

the three Chilean foxes (*P. griseus*, *P. culpaeus* and *P. fulvipes*) at Parque Nacional Nahuelbuta.

### Gaps in knowledge

The need for a deeper understanding of the biology of the chilla has been repeatedly emphasised by Argentine as well as by Chilean studies (e.g., Johnson and Franklin 1994b; González del Solar *et al.* 1997). Reliable information is needed especially with regard to those biological aspects required for population management leading to sustainable use and conservation: population-dynamics, incidence of parasites and other diseases, and research on the role of chillas in small-livestock mortality.

### Core literature

Campos and Ojeda 1996; Durán *et al.* 1985; González del Solar *et al.* 1997; Jaksic *et al.* 1980; Johnson and Franklin 1994a, b, c; Medel and Jaksic 1988; Rau *et al.* 1995.

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## 3.7 Pampas fox *Pseudalopex gymnocercus* (G. Fischer, 1814) Least Concern (2004)

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### Other names

**English:** Azara's fox, Azara's zorro; **French:** renard d'Azara; **German:** Pampasfuchs; **Italian:** volpe Azara, volpe grigia delle Pampas; **Portuguese:** graxaim do campo, cachorro do campo, rasposa do mato; **Spanish:** zorro pampeano (Argentina); zorro de patas amarillas (Bolivia); zorro de Azara, zorro Pampa, zorro del país, zorro de

campo (Uruguay); **Indigenous names:** Guaraní: aguara cha'I (Argentina, Paraguay); Mapuche: ngürü (Argentina); Quechua: ató (Argentina, Bolivia).

### Taxonomy

*Procyon gymnocercus* G. Fischer, 1814. Zoognosia, 3: xi, 178. Type locality: "Paraguay", restricted by Cabrera (1958) to "a los alrededores de Asunción" [Paraguay, c. 25°S, 57°W].

The taxonomic status of the Pampas fox and other related species is controversial. This canid was first included in the genus *Canis* by Linnaeus (1758) and in *Pseudalopex* by Burmeister (1854). However, it was treated as *Dusicyon* by Cabrera (1958) and then by Langguth (1969), who gave *Pseudalopex* subgeneric rank. Later, Langguth (1975) and Van Gelder (1978) placed *Pseudalopex* as a subgenus of *Canis*, excluding *Dusicyon australis*. Clutton-Brock *et al.* (1976) included all these taxa and *Pseudalopex vetulus* in *Dusicyon*. However, Berta (1988) gave full generic recognition to *Pseudalopex*, arguing that the species falling into this genus (*culpaeus*, *griseus*, *gymnocercus*, *sechurae*, and *vetulus*) share derived features that support a single origin for those taxa, separated from other genera now extinct and more closely related with *Dusicyon australis*. Recently, Zunino *et al.* (1995) proposed that *P. griseus* and *P. gymnocercus* represent clinal variants of *Lycalopex gymnocercus*. They considered *Lycalopex* as the valid genus name because it would have been used by Burmeister two years earlier. Chromosome analyses carried out by Gallardo and Formas (1975), and Vitullo and Zuleta (1992) supported this proposal (see Wozencraft 1993 and Zunino *et al.* 1995 for detailed comments).

Chromosome number: 2n=74 (Wayne *et al.* 1987).

### Description

A medium-sized South American fox, smaller than the culpeo (*P. culpaeus*). The head, somewhat triangular in shape, is reddish with a pale grey to white ventral surface.



Adult Pampas fox, thought to be male. Lihuel Calel National Park, La Pampa, Argentina, 2001.

Marcelo Dolisan (via Marcelo Pessino)

**Table 3.7.1. Body measurements for the Pampas fox.**

	<b>La Pampa province,</b> Argentina (Crespo 1971)	<b>Buenos Aires province,</b> Argentina (E. Luengos Vidal and M. Lucherini unpubl.)	<b>Colonia Department,</b> Uruguay (Cravino <i>et al.</i> 2000).
HB male	648mm (597–700) n=10	660mm (620–740) n=20	
HB female	621mm (535–683) n=16	630mm (505–720) n=18	
T male	352mm (320–365) n=10	342mm (280–380) n=24	
T female	319mm (270–356) n=16	325mm (250–410) n=20	
HF male	140mm (135–155) n=10	145mm (130–160) n=22	
HF female	128mm (115–145) n=16	135mm (115–170) n=16	
E male	86mm (80–90) n=10	74mm (61–90) n=24	
E female	84mm (80–90) n=16	73mm (62–83) n=18	
WT male	4.6kg n=116	5.9kg (4–8) n=24	5.9kg n=11
WT female	4.2kg n=163	4.7kg (3–5.7) n=20	4.6kg n=8

