

**3.6 Chilla**  
***Pseudalopex griseus* (Gray, 1837)**  
**Least Concern (2004)**

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**Other names**

**English:** South American grey fox, Argentinean grey fox, grey zorro; **French:** renard gris; **German:** Patagonischen fuchs; **Spanish:** zorro gris, zorro gris chico, zorro gris Patagónico (Argentina); zorro gris, zorro chico, zorro chilla, zorro de la pampa (Chile); **Indigenous names:** Araucano/Mapuche: ngürü, nuru, n’rú (Argentina/Chile); Puelche: yeshgai (Argentina); Quechua: atój (Argentina/Peru).

**Taxonomy**

*Vulpes griseus* Gray, 1837. Mag. Nat. Hist. [Charlesworth’s], 1:578. Type locality: “Magellan”, listed in Cabrera (1958) as “Costa del Estrecho de Magallanes” [Chile].

The Darwin’s fox (*Pseudalopex fulvipes*) was first deemed an island form of *P. griseus* (Osgood 1943; Clutton-

Brock *et al.* 1976; Honacki *et al.* 1982). More recently, however, the discovery of sympatric populations of *P. fulvipes* and *P. griseus* on the Chilean mainland (Medel *et al.* 1990), and studies using metachromatic and genetic (see Yahnke *et al.* 1996) analyses support the recognition of *P. fulvipes* as a species. The Pampas fox (*P. gymnocercus*) has recently been suggested to be conspecific with *P. griseus* on the basis of a craniometric and pelage characters analysis (Zunino *et al.* 1995). These authors conclude that *P. gymnocercus* and *P. griseus* are clinal variations of one single species, namely *Lycalopex gymnocercus*.

Chromosome number is 2n=74; fundamental number is FN=76. Somatic karyotype of the female constituted by 36 pairs of acrocentric chromosomes. The X chromosome is metacentric, and the Y chromosome is a micro-chromosome (Gallardo and Formas 1975).

**Description**

A small fox-like canid with body measurements as shown in Table 3.6.1. Head rufescent, flecked with white. Large ears. Chin with well-marked black spot. Coat brindled grey, made up of agouti guard hairs with pale underfur.

**Table 3.6.1. Body measurements for the chilla.**

	<b>Tucumán, Argentina</b> (Mares <i>et al.</i> 1996).	<b>Parque Nacional Nahuelbuta,</b> Chile (E. McMahon pers. comm.).	<b>Parque Nacional Torres del Paine,</b> Chile (Johnson and Franklin 1994c).	<b>Reserva Nacional Las Chinchillas,</b> Chile (Jiménez 1993, Jiménez <i>et al.</i> 1995).
HB male	520mm (501–540) n=2			
HB female	566mm (562–570) n=2	579mm (515–660) n=14		
T male	337mm (328–347) n=2			
T female	319mm (317–322) n=2	283mm (115–330) n=14		
HF male	128mm (125–131) n=2			
HF female	122mm (120–124) n=2	130mm (118–145) n=14		
E male	75mm (70–81) n=2			
E female	81mm (80–82) n=2	84mm (55–169) n=8		
WT male			4.0 ± 0.1 (SE) kg, n=23	
WT female		3.5kg (2.5–5.0) n=14	3.3 ± 0.1 (SE) kg, n=21	2.5 ± 0.9 (SE) kg, n=16



Rafael González del Solar

Chilla, age and sex unknown. Parque Nacional Talampaya, La Rioja, Argentina.

Thighs crossed by a black patch. Legs and feet pale tawny. Underparts pale grey. Tail long and bushy, with dorsal line and tip black. Tail's underside presents a mixed pale tawny and black pattern (Osgood 1943; Clutton-Brock *et al.* 1976).

The cranium is small, lacking an interparietal crest. Teeth widely separated. The dental formula is 3/3-1/1-4/4-2/3=42.

**Subspecies** Four subspecies are recognised (Osgood 1943).

- *P. g. domeykoanus* (I Region to IX Region, Chile; southern Peru). Dentition weaker than *P. g. griseus*; pelage paler than *P. g. maullinicus*.
- *P. g. gracilis* (Western Argentina [Monte desert], from Santiago del Estero Province to west Río Negro Province).
- *P. g. maullinicus* (Southern temperate forests of Argentina and Chile, and in the latter from VIII Region to XI Region). Dentition weaker than *P. g. griseus*; pelage darker than *P. g. domeykoanus*.
- *P. g. griseus* (Argentinean and Chilean Patagonia, south from Río Negro to Magellan's Strait in the former, and in the steppes from east XI Region to XII Region in the latter; introduced in Tierra del Fuego).

