10-2003

Two Species of *Acuaria* Bremser, 1811 (Nematoda: Acuariioidea: Acuariidae) in Passerine Birds from the Área de Conservación Guanacaste, Costa Rica

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TWO SPECIES OF ACUARIA BREMSER, 1811 (NEMATODA: ACUARIOIDEA: ACUARIIDAE) IN PASSERINE BIRDS FROM THE AREA DE CONSERVACION GUANACASTE, COSTA RICA

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ABSTRACT: Two species of Acuaria were collected from passerine birds from the Area de Conservacion Guanacaste, Costa Rica. Acuaria mayori Lent, Freitas and Proenca, 1945, was collected from Myiarchus nuttangi. Specimens from Costa Rica differ from the original description by having a spicule ratio of 1:1.5–1.7 versus 1:1.43–1.47, as well as shorter spicules and female tails. Acuaria wangi n. sp. in Hyllophilax naevioides and Gymnophyes leucaspis resembles A. alli, A. crami, A. cyanocitta, A. minuta, A. pattoni, and A. cissae by having cordons extending posteriorly to the anterior portion of the glandular esophagus. The new species differs from A. alli by having 4 pairs of preanal and 6 pairs of postanal papillae rather than 2 pairs of preanal and 7 pairs of postanal papillae, a shorter left spicule, a spicule ratio of 1:1.6–1.8 versus 1:1.1 and in having spicules with blunt rather than pointed distal ends. Acuaria crami and A. minuta differ from A. wangi by having 7 pairs of postanal papillae and spicule ratios of 1:1.6–1.8 versus 1:1.3 in A. crami and 1:1.1 in A. minuta; in addition, A. minuta has spatulate-shaped spicules and a tricuspid-shaped distal end of the right spicule. The new species can be distinguished from A. pattoni by having a longer left spicule and a spicule ratio of 1:1.6–1.8 versus 1:2.5–2.7. Acuaria wangi is similar to A. cyanocitta, which has similarly shaped spicules, including a very pointed distal end of the left spicule, but differs in body length, in having shorter spicules, in the arrangement of postanal papillae, and in having smaller eggs.

Acuaria Bremser, 1811, is the most species-rich genus of acuarid nematodes, with more than 70 nominal species (Sherwin and Schmidt, 1988). All but 1 known species inhabit passerine birds, the exception being A. upupa Rasheed, 1960, from the coraciiform bird, Upupa epops, from India (Mawson, 1972). Bremser (1811) proposed Acuaria without designating a type species. Of the 14 species he included in Acuaria, Spiroptera anthuris Rudolphi, 1819, is regarded as the type species for Acuaria Bremser, 1811, renamed; hence, the type species was Acuaria Bremser, 1811, renamed; hence, the type species.

During June 2001 and January 2002, as part of an ongoing biodiversity inventory of the eukaryotic parasites of vertebrates inhabiting the Area de Conservacion Guanacaste (ACG) in northwestern Costa Rica (http://brooksweb.zoo.utoronto.ca/index.html), 2 species of Acuaria were collected from passerine birds. We describe both in this article.

MATERIALS AND METHODS

Nutting’s flycatchers, Myiarchus nuttangi Ridgway, 1883 (n = 5), spotted antbirds, Hyllophilax naevioides (Lafresnaye, 1847) (n = 23), and bicolor antbirds, Gymnophyes leucaspis (Sclater, 1885) (n = 7) were collected in June 2001 and January 2002 and examined for parasites. Nematodes collected from beneath the lining of the gizzard were later cleared in lactophenol for further examination. Drawings were made with the aid of a drawing tube. Measurements (range, followed by mean in parentheses) are given in micrometers unless otherwise stated.

