

Short Communication

A Helminthological Record on Free-Ranging Pikas and Rodents Collected from Tibetan Plateau, China: Preliminary Results

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Abstract

There is little available data regarding helminths of mammals in the Tibetan Plateau, Qinghai Province, China. This study presents preliminary data obtained from the China-Japan co-operative survey, performed in the summers of 2007 and 2009. Alimentary tracts and viscera of 78 small mammals, including plateau pikas (*Ochotona curzoniae*) and rodents (*Mus musculus*, *Alticola stoliczkanus*, *Cricetulus longicaudatus*, *Meriones meridianus* and *Phodopus roborovskii*), were investigated. Thirty of these animals were negative for helminths. Among the helminth-positive samples, no platyhelminthes (including metacestodes of *Echinococcus* spp.) or acanthocephalan parasites were obtained. Four nematode genera, including *Heligmosomoides*, *Heligmosomum*, *Syphacia* and *Trichuris* were obtained from rodents. Four other nematode genera and species, including *Ohbayashinem aochotoni*, *Trichostrongylus retortaeformis*, *Gradiphiella ochotona* and *Cephaluris coloradensis*, were obtained from the plateau pika spp. With the exception of *C. coloradensis*, these were first recorded instances of these species in the pikas. These can be added as newly-recorded nematode parasites in plateau pikas, though none of these are new species, nor do they appear medically relevant.

INTRODUCTION

Small mammals, such as rodents and pikas, play an important role in the ecosystem of the Tibetan Plateau in the Qinghai Province of China [1]. To date, limited data have been collected regarding parasitic helminths of these species, because studies are difficult to conduct in this area [2-4]. Therefore, we present preliminary data from a China-Japan cooperative survey of mammalian species performed in the summers of 2007 and 2009 [5].

Mammals were collected at several sites in Qinghai Province, China, with taking strict rules of the euthanasia and other ethics in both China and Japan into consideration [5]. After then, the fixed alimentary tracts including esophagus, stomach, small large intestines, and viscera including liver, lung, kidney and genital organ shown below were sent to the 1st and correspondence

authors. Each location, longitude, and altitude is previously described by Motokawa et al, [5].

The alimentary tracts and viscera from a total of 78 small mammals, including rodents (*Mus musculus*, *Alticola stoliczkanus*, *Cricetulus longicaudatus*, *Meriones meridianus* and *Phodopus roborovskii*) and plateau pikas (*Ochotona curzoniae*) were stored in 70% ethanol solution and examined under a dissecting microscope. Nematodes were cleared in lactophenol solution. Cross-sections were hand-cut, using a surgery scalpel, and used to examine gradients of ridges [6]. Morphological analysis and measurements were performed using a microscope and photo camera (BH2, OLYMPUS).

Thirty of the collected small mammals were negative for helminths. Namely, we have 48 helminth positive materials. Neither platyhelminth nor acanthocephalan parasites were

obtained from rodents in this study, although metacestodes of the genus *Echinococcus* have previously been reported in the plateau region [2-4].

In the present study, only nematodes were found in positive samples. Four genera were found in the small or large intestines of rodents, including *Heligmosomoides* (Fam. Heligmosomidae; Hosts: *C. longicauda*, *P. roborovskii* and *A. stoliczkanus*), *Heligmosomum* (Fam. Heligmosomidae; Host: *A. sibirica*), *Syphacia* (Fam. Oxyuridae; Hosts: *M. musculus*, *C. longicauda*, *P. roborovskii*, *M. meridianus* and *A. stoliczkanus*) and *Trichuris* (Fam. Trichuridae; Host: *A. stoliczkanus*). We are currently working to further identify, including molecular biology, these nematodes to a species level, using related references [6,7].

