

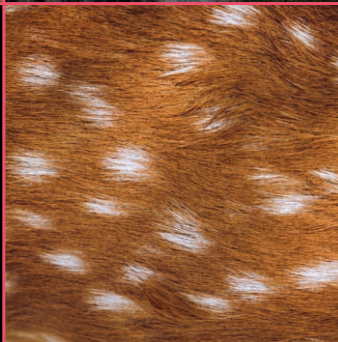


SAREM Series A
Mammalogical Research
Investigaciones Mastozoológicas

VOLUME 3

INTRODUCED INVASIVE MAMMALS OF ARGENTINA

MAMÍFEROS INTRODUCIDOS INVASORES DE ARGENTINA



Alejandro E. J. Valenzuela, Christopher B. Anderson, Sebastián A. Ballari and Ricardo A. Ojeda, EDITORS

The Argentine Society for the Study of Mammals (Sociedad Argentina para el Estudio de los Mamíferos – SAREM) was created in 1983, and currently has about 300 members from several countries. SAREM is an interdisciplinary society of natural sciences professionals whose main goals are the promotion of scientific and technical research, the consolidation of national collections and research centers, and the publication and diffusion of research on living and/or extinct mammals. SAREM has organized scientific meetings for mammal researchers since 1994, publishes the journals *Mastozoología Neotropical* and *Notas sobre Mamíferos Sudamericanos*, and has edited books on the systematics, distribution and conservation of the mammals of southern South America, including *Libro Rojo de los mamíferos amenazados de la Argentina* (first ed. 2000, second ed. 2012) and *Mamíferos de Argentina. Sistemática y distribución* (2006), as well as contributing to the *Libro Rojo de los mamíferos y aves amenazados de la Argentina* (currently out of print).

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SAREM Series A
Mammalogical Research
Investigaciones Mastozoológicas

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SAREM Series A
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Investigaciones Mastozoológicas
Buenos Aires, Argentina

SAREM–Sociedad Argentina para el Estudio de los Mamíferos

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www.sarem.org.ar

Introduced Invasive Mammals of Argentina / Alejandro Valenzuela ... [et al.]. – 1ª ed. –

Mendoza : Sociedad Argentina para Estudio de los Mamíferos SAREM, 2023.

Memoria USB, PDF

ISBN 978-987-98497-9-8

1. Mamífero. 2. Animales Exóticos. I. Valenzuela, Alejandro.

CDD 599.0982

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SAREM Series A
Mammalogical Research
Investigaciones Mastozoológicas

Introduced invasive species are a major driver of local to global environmental change, including important negative impacts on biodiversity, ecosystem processes, economies, health and other social values. At the same time, however, different social actors can hold diverse representations of these species, particularly of introduced invasive mammals (IIMs). Such divergent values and perceptions can lead to conflicts regarding the management of IIMs, but also invite researchers and managers to be reflexive regarding their own work at a more fundamental level. Therefore, it is key that we advance towards a holistic understanding of IIMs and develop strategies to manage them based on solid technical information and plural perspectives regarding their multiple values. Despite a rich history of initiatives in Argentina to study and manage IIMs, until now there has not been an opportunity to assess the state-of-the-art knowledge in our country. This book seeks to provide rigorous, relevant and legitimate information to support research, policymaking and management decisions regarding IIMs in Argentina. With this objective in mind, the book presents a series of chapters selected to highlight priority topics concerning the conceptualization and implementation of IIM research and management. Then, fact sheets are provided for the different IIMs found in Argentina. Finally, beyond the realm of academic inquiry, the timing of this publication is ideal to re-enforce policy and decision-making, such as the recently approved National Invasive Exotic Species Strategy, which seeks to implement actions and enhance institutional capacities related to invasive species management in Argentina, and the Convention on Biological Diversity's new Global Biodiversity Framework, which also addresses biological invasions as part of broader efforts to attain the 2050 Vision for Living in Harmony with Nature.

