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Short Note

Rare Observation of a Living Southern Elephant Seal (*Mirounga leonina*) at Terra Nova Bay, Victoria Land Coast, Ross Sea, Antarctica

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The southern elephant seal (*Mirounga leonina*) is the largest pinniped species in the world, and most of its populations have circumpolar distribution in the Antarctic and sub-Antarctic islands, except for the population in South America (Hindell & Perrin, 2009; Acevedo et al., 2016; Hindell, 2018). The adult individuals of this species show male-biased sexual dimorphism in their morphological characteristics (Hofmeyr, 2015; Jefferson et al., 2015; Hindell, 2018). Males with a long proboscis are much larger because of their polygynous mating system (Hindell & Perrin, 2009; Páez-Rosas et al., 2018). Adult males reach up to 4.5 m in length and weigh 2,000 to 4,000 kg, while adult females reach an average of 2.8 m in length and weigh 400 to 900 kg (Hofmeyr, 2015). There are presently four genetically breeding populations located in Argentina (South America): the South Georgia population in the South Atlantic Ocean; the Kerguelen and Heard populations, including the Crozet and Prince Edwards Archipelagos in the South Indian Ocean; and the Macquarie population in the South Pacific (Corrigan et al., 2016; Hindell, 2018; Chua et al., 2022).

Southern elephant seals have two haul-out periods in their life cycle: (1) the breeding season from September up to November and (2) the molting period from December to March (Hofmeyr, 2015; Páez-Rosas et al., 2018; Alava et al., 2022). They spend most of their time foraging at sea during the non-breeding season (Jefferson et al., 2015). Moreover, southern elephant seals tend to travel thousands of kilometers from their breeding sites to the Southern Ocean (O'Toole et al., 2014; Hindell et al., 2016). Females usually capture prey in deep-water regions, while most males can have longer foraging trips to the Antarctic continental shelf underlying the Southern Ocean (Bailleul et al., 2007; Hindell et al., 2021).

There are several reports on southern elephant seals observed in Antarctica, Prydz Bay, Vincennes Bay, and Palmer Station, which are sites associated with their long-range foraging pathways and molting grounds during the austral summer (Chua et al., 2022). Meanwhile, several vagrant individuals have been occasionally recorded in the northern part of the Antarctic circumpolar zone, outside of their normal range (Alava & Carvajal, 2005; Acevedo et al., 2016; Páez-Rosas et al., 2018; Redwood & Félix, 2018; Avila et al., 2021; de Vos, 2021; Alava et al., 2022), even reaching the Northern Hemisphere in rare occasions (e.g., Gulf of California, Mexico; Elorriaga-Verplancken et al., 2020). Furthermore, reports on the southern elephant seal on the Victoria Land coast are very rare. Herein, we describe an unusual case of a living southern elephant seal in Terra Nova Bay in the Ross Sea, Antarctica.

The southern elephant seal was sighted and photographed at Terra Nova Bay (74° 38' 4" S, 164° 13' 05" E) on 13 February 2013 (Figure 1). It was late summer in open water with several pack ice masses near the coastal area, which are only observed during this time of the year (Koch et al., 2019). Terra Nova Bay, where the southern elephant seal was sighted, belongs to northern Victoria Land and has a diverse range of ecological features (Zappes et al., 2017). This and the surrounding area are important breeding sites for Weddell seals (*Leptonychotes weddellii*; Rumolo et al., 2020) and other seal species, such as crabeater seals (*Lobodon carcinophaga*) and leopard seals (*Hydrurga leptonyx*), which are occasional visitors and are generally observed at least during the austral summer. The observed southern elephant seal was hauled-out and lying on the rocky shore of the beach near the Gondwana Station in apparently healthy condition according to its thick neck and broad body

