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HABITAT AND DIET OF DARWIN'S FOX (*PSEUDALOPEX FULVIPES*) ON THE CHILEAN MAINLAND

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Darwin's fox (*Pseudalopex fulvipes*) is the least known of the South American canids and was believed to be restricted to Chiloe Island in southern Chile (Medel and Jaksic, 1988). However, Medel et al. (1990) recently documented the presence of Darwin's fox on the Chilean mainland in sympatry with its congener the grey fox (*Pseudalopex griseus*). Herein, we report autecological observations on Darwin's fox on the Chilean mainland, 600 km north of its previously known insular ranges. Nahuelbuta National Park consists of 6,831 ha and is located in southern Chile, 35 km W Angol (37°45'S, 72°44'W). Elevations range from 950 to 1,462 m. The vegetation is characterized by relatively undisturbed forests of *Nothofagus* beeches and *Araucaria* pines.

Darwin's fox was first seen in the park during the early 1970s (Medel et al., 1990; L. Pincheira, pers. comm.). It is not abundant, but appears to have increased in numbers starting in 1986, concurrent with a

decrease in numbers of grey foxes. Darwin's fox occurs in forests, whereas the grey fox is seen only in open areas. Whereas Darwin's fox defecates in forests, recurrently in particular spots, and in rarely traversed paths, the grey fox defecates in open areas, often on roads. Feces of Darwin's fox are darker, narrower, and shorter (5–6 cm) than those of the grey fox, and are defecated as single units, unlike those of the grey fox (Medel et al., 1990; L. Pincheira, pers. comm.).

Six field trips were made to the park: 15–20 February 1987 (summer), 20–27 January 1988 (summer), 27 July–1 August 1988 (winter), 6–13 November 1988 (spring), 11 January 1989 (summer), and 23–27 March 1989 (autumn). During all trips except the last, feces were sought in areas of the park where Darwin's fox was most often seen, and where the congeneric grey fox was rarely or never seen (Medel et al., 1990; L. Pincheira, pers. comm.). During winter 1988, 51 luring stations were placed at intervals of 30 m along the path between Pehuenco and Piedra del Aguila. Between 28–30 July, stations were baited alternately with canned sardines and with six commercial urines (Cronk's Outdoor Supplies, Wiscasset, ME). During spring 1988, 100 luring stations were placed along the path. Seventy-one stations were placed at intervals of 50 m and 29 stations were placed at intervals of 100 m (300 m separated stations 71 and 72). Between 7–13 November the same lures were used in alternate stations. On this occasion we quantified the vegetational composition and physiognomy of the surroundings where tracks of Darwin's fox were found. Between 23–27 March 1989 we livetrapped small mammals in two types of forests, dominated by *Araucaria* and by *Nothofagus*. In both cases, two parallel rows separated by 15 m each were equipped with 21 medium Sherman traps placed at 15-m intervals. Traps were baited with rolled oats, operated for 4 nights, and examined each morning, for a total of 168 trap-nights per forest type. Small mammals captured were identified, marked, and released. We follow the nomenclature of Honacki et al. (1982), except for foxes, for which we follow Berta (1987).

Feces of Darwin's fox were located either singly along forest paths, or clumped in defecation spots and inside dens. Along paths, feces were concentrated in flat, rockless places where the dominant overstory vegetation was young *Nothofagus dombeyi* and old *Araucaria araucana* trees, often >20 m tall. A second stratum was composed of trees 2–5 m tall (*Myrceugenia* sp., *Maytenus magellanica*, *Azara lanceolata*), and bamboos (*Chusquea coleu*). The understory was dominated by *Drimys winteri* and *Pernettya* sp. During winter 1988, the only defecation spot where we found clumped feces was a concave depression (1.5 m diameter, 1.8 m deep) at the base of a fallen tree (*N. dombeyi*). During spring 1988, we found new defecation spots containing clumped feces; these defecation spots were slight concavities in the ground, protected from rain by an overhanging boulder.

We found only one den during winter 1988; it was a concavity beneath a boulder 12 m in diameter. The cavity was 2 m deep, 1.8 m wide, and 0.7 m high; the floor was carpeted with rocks and soil. The entrance to the den faced east and was hidden by bamboos. Scattered inside were 12 feces of Darwin's fox. Near the den, large boulders were scattered on the floor of the forest dominated by 10–20 m tall *A. araucana* and *Nothofagus pumilio*; the understory was composed primarily of *C. coleu* and *Pernettya* sp. During spring 1988, we failed to locate new dens.

