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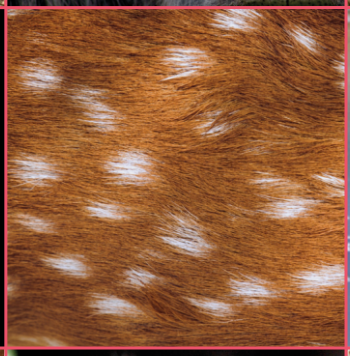


Introduced Invasive Mammals of Argentina

Mamíferos Introducidos Invasores de Argentina











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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 Mammals of Argentina

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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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Antilope cervicapra
blackbuck, antílope negro

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Resumen. El antílope negro es originario del continente asiático y su distribución incluye Pakistán, Nepal e India. Posee dimorfismo sexual en adultos por la coloración del pelaje y machos con astas anilladas y en espiral. Especie principalmente diurna, muy veloces y ágiles, y gregarios, excepto los machos que son territoriales en época de apareamiento. Habita en planicies, bosques abiertos, pastizales y áreas de cultivo. Son herbívoros que se alimentan de pastos bajos, hojas, arbustos y cereales de cultivo. *A. cervicapra* fue introducido en Argentina a principios del siglo XX para cazarlo deportivamente. Actualmente, por los escapes de las áreas de confinamiento, por el movimiento de animales y las actividades de caza ilegales, esta especie tiene poblaciones confirmadas en silvestría y/o confinamiento en las provincias de La Pampa, Córdoba, Buenos Aires, Neuquén, Río Negro, San Luis, Santa Fe, Entre Ríos, Corrientes y Santiago del Estero. En su rango nativo hay escasos reportes de sus impactos, indicando principalmente daños sobre cultivos, mientras que en Argentina no se han indicado daños agrícolas hasta el momento. Los cambios en la vegetación nativa por el antílope podrían provocar alteraciones en la dinámica de los depredadores tope y competencia con herbívoros nativos. El Parque Nacional El Palmar, donde ocasionalmente se ha observado la presencia de la especie, ha incluido al antílope dentro de un plan de control de mamíferos exóticos que controla sus poblaciones a través de la caza. Sin embargo, ningún individuo ha sido cazado hasta el momento dentro del área protegida.

General description of the species

Blackbucks are a medium-sized antelope with a graceful and slender build (Fig. 1). They stand about 81 cm at the shoulder and weigh about 40–45 kg. With pronounced sexual dimorphism, sex is readily distinguishable by color differences. Albinos are fairly common. In mature males, the upper part of the body is black with a white belly and eye rings, while subadults are dark brown above and white below with a prominent white circular patch around the eye. Males also have ringed and coiled horns (45–81 cm long), that are sharply pointed and form a "V" above the head. Females are a yellowish fawn color and lack horns (Nowak, 1991; Long, 2003). Blackbuck are mainly diurnal. They are very fast runners and jumpers, crossing high fences. They are largely herd-living, except territorial males that defend mating arenas in open areas. Gregarious, their herds can range from fifteen to hundreds. Their habitats include plains, open woodlands, wet coastal areas, steppe, dry deciduous forest, riverbanks, scrub and grassland, salty flatlands, undulating, stony

hills with bushes and cultivated areas. Blackbucks are grazers, preferring to feed on short to mid-length grasses, leaves, forbs, and they browse on common bush species and various cultivated cereals. Antelopes generally have one and rarely two calves per year. The normal lifespan is 10–12 years, and rarely they can reach 18 years in the wild or 15–16 in captivity (Canevari and Vaccaro, 2007; Long, 2003; Mahato *et al.*, 2010; Jadeja *et al.*, 2013).



Figure 1. *Antilope cervicapra* in Argentina. Photo: Gabriel Rojo.

History of the invasion

The blackbuck is native to Asia, mainly found in India, but also present in Pakistan and Nepal. Its distribution is discontinuous, with very sparse populations (Long, 2003; Mallon, 2008; Mahato *et al.*, 2010). This antelope was introduced in Argentina between 1906 and 1912 for sport hunting in game reserves in southeastern La Pampa, Córdoba, southwestern Buenos Aires, Chaco and San Luis provinces. Subsequently, other introductions were conducted in eastern Entre Ríos, southern Santa Fe and Buenos Aires between 1940 and 1960 (Petrides, 1975; Navas, 1987; Long, 2003; Canevari and Vaccaro, 2007). More recently, blackbuck is also known to be present in Neuquén, Río Negro, Corrientes, and Santiago del Estero provinces (Ballari *et al.*, 2019).

