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Short communication

Potential existence of a sylvatic cycle of *Taenia ovis krabbei* in Patagonia, Argentina

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Abstract

Red deer (*Cervus elaphus*) were introduced in southern Latin America about a century ago and characteristics of the invasion raise concerns over their epidemiological role for various diseases. We report on the possible occurrence of *Taenia ovis krabbei* established in a sylvatic cycle in Patagonia. Hook characters, size, appearance, and location of a cysticercus from a wild red deer are consistent with *Taenia ovis ovis* or *T. o. krabbei*. Although it is not possible to differentiate between *T. o. ovis* and *T. o. krabbei* on morphological grounds with certainty, several biological characteristics indicate the cysticercus may belong to *T. o. krabbei*. Red deer have been reported to be refractory to *T. o. ovis* infection whereas other potential intermediate hosts like cattle, goats, pigs and sheep have been shown to be refractory to *T. o. krabbei*. Other native ungulates sympatric with red deer in Patagonia include *Lama guanicoe* and the endangered huemul deer (*Hippocamelus bisulcus*). Possible or known definitive hosts include native felids like *Puma concolor*, *Felis colocolo*, *F. guigna* and canids like *Dusicyon griseus*, *D. culpaeus*, and domestic dogs. © 2005 Elsevier B.V. All rights reserved.

Keywords: Biological invasion; *Cervus elaphus*; *Taenia ovis krabbei*; Patagonia

1. Introduction

The spread of exotic species into foreign habitats may result in economic losses and ecological impacts and is a major component of global change. Of primary concern is how the exotic may influence the persistence of native species and affect native biodiversity and ecosystem functions (D'Antonio

et al., 2001). Major effects result from predation or herbivory, competition, habitat changes, and diseases (Clout, 2002). Red deer (*Cervus elaphus*) are known to effectively naturalize in new environments and are considered to be one of the most aggressive invasive mammal (IUCN SSC Invasive Species Specialist Group 2002, <http://www.issg.org>). They were introduced to the southern cone of Latin America about a century ago, and the invasion has yet to reach a state of equilibrium (Flueck and Smith-Flueck, 1993; Flueck et al., 2003).

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The numerical and geographical characteristics of the red deer invasion and their land use behaviour raise concerns over their potential epidemiological role for various diseases important in conservation and the livestock industry, including foot and mouth, brucellosis and tuberculosis (Longhurst et al., 1952; Thorne et al., 1979; Rhyan et al., 1995; Fletcher, 2001). There is little information regarding the role of red deer in the epidemiology of native and exotic parasitic disease. Here we report on the possible occurrence of *Taenia ovis krabbei* established in the sylvatic cycle in Patagonia.

2. Materials and methods

The study site was private land within the Nahuel Huapi national reserve, in the province of Neuquén, Argentina (40°58' S, 71°12' W) at about 1000 m elevation. Collections and evaluations of animals were part of an ongoing project on reproduction (Flueck, 2002). Free-ranging females 2 years or older were approached by stalking and collected at first sight without regard for age or size ($n = 376$). Although standard field necropsies were performed, muscle tissues were not routinely searched for cysticercus, and the present description is the first encountered case. Cardiac muscle, masseter and diaphragm are also preferred by *Taenia ovis krabbei*, but these sites were not evaluated.

3. Results

A well-developed cysticercus was found in muscle of a lactating female red deer approximately 8.5-years old when shot in January 2004. She was of average body size for the area (hind foot length 51 cm, shoulder height 108 cm, total body length 194 cm and girth 134 cm). Dissecting the *supraspinatus* of the scapula revealed a capsule formed by surrounding muscle tissue, containing a typical cysticercus approximately 9 mm long and 3 mm in diameter of perfectly normal appearance and well developed. The scolex had 30 hooks; the large and small hooks measured 147–150 and 103–110 μm , respectively. The specimen has been deposited in the Natural History Museum, London (accession number BMNH 2005.8.9.1.).

4. Discussion

The hook characters, size, appearance and the location of the cysticercus are consistent with *Taenia ovis ovis* or *T. o. krabbei*. Although it is not possible to differentiate between the two forms on morphological grounds with certainty, several biological characteristics indicate that the cysticercus belongs to *T. o. krabbei* (see Jones and Pybus, 2001). Thus, *C. elaphus* has been shown to be refractory to *T. o. ovis* infection (Sweatman and Henshall, 1962), yet our specimen had a normal appearance and was well developed. Furthermore, other potential intermediate hosts like cattle, goats, pigs and sheep have been shown to be refractory to *T. o. krabbei* (Sweatman and Henshall, 1962). As *T. o. ovis* has a very low prevalence in this region (F. Oleachea, personal communication) and the study area contains primarily cattle and only a few sheep for ranch consumption, it appears unlikely that our specimen represents an aberrant cross infection. Furthermore, the biological difference between the two *Taenia* forms has been found to remain with sympatric cervids and sheep (Sweatman and Henshall, 1962; Priemer et al., 2002).

Taenia o. krabbei is only reported from North America and Eurasia where its natural intermediate hosts include several cervid species and pronghorn antelope (*Antilocapra americana*) (see Sweatman and Henshall, 1962; Leiby and Dyer, 1971; Loos-Frank, 2000). Thorne et al. (2002) did not include *T. o. krabbei* in their listing of elk (*C. elaphus*) parasites, although they mention rare reports of its apparent occurrence. However, Sweatman and Henshall (1962) list the European cervids *Capreolus capreolus*, *C. elaphus hippelaphus* and *Dama dama* as intermediate hosts, under the name of its junior synonym, *T. cervi*. Prevalence in red deer has been reported recently as 13% (Shimalov and Shimalov, 2003), and up to 19% (Murai and Sugar, 1979). Other native ungulates sympatric with red deer in Patagonia include the threatened guanaco (*Lama guanicoe*) (Flueck, 1996) and the endangered huemul deer (*Hippocamelus bisulcus*) (Smith-Flueck, 2003).

Elk, but mainly *C. e. hippelaphus* and *D. dama* have been introduced to Argentina about one century ago. Suarez et al. (1991) described several exotic abomasal parasites in captive red deer in central Argentina. Although the deer had been isolated for over 60 years, these introduced nematodes persisted in

the captive population. These nematodes presumably have direct life cycles, whereas *T. ovis* requires a carnivore as definitive host. *Taenia o. krabbei* most commonly cycles between wild predators and wild cervids. Natural definitive hosts in the northern hemisphere include canids, ursids and felids like lynx *Lynx rufus* and puma *Puma concolor* (see Jones and Pybus, 2001), but domestic dogs have also been shown to serve as hosts (Sweatman and Henshall, 1962). Possible native definitive hosts in our study area include felids like puma, *Felis colocolo*, *F. guigna* and canids like the foxes *Dusicyon griseus* and *D. culpaeus* (Andean wolf), as well as domestic dogs. There is no information on parasite diversity of these predators, as a web-of-science (ISI) search on parasites in Argentine predators (puma, fox and dogs) only revealed a few papers on hydatid disease in dogs. However, red deer interact strongly with puma and foxes (Flueck et al., 2005), thus providing the conditions for a sylvatic cycle to occur.

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