Eur J Wildl Res (2007) 53:76–79
DOI 10.1007/s10344-006-0066-y

SHORT COMMUNICATION

First records of *Trichodectes canis* (Insecta: Phthiraptera: Trichodectidae) from Darwin's fox, *Pseudalopex fulvipes* (Mammalia: Carnivora: Canidae)

Daniel González-Acuña · Cristóbal Briceño · Armando Cicchino · Stephan M. Funk · Jaime Jiménez

Received: 6 July 2006 / Accepted: 14 August 2006 / Published online: 18 October 2006

Abstract The presence of the dog biting louse, *Trichodectes canis* (De Geer, 1778; Ischnocera: Trichodectidae), is reported for the first time in the critically endangered *Pseudalopex fulvipes* (Martin, 1837) in Chiloé Island, south Chile.

Keywords *Trichodectes canis* · Phthiraptera · Darwin's fox · Chile

Introduction

Darwin's fox, *Pseudalopex fulvipes* (Martin, 1837), is one of the most vulnerable and least known canids in the world. It is endemic to southern Chile, lives within the temperate rainforests of coastal ranges, and often remote from human interference. Its distribution is restricted to the island of Chiloé in the Tenth Region (42°S, 74°W) and to a smaller population in Nahuelbuta National Park in the Ninth Region on the mainland (37°45′S, 73°00′W; Jiménez and McMahon 2004). This small fox is the rarest and most geographically isolated carnivore in South America with an estimated population of approximately 500 individuals (Yahnke et al. 1996). The Darwin's fox is classified by the International Union for the Conservation of Nature and Natural Resources as critically endangered (Jiménez and McMahon 2004).

Studies of pathogens or parasites from wild canids in Chile are scarce. González-Acuña et al. (2003), studying grey fox *Pseudalopex griseus* (Gray 1837), reported a suspected case of canine distemper in Ñuble (Eighth Region). For *P. griseus* from Tierra del Fuego, Chile, Aguilera (2001) found the endoparasites *Toxascaris leonina* (von Linstow, 1902), *Uncinaria stenocephala* (Railliet 1884), *Taenia* sp., and *Echinococcus granulosus* (Batsch 1786); and Donoso et al. (2000) described *Sarcocystis* sp. In Santiago, Chile, Alvarez (1960) isolated the endoparasite *Linguatula serrata* (Frölich 1789) from the Culpeo fox *P. culpaeus* (Molina 1782). Ectoparasite studies are restricted to the record of white-ribbed dog ticks (*Amblyomma tigrinum* [Koch 1844]) from *P. culpaeus*, *P. griseus*, and/or dogs (*Canis familiaris*) in Pirque and Santiago (Metropolitan Region), Nahuelbuta National Park, Arauco (Ninth Region), Concepción (Eighth Region), Valparaíso, and Santo Domingo (Fifth Region; González-Acuña and Guglielmone 2005). There have been no records of parasites from Darwin's fox (Jiménez and McMahon 2004).

Studies of lice (Phthiraptera) from canids in the southern cone of South America have been limited to dogs. In

D. González-Acuña (✉)
Departamento de Ciencias Pecuarias,
Facultad de Medicina Veterinaria,
Universidad de Concepción,
Chillán, Chile
e-mail: danigonz@udec.cl

C. Briceño · J. Jiménez
Laboratorio de Ecología,
Universidad de Los Lagos,
Osorno, Chile

A. Cicchino
Laboratorio de Artrópodos, Departamento de Biología,
Universidad Nacional de Mar del Plata,
Mar del Plata, Argentina

S. M. Funk
Nature and Heritage Ltd,
London, UK

Present address:
S. M. Funk
Durrell Wildlife Conservation Trust,
Trinity, Jersey,
Channel Island, UK

Argentina, lice reported from carnivores include *Linognathus setosus* (von Olfers 1816) and *Heterodoxus spiniger* (Enderlein 1909; see González et al. 2004) but no records of *Trichodectes canis*. In Chile, Tagle (1966) records the lice *L. setosus*, *H. longitarsus* (Piaget 1880), and *T. canis* from *C. familiaris*. Recently, González-Acuña et al. (2005) reported *L. setosus* and *H. spiniger* on dogs in Ñuble and suggested that the earlier record, by Tagle, of *H. longitarsus* for Chile was erroneous since this species is a parasite of kangaroos from Australia. Considering their morphological similarity, it is possible that Tagle (1966) misidentified *H. spiniger* as *H. longitarsus*. Here, we report for the first time the external parasite *T. canis* found on Darwin's fox.

