

SHORT REPORT

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# A new population of Darwin's fox (*Lycalopex fulvipes*) in the Valdivian Coastal Range

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## Findings

Darwin's fox (*Lycalopex fulvipes* Martin, 1837) is an endemic of the temperate forests of the Coastal Range of southern Chile, that was reported by Charles Darwin in 1834 in southern Chiloé Island (42° S, 74° W; Martin 1837). Initially known exclusively from that island, it was considered both an insular subspecies of the chilla fox (*Lycalopex griseus* Gray, 1837) (Housse 1953; Clutton-Brock et al. 1976) and a valid species (Martin 1837; Gay 1947; Osgood 1943). In 1990, a mainland population was reported at Nahuelbuta National Park (ca. 450 km north of Chiloé Island, 37° 47' S, 72° 59' W; Figure 1a) in sympatry with the chilla and culpeo foxes (*Lycalopex culpaeus* Molina, 1782) (Jaksic et al. 1990; Medel et al. 1990; Jiménez et al. 1991). This supported its status as a valid species, later confirmed through genetic studies (Yahnke et al. 1996). Though this canid uses diverse habitat types, it is highly associated with native forest (Medel et al. 1990; Jiménez et al. 1991; Jiménez 2007). The current population size is not precisely known, but it has been estimated to be fewer than 600 individuals, 90% of them on Chiloé Island (Jiménez and McMahon 2004; Jiménez et al. 2008). In light of its small population size and the vulnerability of remaining populations, Darwin's fox was classified as Critically Endangered (CR: C2a (ii); cf. IUCN 2012). The discontinuous distribution of Darwin's fox, however, raised questions regarding the existence of other populations in under-explored intermediate areas (e.g., Vilá et al. 2004; Jiménez et al. 2008). Recently, Vilá et al. (2004) genetically identified a Darwin's fox skin from Punta Chanchán (39° 21' S, 73° 14' W) and reported possible sightings by local people there and at Fundo Chaihuín (40° 01' S, 73° 25' W), but failed to find evidence of living

individuals. An additional dead individual was reported from the nearby locality of Lastarria (Gorbea district, 39° 11' S, 72° 6' W; D'Elía et al. 2013). These localities are halfway between the previously known populations (Figure 1a), suggesting that indeed the range is less discontinuous than was previously suspected.

Here we report camera-trap (Bushnell Trophy Cam, Bushnell Corporation, Overland Park, KS, USA) records of Darwin's foxes in three different protected areas in Los Ríos region, which indeed confirm the existence of an intermediate population (Figure 1b,c). These records were obtained as part of two independent studies and a monitoring program. One of the studies and the monitoring program were conducted in the Valdivian Coastal Reserve (VCR; 40° 02' S, 73° 35' W; 50,250 ha; Figure 1b) during February to May 2012 and throughout 2012, respectively. The third study surveyed two protected areas (Figure 1b): Oncol Park (ONC; 39° 42' S, 73° 18' W; 753 ha; March to May 2012) and Alerce Costero National Park (ACP; 39° 59' S, 73° 28' W; 24,694 ha; December 2012 to March 2013).

We recorded Darwin's fox in nine different camera traps (i.e., one or more photos per camera trap), three in each protected area (Figure 1c,d,e). Records from ONC came from transects within the park or close to its border, whereas records from ACP came from the highest elevation within the park. In all these cases, photos were obtained in areas of either old-growth forest or dense understory, with cameras that were baited with raw chicken and commercial lures (Minnesota Brand Bobcat Urine, Caven's Violator-7 and Terminator lures; Minnesota Trapline Products Inc., Pennock, MN, USA). All records from the VCR came from cameras set in an area located close to ACP, including native forests and eucalyptus plantations with dense understory (Figure 1b). We did not use lures in the VCR.

Our records add to the skin reported from Punta Chanchán (Vilá et al. 2004) and the parallel report of a dead individual at the nearby locality of Lastarria (D'Elía