Four separate nematode genera were found in the alimentary tracts of pikas, including:

Ohbayashinem aochotoni (Fam. Heligmosomidae). Locations: Kunlunshan-kuo, Kekexili-di. Site: Small intestine. Male: Body coiled ventrally, length 5.8 mm, width 0.84 mm. Esophagus 0.63 mm in length (Figure 1-1). Nerve ring 0.20 mm and excretory pore 0.24 mm from anterior extremity. Eleven ridges in synlophe of midbody, with five dorsal and six ventral. Lateral ridges absent, dorsal ridges more developed than ventral ridges (Figure 1-2). Spicule length 0.45 mm. Bursa symmetrical (Figure 1-3), antero- and postero-ventral rays, and antero-, postero- and medio-lateral rays from same stem, respectively. Dorsal rays (Figure 1-4) well developed, 0.02 mm in length. Externo-dorsal rays and antero-, postero- and medio-lateral rays from common base. Female: Body length 10.3 mm, width 0.1 mm. Esophagus length 0.70 mm. Nerve ring 0.17 mm and excretory pore 0.26 mm from anterior

extremity. Vulva 0.30 mm from posterior extremity (Figure 1-5). Egg oval, 0.08 mm x 0.04 mm. Vagina vera 0.05 mm in length, vestibule 0.41 mm in length, sphincter 0.054 mm x 0.047 mm. Tail length 0.09 mm, curving usually ventrally, ending in spine. Among known species of the genus *Ohbayashinema* [8-10], the most similar species was *O. ochotoni* based on morphologic features of dorsal ray. However, this species has been obtained from different host species as *O. dauurica* (Mongolia), *O. microtus* (Nepal) and *O. cansas* (Gansu, China).

Trichostrongylus retortaeformis (Fam. Trichostrongyloidea). Locations: Xidatang and Kekexili-di. Site: small intestine. Male: Body length 3.9-4.9 mm, body width at midbody 0.06 mm. Esophagus length 0.77 mm. Nerve ring and excretory pore 0.02 mm from anterior extremity (Figure 1-6). Bursa symmetrical, dorsal ray about 3/4 in length of externo-dorsal rays (Figure 1-7,1-8). Spicule length 0.01 mm, gubernaculum 0.007 mm x 0.002 mm (Figure 1-9). Female: Body length 4.4 mm (Figure 1-10), body width at vulva 0.12 mm. Esophagus length 0.67 mm. Nerve ring 0.13 mm and excretory pore 0.15 mm from anterior extremity. Vulva 0.98 mm from posterior extremity, egg 0.063 x 0.030 mm, didelphic (Figure 1-11). These characteristics correspond to *T. retortaeformis*, a common parasite of wild lagomorphs through the Palearctic region [11,12].

Gradiphiella aochotona (Fam. Trichostrongyloidea). Localities: Kekexili-di. Site: Stomach. Male: Cervical papillae and buccal capsule present (Figure 2-1), body length 9.3 mm, width 0.5 mm. Esophagus length 0.61 mm. Nerve ring 0.13 mm and excretory pore 0.23 mm–0.26 mm from anterior extremity, respectively. Prebursalpapillae not observed, bursal ray type