The ears are triangular, broad and relatively large; they are reddish on the outer surface and white on the inner surface. The rostrum is narrow, ventrally pale, black in the chin and reddish to black dorsally. The eyes, near frontally placed, take an oblique appearance. The body, back and sides are grey, like the outer surface of the hind limbs, which show on the lower rear side a characteristic black spot. A dark band, almost black, runs longitudinally along the trunk and tail dorsum. The tail is relatively long, bushy and grey, being black at the tip (Table 3.7.1). The belly and the inner surface of the limbs are pale grey to white. The outer surface of the front limbs and the distal surface of the hind limbs are reddish. Smaller size and lack of interparietal crest distinguish its skull from that of the culpeo (Zunino *et al.* 1995). Dental formula is 3/3-1/1-4/4-2/3=42.

**Subspecies** Three subspecies have been proposed (Massoia 1982). Their geographic limits are not precise and Massoia (1982) suggested that along their borders they could coexist and interbreed. This author did not clarify the subspecific status of the Pampas foxes from Entre Ríos Province in Argentina, and there is no data regarding the taxonomic position of Bolivian foxes.

- *P. g. gymnocercus* (subtropical grasslands of north-eastern Argentina – southern Misiones, northern Corrientes and eastern Formosa provinces – Uruguay, Paraguay and south-eastern Brazil, from Paraná to Rio Grande do Sul estates).
- *P. g. antiquus* (Pampas grasslands, Monte scrublands and Espinal open woodlands of central Argentina, from Córdoba and San Luis provinces to the Río Negro, and from the Atlantic coast to a poorly defined limit west of the Salado-Chadilevú River).
- *P. g. lordi* (restricted to the Chaco-Mountain Tropical Forest ecotone in Salta and Jujuy provinces of Argentina). The smallest subspecies, with pelage smoother and brighter, denser in the tail, and more contrasting in colour than in the other subspecies.

There are characteristic dark (almost black) spots in the pectoral and axillar regions of the body. Its skull is smaller than in the other subspecies, average length and weight being 924mm and 4.3kg, respectively (Massoia 1982), compared with 960mm and 5.9kg in *P. g. gymnocercus* (Barlow, in Redford and Eisenberg 1992) and 967mm and 4.4kg in *P. g. antiquus* (Crespo 1971).

**Similar species** Chilla (*Pseudalopex griseus*): overlaps with the south-eastern portion of the range of the Pampas fox; similar in colour and body proportions, but usually smaller and with a more uniformly grey pelage and shorter

**Figure 3.7.1. Current distribution of the Pampas fox.**



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legs (Clutton-Brock *et al.* 1976; Novaro 1997a). Crab-eating fox (*Cerdocyon thous*): occurs in the northern part of the range; similar in size, but with shorter hair and rostrum, and dark-coloured, shorter, legs (Redford and Eisenberg 1992).

### Current distribution

The Pampas fox inhabits the Southern Cone of South America (Figure 3.7.1), occupying chiefly the Chaco, Argentine Monte, and Pampas eco-regions. From eastern Bolivia, western Paraguay and east of Salta, Catamarca, San Juan, La Rioja and Mendoza provinces in Argentina, to the Atlantic coast; and from south-eastern Brazil to the Río Negro Province, Argentina, in the south. Information on the limits of its distribution and the extent to which it overlaps with congeneric species is uncertain.

**Range countries** Argentina, Bolivia, Brazil, Paraguay, and Uruguay (Redford and Eisenberg 1992).

### Relative abundance

Little quantitative data are available on the abundance of Pampas fox populations. However, it would be either abundant or common in most areas where the species has been studied.

In the coastal area of central Argentina, a study based on scent-stations found that Pampas fox signs were more frequent than the common hog-nosed skunk (*Conepatus chinga*) and grison (*Galictis cuja*) (García 2001). Similarly, the frequency of observation of Pampas fox was higher than that of skunk, grison, and the Geoffroy's cat (*Oncifelis geoffroyi*) in a Sierra grassland area of Buenos Aires Province (M. Lucherini *et al.* unpubl.). In areas where the Pampas fox is sympatric with the crab-eating fox, the former would be more abundant in open habitats, while the latter would more frequently inhabit woodland areas.

