



SAREM Series A
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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

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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

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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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Dama dama

fallow deer, ciervo dama

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Resumen. El ciervo dama o gamo es un ciervo de tamaño mediano, cuya principal característica es la presencia de motas blancas en los flancos de ambos sexos, y astas aplanadas en forma de paleta en los machos. La especie es nativa de Europa occidental, pero fue introducida en Buenos Aires y Neuquén a principios del siglo XIX y luego transportada a diversas estancias y cotos de caza en las provincias de Córdoba, Corrientes, Entre Ríos, La Pampa, Río Negro, San Luis y Santa Fe. La población de la Isla Victoria y Península Huemul, Neuquén, parece ser la más abundante, mientras que en las otras localidades se mantiene restringida principalmente a las estancias o cotos de caza. Existe muy poca información sobre los impactos del ciervo dama, ya que fueron descriptos solo en Isla Victoria, Neuquén, donde ocurre junto al ciervo colorado. Los impactos incluyen reducción de la cobertura vegetal y regeneración de especies palatables, y cambios en la composición vegetal aumentado las especies resistentes a la herbivoría. Además, el ciervo dama raspa y descorteza los árboles, pero este comportamiento solo afecta muy pocos ejemplares (~3%). También se ha observado que los ciervos introducidos pueden facilitar la invasión de pinos introducidos, suprimiendo la vegetación nativa y dispersando hongos micorrízicos. En la Argentina, el único plan de control de ciervo dama se realiza en la Isla Victoria, Neuquén, y tiene como objetivo la erradicación por medio de caza. Además, en la mayoría de los cotos de caza está permitida la caza deportiva, pero se conoce que no es efectiva para controlar las poblaciones de la especie.

General description of the species

The fallow deer is a medium-sized deer, having about 130–160 cm in length and 75–95 cm in height at the shoulder, and weighing about 50–100 kg (Fig. 1). It has much variation in coat color, commonly being reddish brown with numerous white spots on the flanks, which are most pronounced in summer. Only males have antlers, which are up to 70 cm long, palmate, with short tines, that are shed about October. Mainly diurnal and crepuscular, males and females occur in separate single-sex groups, except during the rut, when individual males tend to gather harems (Long, 2003). The rut peaks in April, and one calf is usually born after 235–250 days of gestation. Their life span is about 16–20 years, with males rarely attaining more than 8–10 years (Long, 2003). This deer's home range varies by sex; males may occupy an area of 300–900 ha, while females only 130–200 ha (Ciuti *et al.*, 2006; Borkowski and Pudelko, 2007). Fallow deer graze and browse on a variety of items including grasses and shrubs' leaves, buds, shoots and berries.

History of the invasion

The fallow deer is native to western Eurasia, but it has been introduced in many places around the world. In Argentina, the first introduction appears to have been in Parque Pereyra Iraola, Buenos Aires, in early 19th century (Long, 2003). However, most of invasive populations seem to originate from individuals brought by Ernesto Tornquist from Spain and Poland and released around his home in 1905 near the Sierra de la Ventana hills in southern Buenos Aires province (Chapman and Chapman, 1980; Navas, 1987). Later, individuals were released in nearby ranches and/or spread to several locations across Buenos Aires, including Huetel Ranch, Maipú, Sierra de la Ventana, Tandil, etc. (Chapman and Chapman, 1980). In the 1930s, fallow deer were introduced by Aarón Anchorena in Victoria Island and Huemul Ranch (Daciuk, 1978; Navas, 1987); and by Carl Vogel in Parque Diana and Primavera Ranch, all in Neuquén province. Afterwards, the fallow deer was introduced in several hunting ranches in Córdoba, Corrientes, Entre Ríos, La Pampa, Río Negro, San Luis, and Santa Fe, but unfortunately there are no detailed records.