Received 9 December 2002; revised 7 April 2003; accepted 7 April 2003.
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DESCRIPTION

Acuaria mayori Lent, Freitas and Proenca, 1945
(Figs. 1–6)

Diagnosis: Body small with transverse striations. Two pseudolobia lateral to mouth, each bearing a pair of large cephalic papillae and 1 inconspicuous amphid. Cordons straight, nonanastomosing, and nonrecurring, originating at dorsal and ventral sides of oral opening, continuing posteriorly to middle of muscular esophagus, 3.2–4.8% (4.0%) total body length (TBL) in male and 1.9–2.7% (2.4%) TBL in female. Buccal capsule long and slender, transversely striated. Esophagus clearly divided into short anterior muscular part and long posterior glandular part. Muscular esophagus 4.0–5.6% (5.2%) TBL in male and 2.2–3.4% (2.7%) TBL in female; glandular esophagus 9.8–12.7% (11.4%) TBL in male and 4.8–5.8% (5.2%) TBL in female. Nerve ring located at the level of the anterior end of the muscular esophagus. Cervical papillae located at the same level as nerve ring. Excretory pore immediately posterior to nerve ring.


1,254 (975) long and 48–87 (74) wide. Nerve ring 200–247 (227) from anterior end, excretory pore 292–353 (329) from anterior end, and cervical papillae 205–258 (227) from anterior end. Didelphic. Vulva near the middle of body, 6.74–10.37 mm (9.31 mm) from anterior end, 46–58.4% (49.6%) TBL from anterior end. Tail short and rounded, 129–179 (148) long. Eggs ellipsoid, thick shelled, embryonated, 31.3–38.6 (34.0) long by 18.4–23.9 (20.6) wide.

**Taxonomic summary**


**Locality:** Cafetal, Sector Santa Rosa, ACG, Guanacaste Province, Costa Rica; 10°51′19″N, 85°36′39″W. Quebrada Costa Rica, Sector Santa Rosa, ACG, Guanacaste Province, Costa Rica; 10°49′39″N, 85°38′12″W, new locality.

**Site of infection:** Under the lining of the gizzard.

**Prevalence:** Forty percent (2 of 5 birds).

**Intensity:** Two males and 9 females in 1 host, and 5 males and 1 female in the second host.

**Voucher specimens:** USNPC 93584, 93585.

**Remarks**

*Acuaria mayori* Lent, Freitas and Proenca, 1945, was first described in *Cyanocorax chrysops* (Vieillot, 1818) from Paraguay and has since been reported in *Sporophila caerulescens caerulescens* (Vieillot, 1823) and *Cyanocorax cyanomelas* (Wied, 1821) from Brazil (Pinto et al., 1993, 1997). The present specimens are similar to *A. mayori* in cordon length, number and arrangement of male caudal papillae, and spicule shape but differs from the original description and previous reports by having a spicule ratio of 1:1.5–1.7 versus 1:1.43–1.47, as well as shorter spicules (left spicule 163–186 vs. 190–230; right spicule 102–123 vs. 130–160) and female tails (129–179 vs. 170–230). This is the first report of *A. mayori* from Costa Rica, and *M. nuttingi* is a new host record.

**Acuaria wangi** n. sp.

(Figs. 7–11)

**Diagnosis:** Body small with transverse striations. Two pseudolabia lateral to mouth, each bearing a pair of large cephalic papillae and 1 inconspicuous amphid. Cordons straight, non-anastomosing, and nonrecurrent, originating at dorsal and ventral sides of oral opening, continuing posteriorly to anterior part of glandular esophagus, 15.5–19.8% TBL. Buccal capsule long and slender, transversely striated. Esophagus clearly divided into short anterior muscular part and long posterior glandular part. Muscular esophagus 10.5–11.5% (11%) TBL in male and 6.7–10.3% (8.3%) TBL in female; glandular esophagus 26.5–29.3% (28.1%) TBL in male and 15.5–27.7% (19.7%) TBL in female. Nerve ring located at level of anterior end of muscular esophagus. Cervical papillae immediately anterior to nerve ring. Excretory pore posterior to nerve ring.