The Pampas fox seems to be tolerant of human disturbance, being common in rural areas, where introduced exotic mammals, such as the European hare (*Lepus europaeus*), could form the bulk of its food intake (Crespo 1971; Farias 2000a; D. Birochio and M. Lucherini unpubl.).

**Estimated populations/relative abundance and population trends** The highest density has been reported for the Bañados del Izozog in the Bolivian Chaco (1.8 individuals/km<sup>2</sup>; Ayala and Noss 2000). In an Argentine Pampas area, Crespo (1971) found a density of 1.04 foxes/km<sup>2</sup>, while Brooks (1992) estimated a density of 0.64 fox groups/km<sup>2</sup> for the Paraguayan Chaco, where fox abundance appeared to be correlated with annual rodent abundance. In La Pampa Province, Argentina, data from scent stations showed a stable tendency in the abundance of this species between 1992 and 1998 (Table 3.7.2) (R. Dosio and M. Pessino unpubl.).

### Habitat

The Pampas fox is a typical inhabitant of the Southern Cone Pampas grasslands. It prefers open habitats and tall grass plains and sub-humid to dry habitats, but is also common in ridges, dry scrub lands and open woodlands (Brooks 1992; Redford and Eisenberg 1992). In the driest habitats in the southerly and easterly parts of its range, the species is replaced by the chilla. Where its range overlaps with that of the crab-eating fox, the Pampas fox would select more open areas. Apparently, the Pampas fox has been able to adapt to the alterations caused by extensive cattle breeding and agricultural activities to its natural habitats.

### Food and foraging behaviour

**Food** Like most other medium-sized foxes, the Pampas fox is a generalist and adaptable carnivore. Its diet shows great geographic variation and may include both wild and domestic vertebrates (particularly rodents and birds), fruit, insects, carrion and garbage. Based on stomach contents, wild mammals and sheep appeared to be the two most important food items in Uruguay (Cravino *et al.* 1997), while in La Pampa Province, Argentina, European hares and rodents were the most important food items, followed by birds and carrion (Crespo 1971). Recent studies in Buenos Aires Province, Argentina, using faecal analysis, report high frequencies of occurrence of rodents and birds, but also of insects and fruits (Farias 2000a; D. Birochio and M. Lucherini unpubl.) and crabs (in a coastal

**Table 3.7.2. The status of Pampas foxes in various regions** (Population: A=abundant, C=common, X=present but abundance unknown; Trend: I=increasing, S=stable). When shown, numeric abundance indicated as rough estimates based on the densities given above.

Region	Protected areas		Other areas		Total	
	Population size	Trend	Population size	Trend	Population size	Trend
La Pampa (Argentina)	150	S/I	150,000	S	>150,000	S/I
Buenos Aires (Argentina)	C	S/I	C	S/I	C	S/I
Uruguay	X	?	C	?	C	?
Rio Grande do Sul (Brazil)	X	?	C	?	C	?
Paraguayan Chaco	X	?	C	?	180,000	?
Bolivian Chaco	X	?	C	?	350,000	?

area; Vuillermoz and Sapoznikow 1998). However, in a study where ingested biomass was estimated, mammal carrion, rodents and hares were the main dietary components (Farias 2000a). Seasonal and local variations in diet are likely connected to variations in food availability (Vuillermoz and Sapoznikow 1998; Farias 2000a; García 2001; D. Birochio and M. Lucherini unpubl.). No sex/age differences in food habits have been reported, but occasional observations of food remains at den sites (M. Lucherini pers. obs.) suggest that cubs feed mostly on small- to medium-sized vertebrate prey.

**Foraging behaviour** The Pampas fox is a typical solitary and opportunistic carnivore, foraging both during the day and night (E. Luengos Vidal unpubl.), although feeding activity would become mainly nocturnal where heavily hunted. Large, highly concentrated food resources (i.e., large mammal carcasses) may cause several individuals to gather, possibly through movements exceeding the borders of normal home range size (E. Luengos Vidal and M. Lucherini unpubl.). Food caching behaviour has been observed, apparently related to an increase in the availability of a food resource, i.e., rodents (J. Pereira pers. comm.).