Dr. Alejandro E.J. Valenzuela
Dr. Christopher B. Anderson
Editors, Vol. III SAREM Series A

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FOREWORD

Biological invasions by introduced species are one of the great changes rapidly transforming the globe today, with innumerable impacts on economics, human health, ecosystem services, and biodiversity. Mammals are among the most impactful of invasive species, transmitting diseases to humans, livestock, and native animals, trampling native grasslands, voraciously devouring vegetation from groundcover to saplings of forest trees, fouling water, causing erosion, and preying on and outcompeting native animals. They were among the first species humans introduced worldwide and in Argentina, both deliberately (*e.g.*, livestock) and inadvertently (*e.g.*, rats and mice). They have been introduced for sport (*e.g.*, deer, boar) and companionship (*e.g.*, cats, dogs), or simply as attractive ornamentals (*e.g.*, squirrels). Some that are meant to be kept in captivity, such as cats, dogs, and squirrels, escape and establish feral populations.

Argentina looms large in the history of biological invasions by introduced mammals. The earliest permanent European settlers of Buenos Aires in 1580 discovered huge herds of feral horses already on the pampas, and soon after, Vázquez de Espinoza described feral horses in Tucumán that were “in such numbers that they cover the face of the earth...”. Many sheep were in Tucumán as well at that time, and of course later sheep were enormously numerous in Patagonia, effecting huge changes in the vegetation and driving land degradation and desertification to this day. When Charles Darwin visited the La Plata region in 1832 during the voyage of the *Beagle*, he reported that “...countless herds of horses, cattle, and sheep, not only have altered the whole aspect of the vegetation, but they have almost banished the guanaco, deer and ostrich. Numberless other changes must likewise have taken place; the wild pig in some parts probably replaces the peccari; packs of wild dogs may be heard howling on the wooded banks of the less-frequented streams; and the common cat, altered into a large and fierce animal, inhabits rocky hills.”

Approximately 40 mammals have been introduced to South America, of which 25–30 have established populations; most of these are in the Southern Cone. In Argentina, I count 23 successfully introduced mammal species, including feral cats, dogs, and cows. Many, such as rats, rabbits, boar, and goats, are widely distributed around the world. By contrast, the hairy armadillo has been introduced nowhere else but from the mainland of Patagonia to Tierra del Fuego Island. Strikingly, except for the rats and house mouse, all these mammals were brought to Argentina deliberately; this is very different from, say, introduced insects. A few of these invasive mammals, like the squirrel, were not intended to be released, but I hesitate to term such invaders truly “accidental,” because the people who brought them should have realized that escapes or later releases were almost inevitable. Of course, almost all of these mammals were introduced before the late twentieth century, which was when most scientists and the public began to recognize the extent and importance of impacts of introduced species. However, the squirrel and armadillo introductions were recent enough that potential impacts should have been foreseen. Things could be worse, of course—mammals deliberately brought to Argentina that either were released, but did not establish persistent populations or have not yet escaped from hunting preserves include reindeer, silver fox, mule deer, African buffalo, white-tailed deer, Père David’s deer, thar, barbary sheep, wisent, mouflon, chamois, and ibex.

The technology of eradicating introduced invasive mammals has made enormous strides in the last thirty years—at least 31 mammal species have been eradicated from islands worldwide, including relatively large islands like South Georgia. Both Norway and ship rats have been eradicated hundreds of times, and house mice about 100 times. Most large mammals, such as deer and horses, are technologically easier eradication targets—many can simply be tracked and shot, for instance. However, mammals more than any other introduced species pose the complication that many people—especially hunters—simply do not want to eradicate them, and many animal welfare advocates, even those recognizing the damage some invaders cause, object to eradicating them by the only currently feasible means—killing them, humanely if possible. Even rat eradication has been impeded on animal rights/animal welfare grounds, and free-ranging dog and cat populations frequently are seen more as animal welfare issues than as conservation problems to broad sectors of some societies. In Argentina, the problem of implementing feasible eradication programs for invasive mammals is epitomized by the rather schizophrenic attitude taken by the National Parks Administration (Administración de Parques Nacionales—APN) towards red deer. The APN's conservation imperative is supported by the section of Law #22,351 that forbids propagating introduced animals, yet red deer, known to damage native species and ecosystems, are managed in Lanín National Park to foster ongoing hunting, and even to improve the size and quality of the deer for better hunting trophies. Additionally, there is often inconsistent and inadequate funding for managing and eradicating invasive mammals in protected areas, almost always constituting a supervening impediment even when a rational and effective goal is stated.