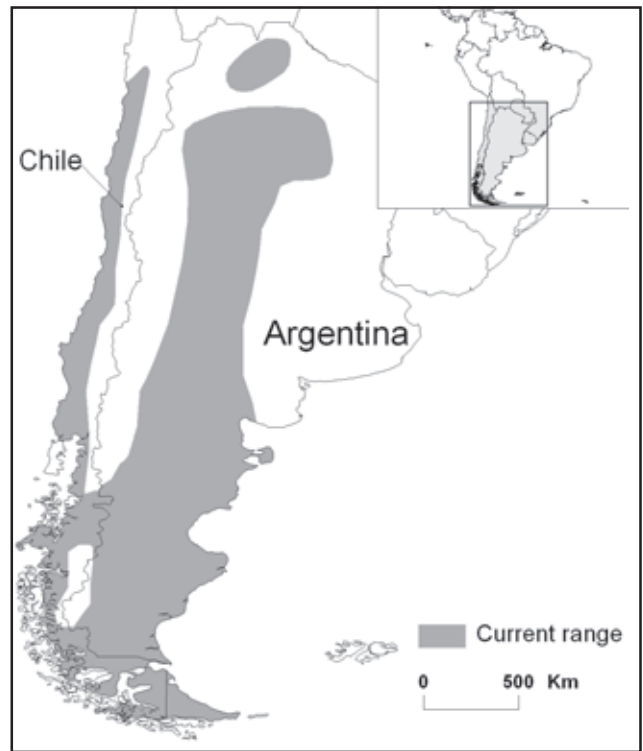
**Similar species** Culpeo (*P. culpaeus*): generally larger; chin whitish; cranium with interparietal crest; relatively longer canines and relatively shorter molars. Pampas fox (*P. gymnocercus*): more robust; pelage more uniformly grey (less rufescent). Darwin's fox (*Pseudalopex fulvipes*): smaller; pelage darker brown; deeper and richer shaded rufescent areas on head, ears and legs; tail not bushy.

### Current distribution

Widespread in plains and mountains on both sides of the Andes (Figure 3.6.1), from northern Chile (17°S) down to Tierra del Fuego (54°S).

In Argentina, they occur in the western and southern arid and semi-arid regions of the country, from *c.* 23°S (Jujuy and Salta) to Tierra del Fuego, and from the eastern foothills of the Andes mountain range to meridian 66°W, reaching the Atlantic coast (*c.* 63°W) south from Río Negro. Present in the following provinces: Jujuy (Jayat *et al.* 1999), Salta (Mares *et al.* 1996), Tucumán, Catamarca, Santiago del Estero, La Rioja, San Juan, Mendoza, west of San Luis, Neuquén, west of La Pampa, Río Negro, Chubut, Santa Cruz, and Tierra del Fuego (Osgood 1943; Olrog and Lucero 1981).

Widespread in Chile from the I Administrative Region (Atacama Province) in the north, south to the Strait of Magellan (XII Administrative Region, Magallanes Province), and Tierra del Fuego (Medel and Jaksic 1988; Marquet *et al.* 1993), and from the western foothills of the



**Figure 3.6.1. Current distribution of the chilla.**

Andes mountain range to the Pacific coast (71–73°W). They were introduced to Tierra del Fuego in 1951 in an attempt to control rabbit (*Oryctolagus cuniculus*) infestation (Jaksic and Yáñez 1983).

Other populations have been reported to exist in some of the southern Atlantic islands, including Malvinas/Falkland (Olrog and Lucero 1981), but this requires confirmation. Their presence in Peru is uncertain.

**Range countries** Argentina, Chile, Peru (?) (Osgood 1943; Olrog and Lucero 1981; Jayat *et al.* 1999).

### Relative abundance

In Argentina, Olrog and Lucero (1981) considered chillas to be “locally common”. In the latter country, relative abundance of chillas has been evaluated mainly through the scent stations technique. Autumn data collected in Pilcaniyeu (Río Negro) from 1983 to 1989, as well as winter data collected in Patagonia from 1989 to 2000 (A. Novaro and M. Funes unpubl.) and in north-eastern Mendoza from 1993 to 1997 (F. Videla *et al.* unpubl., R. González del Solar *et al.* unpubl.), suggest that populations are essentially stable in the southern half of Argentina where habitat is more favourable. They are reported to have expanded their distribution in Tierra del Fuego since their introduction (A. Novaro pers. comm.). J. Bellati (pers. comm.) estimated in 1996 an ecological density of one chilla/km<sup>2</sup> in Tierra del Fuego. Their status in the northern half of the country is unknown.