**Male (n = 4):** Body length 4.212–4.884 mm (4.645 mm). Maximum width 133–185 (170). Cordons 786–951 (868) long. Buccal capsule 137–156 (146) long. Muscular esophagus 486–524 (511) long and 30–53 (41) wide; glandular esophagus 1.159–1.425 mm (1.306 mm) long and 76–99 (86) wide. Nerve ring 182–205 (198) from anterior end, excretory pore 263–285 (273) from anterior end, and cervical papillae 148–171 (159) from anterior end. Caudal alae well developed, 247–285 (271) long, and 32–37 (34) wide. Tail bluntly rounded, 133–152 (143) long. Ten pairs of caudal papillae, 4 pairs of preanal and 6 pairs of postanal papillae (1 male had only 4 pairs of postanal papillae) (Fig. 9). Postanal papillae divided into 2 groups, each group includes 3 pairs of papillae (Fig. 8). Spicules subequal but dissimilar. Left spicule long and slender, 190–209 (199) long, 9.7–12.9 (10.9) wide at base of proximal end, with a pointed distal end. Right spicule short and thick, 103–129 (116) long, 16.1–22.5 (18.9) wide at base of proximal end, with a rounded distal end. Ratio of right spicule:left spicule 1:1.6–1.8 (1:1.7).

**Female (n = 9):** Body length 6.80–10.04 mm (8.59 mm). Maximum width 205–311 (251). Cordons 1.26–1.85 mm (1.55 mm) long. Buccal capsule 144–190 (162) long. Muscular esophagus 623–844 (711) long and 49–65 (53) wide; glandular esophagus 1.48–1.88 mm (1.69 mm) long and 72–103 (83) wide. Nerve ring 197–266 (224) from anterior end, excretory pore 293–380 (324) from anterior end, and cervical papillae 171–228 (201) from anterior end. Didelphic. Vulva just posterior to middle of body, 3.56–5.64 mm (4.63 mm) from anterior end, 51–57% (54%) TBL from anterior end. Tail short and rounded, 141–179 (157) long. Eggs ellipsoid, thick shelled, embryonated, 31–37 (36) long by 18–22 (20) wide.

**Taxonomic summary**

*Type host:* *Hylophylax naevioides* (Aves: Passeriformes: Formicariidae).

*Other host:* *Gymnophithys leucaspis* (Aves: Passeriformes: Formicariidae).

*Type locality:* Estación San Gerardo, San Gerardo, ACG, Guanacaste Province, Costa Rica; 10°52′50″N, 85°23′21″W.

**Site of infection:** Under the lining of the gizzard.

**Prevalence:** In *H. naevioides*, 17.4% (4 of 23 birds). In *G. leucaspis*, 14.3% (1 of 7 birds).

**Intensity:** Range in *H. naevioides*, 1–4; in *G. leucaspis*, 2.

**Type specimens:** Holotype, USNPC 93544; allotype, USNPC 93545; paratypes, USNPC 93546, 93547, 93548, 93549, 93550.

**Etymology:** The new species is named after Professor Puqing Wang, Laboratory of Parasitology, Fujian Normal University, People’s Republic of China, for his contribution to the fauna and taxonomy of nematodes.

**Remarks**

By having cordons extending posteriorly to the anterior portion of the glandular esophagus, *A. wangi* resembles *A. alii* Rasheed, 1960, in *Acridotheres gингinianus* (Latham, 1790) from India, *A. crami* Rasheed, 1960, in *Saxicola caprata caprata* (Linnaeus, 1766) from India (probably not the correct host identification as *S. c. caprata* occurs only in Luzon, Philippines), *A. cyanocitta* (Boyd, 1956) in *Cyanocitta cristata* (Linnaeus, 1758) from the United States, *A. minuta* Williams, 1929, in *Quiscalus quisicala aeneus* (this host record is also doubtful because *Q. q. aeneus* (Linnaeus, 1758) is not a valid name and authority combination; *Q. q. quisicala* (L., 1758) is the type by tautonomy, and *Q. aeneus* Ridgway, 1869, has been synonymized with *Q. q. versicolor* (Vieillot, 1819) from the...