Argentine scientists have participated heavily in the rapid growth of modern invasion science since its inception in the 1980s, and they and overseas colleagues have conducted substantial research on the biology and impacts of many of the introduced invasive mammals in Argentina, as well as other invasive species. Some of the threats posed by these mammals have even become widely known to the general public in Argentina and beyond—the spread of the beaver from Tierra del Fuego to the mainland has been an international news story. *Introduced Invasive Mammals of Argentina* is therefore an exciting and timely addition to the literature on invasions in southern South America for both the Argentine public (and its political representatives and environmental managers) and scientists worldwide. The many authors assembled for this book explore how these biological invasions happened in the first place, how they spread, what they do to biodiversity, ecosystems, and human enterprises, what has been done about them so far, what can be done about them now, and what might be done with them in the future. The editors and authors are to be congratulated for an excellent exposition of the Argentine part of a growing global phenomenon.

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Neogale vison

American mink, visón americano

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Resumen. El visón americano (*Neogale vison*) es un mustélido originario de Norteamérica con cuerpo alargado y pelaje marrón oscuro-negro. Carnívoro estricto, pero generalista, suele habitar riberas de agua dulce y costas marítimas con alta cobertura vegetal. La plasticidad en su dieta y sus adaptaciones reproductivas le han permitido colonizar fácilmente diversos hábitats alrededor del mundo. Han sido introducidos en Europa, Asia y Sudamérica para la explotación en la industria peletera. Liberaciones intencionales han dado lugar al establecimiento de poblaciones exóticas silvestres. En Argentina fue introducido durante la década de 1930 en Patagonia y la provincia de Buenos Aires. Actualmente se distribuye en gran parte de la región Patagónica, y existen avistamientos recientes de potenciales poblaciones en la provincia de Buenos Aires. Sus impactos tienen alcances variados, siendo una amenaza para la avifauna nativa por depredación y para los carnívoros nativos principalmente por una potencial transmisión de enfermedades. Estos impactos afectan distintas actividades económicas como el ecoturismo, las pisciculturas y la cría de aves de corral. Los visones americanos pueden actuar de vectores de enfermedades para la salud humana, como toxoplasmosis y leptospirosis; también son portadores de SARS-CoV-2, aunque se necesitan más estudios para demostrar su potencial contagio a humanos. Se recomiendan planes de manejo basados en el control de las poblaciones, con métodos de captura o muerte selectiva. En Patagonia se llevan a cabo planes de control de visón destinados a la conservación de la fauna nativa en Santa Cruz, Tierra del Fuego, Neuquén y Río Negro.

General description of the species

The American mink (*Neogale vison*) is a crepuscular semi-aquatic generalist carnivore with an elongated tubular body (total length: 50–70 cm) with short limbs and a hairy tail that constitutes approximately 33% of the total length of the body (Fig. 1; Dunstone, 1993; Laviere, 1999). The mink has a wedge-shaped head, narrowing towards the snout, with small ears that are barely visible and a long neck; all of these characteristics help these animals avoid hydrodynamic resistance while swimming (Long, 2003). Additionally, a thick coat provides thermal insulation, with dark brown-black hair with white spots on the chin and chest, but also other pigmentations derived from fur farming can be found in nature (Laviere, 1999). Adult weights vary between 400–1800 g, and the species presents a

marked sexual dimorphism, where males can double the size of females (Dunstone, 1993). Minks live an average of 5 years in the wild (Long, 2003).

