final manuscript. The authors have no conflict of interest.

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REFERENCES

Acevedo J., Aguayo-Lobo, A. & Sielfeld, W. 2003. Eventos reproductivos del león marino común, *Otaria flavescens* (Shaw, 1800), en el norte de Chile (Pacífico Suroriental). Revista de Biología Marina y Oceanografía, 38: 69-75.

Aguayo, A. & Maturana, R. 1973. Presencia del lobo marino común (*Otaria flavescens*) en el litoral chileno. Biología Pesquera, Chile, 6: 45-75.

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

Carrara, F. 1952. Lobos marinos, pinguinos y guaneras de las costas del litoral marítimo e islas adyacentes de la República Argentina. Universidad de La Plata, La Plata.

Crespo, E., Oliveira, L. & Sepúlveda, M. 2021. South American sea lion (*Otaria flavescens*, Shaw, 1800). In: Heckel, G. & Schramm Y. (Eds.). Ecology and conservation of pinnipeds in South America. Springer Nature, Cham, pp. 93-118.

Felix, F. 2002. Una colonia de lobos marinos sudamericanos (*Otaria flavescens*) en Salinas, Ecuador. Acta Oceanográfica del Pacífico, 11: 181-184.

Hamilton, J.E. 1934. The southern sea lion *Otaria byronia* (De Blainville). Discovery Reports, 8: 269-318.

Hamilton, J.E. 1939. A second report on the southern sea lion, *Otaria byronia* (De Blainville). Discovery Reports, 19: 121-164.

King, J. 1983. Seals of the world. Cambridge University Press, Cambridge.

Oliva, D., 1988. *Otaria byronia* (de Blainville, 1820), the valid scientific name for the southern sea lion (Carnivora: Otariidae). Journal of Natural History, 22: 767-722. doi: 10.1080/00222938800770501

Oliva, D., Durán, L.R., Sepúlveda, M., et al. 2020. Estimación poblacional de lobos marinos e impacto de la captura incidental. Informe Final, Proyecto-FIP, 2018-54: 184 pp.

Root-Bernstein, M., Arévalo, N., Osman, L., et al. 2012. Design solutions to coastal human-wildlife conflicts. Journal of Coastal Conservation, 16: 585-596.

Schlatter, R. 1976. Penetración de lobo marino común, *Otaria flavescens* Shaw, en el río Valdivia y afluentes. Medio Ambiente, 2: 86-90.

Scheffer, V.B. 1958. Seals, sea lions and walruses: a review of the Pinnipedia. Stanford University Press, Stanford.

Sepúlveda, M., Carrasco, P. & Quiñones, R. 2021. Long-term abundance dynamics of the South American sea lion (*Otaria flavescens*) in the most important breeding colony in central Chile. Austral Ecology, 46: 1277-1286. doi: 10.1111/aec.13086

Sepúlveda, M., Inostroza, P., Pérez-Alvarez, M.J., et al. 2009. Seasonal variation in the abundance of South American sea lions *Otaria flavescens* (Shaw, 1800) in Chañaral Island, Reserva Nacional Pingüino de Humboldt, Chile. Revista de Biología Marina y Oceanografía, 44: 685-689.

Sepúlveda, M.A., Seguel, M., Alvarado-Rybak, M., et al. 2015. Postmortem findings in four South American sea lions (*Otaria byr*onia) from an urban colony in Valdivia, Chile. Journal of Wildlife Diseases, 51: 279-282. doi: 10.7589/2013-07-161.

Vaz-Ferreira, R. 1975. Behavior of the southern sea lion, *Otaria flavescens*, in the Uruguayan Islands. Rapports et Procès-Verbaux des Réunions. Council International pour l'Exploration de la Mer, 169: 219-227.

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