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Two Species of *Synhimantus* (*Dispharynx*) Railliet, Henry and Sisoff, 1912 (Nematoda: Acuarioidea: Acuariidae), in Passerine Birds from the Área de Conservación Guanacaste, Costa Rica

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TWO SPECIES OF *SYNHIMANTUS* (*DISPHARYNX*) RAILLIET, HENRY AND SISOFF, 1912 (NEMATODA: ACUARIOIDEA: ACUARIIDAE), IN PASSERINE BIRDS FROM THE AREA DE CONSERVACION GUANACASTE, COSTA RICA

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ABSTRACT: Members of 2 species of *Synhimantus* (*Dispharynx*) live under the lining of the gizzard in passerine birds from the Area de Conservacion Guanacaste, Costa Rica. *Synhimantus* (*Dispharynx*) *nasuta* (Rudolphi, 1819) occurs in *Thraupis episcopus*, *Turdus grayi*, *Caryothraustes poliogaster*, *Platyrinchus cancrominus*, *Ramphocaenus melanurus*, *Vermivora peregrina*, and *Geothlypis poliocephala*. A single male, in *Turdus grayi*, apparently representing a new species, distinguishable from all other species of *Synhimantus* (*Dispharynx*) by having similar shaped left and right spicules, is described but not named.

Railliet et al. (1912) revised *Acuaria* Bremser, 1811, erecting the subgenus *Dispharynx*, with *A.* (*D.*) *nasuta* as the type species. Several years later, Skrjabin (1916) raised *Dispharynx* to the generic rank, and Skrjabin et al. (1965) recorded 23 species in the genus. Chabaud (1975) considered *Dispharynx* a subgenus of *Synhimantus* Railliet, Henry and Sisoff, 1912. Since then, new species have been described by Mawson (1982) and Cid del Prado et al. (1985), who accepted Chabaud's subgeneric designation, and by Gogoi and Sarmah (1988), who considered *Dispharynx* a distinct genus. In this contribution, we follow the taxonomic consensus and treat *Dispharynx* as a subgenus of *Synhimantus*. During June 2001 and June 2002, as part of an ongoing biodiversity inventory of the eukaryotic parasites of vertebrates inhabiting the Area de Conservacion Guanacaste in northwestern Costa Rica, 2 species of *Synhimantus* (*Dispharynx*) were collected in passerine birds. We describe them herein.

MATERIALS AND METHODS

Blue-grey tanagers, *Thraupis episcopus* (Linnaeus, 1766) (Aves: Passeriformes: Thraupidae) (n = 9), clay-colored robins, *Turdus grayi* Bonaparte, 1838 (Aves: Passeriformes: Turdidae) (n = 7), black-faced grosbeaks, *Caryothraustes poliogaster* (Du Bus de Gisignies, 1847) (Aves: Passeriformes: Emberizidae) (n = 3), stub-tailed spadebills, *Platyrinchus cancrominus* Sclater and Salvin, 1860 (Aves: Passeriformes: Tyrannidae) (n = 5), long-billed gnatwrens, *Ramphocaenus melanurus* Vieillot, 1819 (Aves: Passeriformes: Sylviiidae) (n = 9), Tennessee warblers, *Vermivora peregrina* Wilson, 1811) (Aves: Passeriformes: Parulidae) (n = 9), and gray-crowned yellowthroats, *Geothlypis poliocephala* Baird, 1865 (Aves: Passeriformes: Parulidae) (n = 9), were collected during June and December 2001, January, February, June, and November 2002, and January, February, and April 2003 and examined for parasites. Additional information about host specimens can be found at http://brooksweb.zoo.utoronto.ca/index.html. Nematodes collected from beneath the lining of the gizzard were fixed in glacial acetic acid and preserved and stored in 70% ethanol. They 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) were given in micrometers unless otherwise stated.

