



**First Records of the Louse *Solenopotes binipilosus* (Insecta: Phthiraptera) and the Mite *Psoroptes ovis* (Arachnida: Acari) from Wild Southern Huemul (*Hippocamelus bisulcus*)**

Authors: González-Acuña, Daniel, Saucedo, G. Cristián, Corti, Paulo, Casanueva, María Eugenia, and Cicchino, Armando

Source: Journal of Wildlife Diseases, 45(4) : 1235-1238

Published By: Wildlife Disease Association

URL: <https://doi.org/10.7589/0090-3558-45.4.1235>

---

BioOne Complete (complete.BioOne.org) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at [www.bioone.org/terms-of-use](http://www.bioone.org/terms-of-use).

Usage of BioOne Complete content is strictly limited to personal, educational, and non - commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

---

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

## First Records of the Louse *Solenopotes binipilosus* (Insecta: Phthiraptera) and the Mite *Psoroptes ovis* (Arachnida: Acari) from Wild Southern Huemul (*Hippocamelus bisulcus*)

Daniel González-Acuña,<sup>1,6</sup> G. Cristián Saucedo,<sup>2</sup> Paulo Corti,<sup>3</sup> María Eugenia Casanueva,<sup>4</sup> and Armando Cicchino<sup>5</sup> <sup>1</sup> Facultad de Medicina Veterinaria, Universidad de Concepción, Casilla 537, Chillán, Chile; <sup>2</sup> Conservación Patagónica, Patagonia Park, Cochrane, Chile; <sup>3</sup> Instituto de Zoología, Universidad Austral de Chile, Casilla 567, Valdivia, Chile; <sup>4</sup> Facultad de Ciencias Naturales y Oceanográficas, Universidad de Concepción, Víctor Jomaras 1290, Concepción, Chile; <sup>5</sup> Laboratorio de Artrópodos, Departamento de Biología, Universidad Nacional de Mar del Plata, Funes 3300, 7600 Mar del Plata, Provincia Buenos Aires, Argentina; <sup>6</sup> Corresponding author (email: danigonz@udec.cl)

**ABSTRACT:** Two species of Phthiraptera, *Bovicola caprae* (Ischnocera: Bovicolidae) and *Solenopotes binipilosus* (Anoplura: Linognathidae), and one species of mite, *Psoroptes ovis* (Acari: Psoroptidae), were recorded on huemul (*Hippocamelus bisulcus*) in Chile. The sucking louse *S. binipilosus* and the mite *P. ovis* are reported for the first time from this host.

**Key words:** Acari, *Bovicola caprae*, first record, huemul, lice, mite, *Psoroptes ovis*, *Solenopotes binipilosus*.

Huemul (*Hippocamelus bisulcus*) is an endemic cervid species of southern Chile and Argentina. It is listed as endangered (IUCN, 2008) as a result of a significant decline in numbers and a reduction of its original distribution range. Possible causes of the huemul's decline are poaching, habitat destruction, predation by dogs (*Canis familiaris*), susceptibility to livestock diseases, competition with domestic animals, and the introduction of exotic species (Povilitis, 1998; Díaz and Smith-Flueck, 2000; Serret, 2001). It is considered an umbrella species (Hunter, 1996) and is one of the most vulnerable and least known cervids in the world (Smith-Flueck, 2000). The current population of huemul is about 1,000–1,500 individuals (Smith-Flueck, 2000; Serret, 2001).

Serret (2001) believes that domestic animals (e.g., cattle [*Bos taurus*], sheep [*Ovis aries*], goats [*Capra hircus*], horses [*Equus caballus*], and dogs) as well as introduced wild mammals (i.e., red deer [*Cervus elaphus*] and wild boar [*Sus*

*scrofa*]), may be the source of endoparasites affecting huemul deer (Díaz and Smith-Flueck, 2000). Studies of the ectoparasites of the huemul are scarce, but a goat-chewing louse *Bovicola caprae* has been reported on captive huemul from Argentina (Serret, 2001).