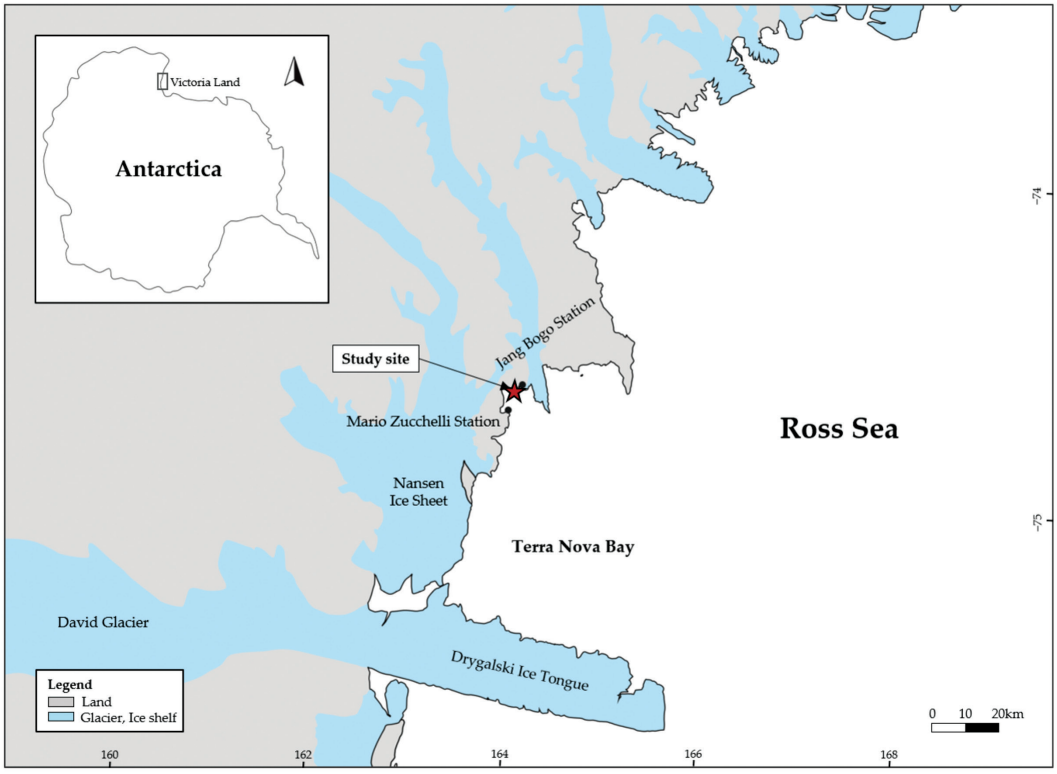

Figure 1. Location of study site and surrounding area in Ross Sea, Antarctica. The star indicates the point where the southern elephant seal (*Mirounga leonina*) was sighted in Terra Nova Bay, Antarctica.

(Figure 2a). Despite external injuries (lesions on the skin of the upper dorsal area), dehydration or emaciation was not observed in this individual (Figure 2a & b).

The taxonomic identification of the animal was based on external morphological characteristics following species identification guidelines for marine mammals, as well as sexual confirmation (Jefferson et al., 2015). The vagrant was identified as a southern elephant seal, approximately 3.3 m in body length; we took pictures at first and measured with tape after the individual left. Based on its specific morphological characteristics, we identified the individual as a subadult male, having a snout with an undeveloped but noticeable proboscis (Figure 2b & c). In addition, greyish brown fur with dark parts and spots on the face and snout of the animal denoted signs of the molting stage (Figure 2). The individual remained on the beach for at least 5 h until it returned to sea.