**Estimated populations/relative abundance and population trends** In Chile, chillas are considered frequent in the northernmost and northern regions (1 individual detected weekly); scarce (1 individual detected monthly) in central Chile; frequent-common (common: 1–5 individuals detected daily) in southern Chile; and common-abundant (abundant: >5 individuals detected daily) in southernmost Chile. The species became very abundant around Bahía Inútil (Tierra del Fuego) in the areas where it was first released in 1951 (Jaksic and Yáñez 1983). Despite having been overexploited for their fur in the past, chillas seem not to be decreasing in number (J. Jiménez pers. comm.).

In Chile, a mean ecological density of 3.3 chillas/km<sup>2</sup> was reported for the core area of Parque Nacional Torres del Paine, which is particularly safe and rich in resources for chillas. However, a much lower crude density (1.3 foxes/km<sup>2</sup>) resulted when the former figure was extrapolated to the whole park. The density of foxes in Parque Nacional Torres del Paine, however, is likely to be higher than in most other Chilean populations, since the park is located in a particularly productive area. Three different density estimates resulted from the use of three different techniques for a site similar to Parque Nacional Torres del Paine (Durán *et al.* 1985). The most conservative of these estimates is 1.3 foxes/km<sup>2</sup> – a result similar to that of Johnson and Franklin (1994a) – and the highest 2.3 foxes/km<sup>2</sup>, a figure that was deemed an overestimation (probably caused by methodological problems) by different authors (see Johnson and Franklin 1994a). In Reserva Nacional Las Chinchillas, the minimum abundance estimate (absolute density) over the entire reserve was 0.43 foxes/km<sup>2</sup>, while the ecological density was 2.04 grey foxes/km<sup>2</sup> (Jiménez 1993).

In north-eastern Mendoza (Argentina), visitation indices progressively decrease from summer to winter, suggesting that the population suffers a decline during the cold season (R. González del Solar unpubl.). A similar pattern was found in Chile's Bosque Experimental San Martín (Martínez *et al.* 1993).

### Habitat

The chilla occurs in steppes, “pampas” (grasslands), and “matorral” (scrublands) (Olrog and Lucero 1981). They generally inhabit plains and low mountains, but they have been reported to occur as high as 3,500–4,000m a.s.l. (see Marquet *et al.* 1993; Jayat *et al.* 1999). Although chillas occur in a variety of habitats, they prefer shrubby open areas. In central Chile, they hunt more commonly in flat, open patches of low height (1–2m) scrub than in areas with dense vegetation or ravines. Yet, they do visit ravines, apparently in search of fruit (Jaksic *et al.* 1980; Jiménez *et al.* 1996b). In southern Chile (Parque Nacional Nahuelbuta), chillas also prefer open areas to those more dense patches where Darwin's foxes occur (Jaksic *et al.*

1990; Jiménez *et al.* 1990; Medel *et al.* 1990). Durán *et al.* (1985) found that in Chilean Patagonia, their typical habitat was the shrubby steppe composed of “coirón” (*Festuca* spp., *Stipa* spp.) and “ñires” (*Nothofagus antarctica*), and that burning and destruction of forests in order to augment the land for sheep farming seems to have been advantageous for chillas. A similar preference was detected in Parque Nacional Torres del Paine, where 58% of the 12 monitored individuals used matorral shrubland or *Nothofagus* thicket habitat within their home ranges, more than was expected (Johnson and Franklin 1994c). In the north-eastern Mendoza desert (Argentina), these foxes seem to prefer the lower levels of the shrubby sand dunes that characterise the landscape or the valleys among dunes rather than their higher sections (R. González del Solar unpubl.).

Chillas are tolerant to very different climatic regimes from remarkably hot and dry areas, such as the Atacama coastal desert in northern Chile (less than 2mm average annual rainfall, 22°C mean annual temperature), to the humid regions of the temperate Valdivian forest (2,000mm average annual rainfall, 12°C mean annual temperature) and the cold Tierra del Fuego (*c.* 400mm average annual rainfall, 7°C mean annual temperature).

### Food and foraging behaviour

**Food** Chillas are omnivorous generalists, feeding on a variety of food types including mammals, arthropods, birds, reptiles, fruit, and carrion (Medel and Jaksic 1988). Fruits ingested include berries of *Cryptocarya alba* and *Lithraea caustica* in Chile (Yáñez and Jaksic 1978; Jaksic *et al.* 1980), pods of *Prosopis* spp., and the berry-like fruits of *Prosopanche americana* and of several Cactaceae in Argentina (González del Solar *et al.* 1997, unpubl.).