Although no foxes were attracted to luring stations during winter 1988, opportunistic observations of tracks on the snow demonstrated the presence of Darwin's fox in surrounding areas. During spring 1988, luring stations attracted Darwin's foxes, *Felis guigna*, and *F. concolor*. The most effective attractant for Darwin's fox was sardines (visited five times), followed by the various commercial urines.

The vegetation surrounding luring stations that attracted Darwin's foxes was dense at the forest floor (ground-projected canopy cover, $\bar{X} \pm SE = 74.3 \pm 4.3\%$, $n = 14$), and dominated by shrubs of *D. winteri* (13.6% of canopy cover), *Pernettya* sp. (13.5%), and *M. magellanica* (11.1%). A middle stratum between 1.5 and 6.0 m height was less dense overall (canopy cover, $59.3 \pm 2.5\%$, $n = 14$), and dominated by trees (*Myrceugenia* sp.; 12.9%), bamboos (*C. coleu*; 10.0%), and young *N. dombeyi* (9.3%). The upper stratum was the least dense (cover, $43.6 \pm 4.3\%$, $n = 14$) and completely dominated by mature *N. dombeyi* (25.7%) and *A. araucana* (17.9%).

Each field trip produced 30–252 fox feces, containing 66–537 prey items. Incidence of plant material ranged from none to 32.4%. Except for spring 1988, samples were too small to warrant examination of between-year and between-season variation in the diet of Darwin's fox. Consequently, all 404 feces collected were pooled for analysis. Following are the percent frequencies of occurrence of 932 prey items in the diet of Darwin's foxes: 3.6% *Dromiciops australis* (Marsupialia); 0.2% *Pudu pudu* (Artiodactyla); 0.6% *Akodon longipilis*, 3.6% *A. olivaceus*, 3.6% *Akodon* sp., 4.5% *Auliscomys micropus*, 1.6% *Irenomys tarsalis*, 9.9% *Notiomys valdivianus*, 3.5% *Oryzomys longicaudatus*, 0.1% *Phyllotis darwini*, 6.2% unidentified cricetid, 0.1% *Rattus rattus*, 1.3% *Aconaemys fuscus*, 2.9% *Octodon bridgesi*, 0.1% unidentified octodontid, and 1.4% unidentified rodent (Rodentia); 0.5% *Oryctolagus cuniculus* (Lagomorpha); 2.4% unidentified mammals; 4.3% *Enicognathus ferrugineus* (Psittaciformes); 0.1% *Sephanoides galeritus* (Apodiformes); 0.2% *Scelor-*

chilus rubecula, 0.1% unidentified Rhinocryptidae, 4.7% unidentified passerines (Passeriformes); 1.7% unidentified bird; 1.4% *Liolaemus pictus*, 1.2% *L. tenuis*, 19.8% *Liolaemus* sp. (Squamata: Sauria); 13.0% Coleoptera; 0.1% Hymenoptera; 6.1% Orthoptera; 0.9% unidentified insect; 0.3% Scorpionida. The diet of Darwin's fox includes 46.1% mammals, 11.1% birds, 22.4% reptiles, 20.1% insects, and 0.3% arachnids. Overall, 17.8% of the feces contained some plant material.

Mammalian prey in the diet of Darwin's fox was that commonly found in the forests of Nahuelbuta, except for the European rabbit (*Oryctolagus cuniculus*), typical of open areas (Greer, 1965). We livetrapped the following species in *Araucaria*-dominated and *Nothofagus*-dominated forest, respectively: *Auliscomys micropus* (four and five individuals), *Oryzomys longicaudatus* (four and one), *Akodon olivaceus* (two and one), and *Akodon longipilis* (one and none). The rank sequence of abundance of these species generally corresponds with their rank occurrence in the diet of Darwin's foxes. The most common mammalian prey of the fox, the semifossorial rodent *Notiomys valdivianus*, reportedly is not susceptible to sampling in Sherman traps (Greer, 1965; Reise and Venegas, 1987). Among avian prey, the chucaco (*S. rubecula*) is a typical inhabitant of the forest floor, but the parakeet *E. ferrugineus* is not. Parakeets feeding on pine cones on the forest floor during winter and early spring may be vulnerable to predation by Darwin's foxes. The high incidence of lizards (*Liolaemus*) was consistent with their high abundance on the forest floor of Nahuelbuta National Park (Webb and Greer, 1969). Insect prey was primarily scarabaeid beetles and crickets (Gryllidae), common dwellers of the forest floor (Ferriere, 1963).

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