Sightings of living southern elephant seals are not common in the Ross Sea region of Antarctica, and they are generally rare along the entire Victoria Land coast. There are a few records of subadult male southern elephant seals hauled-out for molt during late summer on Ross Island (Hall et al., 2006; Ainley, 2010). Additionally, southern elephant seal observations have been reported at Cape Adare by Antarctica New Zealand (ANZ) (n.d.) during the research seasons of 1959-1960 (one female and one juvenile) and 1960-1961 (one male). However, it is a different story in the case of sightings in Terra Nova Bay, where the southern elephant seal might suffer much more compared to other foraging or molting sites (Hindell et al., 2003). This is due to the fact that this area is often ice-free and has been defined as a persisting polynya, where permanent open water has been surrounded by sea ice since the beginning of the Holocene (Baroni & Orombelli, 1994). Hence, there are no records of living southern elephant seals over the past 100+ y on the beaches of the Victoria Land coast. Nonetheless, there was a record of living southern elephant seals at the Mario Zucchelli Station, close to the location of our observation (Programma Nazionale Di Ricerche in Antartide [PNRA], 2010).

Furthermore, there was a breeding population of southern elephant seals on the Victoria Land coast in the past. The release of Victoria Land coast as a habitat, with population dynamics

Figure 2. (a) Observed subadult southern elephant seal individual at Terra Nova Bay lying on the beach in rocky terrain; and (b & c) close-up photographs of subadult male with external injuries in dorsal part, revealing signs of molting around the face and snout. (Photos provided by Dr. Jeong-Hoon Kim, co-corresponding author)

and population abundance impacted by climate change during the Holocene, has been well summarized in previous studies (de Bruyn et al., 2009; Corrigan et al., 2016; Koch et al., 2019). The Victoria Land coast was released as a habitat for the southern elephant seal after retreating ice in the Ross Sea approximately 8,000 YBP (years before present). This new breeding population flourished from 7500 to 1000 YBP and then declined to extinction at approximately 1000 YBP. The last remaining group on Inexpressible Island deserted the Victoria Land coast following sea-ice expansion-induced habitat changes (Hindell et al., 2003; Koch et al., 2019).

Based on the above, the origin of the observed southern elephant seal is a mystery. Annual migrations of the southern elephant seal include travelling long distances to and from foraging and molting areas, often in the Southern Ocean (O'Toole et al., 2014; Hindell et al., 2016). Thus, many cases of vagrant observations include individuals at sea and along coastal areas because of their foraging trips (Páez-Rosas et al., 2018; Alava et al., 2022; Chua et al., 2022). The closest breeding site of the southern elephant seal is Macquarie Island, which is approximately 2,400 km from Terra Nova Bay (Le Boeuf & Laws, 1994). In particular, there are three main groups within the Macquarie Island population categorized according to oceanic regional segregation of habitat use, depending on the foraging sites and habitat quality: (1) the sub-Antarctic, (2) the Ross Sea, and (3) the Victoria Land coast (Hindell et al., 2017).

Foraging site adoption by this species is determined by the availability of food sources, predation pressure, and environmental conditions (Hindell et al., 2003). Ross Sea and Victoria Land coast specialists are dispersed in high-Antarctic regions to access the Antarctic shelf area (van den Hoff et al., 2002; Bailleul et al., 2007). Southern Ocean shelves are preferred by male southern elephant seals, while a very few pass through dense sea ice to reach other productive shelf sites despite predation risks (Hindell et al., 2017). In general, animals need to balance their energy requirements to maximize essential life cycle activities, including foraging, molting, and breeding (Hindell et al., 2021). Southern elephant seals fast during the molting season, especially females, because they need to return to breeding sites; however, males do not generally show the same strict behavior and might return to breeding sites or disperse to other locations (Setsaas et al., 2008). In addition, molting individuals sometimes remain in coastal areas for the entire molting period (Hindell et al., 1994).