A tendency to carnivory, however, is apparent, since vertebrates, especially rodents, are reported to be the most important prey in most studies. Small mammals were the most important vertebrate prey in most sites in the Chilean matorral (Yáñez and Jaksic 1978; Jaksic *et al.* 1980; Simonetti *et al.* 1984; Marquet *et al.* 1993; Jiménez *et al.* 1996b) and in the temperate rainforests of southern Chile (Martínez *et al.* 1993; Rau *et al.* 1995). Different situations have been found elsewhere. In Reserva Malleco (temperate forest of southern Chile), rodents and insects were similarly represented (R. Figueroa and E. Corales pers. comm.), whereas in Parque Nacional Torres del Paine, the European hare (*Lepus europaeus*) was the most represented vertebrate prey, followed by artiodactyl carrion and akodontine rodents (Johnson and Franklin 1994b). In Argentina's Patagonian steppe (Neuquén), artiodactyl carrion was the most important food item in 42 stomachs collected in winter (representing 62% of biomass ingested), followed by hares and cricetine rodents (Novaro *et al.* 2000). Similar results emerged from Argentina's southern Patagonia (Chubut), where carrion was followed by birds, rodents,

and fruit (S. Saba pers. comm.). Finally, in two studies conducted in Tierra del Fuego, invertebrates were followed by ungulates (reportedly carrion), birds, and rodents (Jaksic *et al.* 1983).

In the harshest habitats of its distribution range, the diet of the chilla includes increasingly higher proportions of non-mammal food as small mammal availability decreases (Yáñez and Jaksic 1978). For example, lizards (44% minimum number of individuals) were the most consumed vertebrate prey in winter, the season of lowest small mammal availability in coastal northern Chile (Simonetti *et al.* 1984). In central Chile, where small mammal availability decreases towards autumn, berries appeared in 52% of the droppings (n=127) collected in that season; while in spring, when small mammal availability is the highest, berries were present in only 18% of the faeces (n=62; Jaksic *et al.* 1980). In north-eastern Mendoza (Argentinean Monte desert), fruit (61% annual mean of weight of remains [MWR]) was represented in 35% of faeces (n=116), followed by small mammals (19% frequency of occurrence [FO], 15% MWR) – mostly the murid (*Eligmodontia typus*). Small mammal consumption decreased from autumn (28% MWR) to summer (8% MWR), while fruit consumption simultaneously increased from 59% to 71% (MWR) (González del Solar *et al.* 1997).

Chillas might favour species richness in terrestrial ecosystems by acting as key predators to competitor rodents (J. Rau unpubl.). Chillas may also have an influence on vegetation structure by restricting the low-scale spatial distribution of rodents (e.g., *Octodon degus*) through predation (Martínez *et al.* 1993), and through seed dispersal (Yáñez and Jaksic 1978; Campos and Ojeda 1997; R. González del Solar unpubl.).

**Foraging behaviour** Feeding behaviour appears to be rather selective in certain areas (Martínez *et al.* 1993; Novaro *et al.* 2000a) and more or less opportunistic in others (Jaksic *et al.* 1980, 1983; Simonetti *et al.* 1984). Foraging occurs mostly in open areas (Jaksic *et al.* 1980; Jiménez *et al.* 1996b). Although hunting groups of up to 4–5 individuals have been reported, grey foxes mostly hunt solitarily except perhaps at the end of the breeding season, when juveniles may join the parents in the search for food. In Parque Nacional Torres del Paine, the most common foraging behaviour consists of “slow walking, with abrupt, irregular turns through the low (<500 mm) vegetation”, while “prey appear to be located by sound, sight, and smell, with the fox’s ears often turned forward and back in response to sound and the muzzle turned upward sniffing into the breeze” (Johnson and Franklin 1994a). Mice are captured with a sudden leap or by rapidly digging holes (40–100mm deep, 20–40mm wide). Scavenging is common, as well as defecation on and around guanaco (*Lama guanicoe*) and goat (*Capra hircus*) carcasses (Johnson and Franklin 1994a; R. González del Solar *et al.* unpubl.).

Caching behaviour has also been reported (Johnson and Franklin 1994a).