Materials and methods

Between March 2003 and January 2005, as part of the Darwin's Fox Research and Conservation Project, 33 Darwin's foxes (14 adult male, 12 adult female, 1 juvenile male, and 6 juvenile female) were captured in temperate rain forests in several areas of Chiloé Island in southern Chile. Foxes were caught by Cristóbal Briceño using tomahawk type traps that were baited with canned mackerel. The animals were anesthetized with ketamine–xylazine, blood samples were extracted, measurements were taken, and clinical examinations were performed, during which ectoparasites were collected. Each animal was taken out of the trap and placed in lateral recumbence over a canvas. A thorough visual examination and parasite screening were performed on the flanks of each fox. Prior to the release, foxes were identified with a numbered ear tag. In the laboratory, under a microscope, the lice collected were separated by gender and age group (i.e., adults or nymphs).

Lice were fixed and preserved in 70% alcohol and later mounted in Canada balsam, following the technique published by Palma (1978) for identification. The specimens were deposited in the collection of the Zoology Department in Universidad de Concepción, Chillán, Chile. One of the isolated egg of *T. canis* is shown in Fig. 2.

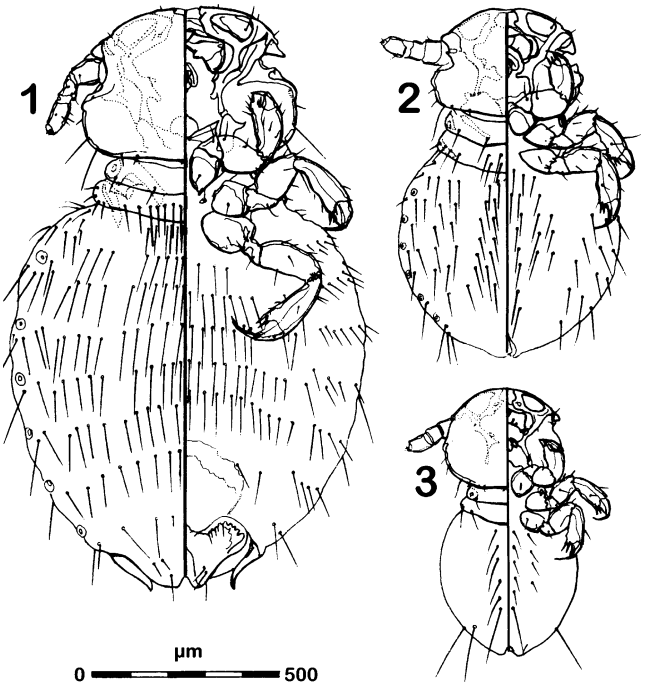

Fig. 1 Drawings of *Trichodectes canis* collected from Darwin's foxes; *1* adult female, *2* nymph II, *3* nymph I

Results and discussion

A total of 12 lice (7 adults and 5 nymphs), identified as *T. canis*, were found on six foxes (18.2%; Table 1). One juvenile female, two adult male, and three female foxes were infested. The lice were located on the thighs, loins, and lateral sides of the trunk of the animals. All parasitized foxes were from approximately the same area, i.e., the middle west of the island (Quilán, Tepuhueico, and Huillinco). The identification of the lice as *T. canis* was based on their size, antennal shape, chaetotaxy, thorax shape, and genitalia following the characteristics used by Morse (1903), Werneck (1936), and Kéler (1939). Drawings of an adult and of two nymphal stages made from the available material are shown in Fig. 1. A photograph of an egg of *T. canis* on a fox hair is shown in Fig. 2.

Table 1 Information on the Darwin's foxes caught in Chiloé positive for *Trichodectes canis* (Phthiraptera)

Number	Date	Gender	Age	Location	*Trichodectes canis*
1	24 Apr 2003	Female	Adult	Quilán	1 F
2	29 Apr 2003	Female	Adult	Quilán	1 F 2 NII
3	23 May 2003	Female	Juvenile	Tepuhueico	2 F
4	29 May 2003	Female	Adult	Huillinco	2 F
5	06 Oct 2003	Male	Adult	Tepuhueico	1 F 1NI
6	17 Jan 2004	Male	Adult	Tepuhueico	1 NI 1 NII