In conclusion, a robust southern elephant seal subadult male was sighted with signs of molting at Terra Nova Bay on the Victoria Land coast in February 2013. It was difficult to determine the exact origin of the individual due to a lack of adequate information, and we assume that the observed individual might have potentially dispersed from Macquarie Island. Although this was the second sighting on record, our results are the first academic documentation of a living southern elephant seal in Terra Nova Bay. Further monitoring efforts and cooperation with other researchers from different countries are needed to accumulate consistent observational records of southern elephant seals. Subsequently, it would be useful to understand how species respond to future environmental and climatic changes in the Southern Ocean and Antarctic regions (Alava et al., 2022), including the Victoria Land coast.

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Literature Cited

Acevedo, J., Aguayo-Lobo, A., Brito, J. L., Torres, D., Cáceres, B., Vila, A., Cardeña, M., & Acuña, P. (2016). Review of the current distribution of southern elephant seals in the eastern South Pacific. *New Zealand Journal of Marine and Freshwater Research*, *50*(2), 240-258. https://doi.org/10.1080/00288330.2015.1132746

Ainley, D. G. (2010). A history of the exploitation of the Ross Sea, Antarctica. *Polar Record*, *46*(3), 233-243. https://doi.org/10.1017/S003224740999009X

Alava, J. J., & Carvajal, R. (2005). First records of elephant seals on the Guayaquil gulf, Ecuador: On the occurrence of either a *Mirounga leonina* or *M. angustirostris*. *Latin American Journal of Aquatic Mammals*, *4*(2), 195-198. https://doi.org/10.5597/lajam00086

Alava, J. J., Riofrío-Lazo, M., Reygondeau, G., Rosero, P., Avila, I. C., Lara, D., Gil, F., Yaipen-Llanos, C., Elorriaga-Verplancken, F. R., & Páez-Rosas, D. (2022). Southern elephant seals (*Mirounga leonina*) in the Galapagos Islands and the Eastern Tropical Pacific amid ocean environmental changes: Towards a Habitat Suitability Index. *Aquatic Mammals*, *48*(5), 418-431. https://doi.org/10.1578/AM.48.5.2022.418

Antarctica New Zealand (ANZ). (n.d.). *Antarctica New Zealand pictorial collection*. ANZ. www.adam.antarcticanz.govt.nz

Avila, I. C., Trujillo, G. A., & Alava, J. J. (2021). Primeros registros de elefantes marinos en el Pacífico colombiano: ¿Elefantes marinos del sur, *Mirounga leonina*? [First records of elephant seals in the Colombian Pacific: Southern elephant seals, *Mirounga leonina*?] *Caldasia*, *43*(1). https://doi.org/10.15446/caldasia.v43n2.84687

Bailleul, F., Charrassin, J., Ezraty, R., Girard-Ardhuin, F., McMahon, C. R., Field, I. C., & Guinet, C. (2007). Southern elephant seals from Kerguelen Islands confronted by Antarctic sea ice: Changes in movements and in diving behaviour. *Deep Sea Research Part II: Topical Studies in Oceanography*, *54*(3-4), 343-355. https://doi.org/10.1016/j.dsr2.2006.11.005

Baroni, C., & Orombelli, G. (1994). Holocene glacier variations in the Terra Nova Bay area (Victoria Land, Antarctica). *Antarctic Science*, *6*(4), 497-505. https://doi.org/10.1017/S0954102094000751

Chua, M., Ho, S. Y. W., McMahon, C. R., Jonsen, I. D., & de Bruyn, M. (2022). Movements of southern elephant seals (*Mirounga leonina*) from Davis Base, Antarctica: Combining population genetics and tracking data. *Polar Biology*, *45*(7), 1163-1174. https://doi.org/10.1007/s00300-022-03058-9