**Damage to livestock or game** Predation on domestic stock traditionally has been one of the main reasons to justify this fox's persecution by rural people. Nevertheless, it is likely that mainly adult sheep are scavenged, while some studies found evidence of predation on newborn lambs, but concluded that foxes were only a secondary factor of lamb mortality (2.9% of total lamb mortality in Uruguay, Cravino *et al.* 1997; 4.1% and 6.9% in Argentina, Bellati 1980 and Olachea *et al.* 1981, respectively), especially when compared to climate (Cravino *et al.* 1997). High levels of predation on poultry have never been supported by observations or dietary studies. Similarly, although Pampas foxes are commonly accused of causing important reductions in game populations, particularly by feeding on eggs and chicks of ground-nesting birds, there is little data to support this view (Vuillermoz and Sapoznikow 1998; Farias 2000a).

### **Adaptations**

Very little is known about the behavioural, morphological and physiological adaptations of this species.

### **Social behaviour**

Pampas foxes are thought to form monogamous pairs. However, they spend most of their time solitarily: in the Paraguayan Chaco (Brooks 1992) and La Pampa Province, Argentina (Branch 1994) 88–93% of observations, respectively, were of single individuals. Pairs are frequently observed from mating until cubs leave the natal den.

In a Sierra grassland area, the home ranges of two adult males have been estimated at 40 and 45ha (E. Luengos Vidal and M. Lucherini unpubl.). In the same area, foxes showed a relatively low frequency of re-use of scat marking sites, and a tendency to mark latrines used by Geoffroy's cats and common hog-nosed skunks (M. Lucherini and C. Manfredi unpubl.). Defecation site features suggest that scats are used in intraspecific communication (M. Lucherini and D. Birochio unpubl.; A.A. Farias pers. obs.).

The long-distance calls of Pampas foxes, which show a peak in frequency during the breeding period, may serve to maintain contact between pair members, as well as in territorial behaviour (Branch 1994). During the breeding season, both pair mates have been observed using a brief and repeated alarm call when detecting potential threats to the young (M. Lucherini pers. obs.).

### **Reproduction and denning behaviour**

In central Argentina, cubs are born in spring, from October to December. Gestation lasts 55–60 days, and litter size ranges from 3–5 (Crespo 1971; M. Lucherini and E. Luengos Vidal unpubl.). Dens may be located in a variety of shelters, e.g., a hole at the base of a tree trunk, in armadillo dens, or among rocks. Cubs are frequently moved to a new location (M. Lucherini and E. Luengos Vidal pers. obs.). Young stay at the den for the first three months. Both pair mates have been observed to guard the den (M. Lucherini pers. obs.) and males provide food to cubs and females at the den. Females may breed at 8–12 months of age. In a Sierra Pampas area, reproductive dens did not appear to be re-used in following years (M. Lucherini pers. obs.).

### **Competition**

In the Lihuel Calel National Park, Argentina, remains of armadillos (*Zaedyus pichy* and *Chaetophractus villosus*), plain viscachas (*Lagostomus maximus*), small rodents (*Ctenomys* spp., *Galea musteloides*) and European hares appeared in the droppings of both the puma (*Puma concolor*) and Pampas fox (M. Pessino unpubl.).

Partial dietary overlap has also been found with the Geoffroy's cat, a similar-sized carnivore whose range widely overlaps that of the Pampas fox. In Buenos Aires Province, most of the food items in the droppings of these two carnivores (e.g., *Cavia*, *Oligorizomys* and *Akodon* rodents), European hares, small passerines and doves were the same, although their frequency of occurrence was different (Vuillermoz and Sapoznikow 1998, M. Lucherini and C. Manfredi unpubl.). However, signs of presence, suggest that spatial segregation between the Pampas fox and Geoffroy's cat may occur in Mar Chiquita, Atlantic coast of Buenos Aires Province (A.A. Farias unpubl.).

In Uruguay, although temporal segregation has been suggested, a very large food niche overlap was reported between the Pampas fox and crab-eating fox (Cravino *et al.* 2000).

Very little information is available on two other species that share a large proportion of their ranges with the Pampas fox: the Pampas cat (*Oncifelis colocolo*) and the common grison. Some data from scat analysis suggest extensive food niche overlap between the Pampas fox and the grison in a Sierra Pampas area (M. Lucherini *et al.* unpubl.).

