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UNUSUAL FINDING OF ENCAPSULATED NEMATODE LARVAE (SPIRUROIDEA) IN *BARTRAMIA LONGICAUDA* AND *NUMENIUS AMERICANUS* (CHARADRIIFORMES) IN WESTERN CANADA

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ABSTRACT: Third-stage spiruroid larvae were found encapsulated on the serosa of the small and large intestines and in the mesentery of one of 15 adult upland sandpipers (*Bartramia longicauda*) from Manitoba, Canada, and three of 18 adult long-billed curlews (*Numenius americanus*) from Alberta, Canada. The larvae resemble third-stage larvae of *Physocephalus sexalatus* and birds may serve as a paratenic host of this unidentified spiruroid species.

Key words: Spiruroidea, encapsulated nematode larvae, upland sandpipers, *Bartramia longicauda*, long-billed curlews, *Numenius americanus*, *Physocephalus sexalatus*, Charadriiformes.

INTRODUCTION

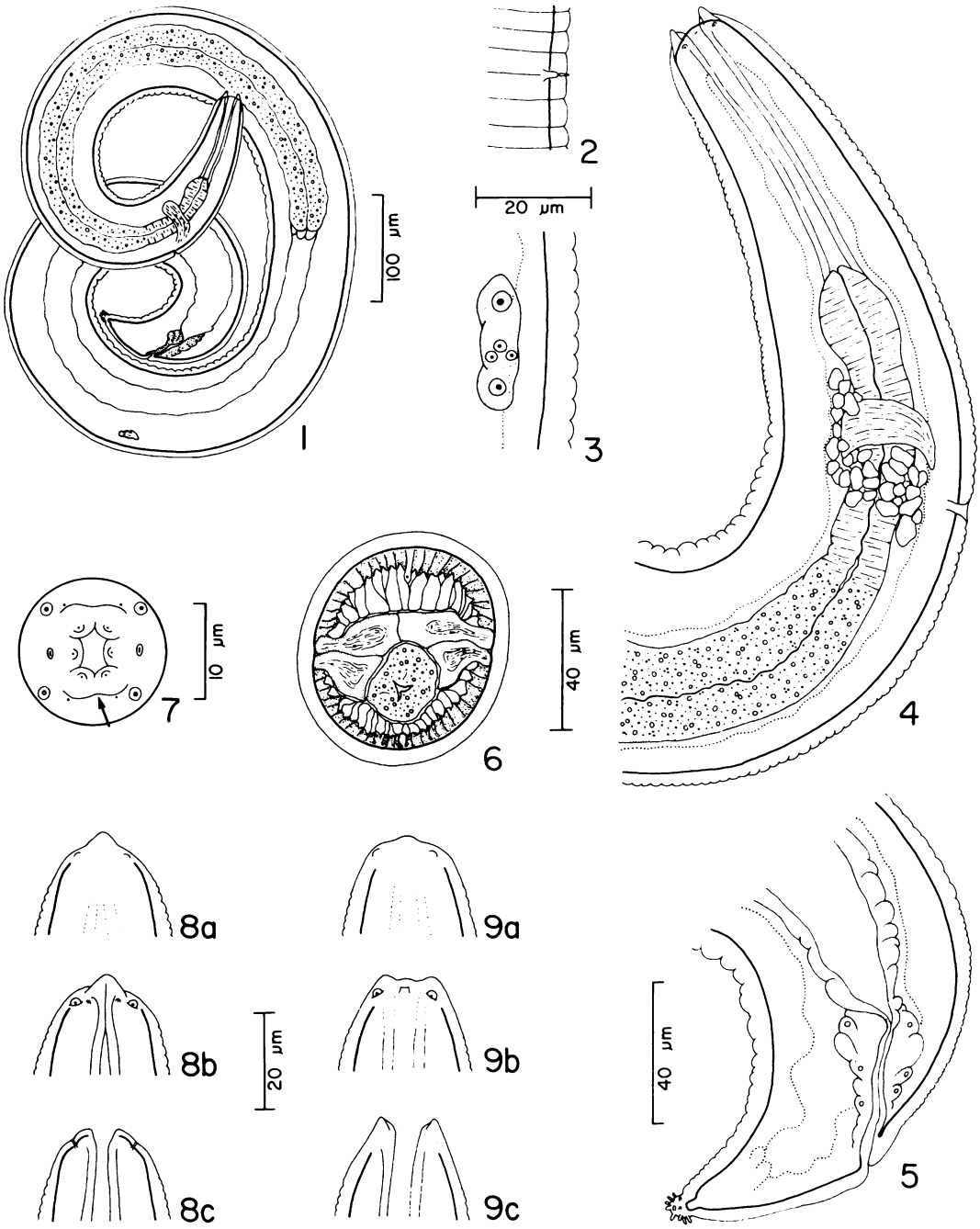
Adult nematodes in the superfamily Spiruroidea are found in, or associated with, the upper digestive tract of reptiles, mammals, and birds. All spiruroids utilize insects as intermediate hosts and some species are known also to use vertebrate paratenic hosts. Reports of wild birds serving as paratenic hosts are rare and largely limited to Anseriformes, Galliformes, and Passeriformes. The present paper reports third-stage larvae encapsulated in the abdominal cavity of upland sandpipers (*Bartramia longicauda*) and long-billed curlews (*Numenius americanus*) collected in western Canada. These larvae differ from previously described third-stage spiruroid larvae. Thus, we describe them in the hope that future investigators might determine the species and the possible role of avian paratenic hosts in its transmission.