Corrigan, L. J., Fabiani, A., Chauke, L. F., McMahon, C. R., de Bruyn, M., Bester, M. N., Bastos, A. D., Campagna, C., Muelbert, M. M. C., & Hoelzel, A. R. (2016). Population differentiation in the context of Holocene climate change for a migratory marine species, the southern elephant seal. *Journal of Evolutionary Biology*, *29*(9), 1667-1679. https://doi.org/10.1111/jeb.12870

de Bruyn, M., Hall, B. L., Chauke, L. F., Baroni, C., Koch, P. L., & Hoelzel, A. R. (2009). Rapid response of a marine mammal species to Holocene climate and habitat change. *PLOS Genetics*, *5*(7), e1000554. https://doi.org/10.1371/journal.pgen.1000554

de Vos, A. (2021). First record of a southern elephant seal (*Mirounga leonina*) in Sri Lankan waters. *Marine Biodiversity Records*, *14*, 5. https://doi.org/10.1186/s41200-020-00196-z

Elorriaga-Verplancken, F. R., Blanco-Jarvio, A., Silva-Segundo, C. A., Paniagua-Mendoza, A., Rosales, H., Robles, R., Mote, S., Amador-Capitanachi, M. L., & Sandoval-Sierra, J. (2020). A southern elephant seal (*Mirounga leonina*) in the Gulf of California: Genetic confirmation of the northernmost record to date. *Aquatic Mammals*, *46*(2), 137-145. https://doi.org/10.1578/AM.46.2.2020.137

Hall, B. L., Hoelzel, A. R., Baroni, C., Denton, G. H., Le Boeuf, B. J., Overturf, B., & Töpf, A. L. (2006). Holocene elephant seal distribution implies warmer-than-present climate in the Ross Sea. *Proceedings of the National Academy of Sciences*, *103*(27), 10213-10217. https://doi.org/10.1073/pnas.0604002103

Hindell, M. A. (2018). Elephant seals: *Mirounga angustirostris* and *M. leonina*, Linnaeus, 1758 (Carnivora: Pinnipedia: Phocidae). In B. Würsig, J. G. M. Thewissen, & K. M. Kovacs (Eds.), *Encyclopedia of marine mammals* (3rd ed., pp. 303-307). Academic Press. https://doi.org/10.1016/B978-0-12-804327-1.00115-1

Hindell, M. A., & Perrin, W. F. (2009). Elephant seals: *Mirounga angustirostris* and *M. leonina*. In W. F. Perrin, B. Würsig, & J. G. M. Thewissen (Eds.), *Encyclopedia of marine mammals* (2nd ed., pp. 364-368). Academic Press. https://doi.org/10.1016/B978-0-12-373553-9.00088-2

Hindell, M. A., Slip, D., & Burton, H. R. (1994). Body mass loss of moulting female southern elephant seals, *Mirounga leonina*, at Macquarie Island. *Polar Biology*, *14*(4), 275-278. https://doi.org/10.1007/BF00239176

Hindell, M. A., Bradshaw, C. J., Sumner, M. D., Michael, K. J., & Burton, H. R. (2003). Dispersal of female southern elephant seals and their prey consumption during the austral summer: Relevance to management and oceanographic zones. *Journal of Applied Ecology*, *40*(4), 703-715. https://doi.org/10.1046/j.1365-2664.2003.00832.x

Hindell, M. A., McMahon, C. R., Jonsen, I. D., Harcourt, R. G., Arce, F., & Guinet, C. (2021). Inter- and intra-sex habitat partitioning in the highly dimorphic southern elephant seal. *Ecology and Evolution*, *11*(4), 1620-1633. https://doi.org/10.1002/ece3.7147

Hindell, M. A., Sumner, M. D., Bestley, S., Wotherspoon, S., Harcourt, R. G., Lea, M., Alderman, R. L., & McMahon,

C. R. (2017). Decadal changes in habitat characteristics influence population trajectories of southern elephant seals. *Global Change Biology*, *23*(12), 5136-5150. https://doi.org/10.1111/gcb.13776