United States, *A. pattoni* Williams, 1929, in *Sturnella neglecta* (Audubon, 1844) from the United States, and *A. cissae* Wang, 1976, in *Cissa e. erythrornycha* (Boddaert, 1783) from China. Other members of the genus either have very short cordons, extending to the part of muscular esophagus, or longer cordons, extending behind the glandular esophagus or to the posterior part of body.

The new species, however, differs from *A. alii* in having 4 pairs of preanal and 6 pairs of postanal rather than 2 pairs of preanal and 7 pairs of postanal papillae, a longer left spicule...
(190–209 vs. 110), a different spicule ratio (1:1.6–1.8 vs. 1:1.1), and a right spicule with a blunt rather than pointed distal end. The new species can be distinguished from A. crami and A. minuta by its possession of 6 pairs of postanal papillae and a different spicule ratio (1:1.6–1.8 vs. 1:1.3 in A. crami and 1:1.1 in A. minuta); in addition, A. minuta has spatulate-shaped spicules and a tricuspid-shaped distal end of the right spicule. The remaining 3 species resemble A. wangi by possessing 4 preanal and 6 postanal papillae. Of these, the new species can be distinguished from A. patteni by having a longer left spicule (190–209 vs. 156) and a spicule ratio of 1:1.6–1.8 versus 1:1; and from A. cissae by having a shorter left spicule (190–209 vs. 268–280) and a spicule ratio of 1:1.6–1.8 versus 1:2.5–2.7.

Acuaria wangi is related to A. cyanocitta, which has similarly shaped spicules, including a very pointed distal end of the left spicule and a similar spicule ratio (1:1.6–1.8 vs. 1:1.4–1.6), but the new species differs in body length (male 4.2–4.9 mm long and female 6.8–10.0 mm long in A. wangi vs. male 7.5–10.0 mm long and female 12.8–18.4 mm long in A. cyanocitta), in having shorter spicules (left spicule 190–209 vs. 315–370; right spicule 103–129 vs. 220–230), in the arrangement of postanal papillae (2 groups vs. 3 groups), and in having smaller eggs (31–37 long by 18–22 wide vs. 42 long by 24 wide).

**DISCUSSION**

Acuaria mayori was collected only from dry forest sites (Cafetal, Quebrada Costa Rica), whereas A. wangi occurred in a wet forest site (Estación San Gerardo). These are sites with abundant running water and associated riparian vegetation. Acuaria mayori was collected at the beginning of the wet season (5 and 7 June 2001), whereas A. wangi was collected at the beginning of the wet season (13–14 June 2001 in H. naevioides and G. leucaspis) and at the beginning of the dry season (13 January 2002 in H. naevioides).

**ACKNOWLEDGMENTS**

We are grateful to the scientific and technical staff of the ACG for supporting this study, in particular, Elda Araya, Roger Blanco, Carolina Cano, Maria Marta Chavarria, Felipe Chavarria, Roberto Espinoza, Dunia García, Guillermo Jimenez, Elba Lopez, Sigifredo Marín, Alejandro Masis, Calixto Moraga, Fredy Quesada, and Petrona Rios. Thanks are also due to Dan Janzen and Winnie Hallwachs, scientific advisers to the ACG, for their support. Host specimens were collected by D.C., Jeremiah Trimble (Museum of Comparative Zoology (MCZ)), and Calixto Moraga (ACG) under the authority of CITES (Commission on International Trade in Endangered Species) Permit U89258251, CITES Permit CB9123440, Costa Rica Ministerio del Ambiente y Energía Licencia 203640283 and Resoluciones 215-2001-OFAU and 411-2001-OFAU, Harvard University IACUC Protocol 21-09, and U.S. Department of Agriculture Animal and Plant Health Inspection Service Permit 47956 (Form VS16-6A). Host necropsy and parasite collections were made by D.R.B., D.C., Elda Araya, Sara Brant, Marie Causey, Ben Hanelt, Calixto Moraga, and Petrona Rios. This study was funded by a research grant from the Natural Sciences and Engineering Research Council of Canada to D.R.B. and by a grant from the MCZ Putnam Expedition Fund to D.C.

**LITERATURE CITED**