Direct observation reports suggest that chillas are crepuscular, although they can be commonly seen in daylight (Greer 1965; R. González del Solar pers. obs.). Data from radio-collared individuals showed that they were primarily nocturnal in Parque Nacional Torres del Paine, although having a greater mean daily activity rate in summer and autumn than culpeos (Johnson and Franklin 1994c). Radio-tracking data from Reserva Nacional Las Chinchillas showed that foxes were active day and night (Jiménez 1993). As inferred from their prey, they would be most active in late afternoon and night (Yáñez and Jaksic 1978; Jaksic *et al.* 1980; R. González del Solar *et al.* unpubl.).

**Damage to livestock or game** The chilla has been considered a voracious predator of livestock, poultry and game (Yáñez and Jaksic 1978). In north-eastern Mendoza (Argentina), local breeders claim important goat losses due to grey fox predation. Despite this, dietary studies suggest that the remains of domestic animals found in faeces (R. González del Solar *et al.* unpubl.) and stomachs are not only scarce but probably come from carrion, since such remains are often associated with larvae of Diptera (e.g., Calliphoridae) that usually occur in rotten carcasses (Jaksic *et al.* 1983). Furthermore, it is unlikely that one individual of such a small canid would be able to kill a healthy adult goat or sheep. A different situation concerns newly-born livestock. Predation on lambs has been observed in Reserva Nacional Las Chinchillas (Chilean matorral), where an individual fox was seen distracting a ewe while another robbed its lamb (J.E. Jiménez pers. comm.).

## Adaptations

The chilla has relatively short canines and relatively long second molars, traits that suggest a tendency to include less meat and more plant and insect food in its diet (Wayne *et al.* 1989).

## Social behaviour

The basic component of social organisation in Parque Nacional Torres del Paine is the breeding monogamous pair, accompanied by occasional female helpers, male dispersal, and occasional polygyny (Johnson and Franklin 1994a). Solitary individuals were seen from March to July (94% mean monthly visual observations), while pairs comprised 42% of sightings during August. Male and female of the pair maintained an exclusive home range year-round, which did not overlap with home ranges of neighbouring grey fox pairs. Intraspecific interactions displayed were few and usually aggressive. Individual home range sizes (n=23) varied between  $2.0 \pm 0.2\text{km}^2$  (minimum convex polygon) and  $2.9 \pm 0.3\text{km}^2$  (95% harmonic mean) (Johnson and Franklin 1994a, b, c).

## Reproduction and denning behaviour

Mating occurs in August and September, and the gestation period is 53–58 days (Johnson and Franklin 1994a). In Parque Nacional Torres del Paine, mating takes place mainly in August, and 4–6 pups are born in October. Dens are located in a variety of natural and man-made places such as a hole at the base of a shrub or in culverts under a dirt road, and may be changed to a new location during the nursing period. During the first 3–4 days, the mother rarely leaves the den; during this period the male provisions her with food. Pups are cared for by both parents on an approximately equal time basis. Young foxes start to emerge from the den when they are about one month old, and start to disperse (8–65km) around 5–6 months later, i.e., at 6–7 months of age (Johnson and Franklin 1994a). Therefore, lactation lasts 4–5 months as inferred from the time when radio-tracked adults in Parque Nacional Torres del Paine were last seen with their pups (Johnson and Franklin 1994a). Age of sexual maturity is uncertain but believed to be about one year.

Two interesting phenomena concerning breeding behaviour may occur: combined litters (associated with polygyny) and the presence of female helpers. Both phenomena seem to be related to higher food availability and the possibility to raise larger litters, since an extra female would contribute by bringing more food to the den, increasing anti-predator vigilance, and/or substituting for the other female if she dies during the breeding period (Johnson and Franklin 1994a).

## Competition

Interspecific competition has been suggested as a potential mechanism for explaining the distribution patterns of the chilla and the culpeo, since populations of these species coexist in a large section of their geographical distribution, consume similar vertebrate prey items, and have similar activity patterns (Fuentes and Jaksic 1979; Jiménez 1993; Johnson and Franklin 1994b, 1994c; Jiménez *et al.* 1996b). Chillas and culpeos are allopatric in northern Chile and central Argentina, whereas they are sympatric in the southern regions of both countries (Johnson and Franklin 1994b; Jiménez *et al.* 1996b; Novaro *et al.* 2000a), and in north-western Argentina (Jayat *et al.* 1999).

Fuentes and Jaksic (1979) attempted to explain this pattern of distribution in terms of character displacement of body size and altitudinal habitat partitioning (niche complementarity hypothesis). According to these authors, the similar size of both species in central Chile would be due to the chillas tending to use lower and more open habitats, while culpeos would usually occupy higher lands or more densely vegetated areas such as ravines. In the southern part of the country (south of 33°S, Reserva Nacional Las Chinchillas and Parque Nacional Torres del Paine), the rather homogeneous topographic profile would preclude habitat segregation by altitude, causing foxes to diverge in

body size (culpeo: 7–12kg, chilla: 3–4kg) and partition food resources in order to lessen interspecific competition.

