



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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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

# CONTENTS

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LIST OF REVIEWERS.....	VII
FOREWORD.....	IX–X
DANIEL SIMBERLOFF	
1 INTRODUCED AND INVASIVE MAMMALS: CONCEPTUAL AND HISTORICAL PERSPECTIVES FOR ARGENTINA.....	1–30
S. YASMIN BOBADILLA, ANDREA DEL PILAR TARQUINO-CARBONELL AND RICARDO A. OJEDA	
2 RECONCEIVING BIOLOGICAL INVASIONS AS A SOCIO-ECOLOGICAL PHENOMENON USING THE CASE STUDY OF BEAVERS IN PATAGONIA.....	31–51
CHRISTOPHER B. ANDERSON AND J. CRISTOBAL PIZARRO	
3 CHARISMA AS A KEY ATTRIBUTE FOR THE EXPANSION AND PROTECTION OF SQUIRRELS INTRODUCED TO ARGENTINA.....	53–73
M. LAURA GUICHÓN, MARIELA BORGNA, VERÓNICA BENITEZ AND A. CECILIA GOZZI	
4 HUNTING AS A DRIVER OF MAMMAL INTRODUCTIONS.....	75–93
SEBASTIÁN A. BALLARI, M. NOELIA BARRIOS-GARCÍA, JAVIER SANGUINETTI, HERNÁN PASTORE AND M. FERNANDA CUEVAS	
5 IMPACT OF INTRODUCED INVASIVE HERBIVORES IN PATAGONIAN FORESTS.....	95–110
M. NOELIA BARRIOS-GARCÍA, CAROLINA QUINTERO, YAMILA SASAL, SEBASTIÁN A. BALLARI, AGUSTÍN VITALI AND MARIANO A. RODRIGUEZ-CABAL	
6 MANAGEMENT OF FERAL HORSES AS INVASIVE MAMMALS: BIODIVERSITY CONSERVATION VERSUS CULTURE?.....	111–126
ALBERTO L. SCOROLLI	
7 PROGRESS OF BIOLOGICAL INVASION GENETICS AND THE MANAGEMENT OF INVASIVE MAMMALS IN ARGENTINA.....	127–141
MARTA S. LIZARRALDE, MARIANA FASANELLA, SEBASTIÁN POLJAK AND MAGALI GABRIELLI	
8 DISEASE RISKS FROM INTRODUCED MAMMALS.....	143–172
MARCELA M. UHART	
9 EXOTIC SPECIES IN THE FORMAL EDUCATIONAL SPHERE IN ARGENTINA.....	173–191
CLAUDIA M. CAMPOS, GONZALO M. BERMUDEZ, GABRIELA B. DIAZ AND ALFREDO VILCHES	
10 MEDIA REPRESENTATIONS OF INTRODUCED INVASIVE MAMMALS: A COMPARISON BETWEEN TRENDS IN ARGENTINA AND TIERRA DEL FUEGO PROVINCE.....	193–205
VALERIA CAR, NATALIA ADER, CHRISTOPHER B. ANDERSON AND ALEJANDRO E.J. VALENZUELA	
FACT SHEETS ON THE INTRODUCED INVASIVE MAMMALS OF ARGENTINA	
<i>Antilope cervicapra</i>   blackbuck, antílope negro.....	209–213
SEBASTIÁN A. BALLARI	
<i>Axis axis</i>   chital, ciervo axis.....	215–221
JUAN F. TELLARINI, MARIANO L. MERINO AND JAVIER A. PEREIRA	
<i>Bubalus arnee bubalis</i>   wild water buffalo, búfalo asiático.....	223–229
LUCÍA I. RODRÍGUEZ-PLANES, SEBASTIÁN CIRIGNOLI, DIEGO VARELA, MARTA S. KIN AND MARTÍN MONTEVERDE	