Between 14 June and 29 September 2007, 18 huemul (nine adult males and nine adult females) were live-captured in the vicinity of Cochrane (47°11'S, 72°29'W), Aysén District, Chile, at the Lago Cochrane National Reserve (LCNR). The LCNR was created in 1967 to protect southern beech or lenga (*Nothofagus pumilio*) forest and a population of huemul. The reserve's vegetation is classified as deciduous forest with a mosaic of shrubs and trees dominated by Antarctic beech or ñirre (*Nothofagus antarctica*), along with stands of *N. pumilio* and coihue (*Nothofagus dombeyi*). There are also old burned areas resulting from a fire that occurred in 1942–45. Much of the reserve used by huemul is dominated by steep terrain (23% of the entire area has more than a 45° slope) and flat rocky outcrops. Mean annual temperature is 7.6 C, and annual precipitation is around 805 mm. The 6,925 ha of the reserve are surrounded by a private park on the north and east sides, small sheep farms on the west side, and by Lake Cochrane and a river to the south and southeast.

The 18 huemul were captured and chemically immobilized with a combina-

tion of ketamine ( $\sim 2.0 \pm 0.7$  mg/kg) and medetomidine ( $\sim 0.09 \pm 0.05$  mg/kg), followed by the injection of atipamezole ( $\sim 0.40 \pm 0.2$  mg/kg) as antagonist agent (P. Corti and C. Saucedo, unpubl. data). Capture was authorized by the Chile Agricultural Service. After sedation, each animal was placed over a canvas sling in a sternal position, and both flanks of the animals were visually examined for ectoparasites. Blood samples were collected, body measurements were taken, and clinical examinations were performed. Prior to their release, huemul were identified and marked with a numbered ear tag, and some were tagged with a very high frequency (VHF) radio collar. In the laboratory, ectoparasites were separated taxonomically into chewing lice, sucking lice, and mites, and sex and developmental stages (i.e., adults or nymphs) were determined using a stereomicroscope. Ectoparasites were fixed and preserved in 70% alcohol. Lice were slide-mounted in Canada balsam following the technique described by Palma (1978), and mites were cleared with Nesbitt solution for 72 hr at 55 C, dehydrated with alcohol, and slide-mounted in Berlesse mixture (Krantz, 1978). All specimens were deposited in the collection of the Zoology Department at the Universidad de Concepción, Chillán, Chile.

Identification of the chewing lice as *Bovicola caprae* (Ischnocera: Bovicoliidae) was based on size, antennal shape, chaetotaxy, thorax shape, and genitalia, following Werneck (1936, 1948, 1950). The sucking lice were identified as *Solenopotes binipilosus* (Anoplura: Linognathidae) following Ferris (1932). Identification of the mites as *Psoroptes ovis* (Acari: Psoroptidae) was based on previously published descriptions (Sweatman, 1958; Sanders et al., 2000; Pegler et al., 2005).

Five (27%) of the 18 huemul were infested with ectoparasites. Two (11%) animals carried adult *B. caprae*, and two (11%) carried *S. binipilosus*; one presented both louse species. Four (22%) huemul were affected by *P. ovis*, but two of them

showed heavy infestations, causing skin damage manifested by redness, thickening, and desquamation. A single animal was coinfecting with all three species of ectoparasites. Negative animals had no evidence of skin damage due to the ectoparasites, which are easily recognized on affected individuals. Lice were located mainly on the head, thighs, loins, and lateral sides of the trunk of the animals. The mites were mainly found on the back.

The small total number of both louse species (chewing and sucking lice) found ( $n=23$ ) in this study was presumably due to the relative low density, small group size, and scattered distribution of huemul in the area (Corti, 2008). Low host numbers, scattered distribution, and small group size are mechanisms that reduce the probability of parasite infestations (Lohele, 1995).

Lice are highly specialized obligate ectoparasites of mammals and birds (Johnson and Clayton, 2003). The primary host of *B. caprae* is the domestic goat (including goats in Chile; Tagle, 1966), and infestations have been reported from dead captive huemul in Argentina (Serret, 2001) and Chile (Povilitis, 1998). Because several developmental stages (nymphs, males and female) were found on the huemul sampled in the present study, we conclude that this louse species is now established on wild huemul, and detected infestations were not the result of contact with domestic goats. Goats have been suggested as a potential source of an infestation of *B. caprae* in captive pudu (*Pudu puda*; González-Acuña et al., 2004), but we believe that the current infestations are a result of introduction via domestic goats and a successful host-switch (see Paterson and Gray, 1997; Paterson et al., 1999, 2003). Other cervid species are not known to be parasitized by *B. caprae* (Price et al., 2003).

The present report of *S. binipilosus* from huemul constitutes a new host record. This parasite has been recorded from three species of deer in South America, including *Mazama gouazoubira*, *Mazama americana*

(Castro and Cicchino, 1998), and pudu (González-Acuña et al., 2004), and has been associated with disease. Because of the low number of specimens collected during this study (two females), the significance of this new host record is unknown, and additional studies that include goats and other mammalian hosts are needed to fully understand its host range.