Other authors (Jiménez 1993; Johnson and Franklin 1994b, c) have suggested that culpeo and chilla distributions are an effect of different energy requirements and interspecific interference. Small size and lower energetic needs would allow chillas to exploit a broader spectrum of less optimal food categories and inhabit poorer habitats, from which culpeos would be excluded because of their higher energetic needs. When in sympatry, chillas would be excluded from the richest patches by culpeos, which are larger and more aggressive.

The Darwin's fox is also thought to be a potential competitor of the chilla, since initial data on the ecology of sympatric populations of these foxes suggest that they exhibit similar activity patterns, a high degree of overlap in home range and habitat use, and considerable overlap in their diets (E. McMahon pers. comm.).

## Mortality and pathogens

**Natural sources of mortality** Little known. A culpeo was reported to attack and kill a chilla at Parque Nacional Nahuelbuta (Jiménez *et al.* 1996b). In Parque Nacional Torres del Paine, five out of 11 radio-tracked individuals lost during the study died from natural causes, and one unmarked individual was killed, but not eaten, by a puma (*Puma concolor*) (Johnson and Franklin 1994a).

**Persecution** Chillas are hunted on the belief that they are voracious predators of small livestock, poultry and game. The usual means are shooting, dogs, poison, snares, and foothold traps. Hunting occurs despite foxes being protected by legal regulations (Johnson and Franklin 1994a; R. González del Solar pers. obs.). Domestic dogs may also kill chillas. Around 45% of the mortality documented by Johnson and Franklin (1994a) in Parque Nacional Torres del Paine resulted from either poaching or dog attacks.

**Hunting and trapping for fur** Chillas have been heavily hunted for their pelts in the past (Ojeda and Mares 1982; Iriarte and Jaksic 1986), and are still hunted (though apparently with much less intensity) in Chilean and Argentinean Patagonia.

Ojeda and Mares (1982) report that 5,789,011 pelts were legally exported from Argentina generically labelled as “zorro gris” (grey fox) from 1972 to 1979. In 1979 the total amount of exports reached US\$40,877,042, at US\$39 per skin. At about the same time (1978), a hunter would receive US\$8 for a skin in Salta Province (Ojeda and Mares 1982). From 1976 to 1979, the approximate annual number of pelts reported to have been exported ranged from 700,000 to 1,200,000. However, these extremely high numbers are difficult to interpret, and it is unlikely that the chilla was as heavily hunted as previously thought. Official reports on exports appear to have labelled as “grey fox” pelts

corresponding to three different species, namely the chilla, the crab-eating fox (*Cerdocyon thous*), and, particularly, the Pampas fox (Ojeda and Mares 1982). On the other hand, available data do not include illegal exports or internal commerce. In any case, the legal exports of chilla pelts markedly decreased from 1980 onwards. During the 1980 to 1986 period, annual exports – mostly to Germany – averaged 100,000, reaching 300,000 pelts in some years. The fox-fur market experienced another decline in the late 1980s and early 1990s, plunging from about 100,000 pelts exported in 1987 to approximately 33,000 in 1990. The number of pelts commercialised through the Fine Fur Auctions Office of Río Negro Province also decreased from about 9,000 pelts in 1988 to about 1,000 in 1991, at a rate of roughly one half per year. Whether the cause of this trend was a decline in fox populations, decreased demand for their fur, or simply the failure of the country's administration to cope with the black market is unknown. The continued decline of fox-pelt exports – even when foxes are still heavily hunted in some regions of the country – could also be linked to the particular exchange rate between domestic and foreign currency, which makes exporting goods a barely profitable alternative. In 1996, there was a brief reactivation of the fox-fur market due to commerce with Russia, but during the 1997 to 1999 period the national exports reached an annual average of only 8,000 fox (*Pseudalopex* spp.) pelts (A. Novaro and M. Funes pers. comm.; but see also illegal exports from Chile, below). The current price of a skin at Río Gallegos (Santa Cruz Province) is US\$ 2–3 (A. Iriarte pers. comm.).