Habitat

Mink are solitary territorial animals that usually inhabit highly vegetated habitats associated with freshwater shores (rivers, streams, lakes, lagoons, swamps, peat bogs, etc.) and marine coasts (Valenzuela *et al.*, 2013). Mink use natural holes between rocks and trunks as dens (Dunstone, 1993). Their territories are lineal, following the coastlines and riverbanks, and vary between 0.5–3.4 km in length, depending on individual (age and sex) and habitat characteristics, but also prey availability (Dunstone, 1993).



Figure 1. *Neogale vison* in Tierra del Fuego Island, Argentina. **a.** Regular color. **b.** Farm color. (Photos: Sergio Anselmino).

Reproduction

The mink's mating season is during winter; only the female takes care of the cubs, that are born around the end of spring and leave the mother's territory as juveniles at the end of summer (Macdonald and Strachan, 1999). Females are able to reproduce in their first year of life and can have litters of more than four individuals per year with different males, and present delayed implantation of fertilized eggs (Macdonald and Harrington, 2003).

Native range distribution

Neogale vison is native to North America, including Alaska, Canada and most of the continental USA, with the exception of the driest areas in Arizona, California, Nevada, New Mexico and Texas (Long, 2003).

History of the invasion

Due to the high quality of its pelt and its easy domestication, the American mink was intensely bred and farmed for the fur industry at a global level (Laviere, 1999). For

this reason, mink farms were established all around the world, and subsequent accidental escapes or deliberate releases caused the American mink to be present as an introduced invasive species in 33 countries of Europe, Asia and South America (Anderson and Valenzuela, 2011).

In Argentina, fur farms were established beginning in the 1930s in all Argentine Patagonian provinces and in Buenos Aires province (Godoy, 1963; Valenzuela *et al.*, 2019). After an initial period of success, the mink fur industry was no longer sustainable, and the farms were mostly abandoned. This led to many animals being released or escaping to ultimately found free-range populations (Valenzuela *et al.*, 2016). The first recorded release event occurred on Tierra del Fuego Island in 1948 (Fabbro, 1989), and further releases were recorded in continental Patagonia. By the 1960s there were already small populations established in the wild (Previtali *et al.*, 1998).

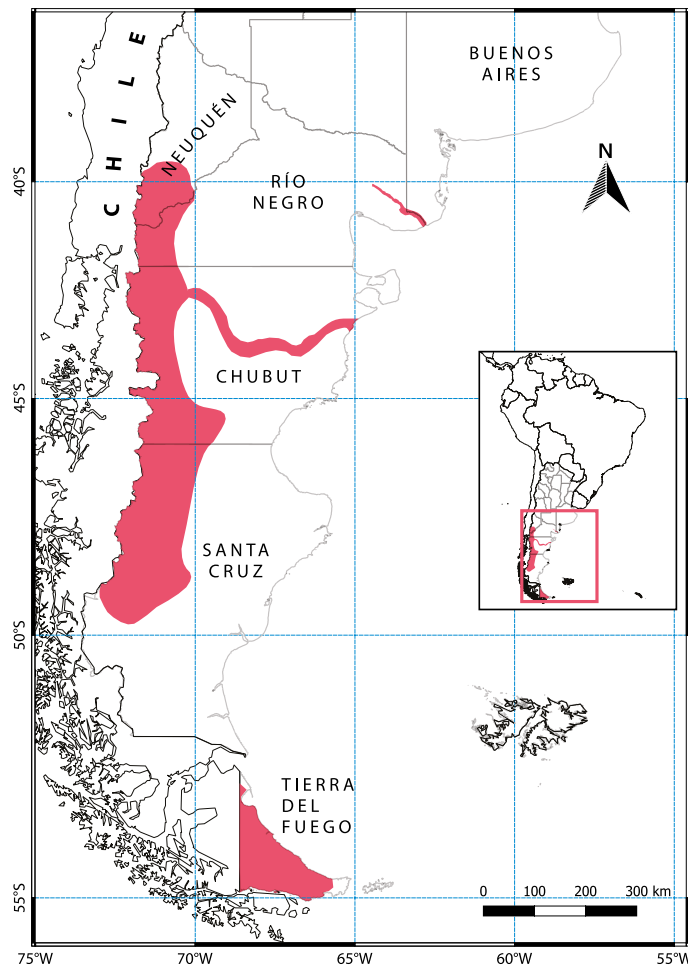


Figure 2. Distribution of *Neogale vison* in Argentina. Modified from Valenzuela *et al.* (2019). (Mapping: Alfredo Claverie and Ian Barbe).