MATERIALS AND METHODS

As part of a study of gastrointestinal helminth communities in selected species of Charadriiformes (A. O. Bush, unpubl. data), adult birds were shot in June during 1982–1986 near Oak Lake in southwestern Manitoba and near Brooks in southern Alberta, Canada. Species and numbers of birds collected in Manitoba (M) and Alberta (A) included: (1) upland sandpipers (*Bartramia longicauda*), M = 15, A = 9; (2) avocets (*Recurvirostra americana*), M = 5, A = 16; (3) marbled godwits (*Limosa fedoa*), M = 21, A = 32; (4) willets (*Catoptrophorus semipalmatus*), M = 17, A = 40; (5) killdeers (*Charadrius vociferus*), M = 1, A = 0; and (6) long-billed curlews (*Numenius americanus*), M = 0, A = 18. Intestinal tracts were removed within 5 min of death and quick-frozen by immersion in a mixture of alcohol and dry ice (−70 C). Material was thawed in the laboratory and examined for helminths. Capsules noted on the intestinal serosa and in the mesentery were excised and fixed in 10% buffered formalin. Later, capsules were placed in a drop of lactophenol on a microscope slide and their diameter measured with the aid of a camera lucida. Larvae within capsules were teased free and studied in lactophenol. En face views were prepared following the method of Anderson (1958) and cross sections were cut freehand using a mounted razor blade.

RESULTS

Encapsulated larvae were found in one upland sandpiper collected in Manitoba in 1986 and were distributed as follows: seven on the serosa of the small intestine; 14 on the serosa of the large intestine; one on the serosa of one caecum; and, 24 scattered in the mesentery. Capsules were ellipsoidal in shape; they had a mean width of 465 μm (range = 260–600 μm) and a mean length of 630 μm (range = 380–840 μm). Only one larva was present in each capsule and the mean thickness of the capsule wall was 110 μm (range = 40–200 μm). Encapsulated larvae were found also in three long-billed curlews collected in Alberta in 1984. Numbers of capsules in these birds



FIGURES 1–9. Third-stage spiruroid larvae encapsulated in the abdominal cavity of *Bartramia longicauda* from Manitoba, Canada. 1. Whole larva, lateral view. 2. Right deirid, lateral view. 3. Genital primordium, lateral view. 4. Anterior end, lateral view. 5. Posterior end, lateral view. 6. Transverse section of body near middle of glandular esophagus. 7. En face view of cephalic extremity, arrow indicates slight concavity in outer surface of median lip. 8. Cephalic extremity, ventral view at level of outermost cuticle (8a), median lip (8b), and mid region of oral opening (8c). 9. Cephalic extremity, lateral view at level of outermost cuticle (9a), outer shoulders of median lips (9b), and mid region of oral opening (9c).

were not determined; all capsules were on the serosa of the small and large intestines. Encapsulated larvae were not noted in avocets, marbled godwits, willets, or killdeers.