### **Mortality and pathogens**

**Natural sources of mortality** Little is known about natural causes of mortality. Pampas fox remains have been found in puma scats collected in the Lihuel Calel National Park, Argentina (Wander *et al.* unpubl.). Kills by feral dogs have also been reported (A.A. Fariás pers. obs., A. Canepuccia and D. Queirolo Morato pers. comm.).

**Persecution** In Argentina and southern Brazil (Rio Grande do Sul State, C. Indrusiak pers. comm.), the Pampas fox has been considered an important predator of sheep and goats, and consequently has been actively persecuted by livestock ranchers. In the provinces of La Pampa, Buenos Aires, and San Luis, control campaigns were carried out against this species between 1949 and the early 1970s, in order to reduce economic losses caused by predation. As a result, 361,560 individuals were killed using different methods, including leg-hold traps, selective traps with toxic cartridges, shooting, dogs and poisoned baits (Godoy 1963; M. Pessino and R. Sosa unpubl.). Pampas foxes were also hunted by the bounty system in the provinces of San Juan, Catamarca, and Río Negro during 1959 and Córdoba during 1960.

In 2001, the bounty system was used again for the control of this species in La Pampa Province, while fox hunting has been re-opened in Buenos Aires Province. In Brazil, although the fox is protected by law, control measures are regularly taken by sheep breeders with no legal permission (C. Indrusiak pers. comm.). In Uruguay, special hunting authorisation may be easily obtained by the government to control predation on sheep herds (Cravino *et al.* 2000).

**Hunting and trapping for fur** Rural residents have traditionally hunted the Pampas fox for its fur, and this activity has been an important source of income for them. From 1975 to 1985, *Pseudalopex* fox skins (mostly belonging to *P. gymnocercus*; García Fernández 1991) were among the most numerous to be exported legally from Argentina (Chebez 1994). However, exports have declined from the levels of the early and mid-1980s mainly due to a decline in demand (Novaro and Funes 1994). From 1997 to 1999, national fox pelt exports averaged a

mere 8,000 specimens per annum (M. Elisetoh unpubl.). In Uruguay, because of their relatively high commercial value, illegal trade of *P. gymnocercus* fur is still widespread (D. Queirolo Morato pers. comm.), while in Paraguay no illegal fox pelts were confiscated during 1995 to 2000 (J. Cartes pers. comm.).

**Road kills** Pampas foxes are frequently struck by cars (N. Fracassi and D. Queirolo Morato pers. comm.). However, no data are available in order to establish the impact of road kills on fox populations.

**Pathogens and parasites** Animals kept in captivity are susceptible to parvovirus and distemper (F. Baschetto pers. comm.). Ectoparasites in the Pampas fox include ticks (*Amblyomma maculatum*, *A. auriculare*) and fleas (*Pulex irritans*, *Ctenocephalides felix*, *Hectopsylla broscus*, *Malacopsylla grossiventris*, *Tiamastus cavicola*, *Polygenis* spp.). In a sample of 132 foxes, the most common parasites were *A. maculatum*, *M. grossiventris* and *P. irritans* (A. Bischoff de Alzuet unpubl.). Recorded endoparasites include *Taenia pisiformis* (*Taenidae*), *Dipylidium caninum* (*Dilepididae*), *Joyeuxiella* spp. (*Dilepididae*), and many species from the *Cestoda* Class. Nematodes such as *Molineus felineus* (*Trichostrongylidae*), *Toxocara canis* (*Ascariidae*), *Ancylostoma caninum* (*Ancylostomidae*), *Rictularia* spp. (*Rictularidae*), and *Physaloptera* spp. (*Physalopteridae*) (Led *et al.* 1970), as well as *Echinococcus granulosus* and *E. cepanchoi*, have also been noted. Another internal parasite, *Athesmia foxi* (*Trematoda: Dicrocoeliidae*), was found in the small intestine. Cases of *Sarcoptes scabiei* infection have also been reported (S. Deem pers. comm.).

**Longevity** Few individuals are likely to live more than a few years in the wild, but a captive animal lived nearly 14 years (Jones 1982).

### **Historical perspective**

Fox furs were used by native communities for making shawls. When white traders appeared, fox furs became valued merchandise. Rural people inhabiting La Pampa Province use Pampas fox fat for medicinal purposes (M. Pessino pers. obs.). Among natives and settlers, foxes in general, and particularly the Pampas fox, have been the main characters of numerous stories and proverbs, which have been passed down from generation to generation. Also, these communities have interpreted their presence and behaviour in certain circumstances as omens.