Hindell, M. A., McMahon, C. R., Bester, M. N., Boehme, L., Costa, D. P., Fedak, M. A., Guinet, C., Herraiz-Borreguero, L., Harcourt, R. G., Hückstädt, L. A., Kovacs, K. M., Lydersen, C., McIntyre, T., Muelbert, M. M., Patterson, T. A., Roquet, F., Williams, G. D., & Charrassin, J. (2016). Circumpolar habitat use in the southern elephant seal: Implications for foraging success and population trajectories. *Ecosphere*, *7*(5), e01213. https://doi.org/10.1002/ecs2.1213

Hofmeyr, G. J. G. (2015). *Mirounga leonina*. In International Union for Conservation of Nature (Ed.), *The IUCN red list of threatened species 2015* (e.T13583A45227247). IUCN. https://doi.org/10.2305/IUCN.UK.2015-4.RLTS.T13583A45227247.en

Jefferson, T. A., Webber, M. A., & Pitman, R. L. (Eds.). (2015). *Marine mammals of the world: A comprehensive guide to their identification* (2nd ed.). Academic Press.

Koch, P. L., Hall, B. L., de Bruyn, M., Hoelzel, A. R., Baroni, C., & Salvatore, M. C. (2019). Mummified and skeletal southern elephant seals (*Mirounga leonina*) from the Victoria Land coast, Ross Sea, Antarctica. *Marine Mammal Science*, *35*(3), 934-956. https://doi.org/10.1111/mms.12581

Le Boeuf, B. J., & Laws, R. M. (1994). *Elephant seals: Population ecology, behaviour, and physiology*. University of California Press. https://doi.org/10.1525/9780520328150

O'Toole, M. D., Hindell, M. A., Charrassin, J., & Guinet, C. (2014). Foraging behaviour of southern elephant seals over the Kerguelen Plateau. *Marine Ecology Progress Series*, *502*, 281-294. https://doi.org/10.3354/meps10709

Páez-Rosas, D., Riofrío-Lazo, M., Ortega, J. M., Morales, J., Carvajal, R., & Alava, J. J. (2018). Southern elephant seal vagrants in Ecuador: A symptom of La Niña events? *Marine Biodiversity Records*, *11*, 13. https://doi.org/10.1186/s41200-018-0149-y

Programma Nazionale Di Ricerche in Antartide (PNRA). (2010). *Immersioni in Antartide* [Diving in Antarctica]. PNRA.

Redwood, S. D., & Félix, F. (2018). The most northerly record of a southern elephant seal (*Mirounga leonina*) in the Pacific Ocean at the island of Taboga, Gulf of Panama, Panama. *Aquatic Mammals*, *44*(1), 13-18. https://doi.org/10.1578/AM.44.1.2018.13

Rumolo, P., Zappes, I. A., Fabiani, A., Barra, M., Rakaj, A., Palozzi, R., & Allegrucci, G. (2020). The diet of Weddell seals (*Leptonychotes weddellii*) in Terra Nova Bay using stable isotope analysis. *The European Zoological Journal*, *87*(1), 94-104. https://doi.org/10.1080/24750263.2020.1720832

Setsaas, T. H., Bester, M. N., & van Niekerk, J. H. (2008). Dispersion during the moult haulout of southern elephant seals at the Courbet Peninsula, Iles Kerguelen. *Polar Biology*, *31*(2), 249-253. https://doi.org/10.1007/s00300-007-0378-8

van den Hoff, J., Burton, H. R., Hindell, M. A., Sumner, M. D., & McMahon, C. R. (2002). Migrations and foraging of juvenile southern elephant seals from Macquarie Island within CCAMLR managed areas. *Antarctic Science*, *14*(2), 134-145. https://doi.org/10.1017/S095410200200069X

Zappes, I. A., Fabiani, A., Sbordoni, V., Rakaj, A., Palozzi, R., & Allegrucci, G. (2017). New data on Weddell seal (*Leptonychotes weddellii*) colonies: A genetic analysis of a top predator from the Ross Sea, Antarctica. *PLOS ONE*, *12*(8), e0182922. https://doi.org/10.1371/journal.pone.0182922