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<i>Callosciurus erythraeus</i>   Pallas's squirrel, ardilla de vientre rojo .....	231-242
A. CECILIA GOZZI, VERÓNICA BENITEZ, MARIELA BORGNIA AND M. LAURA GUICHÓN	
<i>Canis lupus familiaris</i>   domestic feral dog, perro doméstico asilvestrado.....	243-248
IAN BARBE, ALFREDO Ñ. CLAVERIE AND ALEJANDRO E.J. VALENZUELA	
<i>Castor canadensis</i>   North American beaver, castor americano .....	249-254
CHRISTOPHER B. ANDERSON AND CATHERINE ROULIER	
<i>Cervus elaphus</i>   red deer, ciervo colorado.....	255-263
JO ANNE M. SMITH-FLUECK AND WERNER T. FLUECK	
<i>Chaetophractus villosus</i>   large hairy armadillo, peludo .....	265-271
SEBASTIÁN POLJAK, MAGALI GABRIELLI, JULIETA SÁNCHEZ AND MARTA S. LIZARRALDE	
Rodentia: Muridae   commensal rodents, roedores comensales .....	273-286
<i>Mus musculus</i>   house mouse, ratón doméstico	
<i>Rattus norvegicus</i>   Norway rat, rata parda o noruega	
<i>Rattus rattus</i>   black rat, rata negra o de los tejados	
REGINO CAVIA AND ISABEL E. GÓMEZ VILLAFañE	
<i>Dama dama</i>   fallow deer, ciervo dama.....	287-291
M. NOELIA BARRIOS-GARCIA	
<i>Felis sylvestris catus</i>   domestic feral cat, gato doméstico asilvestrado.....	293-299
IAN BARBE, ALFREDO Ñ. CLAVERIE AND ALEJANDRO E.J. VALENZUELA	
Feral livestock, ganado cimarrón.....	301-309
<i>Equus ferus caballus</i>   feral horse, caballo cimarrón	
<i>Equus africanus asinus</i>   feral donkey, burro orejano	
<i>Bos primigenius taurus</i>   feral cattle, vaca	
<i>Capra aegagrus hircus</i>   feral goat, cabra	
ALBERTO L. SCOROLLI	
Lagomorpha   European hare and rabbit, liebre y conejo europeos .....	311-317
<i>Lepus europaeus</i>   European hare, liebre europea	
<i>Oryctolagus cuniculus</i>   European rabbit, conejo europeo o de Castilla	
ALEJANDRO E.J. VALENZUELA	
<i>Lycalopex gymnocercus</i>   Pampa fox, zorro gris.....	319-322
ALEJANDRO E.J. VALENZUELA	
<i>Neogale vison</i>   American mink, visón americano .....	323-328
ALFREDO Ñ. CLAVERIE, IAN BARBE, L. ALEJANDRO VILLAGRA AND ALEJANDRO E.J. VALENZUELA	
<i>Ondatra zibethicus</i>   muskrat, rata almizclera.....	329-333
GUILLERMO A. DEFERRARI	
<i>Sus scrofa</i>   wild boar, jabalí .....	335-340
M. FERNANDA CUEVAS	

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## FOREWORD

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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.



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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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*Felis sylvestris catus*

**domestic feral cat, gato doméstico asilvestrado**

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**Resumen.** El gato doméstico semiasilvestrado, cuyo origen se encuentra en Medio Oriente, es un depredador ágil y eficiente de gran adaptabilidad a diversos entornos y condiciones climáticas. Es una especie solitaria y de actividad nocturna-crepuscular y presenta un número medio de entre 3 y 6 crías por camada. Si bien no existen estudios específicos para Argentina, analizando las tendencias poblacionales mundiales es muy probable que las poblaciones de este felino se encuentren en franca expansión en ambientes silvestres. Según la descripción global, fueron introducidos deliberadamente probablemente con los primeros colonizadores como mascotas, comensales o control de plagas. La especie ha colonizado con éxito buena parte del territorio argentino y se ha registrado su presencia en numerosas áreas protegidas del país. Su propagación se asocia principalmente a las personas, debido a su papel como mascotas, y a su capacidad de dispersión natural cuando son asilvestrados. Su principal impacto es la depredación sobre especies nativas y pueden desplazar a los carnívoros nativos debido a la competencia por los recursos. El gato doméstico asilvestrado puede ser portador de numerosas enfermedades que pueden transmitirse al ser humano o a otros animales salvajes. Hasta el momento no se ha realizado una gestión nacional y el único caso documentado es el control no letal de gatos domésticos asilvestrados en la Reserva Natural Isla Martín García, Buenos Aires, cuyos primeros resultados lograron reducir el número de felinos circulantes en la isla (alrededor del 20%) y, con ello, el impacto en algunas especies de la fauna nativa.

### **General description of the species**

The domestic cat (*Felis sylvestris catus*) is one of the smallest members of the family Felidae. It is an agile and efficient predator, with morphological adaptations, such as a flexible body, great vision, retractable claws, sharp teeth, and a long and flexible tail that helps balance. Color variations include shades of brown, black and white in spotted, striped and smooth patterns. Feral populations present adaptations that would be associated with the habitat where they live, such as longer and denser coats in cold areas and shorter hair in warmer environments (Fig. 1). There are more than 100 domestic cat breeds, mostly of similar size, with an average length of 76.5 cm and weighing between 2–6 kg (Long, 2003).