DESCRIPTION

Synhimantus (*Dispharynx*) *nasuta* (Rudolphi, 1819) Chabaud, 1975

(Figs. 1–8)

General: Body stout. Two pseudolabia present, each bearing 1 pair of large cephalic papillae and 1 inconspicuous amphid. Four distinct cordons convoluted, beginning at dorsal and ventral sides of oral opening, extending posteriorly to posterior part of muscular esophagus, recurrent anteriorly to anterior part of muscular esophagus. Buccal capsule short, transversely striated. Esophagus clearly divided into short anterior muscular part and long posterior glandular part. Muscular esophagus 8.6–14.3% total body length (TBL); glandular esophagus 21.0–42.1% TBL. Nerve ring located at level of anterior part of muscular esophagus. Excretory pore posterior to nerve ring. Cervical papillae bicuspid or tricuspid, 3 different types observed (Fig. 4), located at the same level as the excretory pore.

Male (n = 22): Body length 3.61–6.36 mm (4.97 mm). Maximum width 141–311 (243). Cordons 298–606 (505) in total length, descending branch 209–439 (338) long, recurrent branch 89–226 (168) long. Buccal capsule 73–125 (100) long. Muscular esophagus 422–740 (552) long and 44–106 (70) wide, glandular esophagus 1.18–2.00 mm (1.51 mm) long and 81–190 (112) wide. Nerve ring 159–289 (235) from anterior end, excretory pore 203–429 (318) from anterior end, and cervical papillae 200–456 (325) from anterior end. Posterior end of body highly coiled. Caudal alae well developed, 476–760 long. Tail bluntly rounded, 159–333 (254) long. Pedunculate caudal papillae present, 4 pairs preanal and 5 pairs postanal. One or 2 pairs of sessile papillae near tip of tail. Ventral surface of precloacal region with prominent longitudinal ridges. Spicules unequal and dissimilar. Left spicule long and slender, spine shaped, 380–589 (453) long. Right spicule short and thick, canoe shaped with enlarged proximal portion with irregular medial edges, 133–193 171) long. Ratio of right spicule–left spicule 1:2.2–3.3 (1:2.7).

Female (n = 29): Body length 3.26–7.84 mm (5.13 mm). Maximum width 252–607 (402). Cordons 441–1051 (765) in total length, descending branch 312–619 (490) long, recurrent branch 125–458 (275) long. Buccal capsule 95–152 (125) long. Muscular esophagus 444–761 (570) long and 52–118 (89) wide, glandular esophagus 1.12–2.00 mm (1.63 mm) long and 111–236 (147) wide. Nerve ring 220–403 (313) from anterior end, excretory pore 266–568 (443) from anterior end, and cervical papillae 277–585 (436) from anterior end. Didelphic. Vulva located at posterior fifth of body, 0.67–1.41 mm (1.11 mm) from posterior end, 16.4–28.7% (21.9%) TBL from posterior end. Tail short and cone shaped, 114–156 (133) long. Eggs ellipsoid, thick shelled, 33–40 (37) long, 17–26 (21) wide.

Taxonomic summary

Hosts: Thraupis episcopus (Linnaeus, 1766) (Aves: Passeriformes: Thraupidae); *T. grayi* Bonaparte, 1838 (Aves: Passeri-