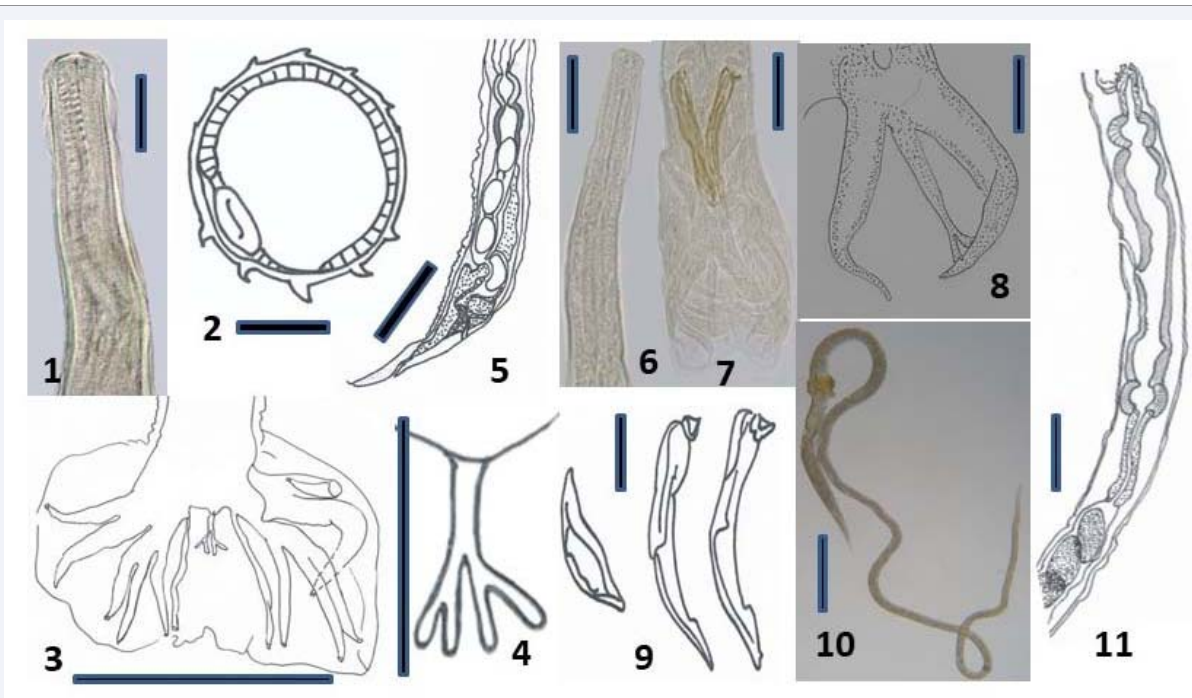


Figure 1 *Ohbayashinema aochotoni* (1 to 4) and *Trichostrongylus retortaeformis* (6 to 11) obtained from *Ochotona curzoniae* in Qinghai Province. 1 and 6: anterior extremity of male; 2: cross-section at mid-body of male; 3 and 7: ventral side of bursa; 4 and 8: dorsal ray; 9: spicules and gubernaculum; 10: whole body of female; 11: genital organ. Scale bars. 1, 3, 5, 7 and 11: 0.1 mm; 2: 0.01 mm; 4, 8 and 9: 0.05 mm; 6: 0.2 mm; 10: 0.5 mm.