F female; *NI* nymph, first stage; *NII* nymph, second stage

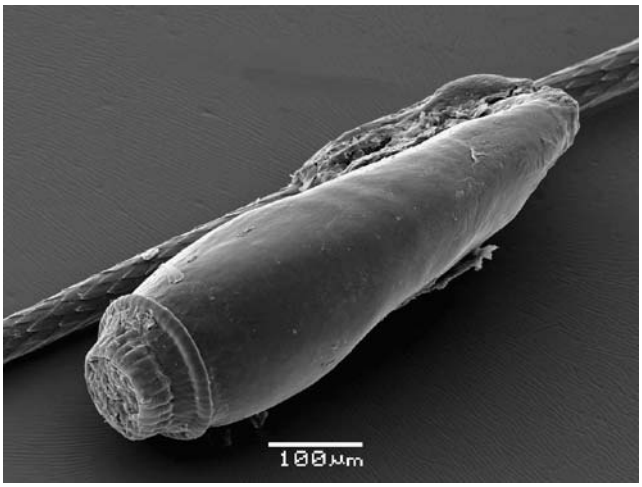

Fig. 2 Photograph of an egg of *Trichodectes canis* from a Darwin's fox naturally attached to a hair

The dog (*C. familiaris*) is considered to be the principal host of *T. canis* (Bádr et al. 2005) and is recorded in Chile by Tagle (1966) without giving any other details, such as locality, prevalence, intensity, etc. Unfortunately, the material collected by Tagle is not available to corroborate his diagnosis. Additional South American records are from several states of Brazil (Rio Grande do Sul, Minas Gerais, Mato Grosso, Paraná, São Paulo, and Distrito Federal; see Werneck 1948). Other records from domestic dogs and several wild canines, such as *Canis lupus*, are from Panama (Emerson 1966) and from North America: in the provinces of Ontario (Thomson 1934) and Saskatchewan (Wobeser et al. 1983) in Canada, as well as in the Kenai Peninsula in Alaska, USA (Schwartz et al. 1983), in Minnesota, and in Wisconsin (Mech et al. 1985) in the USA. In addition, this louse has been found on *Canis latrans* in Texas (Eads 1948), Kansas, Minnesota, and Wisconsin in the USA (Gier and Ameel 1959; Mech et al. 1985). Mey (2003) also records *T. canis* in Europe as a parasite on *C. familiaris*, *C. lupus*, *C. aureus*, *C. latrans*, *Dusicyon culpaeus*, *Cerdocyon thous*, *Vulpes bengalensis*, *Nyctereutes procyonoides*, and *Viverra civetta*. Recently, Bádr et al. (2005) reported it on *N. procyonoides* in the Czech Republic.

We suppose that the louse was established on this host since we found various stages of the parasite's life cycle (eggs, nymphs I, II, III, and female) on the specimens. The small number of lice found in this study was presumably due to the intensive hygiene and the good immunity status of the foxes. The absence of males may be ascribed to their greater mobility and their shorter lifetime compared to females (Marshall 1981).

In contrast with the observations made by Foreyt et al. (1978) and Mech et al. (1985) who described lesions due to heavy *T. canis* infestations on wild canines, the low *T. canis* numbers recorded in this study were not associated with any lesions in the infested Darwin's foxes. Considering that *T. canis* has to be confirmed as a parasite on other canids in Chile, it would be of interest to see if dogs in the island of Chiloé are parasitized by this species of chewing louse.

Acknowledgements Funding for the fieldwork was provided by the Darwin Initiative, Department of Environment, Food, and Rural Affairs, UK. We are indebted to Ricardo L. Palma (Museum of New Zealand, Wellington) for his critical review of the manuscript.

References

Aguilera JF (2001) Estudio preliminar de echinococosis y helmintiasis gastrointestinal en zorro gris (*Pseudalopex griseus*) silvestre de Tierra del Fuego, Chile. Memoria de Título. Med Vet Universidad de Concepción, Facultad de Medicina Veterinaria, Chillán, Chile

Alvarez V (1960) Presencia de *Linguatula serrata* (Froelich, 1789) en *Dusicyon culpaeus* y de formas ninfales en *O. degus* y *A. b. bennetti*. Bol Chil Parasitol 15:22

Bádr VP, Stefan P, Preisler J (2005) *Trichodectes canis* (De Geer, 1778) (Phthiraptera, Ischnocera), a new ectoparasite of the raccoon dog (*Nyctereutes procyonoides*) in the Czech Republic. Eur J Wildl Res 51:133–135