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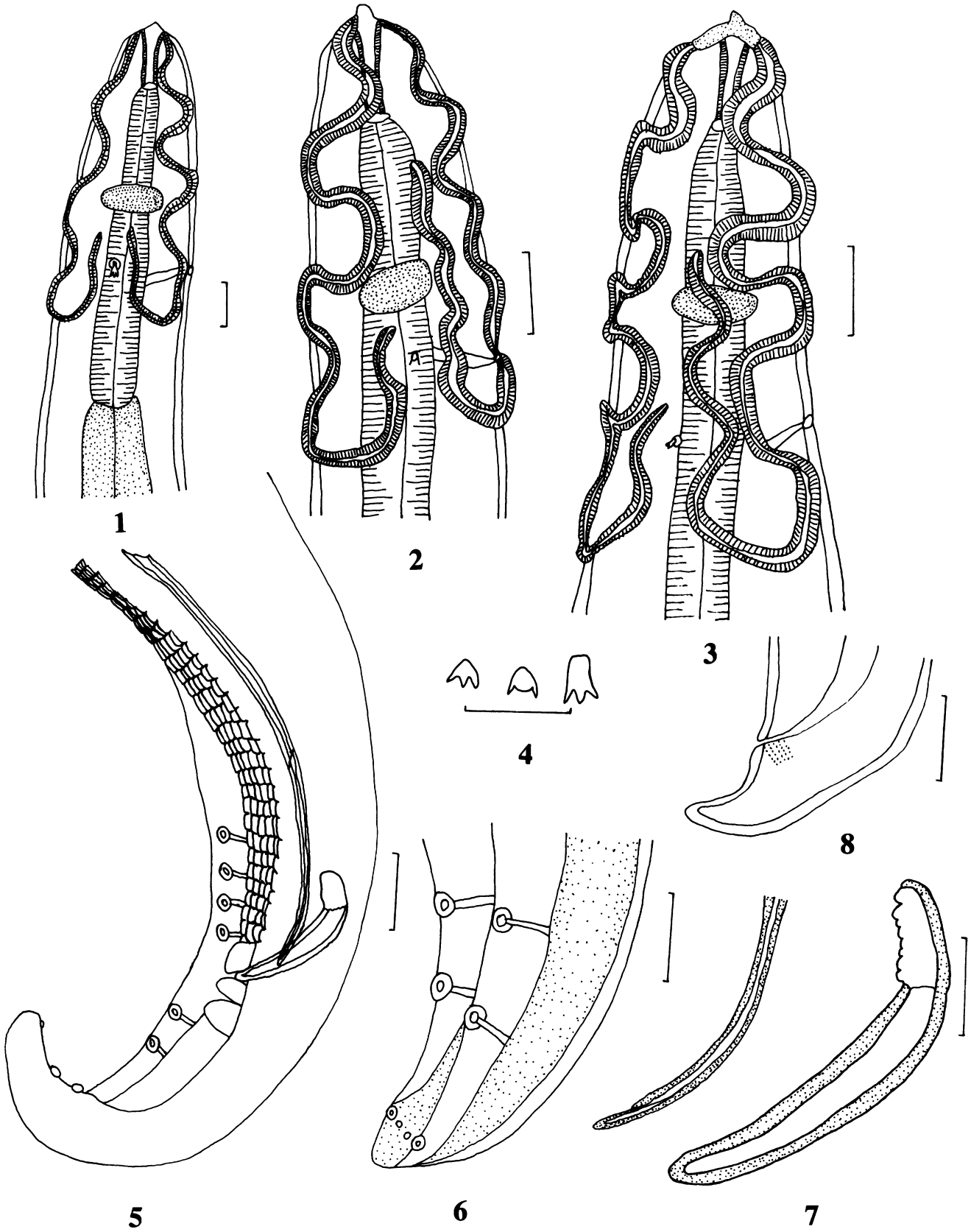


FIGURES 1–8. *Synhimantus* (*Dispharynx*) *nasuta*. **1–3.** Anterior region of female, lateral view. **4.** Shape of cervical papillae. **5.** Posterior end of male, lateral view. **6.** Tip of male tail, lateral view. **7.** Distal end of left spicule and right spicule. **8.** Posterior end of female, lateral view. 1–3, 5, 8: bar = 100 μm; 4, 6, 7: bar = 50 μm.

formes: Turdidae); *C. poliogaster* (Du Bus de Gisignies, 1847) (Aves: Passeriformes: Emberizidae); *P. cancrominus* Sclater y Salvin, 1860 (Aves: Passeriformes: Tyrannidae); *R. melanurus* Vieillot, 1819 (Aves: Passeriformes: Sylviiidae); *V. peregrina* (Wilson, 1811) (Aves: Passeriformes: Parulidae); *G. poliocephala* Baird, 1865 (Aves: Passeriformes: Parulidae); all new hosts.

Localities: Estacion San Gerardo, San Gerardo, Area de Conservacion Guanacaste, Guanacaste Province, Costa Rica, 10°52′50″N, 85°23′21″W; Cafetal, Sector Santa Rosa, Area de Conservacion Guanacaste, Guanacaste Province, Costa Rica, 10°52′53″N, 85°36′42″W; Estacion Pitilla, Sector Pitilla, Area de Conservacion Guanacaste, Guanacaste Province, Costa Rica; all new localities.

Site of infection: Lining of the gizzard.

Prevalence: It was 42.9% (3 of 7 birds) in *T. episcopus*, 16.7% (1 of 6 birds) in *T. grayi*, 66.7% (2 of 3 birds) in *C. poliogaster*, 25% (1 of 4 birds) in *P. cancrominus*, 50% (1 of 2 birds) in *R. melanurus*, 5.8% (1 of 17 birds) in *V. peregrina*, and 25% (1 of 4 birds) in *G. poliocephala*.