*Psoroptes* mites are a major cause of psoroptic mange in domestic and wild ungulates, causing livestock welfare problems and economic losses in many areas of the world (Van den Broek and Huntley, 2003). Several species of the genus *Psoroptes*, which are all currently considered junior synonyms of *P. ovis* (Zahler et al., 2000 [*P. equi*]; Wall and Kolbe, 2006 [*P. ovis*]), have been described and recorded from different species of wild herbivores, such as European bison (*Bison bonasus*; Kadulski et al., 1996), Wapiti (*Cervus canadensis*; Zahler et al., 2000), and African buffalo (*Syncerus caffer*) in Kenya (Sweatman et al., 1969). This is the first record of *P. ovis* in huemul, and as with *B. caprae*, the significance of these infestations to huemul conservation is unclear and deserves additional study.

We are greatly indebted to K. Ardiles for her help in the preparation of the ectoparasites in the laboratory; J. Avila for assistance; and R. L. Palma (Museum of New Zealand Te Papa Tongarewa) for his critical review of the manuscript. We would like to thank all the people that helped in the capturing of huemul and in the fieldwork, D. Velasquez, D. Jara, R. Millacura, H. Velasquez, and T. Ormeño. We are also very thankful to D. Shackleton for correcting the English and improving early drafts and to J. A. and W. Flueck for sharing information. This research would not have been possible without funding from the Denver Zoological Foundation, Conservación Patagónica, and Wildlife Conservation Society (WCS) Field Veterinary Program. During this research, P. Corti received economic support from a PhD scholarship from the Université de

Sherbrooke through a National Science and Engineering Research Council of Canada (NSERC) grant given to M. Festa-Bianchet that covered a large part of the research expenses. Conaf Aysén District Office allowed us the access to work in LCNR. Huemul-capturing permits were issued for P. Corti by the Wildlife Subdepartment, Natural Renewable Resources Division of the Agricultural Service of Chile (SAG).

#### LITERATURE CITED

- CASTRO, D. C., AND C. A. CICHINO. 1998. Anoplura. In Biodiversidad de artrópodos Argentinos, Una perspectiva biotaxonomía, J. Morrone and S. Coscarón (eds.). Ediciones Sur, La Plata, Argentina, pp. 125–143.
- CORTI, P. 2008. Organisation sociale, dynamique de population, et conservation du cerf huemul (*Hippocamelus bisulcus*) dans la Patagonie du Chili. PhD Thesis, Université de Sherbrooke, Sherbrooke, Quebec, Canada.
- DÍAZ, N. I., AND J. M. SMITH-FLUECK. 2000. The Patagonian huemul. A mysterious deer on the brink of extinction. *Literatura of Latin America*, Buenos Aires, Argentina, 149 pp.
- FERRIS, G. F. 1932. Contributions toward a monograph of the sucking lice. Part V. Stanford University Publications, Biological Series 2: 271–413.
- GONZÁLEZ-ACUÑA, D., D. C. DEL CASTRO, L. MORENO, AND E. MEY. 2004. First records of lice (Insecta: Phthiraptera) from wild southern pudu, *Pudu puda* (Mammalia: Artiodactyla: Cervidae). *European Journal of Wildlife Research* 50: 216–217.
- HUNTER, M. L. 1996. *Fundamentals of conservation biology*. Blackwell Science, Cambridge, pp. 483.
- IUCN. 2008. *IUCN Red List of Threatened Species*, www.iucnredlist.org. Accessed May 2008.
- JOHNSON, K. P., AND D. H. CLAYTON. 2003. The biology, ecology, and evolution of chewing lice. In *The chewing lice: World checklist and biological overview*. Special Publication 24, R. D. Price, R. A. Hellenthal, R. L. Palma, K. P. Johnson, and D. H. Clayton (eds.). Illinois Natural History Survey, Illinois, pp. 449–476.
- KADULSKI, S., J. N. IZDEBSKA, AND M. KONCZYK. 1996. Parasitic arthropods of *Bison bonasus* from Bialowieza primeval forest. *Wiadomości Parazytologiczne* 42: 255–260.
- KRANTZ, G. W. 1978. *A manual of Acarology*. 2nd Edition. Oregon State University Book Stores, Inc., Corvallis, Oregon, 509 pp.
- LOHELE, C. 1995. Social barriers to pathogen transmission in wild animal populations. *Ecology* 76: 326–335.