Patterns of expansion and current distribution

The antelope is currently found in the central and northeastern region of Argentina (Fig. 2). The main vector for its movement to new locations is people and their activities

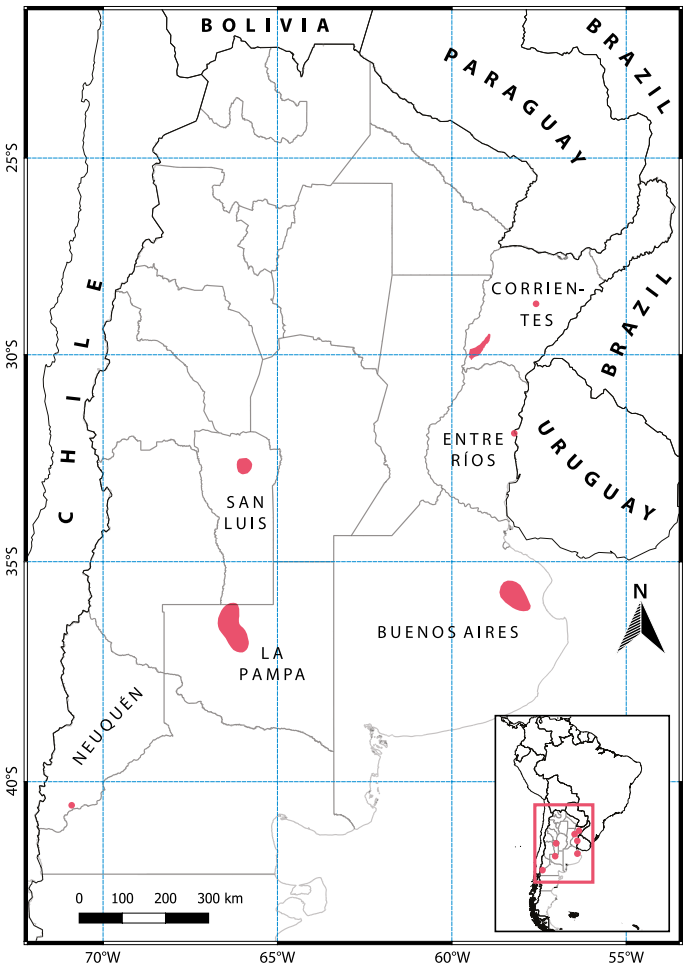


Figure 2. Distribution of *Antilope cervicapra* in Argentina. Modified from Ballari *et al.* (2019). (Mapping: Ian Barbe and Alfredo Claverie).

related to legal and illegal hunting. The unregulated transport of animals and the presence of illegal hunting reserves seem to be the current sources of dispersion of this species in Argentina (Ballari *et al.*, 2019). Additionally, there are numerous legal hunting reserves in central and northeastern Argentina, where the species can be found and represent potential sources for new escapes (Ballari *et al.*, 2016). The species' wide and continuous dispersal for hunting purposes and the scarcity of natural predators mean that antelope populations are abundant and increasing (Ballari *et al.*, 2019).

Impacts

There are no studies of this species' impacts in Argentina. In its native range, blackbucks can damage agricultural crops, but overall their effects are not significant (Chauhan

and Singh, 1990; Jhala, 1993). On the other hand, antelopes do host internal and external parasites (Thornton *et al.*, 1973; Mertins *et al.*, 1992) that may harbor diseases that endanger native wildlife. In particular, this could affect native deer that coexist with antelopes, such as brown brocket (*Mazama gouazoubira*) and marsh deer (*Blastocerus dichotomus*). In their native range, blackbucks are important seed dispersers, including seeds of invasive weeds that mostly depend of the large behavioral differences between individuals of a species, arising from extreme male mating strategies (Jadeja *et al.*, 2013). In Argentina, studies have indicated that antelope modifying plant communities could alter the population dynamics of predators (*e.g.*, cougar *Puma concolor*) and compete with native herbivore species (*e.g.*, patagonian mara *Dolichotis patagonum*, greater rhea *Rhea americana*) (Cabrera, 2015; Sánchez, 2015).

Management

In Argentina, no national management strategy has been implemented. Parque Nacional El Palmar in Entre Ríos included *A. cervicapra* in the list of potential targets in its controlled hunting plan since 2006. However, no individuals were hunted because their presence inside the protected areas is circumstantial (Gürtler *et al.*, 2018).

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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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