Third-stage larvae from the upland sandpiper and long-billed curlews were similar. The following description (Figs. 1–9) is based on 10 larvae from the upland sandpiper. Measurements are in μm and are the mean followed by the range in parentheses. Total length 1,365 (1,135–1,595). Maximum width 71 (55–90). Cuticle thick, with strong transverse striations. Lateral alae absent (Fig. 6). Cephalic extremity with two amphids, one dorsal and one ventral median lip, six semilobate circumoral labia, six conspicuous inner labial papillae, four tiny outer labial papillae, and four conspicuous cephalic papillae (Fig. 7). Middle region of outer surface of each median lip slightly concave. Pseudolabia absent. Length buccal cavity 83 (75–90), muscular esophagus 85 (75–100), glandular esophagus 475 (350–595), total esophagus 560 (440–695). Nerve ring 120 (106–140) and excretory pore 137 (126–147) from anterior extremity. Deirids difficult to discern, asymmetric with one anterior and other posterior to excretory pore, narrowly conical in shape and slightly salient (Fig. 2). Genital primordium visible in three specimens only 915–982 from anterior extremity (=460–540 from posterior extremity); irregularly ellipsoidal in shape and 20 long, consisting of two large nuclei and three to five smaller nuclei (Fig. 3). Anus 52 (40–60) from posterior extremity. Posterior extremity knob-shaped with numerous small finger-like projections (Fig. 5).

Larvae (free and encapsulated) have been deposited in the U.S. National Parasite Collection in Beltsville, Maryland 20705, USA (Nos. 79709–79711).

DISCUSSION

Third-stage larvae described herein are identified as spiruroid larvae on the basis of cephalic structures, an elongate buccal cavity, and divided esophagus. These larvae resemble third-stage larvae of *Physocephalus sexalatus,* as described by Alicata (1935). Adult *P. sexalatus* parasitize the Suidae, coprophagous beetles serve as intermediate hosts (Alicata, 1935; Fincher et al., 1969), and encapsulated third-stage larvae are reported from a species of Charadriiformes (see Bondarenko, 1969) and various other birds (Alicata, 1935; Smogorzhevskaia et al., 1965; Dzhaparidze and Savvateeva, 1967; Nikulin, 1967; Barus and Garrido, 1968; Berezantsev, 1968; Jones, 1968; Shevtsov, 1968). However, we are reluctant to identify larvae in the present study as *P. sexalatus* since they possess median lips (sensu Chabaud, 1954; Fig. 8c) which have, in en face view, a slightly concave outer surface. A markedly convex outer surface apparently characterizes the median lip in third-stage *P. sexalatus* (see Alicata, 1935) and *P. theodoridesi* (see Chabaud, 1954). Also, the circumoral cuticle forms six semilobate labia in larvae in the present study whereas in *P. sexalatus* this cuticle has been illustrated as simply forming an hexagonal oral opening (Alicata, 1935) which Quentin (1970, 1971) refers to as bearing "6 dents péribuccales."

Other spiruroids reported as encapsulated third-stage larvae in birds include unidentified species of *Physocephalus* and *Ascarops* (see Tsimbaliuk, 1965; Krahwinkel and McCue, 1967) and *Spirocerca lupi* (see Alicata, 1935; Krahwinkel and McCue, 1967; Macchioni and Bragazzi, 1968). A "smooth knoblike process" is present on the tail of third-stage larvae of *Ascarops strongylina* (see Alicata, 1935) and a short buccal cavity characterizes third-stage larvae of *Spirocerca lupi* (see Chhabra and Singh, 1972). Adult *Ascarops strongylina* occur in the Suidae and adult *S. lupi* in the Canidae.

Sandpipers and curlews undoubtedly acquire larvae while eating infected insects. Upland sandpipers typically feed, throughout the year, in natural grasslands,

pastures, and old fields (Johnsgard, 1981). This is also the type of habitat in which long-billed curlews feed while on their summer range (Godfrey, 1986). However, on their winter range curlews typically feed in wetter areas such as along the edges of inland and coastal waters, as do the uninfected marbled godwits, avocets, and willets (Johnsgard, 1981). On their summer range, the uninfected bird species also tend to feed in wet areas, typically the edges of prairie sloughs and lakes (Godfrey, 1986). This suggests that the intermediate host of the spiruroid in question are insects living in more xeric habitats.

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