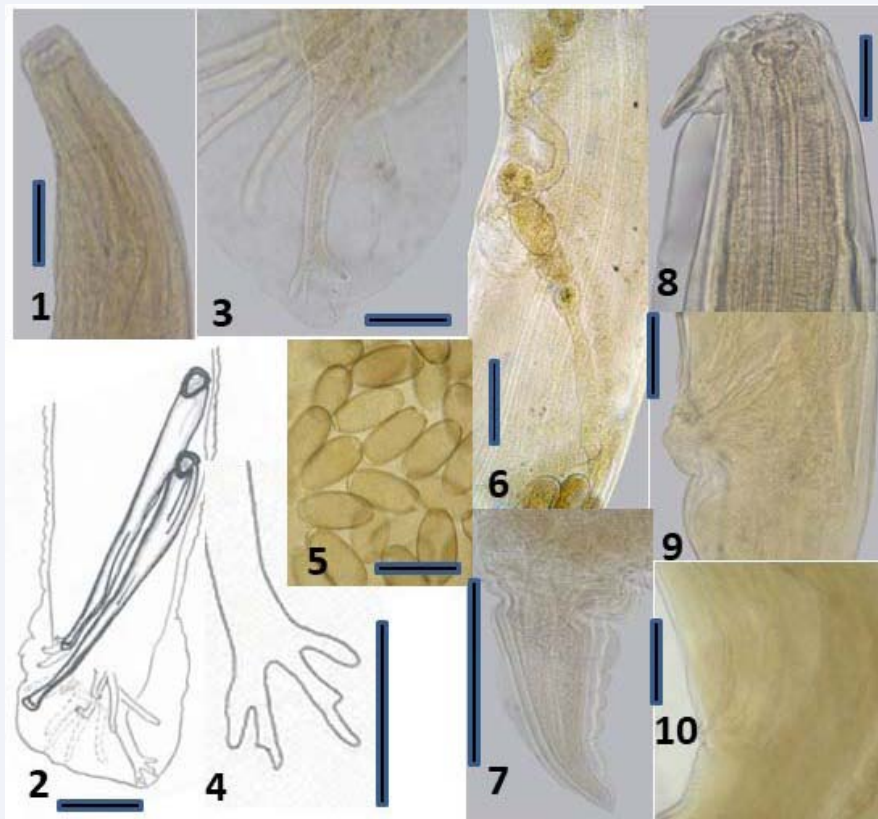


Figure 2 *Gradiphiella ochotoniae* (1 to 7) and *Cephaluris coloradensis* (8 to 10) obtained from *Ochotona curzoniae* in Qinghai Province. 1 and 8: anterior extremity of male; 2: bursa and spicules; 3 and -4: dorsal ray; 5: eggs; 6: genital organ of female; 7: tail of female; 9: cloaca of male, 10: vulva. Scale bars. 1, 2, 5 and 6: 0.1 mm; 3, 4, 8, 9 and 10: 0.05 mm; 7: 0.5 mm.

2-3, externo-dorsal rays shorter than dorsal rays, spicule length 0.56 mm, gubernaculum absent (Figure 2-2 to 2-4). Female: Body length 15.2 mm, uncoiled, width at midbody 0.82 mm. Esophagus length 0.67 mm. Nerve ring 0.25 mm and excretory pore 0.37 mm from anterior extremity. Cervical papillae and buccal capsule present. Vulva 7.4 mm–8.4 mm from posterior extremity, uterus didelphic, ovejektor type I, vestibule length 0.44 mm–0.47 mm, eggs in uterus 0.16 mm x 0.08 mm, tail length 0.43 mm (Figure 2-5 to 2-7). According to Olsen [13], these characteristics correspond to *G. ochotoniae*.

Cephaluris coloradensis (Fam: Heteroxyematidae). Locations: Kunlunshan-kuo, Fenghuoshan, Tuotuohe Gonglu, Kekexili di. Site: Large intestine. Male: Body length 5.7 mm–7.3 mm, width 0.03 mm, cephalic extremity with cuticular shield developed and pharyngeal cavity reduced (Figure 2-8). Esophagus length 0.5 mm–0.6 mm, esophagus bulb diameter 0.09 mm–0.13 mm. Nerve ring 0.1 mm and excretory pore 0.3 mm–0.5 mm from anterior extremity. Tail length 0.6 mm–0.7 mm, cloaca surrounded by three cushions (Figure 2-9). Female: Body length 7.2 mm–15.4 mm, width 0.5 mm–0.6 mm. Esophagus length 1.0 mm, oesophagus bulb diameter 0.15 mm–0.16 mm. Nerve ring 0.16 mm and excretory pore 0.83 mm–0.93 mm from anterior extremity. Vulva not significantly protruding (Figure 2-9), vulvar opens from anterior extremity 0.39 mm–0.43 mm. Eggs in uterus 0.08 mm–0.10 mm x 0.05 mm–0.06 mm, tail 0.96 mm–1.36 mm in length (Figure 2-10). The species belongs to the genus

Cephaluris, which includes *C. alaskensis* (Alaska; host *Ochotona collaris*), *C. andrejevi* (Kazakhstan; *Ochotona alpine*), *C. collaris* (Alaska; *Ochotona collaris*), *C. coloradensis* (Colorado; *Ochotona princeps*), *C. hashmi* (Quatta; *Ochotona rufescensvulturina*), *C. jtachaeahsis* (Tibet; *Microtus* spp.), *C. vakhanica*, *C. chabaudi* and *C. ochotoniae* (*Ochotona rufescens*) [2,14-18]. The specimens correspond most closely to *C. coloradensis*.

CONCLUSION

This is the first record of *O. ochotoni*, *T. retortaeformis* and *G. ochotoniae* in the pika species. Wang et al. [2], previously reported *C. coloradensis* and nematodes, including *Oesophagostomum* sp., *Eugenuris schumakowiescsi*, *Haemonchus* sp., *Trichuris* sp. and Chabertiinae gen. sp., in pikas from the southeastern Qinghai Province. *O. ochotoni*, *T. retortaeformis* and *G. ochotoniae* can be added as newly-recorded nematode parasites in plateau pikas, though none of these are new species, nor do they appear medically relevant.

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