Intensity: Two, 4, 13 in *T. episcopus*, 11 in *T. grayi*, 2, 19 in *C. poliogaster*, 2 in *P. cancrominus*, 1 in *R. melanurus*, 8 in *V. peregrina*, and 43 in *G. poliocephala*.

Voucher specimens: U.S. National Parasite Collection (USNPC) 94020–94027.

Remarks

Synhimantus (*Dispharynx*) *nasuta* is a common species parasitizing many different species of birds from different areas (Goble and Kutz, 1945; Skrjabin et al., 1965). Macko et al. (1974a, 1974b) studied *S.* (*D.*) *nasuta* collected from different birds from Cuba. They reported that the cordon length and the structure of cervical papillae were the most variable features in *S.* (*D.*) *nasuta*; however, they found that the shape and length of the spicules, numbers of caudal papillae, and pharynx length are sufficiently stable characters for distinguishing species. Our specimens also exhibit high variability in cordon length and structure of cervical papillae, less variability in the shape and length of spicules, and only 1 specimen showed any variation in the number of caudal papillae (Table I). The measurements of all specimens collected from different birds from Costa Rica fit the range of variability of this species, although the specimens collected from *G. poliocephala* have thinner bodies and shorter male tails than that collected from other birds (Table I). Future studies, based on additional specimens, may demonstrate that these specimens represent a distinct species. Our specimens exhibited spicule ratios of 1:2.2–3.3, with an average of 1:2.7, whereas most other studies of the species have reported spicule ratios of 1:2.2–2.9 (Skrabin et al., 1965; Macko et al., 1974a, 1974b). Specimens identified as *S.* (*D.*) *nasuta* by Gupta (1960) had a spicule ratio of 1:1.8 and those reported by Barus (1966) had a spicule ratio of 1:3.3–4.3, suggesting that these specimens represented species other than *S.* (*D.*) *nasuta*.

Macko et al. (1974a, 1974b) reported *S.* (*D.*) *nasuta* inhabiting many different avian host species, ranging from birds of water-dominated habitats to dry open fields to old growth forests. In Cuba, 3 of 20 (15%) known hosts are migratory, the remainder comprising a diverse group of resident omnivores. Matching these findings, we found *S.* (*D.*) *nasuta* in 7 hosts, 1 of which (14%) is migratory. The 6 residents occur in the tropical dry forest and the tropical humid forests, in dry to humid habitats, year round. The Tennessee warbler is a winter migrant from North America and spends about half the year at low to middle elevations (up to about 1,000 m) in Costa Rica. Five of the 7 hosts are primarily insectivores, excepting the Tennessee warbler, an omnivore commonly feeding on flower nectar and berries, and the blue-grey tanager, most commonly feeding on berries, nectar, and vegetation.

DESCRIPTION

Synhimantus (*Dispharynx*) sp.

(Figs. 9–11)

General: Body stout. Two pseudolabia present, each bearing a pair of large cephalic papillae and 1 inconspicuous amphid. Four distinct cordons convoluted, beginning at dorsal and ventral sides of oral opening, extending posteriorly to the posterior part of the muscular esophagus, recurrent anteriorly to the anterior part of muscular esophagus. Buccal capsule short, transversely striated. Esophagus clearly divided into short anterior muscular part and long posterior glandular part. Muscular esophagus 9.5% TBL; glandular esophagus 28.6% TBL. Nerve ring located at level of anterior part of muscular esophagus. Excretory pore posterior to nerve ring. Cervical papillae bicuspid, posterior to excretory pore.

Male (n = 1): Body length 6.77 mm. Maximum width 303. Cordons 587 in total length, descending branch 413 long, recurrent branch 174 long. Buccal capsule 127 long. Muscular esophagus 645 long and 79 wide; glandular esophagus 1.94 mm long and 117 wide. Nerve ring 297 from anterior end, excretory pore 333 from anterior end, and cervical papillae 381 from anterior end. Posterior end of body highly coiled. Caudal alae well developed, 664 long. Tail bluntly rounded, 342 long. Pedunculate caudal papillae present, 4 pairs preanal and 5 pairs postanal. Ventral surface of precloacal region with prominent longitudinal ridges. Spicules unequal but with similar shape, spine shaped. Left spicule long, 460 long, and 12.7 wide. Right spicule short, 244 long, and 15.9 wide. Ratio of right spicule–left spicule 1:1.9.