**Figure 1.** *Felis sylvestris catus* in Reserva Natural Isla Martín García, Argentina. (Photo: Ian Barbe).

## Habitat

Cats are highly adaptable animals to various environments and climatic conditions. There are resident feral populations of domestic cats on every continent except Antarctica, including several oceanic islands. They can survive in almost all environments, from the sub-Saharan desert to sub-Antarctic islands, even in the absence of humans. It is estimated that at least 500 million domestic cats are kept as pets in the world and several million more are estimated to live with little human contact or completely feral. Terrestrial with crepuscular to nocturnal activity patterns, the cat is a solitary generalist carnivore (Palacios *et al.*, 2019).

## Reproduction

Female cats reach sexual maturity on average at six months of age, while males become reproductive at around 10 months. Females are seasonal polyesters, varying the number of estrus periods based on environmental conditions, but generally with two per year. Complete estrus lasts approximately 15 days and the gestation period from 62–64 days. The average number of kits per litter is between three to six (Palacios *et al.*, 2019).

## Native range distribution

Archaeological records, supported by genetic and morphological evidence, suggest that cat domestication arose from its relative the African wild cat (*Felis silvestris lybica*),

which must have occurred about 9,000–10,000 years ago in the Fertile Crescent region of the Near East (Driscoll *et al.*, 2007; Macdonald *et al.*, 2010). This fact could have been related to the increase in agriculture and the consequent need to protect crops from rodents. Wild cats probably approached grain accumulation areas, and humans took advantage of their hunting skills to protect the production, taking kittens to breed in captivity (Wilson and Mittermeier, 2009). Although there are no specific studies for Argentina, analyzing world population trends it is highly probable that the populations of this feline are expanding in wild environments.

## History of the invasion

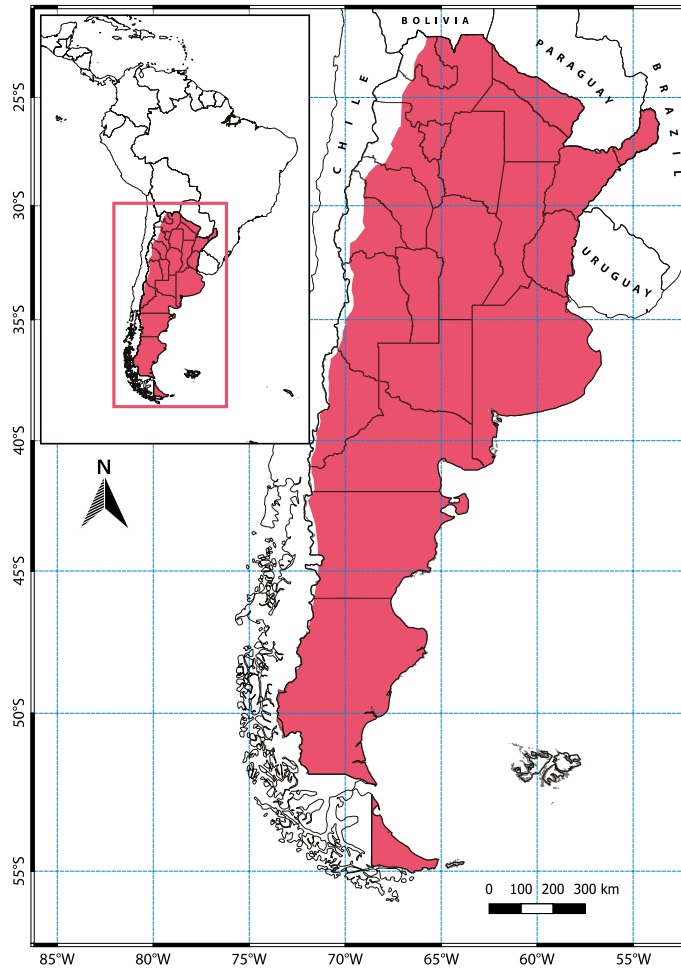
There are no records of the date of introduction, but according to the global description (Nogales *et al.*, 2004), they were deliberately introduced, probably with the first European colonizers, as pets, commensals or pest control agents (Nogales *et al.*, 2004; Valenzuela *et al.*, 2014; Ballari *et al.*, 2016). Subsequently, cats must have become feral as a result of escapes or abandonment. It is probably also the case that the species has successfully colonized most of Argentina, with stable populations of feral/semi-feral/semi-domestical individuals associated to the peripheries of urban centers, rural establishments, and even isolated houses; but also, the species is surely found in natural environments (Palacios *et al.*, 2019).