American mink characteristics, including reproductive strategy, diet and habitat use flexibility, confer this species a great advantage to adapt and therefore to invade new habitats and environments (Anderson and Valenzuela, 2011).

Patterns of expansion and current distribution

American mink distribution is associated with water bodies, using banks and coasts to disperse, reaching distances of up to 20 km per day, and also being able to cross maritime barriers, such as channels (Valenzuela *et al.*, 2019). Currently, the mink is the most widely distributed introduced invasive carnivore in Patagonia (Valenzuela *et al.*, 2016), with feral populations in Tierra del Fuego, Santa Cruz, Chubut, Río Negro, Neuquén and Buenos Aires provinces (Fig. 2). American mink are still invading new parts of the region, even crossing the Andes range between Chile and Argentina (Jaksic *et al.*, 2002), and with a recently reported new population in Uruguay (Laufer *et al.*, 2022).

Impacts

Ecological impact

Negative impacts are observed on local fauna mostly due to predation, but also due to resources competition or disease transmission. In particular, the mink has a strong impact on aquatic birds (Peris *et al.*, 2009). Furthermore, the species can host and eventually transmit pathogens (*e.g.*, canine distemper virus) between domestic dogs and native carnivores (Sepúlveda *et al.*, 2014).

Economic impact

Economic impacts for nature-based tourism and ecotourism, such as rafting, sport fishing, and especially birdwatching, are inferred, but not quantified (Cerón and Trejo, 2012). Also, mink could affect productive activities, such as fish and poultry farming (Valenzuela *et al.*, 2019).

Health impact

Sepúlveda *et al.* (2011) found *Toxoplasma gondii* and Barros *et al.* (2014) detected *Leptospira* in wild mink. Additionally, recent studies have shown that the species could host SARS-CoV-2 (Aguiló-Gisbert *et al.*, 2021), influenza A virus (Gholipour *et al.*, 2017), and *Pseudomonas aeruginosa* (Salomonsen *et al.*, 2013).

Management

There is no national or regional management strategy or plan for American mink, and rather there are only local efforts (Fasola and Valenzuela, 2014; Valenzuela *et al.*, 2019). Different actions related to the conservation of the native torrent duck (*Merganetta armata*)

have been implemented in the north of Neuquén province, and in Parque Nacional Nahuel Huapi in Río Negro province (Valenzuela *et al.*, 2019). In the southern region of Parque Nacional Lanín, a mink control plan has been carried out since 2010 to promote bird community recovery (Sanguinetti, 2015; Girini, 2018). In Santa Cruz province, a mink control plan has been carried out since 2014 to specifically protect the critically-endangered hooded grebe (*Podiceps gallardoi*; Fasola and Roesler, 2016). Finally, a comprehensive approach to control the species is carried out in Parque Nacional Tierra del Fuego (Valenzuela *et al.*, 2019).

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INTRODUCED INVASIVE MAMMALS OF ARGENTINA

Introduced Invasive Mammals (IIMs) are a major driver of global and local environmental change, including negative impacts on biodiversity, ecosystem processes, economies, health and other social values. However, as complex social-ecological systems, invasive species cannot be conceived solely as “negative,” nor merely as “biological” invasions. This book presents conceptual and practical perspectives from 49 authors with expertise in communication, ecology, education, genetics, history, philosophy, social sciences and veterinary medicine to better understand and manage IIMs in Argentina. It concludes by providing updated information on Argentina's IIM assemblage, which includes 23 species.

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and Ricardo A. Ojeda, EDITORS**



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