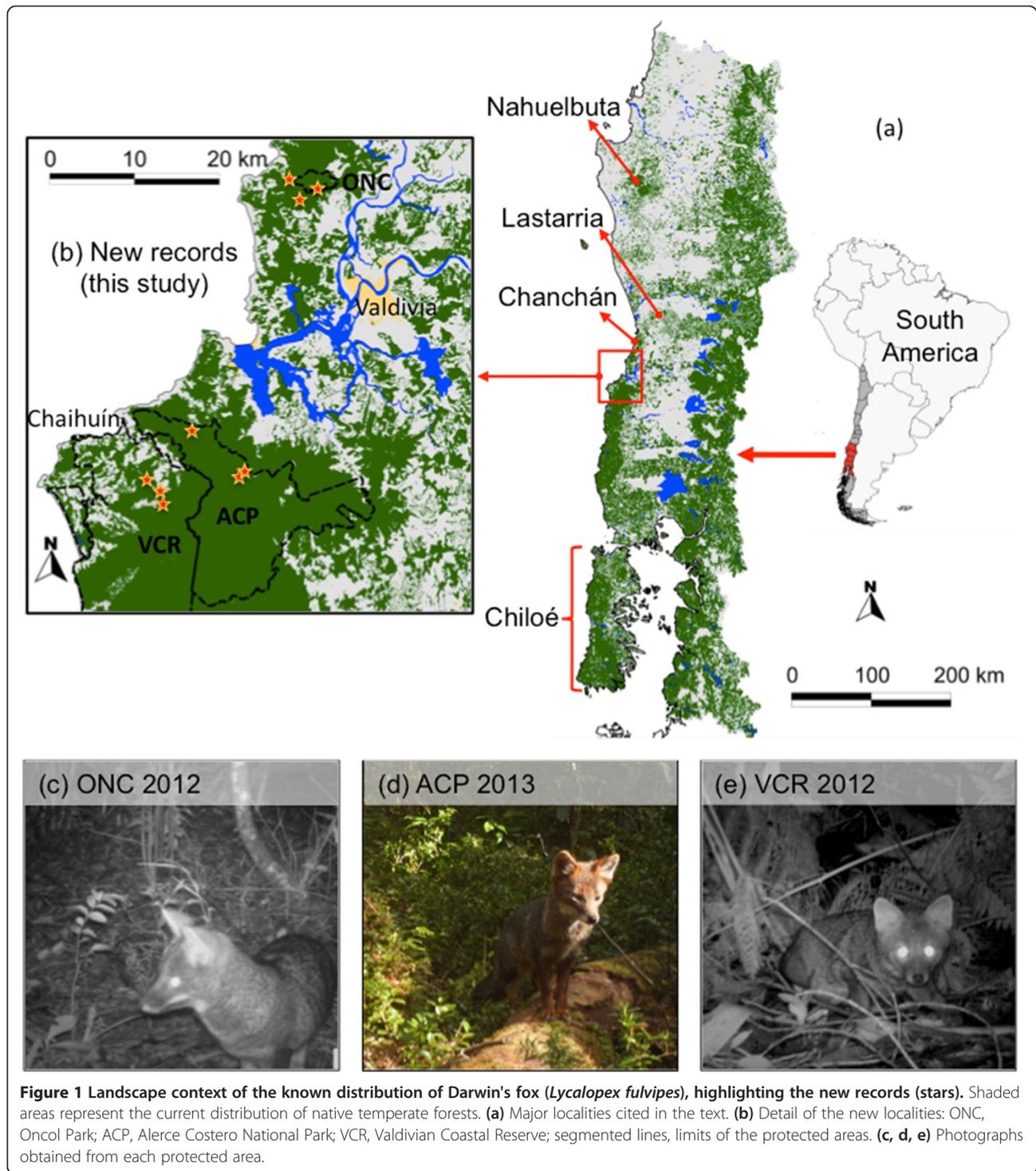
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**Figure 1** Landscape context of the known distribution of Darwin's fox (*Lycalopex fulvipes*), highlighting the new records (stars). Shaded areas represent the current distribution of native temperate forests. (a) Major localities cited in the text. (b) Detail of the new localities: ONC, Oncol Park; ACP, Alerce Costero National Park; VCR, Valdivian Coastal Reserve; segmented lines, limits of the protected areas. (c, d, e) Photographs obtained from each protected area.

et al. 2013), confirming the current presence of Darwin's fox in the area and suggesting a wide distribution of Darwin's fox throughout the Coastal Range (Yahnke et al. 1996; Vilá et al. 2004). Furthermore, the records from Alerce Costero National Park and Valdivian Coastal Reserve are in the northern extreme of a forested corridor that extends southwards almost continuously for

ca. 150 km, covering an area slightly smaller than that occupied by similar forests in Chiloé Island (Figure 1a) where the main population is located. This opens the possibility that the distribution and population size of this canid could be significantly larger than previously estimated. Confirmation of a widespread distribution and population larger than the previous estimate of ca. 600

individuals for Darwin's fox could require a reassessment of the conservation status (Jiménez and McMahon 2004; IUCN 2012). Further, the current presence of Darwin's fox in the Valdivian Coastal Range, and at the locality of Lastarria (D'Elía et al. 2013), is crucial given that a significant part of this area is currently under protection by the Valdivian Coastal Reserve, the Alerce Costero National Park, Oncol Park and other smaller private initiatives. Nevertheless, the area is not free of anthropogenic threats, such as the projected extension of the coastal highway (Wilson et al. 2005), conflicts between wild carnivores and local communities (Stowhas 2012), free-ranging dogs (*Canis familiaris* Linnaeus, 1758) (Silva-Rodríguez and Sieving 2012; Sepúlveda et al. (2014a)), and the risk of canine distemper virus (Sepúlveda et al. (2014b)). In consequence, it is necessary to conduct further studies to clarify the actual conservation status of the newly discovered population of Darwin's fox.

#### Competing interest

The authors declared that they have no competing interest.

#### Authors' contribution

AAF conceived the study at ONC and ACP, and participated in fieldwork; AAF and GLS coordinated surveys at ONC and ACP. MAS and EAS conceived the studies at VCR; DG, EO, AE and PS set and operated the cameras at VCR; MAS, EAS, DG, EO, AE and PS identified the records. NIJ and GLS set and operated the cameras and identified the records at ONC and CAP. AAF, MAS and EAS wrote the manuscript. All authors read and approved the final manuscript.

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