## Patterns of expansion and current distribution

The spread of the domestic cat is mainly associated with humans and their infrastructure (including routes, etc.) or vehicles (ships, etc.). Although there are few records of the presence of this species in Argentina, its reproductive and ecological characteristics suggest that feral cats could be occupying different habitats in natural areas, but urban areas as well, making it likely that its distribution is almost continuous in the country (Fig. 2). However, there are only a few published records of feral cat populations: 1) Tierra del Fuego Island (Lizarralde and Escobar, 2000) and Observatorio Island (A. Raya Rey, pers. comm.), both in Tierra del Fuego province; 2) several national parks (Merino *et al.*, 2009); 3) Tova and Tovita Islands in Chubut province (Udrizar Sauthier *et al.*, 2017); 4) Reserva Natural Isla Martín García in the La Plata River (Barbe, 2020); and recently, 5) the species was detected for first time in the Parque Nacional Tierra del Fuego (Rodríguez Planes *et al.*, 2019).

Regarding Tierra del Fuego province, in 2008 there were at least 15 feral cats in the Reserva Provincial Corazón de la Isla in Tierra del Fuego Island and the previously mentioned first record in the Parque Nacional Tierra del Fuego, while on Observatorio Island there is only one individual, probably abandoned by Navy personnel associated with the lighthouse, like on other islands in the archipelago (Anderson *et al.*, 2006).

The cat was introduced to Martín García Island (Buenos Aires province) by Europeans in the 16th century, when the first individuals of this species arrived, used on ships to control rodents. In 2018, the cat population in the Reserva Natural Isla Martín García reached 224 individuals of domestic and semi-feral cats (Barbe, 2020). On the other hand, there are



**Figure 2.** Distribution of *Felis sylvestris catus* in Argentina. Modified from Palacios *et al.* (2019). (Mapping: Ian Barbe and Alfredo Claverie).

records of feral, semi-domestic or domestic cats in at least 10 different national and provincial protected areas (Merino *et al.*, 2009).

In the case of Tova and Tovita Islands, at least three different adult specimens have been observed, identified by their different fur, and two dead kittens (indicating reproduction; Udrizar Sauthier *et al.*, 2017). It is likely that cats arrived to these islands with seaweed collectors around the 1970s (Udrizar Sauthier *et al.*, 2017).

## Impacts

### Ecological impact

*Felis sylvestris catus* is one of the world's 100 most harmful introduced invasive species (Lowe *et al.*, 2004). The main impact of cats is by predation on native species—generally

underestimated—, reaching billions of birds, rodents and reptiles annually just in the USA (Loss *et al.*, 2013; Mrcruer *et al.*, 2016). Additionally, they depredate marine bird nests on islands located in the south-east portion of Chubut province and in the Fuegian Archipelago, Argentina (Palacios *et al.*, 2019). Also they can displace native meso-carnivores due to competition for resources. Incursions of free-range domestic cats into natural environments favors the transmission of diseases, which can be potentially devastating for native species (Funk *et al.*, 2001). Additionally, hybridization with small wild cats is possible (Wayne and Brown, 2001; Sunquist and Sunquist, 2002) and can lead to local extirpation of native species (MacDonald *et al.*, 2010).

### **Economic impact**

The population control exercised by domestic cats over rat populations in food production areas produces a positive effect on yield (Palacios *et al.*, 2019). Additionally, economic cost of management should be accounted as economic impact, since programs to reduce free-range domestic or feral cat populations through capture-castration-release or removing individuals are expensive (Andersen *et al.*, 2004; Robertson, 2008).

### **Health impact**

Domestic and feral cats carry numerous diseases that can be transmitted to humans or other wild animals (Palacios *et al.*, 2019), including rabies and *Toxoplasma gondii* (Perez *et al.*, 2011). Parasites of epidemiological importance were detected in feral cats from the Reserva Natural Isla Martín García, such as hemotrophic mycoplasma (Perez *et al.*, 2019).

### **Management**

To date, there is no national management plan for cats (Palacios *et al.*, 2019). Due to its status as a pet, the social perception of the species and its impacts by large sectors of society do not necessarily correspond to the ecological reality, generating a potential conflict regarding the management of feral or semi-feral populations. The management of an introduced invasive charismatic species needs the support of the society (Guichón *et al.*, this volume), not only through responsible ownership, but also by supporting feral populations reduction actions. A cat management plan was carried out in the Reserva Natural Isla Martín García, Buenos Aires province, through non-lethal control of domestic and feral cats, reducing the number of cats on the island by about 20%, leading to decreases in the impact on some native species (Barbe, 2020). Since 2011, a National Program for Responsible Ownership and Health of Dogs and Cats has been in effect, with the dual goal of preserving native biodiversity and avoiding cruelty to these species (National Decree #1088/2011).

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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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