- PALMA, R. L. 1978. Slide-mounting of lice: A detailed description of the Canada balsam technique. *New Zealand Entomologist* 6: 432–436.
- PATERSON, A. M., AND R. D. GRAY. 1997. Host-parasite cospeciation, host switching and missing the boat. *In* Host-parasite evolution: General principles and avian models, D. H. Clayton and J. Moore (eds.). Oxford University Press, Oxford, England, pp. 326–250.
- , R. L. PALMA, AND R. D. GRAY. 1999. How frequently do avian lice miss the boat? Implications for coevolutionary studies. *Systematic Biology* 48: 214–223.
- , ———, AND ———. 2003. Drowning on arrival, missing the boat, and x-events: How likely are sorting events? *In* Tangled trees: Phylogeny, cospeciation, and coevolution, R. D. M. Page (ed.). University of Chicago Press, Chicago and London, pp. 287–309.
- PEGLER, K. R., L. EVANS, J. R. STEVENS, AND R. WALL. 2005. Morphological and molecular comparison of host-derived populations of parasitic *Psoroptes* mites. *Medical and Veterinary Entomology* 19: 392–403.
- POVILITIS, A. 1998. Characteristics and conservation of a fragmented population of huemul *Hippocamelus bisulcus* in central Chile. *Biological Conservation* 86: 97–104.
- PRICE, R. D., R. A. HELLENTHAL, AND R. L. PALMA. 2003. World checklist of chewing lice with host associations and keys to families and genera. *In* The chewing lice: World checklist and biological overview, Special Publication 24, R. D. Price, R. A. Helleenthal, R. L. Palma, K. P. Johnson, and D. H. Clayton (eds.). Illinois Natural History Survey, Illinois, pp. 1–448.
- SANDERS, A., P. FROGGATT, R. WALL, AND K. E. SMITH. 2000. Life-cycle stage morphology of *Psoroptes* mange mites. *Medical and Veterinary Entomology* 14: 131–141.
- SERRET, A. 2001. El huemul, fantasma de la Patagonia. Zagier and Urruty Ed., Ushuaia, Argentina, 130 pp.
- SMITH-FLUECK, J. M. 2000. La situación actual del huemul patagónico. *In* El huemul patagónico: Un misterioso cérvido al borde de la extinción, N. Díaz and J. Smith-Flueck (eds.). L.O.L.A., Buenos Aires, Argentina, pp. 67–150.
- SWEATMAN, G. K. 1958. On the life history and validity of the species in *Psoroptes*, a genus of mange mites. *Canadian Journal of Zoology* 36: 905–929.
- , J. B. WALKER, AND J. A. BINDERNAGEL. 1969. Stages in the development of *Choriopsoroptes kenyensis* gen. et sp. n. (Acari: Sarcoptiformes: Psoroptidae), a body mange mite from captive African buffalo, *Syncerus caffer*, in Kenya. *Journal of Parasitology* 55: 1298–1310.
- TAGLE, I. 1966. Parásitos de los animales domésticos en Chile. *Boletín Chileno de Parasitología* 21: 118–121.
- VAN DEN BROEK A. H., AND J. F. HUNTLEY. 2003. Sheep scab: The disease, pathogenesis and control. *Journal of Comparative Pathology* 128: 79–91.
- WALL, R., AND K. KOLBE. 2006. Taxonomic priority in *Psoroptes* mange mites: *P. ovis* or *P. equi*? *Experimental and Applied Acarology* 39: 159–162.
- WERNECK, F. L. 1936. Contribuição ao conhecimento dos mallophagos encontrados nos mamíferos sul-americanos. *Memórias do Instituto Oswaldo Cruz* 31: 391–589.
- . 1948. Os malófagos de mamíferos. Parte I: Amblycera e Ischnocera (Phlopteraeidae e parte de Trichodectidae). *Revista Brasileira de Biologia*, Rio de Janeiro, Brazil, 243 pp.
- . 1950. Os malófagos de mamíferos. Parte II: Ischnocera (continuação de Trichodectidae) e Rhyncophthirina. Instituto Oswaldo Cruz, Rio de Janeiro, Brazil, 207 pp.
- ZAHLER, M., W. M. L. HENDRIKX, A. ESSIG, H. RINDER, AND R. GOTHE. 2000. Species of the genus *Psoroptes* (Acari: Psoroptidae): A taxonomic consideration. *Experimental and Applied Acarology* 24 3: 213–225.

Received for publication 22 May 2008.