Taxonomic summary

Host: Turdus grayi Bonaparte, 1838 (Aves: Passeriformes: Turdidae).

Locality: Estacion San Gerardo, San Gerardo, Area de Conservacion Guanacaste, Guanacaste Province, Costa Rica, 10°52′50″N, 85°23′21″W.

Site of infection: Under the lining of the gizzard.

Prevalence: In all, 16.7% (1 of 6 birds).

Intensity: One male in 1 host.

Voucher specimen: USNPC 94028.

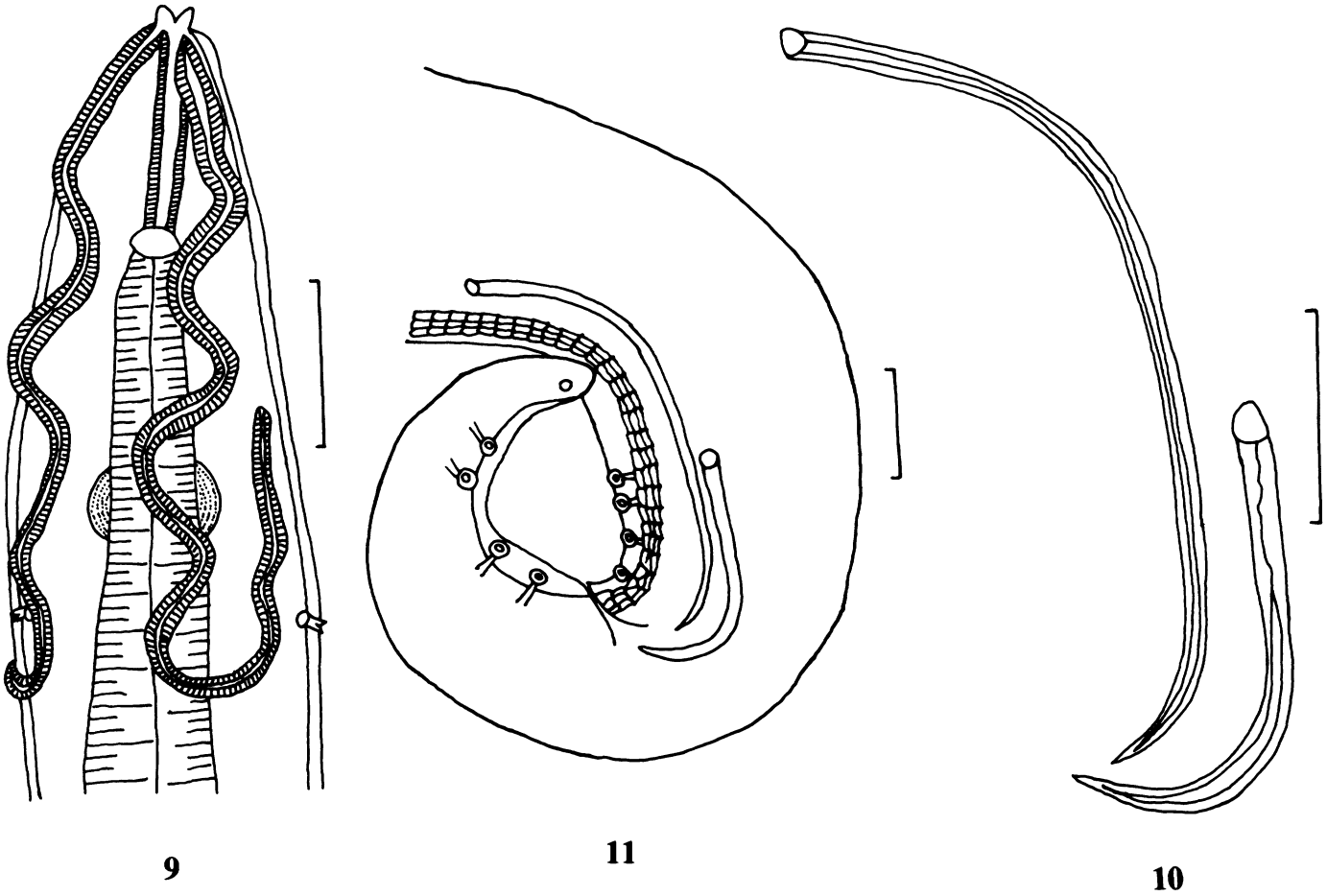
Remarks

We are convinced that this represents an undescribed species but refrain from naming it at this time because of the paucity of the material. The single male specimen can be readily distinguished from all other species of *Synhimantus* (*Dispharynx*) by having similar, rather than dissimilar, shaped left and right spicules. It is similar to *S.* (*D.*) *nasuta* (Rudolph, 1819) in cor-

TABLE I. Measurements in micrometers, unless otherwise stated, of *Synhimantus* (*Dispharynx*) *nasuta* collected from different hosts from the Area de Conservacion Guanacaste, Costa Rica.

	Thraupis episcopus	*Turdus grayi*	*Vermivora peregrina*	*Rampho-caenus melanurus*	*Platyrinchus cancrominus*	*Caryothraustes poliogaster*	*Geothlypis poliocephala*
Male							
Body length	5.33–6.36 mm	4.22–5.99 mm	4.99–5.92 mm	4.51 mm	—	—	3.61–4.85 mm
Body width	215–303	222–311	296–303	274	—	—	141–178
Cordons (descending branch)	361–439	392–444	377–422	353	—	—	209–333
Buccal capsule	104–114	89–104	91–110	125	—	—	73–104
Muscular esophagus	518–740	518–703	481–614	524	—	—	392–518
Glandular esophagus	1,554–1,702	1,517–1,998	1,369–1,665	1,444	—	—	1,184–1,495
Nerve ring*	237–289	207–281	228–285	232	—	—	156–222
Excretory pore*	363–429	244–370	312–361	274	—	—	203–303
Cervical papillae*	363–456	259–377	315–369	293	—	—	200–296
Tail	254–333	—	277–293	—	—	—	159–216