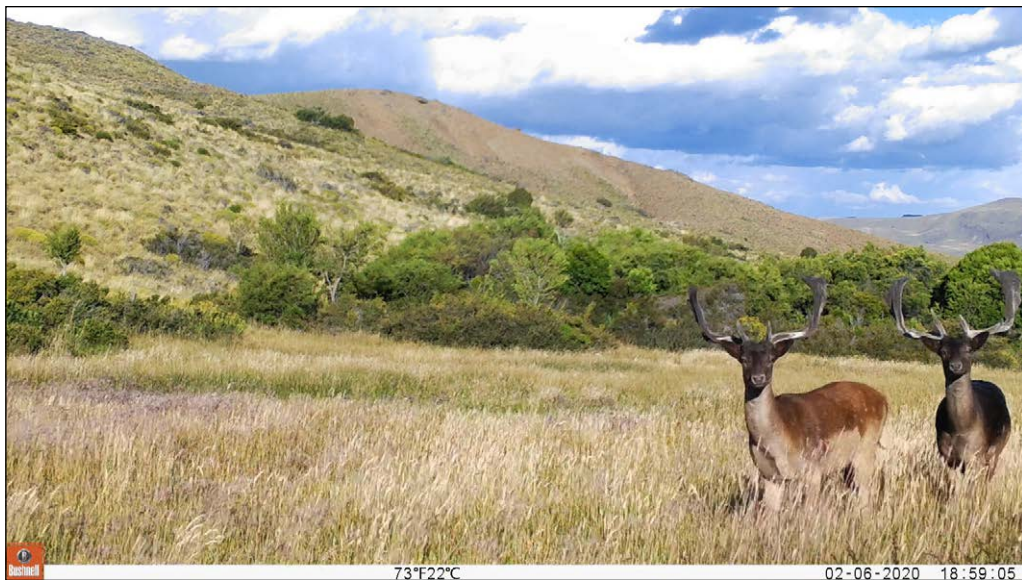


Figure 1. *Dama dama* in Parque Nacional Nahuel Huapi, Argentina. (Photo: Sebastián Ballari).

Patterns of expansion and current distribution

While the fallow deer was introduced in several locations, they are only very abundant on Victoria Island and the Huemul Peninsula in Neuquén province (Daciuk, 1978; Navas, 1987). Otherwise, fallow deer seem to be scarce or restricted to hunting ranches (de Vos *et al.*, 1956; Navas, 1987; Bonino, 1995; Long, 2003; Canevari and Vaccaro, 2007; Novillo and Ojeda, 2008; Fig. 2).

Impacts

Although the effects of fallow deer on native vegetation have been described as detrimental (Daciuk, 1978), there have not been any systematic evaluations of the impact (Bonino, 1995). The only two available studies describe the impact of both fallow and red deer on Victoria Island, Neuquén (Veblen *et al.*, 1989; Barrios-García *et al.*, 2012). These studies indicate that browsing is species-specific, reducing plant cover and regeneration of palatable species, altering plant composition to browse-resistant species (Veblen *et al.*, 1989; Relva and Veblen, 1998; Relva *et al.*, 2009; Barrios-García *et al.*, 2012). Tree fraying and bark stripping is also species-specific, but occur at a very low incidence (only ~3% of the individuals), suggesting that impact might be negligible (Barrios-García *et al.*, 2012).

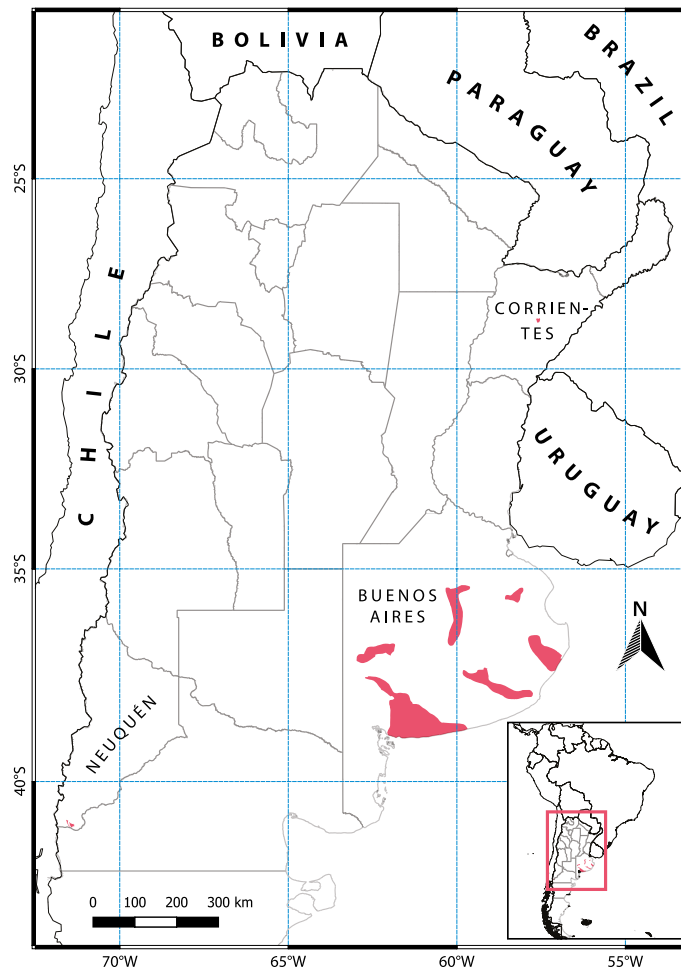


Figure 2. Distribution of *Dama dama* in Argentina. Modified from Barrios-García *et al.* (2019). (Mapping: Alfredo Claverie and Ian Barbe).

Similarly, one study reported no effects of deer on soil physical and chemical properties (Relva *et al.*, 2014). Lastly, another study showed that introduced deer on Victoria Island facilitate pine invasion by browsing on native species and dispersing ectomycorrhizal fungi (Relva *et al.*, 2010; Nuñez *et al.*, 2013).

Management

Like other deer species, hunting is the main control measure for fallow deer. In Argentina, the only approved management plan aims to eradicate fallow deer on Victoria Island, Neuquén, by means of hunting. Otherwise, sport hunting is allowed in most of the hunting ranches across the country, but it is known to be ineffective to control fallow deer populations.

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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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