### **Conservation status**

**Threats** The implementation of control measures (promoted by ranchers) by official organisations, coupled with the use of non-selective methods of capture, represent actual threats for the Pampas fox. Fox control by

government agencies involves the use of bounty systems without any serious studies on population abundance or the real damage that this species may cause. In rural areas, direct persecution is also common, even where hunting is officially illegal.

Most of the species' range has suffered massive habitat alteration. For instance, the Pampas, which represents a large proportion of the species' distribution range, has been affected by extensive cattle breeding and agriculture. Approximately 0.1% of the original 500,000km<sup>2</sup> range remains unaffected. However, due to the species' adaptability, the Pampas fox seems able to withstand the loss and degradation of its natural habitat, as well as hunting pressure. Since no studies are available on its population dynamics in rural ecosystems, caution is required, since the sum of these threats may eventually promote the depletion of fox populations. Hunting pressure has resulted in diminished populations in the provinces of Tucumán (Barquez *et al.* 1991) and Salta (Cajal 1986) of north-western Argentina.

**Commercial use** Considering that the Pampas fox trade is banned, no statistical information on the fur harvest is available. Different authors have pointed out that Argentine exports corresponding to the chilla historically included other species, such as the crab-eating fox and the Pampas fox (Ojeda and Mares 1982; García Fernandez 1991).

#### **Occurrence in protected areas**

- In Uruguay, the Pampas fox has been reported in many protected areas which are included in a law passed in 2000 establishing the national protected areas system. However, this law has not been implemented yet (R. Rodríguez-Mazzini and D. Queirolo Morato pers. comm.).
- *Argentina*: National Parks Chaco (Chaco), Mburucuyá (Corrientes), Calilegua (Jujuy), El Palmar (Entre Ríos), Lihuel Calel (La Pampa) (Heinonen Fortabat and Chebez 1997), E. Tornquist and Bahía Samborombón Provincial Parks, and Campos del Tuyú Wildlife Reserve (Buenos Aires). The Pampas fox is the least well represented among the *Pseudalopex* species in the National Park system of Argentina (Heinonen Fortabat and Chebez 1997).

#### **Protection status** CITES – Appendix II.

The Argentina Red List of Mammals (Díaz and Ojeda 2000) assigned the Pampas fox to the “Least Concern” category.

**Current legal protection** In Argentina, it was declared not threatened in 1983, and its trade was prohibited in 1987. However, this species continues to be hunted and demand for its fur exists.

In Uruguay, all foxes are protected by law, and the only legal exception is the government's so-called “control hunting permission”, which does not allow the taking of animals for the fur trade. The situation is very similar in Paraguay.

**Conservation measures taken** None.

#### **Occurrence in captivity**

In Argentina, the Pampas fox has been successfully bred in captivity and presently is the best represented carnivore species in captivity in the country (Aprile 1999).

#### **Current or planned research projects**

In the Argentina Pampas grassland, the GECM (Grupo de Ecología Comportamental de Mamíferos), Universidad Nacional del Sur, Argentina, is presently comparing the abundance, spatial behaviour and social organisation as well as food niche of the Pampas fox in a protected site versus a site affected by farming.

A. Farias and V.B. García (Pontificia Universidad Católica de Chile) have started studies on the trophic ecology of the Pampas fox in two coastal areas of Buenos Aires Province.

S.J. O'Brien and W.E. Johnson (National Cancer Institute, USA) have proposed a DNA-based study on the phylogeny of *Pseudalopex* foxes.

S. González *et al.* (División Citogenética-IIBCE, Unidad Asociada Facultad de Ciencias, Uruguay) initiated a study aimed at determining the genetic variability of *P. gymnocercus* and the crab-eating fox in wooded areas in northern and eastern Uruguay in order to test whether hybridisation occurs.

#### **Gaps in knowledge**

Most aspects of the species' ecology remain unknown. Studies on population dynamics in agricultural land, impact and sustainability of hunting, effect of predation on livestock and game species are needed, particularly for an appropriate management of wild populations. In addition, resolution of the species' taxonomic status is essential.

#### **Core literature**

Crespo 1971; Massoia 1982; Zunino *et al.* 1995.

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