Donoso R, Skewes O, Rubilar L, Donoso S, C. Brevis (2000) Estudio histopatológico de *Sarcocystis* sp. en intestino delgado de zorro gris (*Pseudalopex griseus*) de Tierra del Fuego, Chile. Proceedings of the XI Congreso Chileno de Medicina Veterinaria, Santiago, Chile (on CD-ROM only)

Eads RB (1948) Ectoparasites from a series of Texan coyotes. J Mammal 29:268–271

Emerson KC (1966) Mallophaga of Mammals of Panama. In: Wenzel L, Tipton J (eds) Ectoparasites of Panama. Field Museum of Natural History, Chicago, Illinois, pp 267–272

Foreyt WJ, Long GG, NL Gates (1978) *Trichodectes canis*: severe pediculosis in coyotes. Vet Med Small Anim Clin 73:503–505

Gier HT, Ameel DJ (1959) Parasites and diseases of Kansas coyotes. Kans Agric Exp Stn Maniatan Tech Bull 91:1–34

González-Acuña D, Guglielmone A (2005) Ticks (Acari: Ixodoidea: Argasidae, Ixodidae) of Chile. Exp Appl Acarol 35:147–163

González-Acuña D, Ortega R, Rivera P, J Cabello (2003) Verdacht auf Staupe beim Graufuchs (*Pseudalopex griseus*) in mittleren Chile (Fallbericht). Z Jagdwiss 49:1–4

González A, del Castro D, S González (2004) Ectoparasitic species from *Canis familiaris* (Linné) in Buenos Aires province, Argentina. Vet Parasitol 120:123–129

González-Acuña D, del Castro D, Mey E, L Moreno-Salas (2005) Nuevos registros de Phthiraptera en cánidos y caprinos en Chile. Arch Med Vet 37:77–78

Jiménez JE, McMahon E (2004) Darwin's fox *Pseudalopex fulvipes* (Martin, 1837). In: Sillero-Zubiri C, Hoffmann M, Macdonald DW (eds) Canids: foxes, wolves, jackals and dogs. Status survey and conservation action plan. IUCN/SSC Canid Specialist Group. Gland, Switzerland, pp 50–55

Kéler S (1939) Baustoffe zu einer Monographie der Mallophagen. 1. Teil: Überfamilie der Trichodectoidea. Nova acta Leopold (Neue Folge) 5:395–467

Marshall AG (1981) The ecology of ectoparasitic insects. Academic, London, p 459

Mech DL, Thiel RP, Fritts SH, WE Berg (1985) Presence and effects of the dog louse *Trichodectes canis* (Mallophaga, Trichodectidae) on wolves and coyotes from Minnesota and Wisconsin. Am Midl Nat 114:404–405

Mey E (2003) Verzeichnis der Tierläuse (Phthiraptera) Deutschlands. In: B Klausnitzer (ed) Entomofauna Germanica 6. Entomol Nachr Ver Beih 6:72–129

Morse M (1903) Synopses of North American invertebrates. XIX. The Trichodectidae. Am Nat 37:609–624

Palma R (1978) Slide-mounting of lice: a detailed description of the Canada balsam technique. N Z Entomol 6:432–436

Schwartz CC, Stephenson R, Wilson N (1983) *Trichodectes canis* on the gray wolf and coyote in south central Alaska. J Wildl Dis 19:372–373

Tagle I (1966) Parásitos de los animales domésticos en Chile. Bol Chil Parasitol 21:118–121

Thomson GB (1934) Records of Siphunculata and Mallophaga from Canadian host. Can Entomol 66:279–281

Werneck FL (1936) Contribuiçao ao conhecimento dos Mallophaga encontrados nos mamíferos sul-americanos. Mem Inst Oswaldo Cruz 31:391–589

Werneck FL (1948) Os Malofagos de Mamíferos. Parte 1: Amblycera e Ischnocera (Philopteridae e parte de Trichodectidae). Revista Brasileira de Biología, Río de Janeiro, Parte 1, 241 pp

Wobeser G, Runge W, Stwart RR (1983) *Melorchis conjuctus* (Cobbold, 1860) infection in wolves (*Canis lupus*), with pancreatic involvement in two animals. J Wildl Dis 19:353–356

Yahnke CJ, Johnson WE, Geffen E, Smith D, Hertel F, Roy MS, Bonacic CF, Fuller TK, Van Valkenburgh V, Wayne RK (1996) Darwin's fox: a distinct endangered species in a vanishing habitat. Conserv Biol 10:366–375