In Chile, there are official reports on pelt exports since 1910; however, available data correspond to voluntary declaration of legal exports, leaving aside unreported legal exports and illegal trade. Besides, as in the case of Argentina, the significance of the internal commerce is unknown. From 1926 to 1946, fox pelts were the principal native wildlife item being exported from the country, even though no hunting or commercialisation was permitted since 1929. Between 1939 and 1944 the average amount of skins exported was *c.* 24,000 every five years (see details in Iriarte and Jaksic 1986). Chilla pelts, more valuable than those of culpeo, comprised *c.* 90% of the total exports. In 1939, about 1,000 skins, plausibly including a few culpeos, were reported as being brought to market in Punta Arenas, southernmost Chile (Osgood 1943). From 1945 to 1949 (9,692 skins) until 1955 to 1959 (2,845 skins), the exports decreased dramatically, exhibiting a new increase (an average of *c.* 14,000 pelts per five-year period) during the 1960 to 1974 interval, and a final decline from 1975 to 1984 (Iriarte and Jaksic 1986). The numbers of fox skins exported from Chile are consistently lower than those reported from Argentina, even when the area of each country is considered. For the period 1970 to 1979 (see information above for Argentina), a total of 12,846 fox skins (*Pseudalopex* spp.) were exported (see Iriarte and Jaksic 1986). The ban on

chilla hunting was lifted for two years in the mid-1980s, on the basis of density estimates obtained from southernmost Chile (Durán *et al.* 1985). New regulations allowed a limited harvest of 10,000 individuals in Chile, and this was never completed, perhaps due to the difficulty in capturing enough individuals (Johnson and Franklin 1994b, Iriarte 2000). From 1985 to 1995, the chilla was the third most exported Chilean wild mammal (3,630 skins; Iriarte 2000). Illegal exports are estimated at 10,000–15,000 skins/year, especially from Magallanes Region (southernmost Chile) to Río Gallegos (southernmost Argentina). Between 1991 and 1994, a total of 996 chilla pelts or individuals were confiscated by the SAG, the Chilean Bureau of Livestock and Agriculture (Iriarte 2000). In 1996, 8,500 pelts were exported to Argentina (A. Iriarte pers. comm.).

**Road kills** Little data available, but frequently observed in Mendoza (Argentina), especially in summer (R. González del Solar pers. obs.).

**Pathogens and parasites** Stein *et al.* (1994) report the presence of nematodes in most of the stomachs (*n*=22) collected in Neuquén (Argentina) and suggested that the high prevalence of *Physaloptera clausa* (present in 68% of the sample), and the lower prevalence of *Toxascaris leonina* (23%) and *Protospirura numidica criceticola* (9%) may be a result of characteristics of diet and the intermediate vectors of the parasites.

Different gastrointestinal parasites were found in 63% of 22 stomachs obtained in the coastal steppe of Chubut (Argentina), during 1996 (S. Saba pers. comm.). Nematodes were present in 100% of the infected stomachs, cestodes in 14%, and acanthocephalans in 14%. Proglotides of *Echinococcus* spp. were found in the anus and faeces of a chilla captured in Reserva Nacional Las Chinchillas (J.E. Jiménez pers. comm.). Chagas' trypanosomes (*Trypanosoma cruzi*) were absent from the blood samples of two foxes captured at the same site (Jiménez and Lorca 1990).

**Longevity** Longevity is unknown in the wild. Individuals of undetermined age lived a maximum of five years in the Chilean National Zoo (G. González pers. comm.).

### Historical perspective

In ancient times, chillas were used as food by some Argentinean aboriginal groups such as Matacos and Mocovíes, but this was not a common practice among other indigenous groups or among the “criollo” people (the offspring of European immigrants born in Argentinean territory), who only ate fox meat under extreme circumstances. Several aboriginal groups, such as Onas, Yámanas, and Tehuelches, used foxes' pelts to make clothes of different sorts. With the arrival of the Europeans and the emergence of criollos, pelts began to be used as currency. In general, the relation between chillas and human beings

has been conflictive, especially from the settling of small-livestock breeders onwards. Traditionally, Argentinean peasants have deemed foxes to be a nuisance or even a menace for poultry, sheep, goat, and game. Chillas were even considered a pest some 20 years ago in areas of Argentina, where there are still occasional attempts to legalise commerce in fox pelts and their status as a pest. For example, in 1999, small-livestock breeders' pressure led the Office for Natural Resources of Mendoza to partially lift the ban, allowing breeders to kill those individual foxes demonstrably causing trouble to them (González del Solar *et al.* 1997, unpubl.).