Left spicule	456–589	456–532	429–475	407	—	—	380–456
Right spicule	167–179	175–186	152–179	182	—	—	133–193
Spicule ratio	1:2.7–3.3	1:2.6–2.9	1:2.7–2.8	1:2.2	—	—	1:2.5
Female							
Body length	5.87–7.84 mm	4.07–5.81 mm	4.66–5.42 mm	—	3.25–3.48 mm	4.14–4.392 mm	3.92–4.66 mm
Body width	361–474	385–458	488–607	—	296–407	340–355	252–274
Cordons (descending branch)	490–645	496–570	555–688	—	312–315	437–481	370–429
Buccal capsule	110–152	103–133	122–133	—	95	141–148	104–126
Muscular esophagus	516–761	533–710	444–577	—	399–505	444–599	444–481
Glandular esophagus	1,664–1,998	1,554–1,850	1,554–1,680	—	1,216–1,463	1,702–1,776	1,221–1,406
Nerve ring*	259–363	296–340	266–312	—	220–232	357–403	244–274
Excretory pore*	477–568	407–474	456–532	—	266–312	365–418	266–355
Cervical papillae	456–581	407–444	422–494	—	277–285	357–410	311–363
Tail	116–156	118–133	129–152	—	114–141	125–133	118–148
Vulva†	1,147–1,406	999–1,256	888–1,058	—	607–888	814–1,258	692–1,051
Vulva/TBL	17.9–19.5%	21.6–24.5%	19.1–19.5%	—	18.6–25.5%	19.6–28.7%	21–26%
Egg size	35–40 × 20–22	33–37 × 18–20	37–40 × 21–22	—	35–37 × 17–22	—	33–39 × 17–20

* From anterior end.
† From posterior end.



FIGURES 9–11. *Synhimantus* (*Dispharynx*) sp. **9.** Anterior end of male, ventral view. **10.** Posterior end of male, lateral view. **11.** Spicules. Bar = 100 μm.

don length, the number of caudal papillae in males, and in body size, but differs in having a longer right spicule (244 vs. 152–186) and in having 2 spine-shaped spicules rather a spine-shaped left spicule and a canoe-shaped right spicule with an enlarged proximal portion with irregular medial edges (Figs. 7, 10), characteristic of other members of the subgenus.

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