Argentinean indigenous folklore regards “Juan” (or “Don Juan”) the fox (*Pseudalopex* spp., *Cerdocyon*), as representing shrewdness and generally challenging the authoritarian power of his rich uncle the jaguar (*Panthera onca*). However, far from being the perfect hero, Juan is selfish and never tries to unite with other weak animals. Moreover, Juan sometimes tries to deceive other small animals (e.g., the armadillo *Chaetophractus* spp.), aiming to rob them of their food or females. But, more often than not, the fox ends up fooled by his supposed victims.

### Conservation status

**Threats** The main threat to chilla populations in the past was commercial hunting. However, inferences on the historical rate of chilla extraction are difficult, since official pelt-export reports apparently have conflated data corresponding to different species. Hunting intensity has apparently declined in recent years (see Commercial use). Illegal trapping still occurs in some regions of Chile and Argentina, mainly related to controlling predation on small livestock and apparently not as intensively as in the past (A. Iriarte pers. comm.).

**Commercial use** Hunted for its pelt in Argentina and Chile (see Hunting and trapping for fur).

### Occurrence in protected areas

- *Argentina*: Uncertain. Present in at least six protected areas in central west Argentina: Parque Nacional Talampaya, Parque Nacional Ischigualasto, Reserva Provincial Bosque Telteca, Parque Nacional Las Quijadas, Man and Biosphere Reserve of Ñacuñán, Reserva Provincial La Payunia;
- *Chile*: present in 30 Wildlife Protected Areas (WPA) from a total of 49 surveyed. However, 40% of those 30 WPAs are smaller than the 115km<sup>2</sup> needed to sustain a minimum viable population (500 individuals). Estimates of local extinctions in WPAs from central Chile reach 50% (see Simonetti and Mella 1997). The most important Chilean WPAs in which chillas occur include: Parque Nacional Lauca, Parque Nacional Puyehue, Parque Nacional Vicente Pérez Rosales, Parque Nacional Torres del Paine.

**Protection status** CITES – Appendix II.

**Current legal protection** Resolution 144/83 of the former National Secretary of Natural Resources and Sustainable Development of Argentina categorises this species as “In Danger”. Chillas are totally protected in Mendoza, Catamarca, and San Luis, while in the continental provinces of Patagonia and in Tierra del Fuego, hunting and fur trading are legal (A. Novaro and M. Funes pers. comm.).

In Chile, the passing of the 1972 furbearer's protection law appears to have curtailed the exports of pelts (Iriarte and Jaksic 1986; Iriarte 2000; but see above). Currently, all Chilean populations are protected by law N° 19,473 [1996], except for those from Tierra del Fuego (XII Region), where a maximum of 10 individuals/day/hunter are allowed from May 1 to July 31 (A. Iriarte pers. comm.).

**Conservation measures taken** Efforts are being made in Argentina to concentrate the relevant biological, legal and commercial information on the species in an attempt to design a plan for sustainable use and conservation (A. Novaro and M. Funes pers. comm.).

### Occurrence in captivity

Chillas occur in many zoos of Argentina and Chile, but details of breeding in captivity are not known.

### Current or planned research projects

A. Novaro and M. Funes (Centro de Ecología Aplicada del Neuquén, Neuquén, Argentina) have been coordinating an ongoing survey of Patagonian carnivores in Argentina since 1992. The programme includes annual surveys of chilla population trends and periodic meetings attended by specialists, government officials, and pelt-market entrepreneurs.

R. González del Solar, S. Puig and F. Videla (Instituto Argentino de Investigaciones de las Zonas Áridas, Mendoza, Argentina) are conducting a dietary study on the species in the Argentinean central Monte desert.

J. Rau (Universidad de Los Lagos, Osorno, Chile) and A. Muñoz-Pederos (Universidad Católica de Temuco, Temuco, Chile) are also involved in a dietary study in the Araucania Region (southern Chile), and at the time of writing, were finishing their analysis of a large sample of chilla droppings.

A. Mangione and B. Núñez (Universidad Nacional de San Luis, San Luis, Argentina) are carrying out research on the nutritional ecology of chillas.

F. Jaksic (Universidad Católica de Chile, Santiago, Chile), J. Jiménez. (Universidad de Los Lagos, Osorno, Chile) and collaborators have conducted monitoring of chilla food habits since 1987 in Reserva Nacional Las Chinchillas.

E. McMahon (University of Massachusetts, Amherst, USA) is coordinating a study of niche relationships among

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.

**Reviewers:** Fabián Jaksic, Jaime Jiménez, Mauro Lucherini, Andrés Novaro. **Editors:** Claudio Sillero-Zubiri, Michael Hoffmann.

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

M. Lucherini, M. Pessino and A.A. Farias

### 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: atój (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)