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SKRJABINURA GNEDINA, 1933 (NEMATODA: SEURATOIDEA: SEURATIDAE), IN BIRDS FROM THE AREA DE CONSERVACION GUANACASTE, COSTA RICA WITH DESCRIPTION OF A NEW SPECIES

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ABSTRACT: Two species of *Skrjabinura* Gnedina, 1933, were collected in the intestines of birds from the Area de Conservación Guanacaste (ACG), Costa Rica. *Skrjabinura mesoamericana* n. sp. inhabits *Dendrocincla homochroa*, *Calocitta formosa*, *Dendrocolaptes certhia*, *Basileuterus rufifrons*, and *Chordeiles acutipennis*. The new species differs from all species of the genus by having dissimilar spicules, the right having a distinctive thin and bent handle on the proximal end. The new species can be further distinguished from *Skrjabinura pomatostomi* and *Skrjabinura brevicaudatum* by having subequal versus equal spicules. *Skrjabinura mesoamericana* resembles *S. brevicaudatum* in the number and arrangement of male caudal papillae but differs in the vulva position and in having smaller eggs. The new species differs from *S. potamostomi* in having 6 versus 8 pairs of postcloacal papillae. Among those species having subequal spicules, the new species further differs from *Skrjabinura spiralis* in having 1 pair of paracloacal papillae and 6 pairs of postcloacal papillae, versus no paracloacal papillae and 4 pairs of postcloacal papillae, and in the vulva position. The new species is perhaps most similar to *Skrjabinura vali*, from which it further differs by having 3 pairs of precloacal, 1 pair of paracloacal, and 6 pairs of postcloacal versus 2 pairs of precloacal, 2 pairs of paracloacal, and 6 pairs of postcloacal papillae in the vulva position and in the shape of the eggs. *Skrjabinura vali* (Guerrero, 1971) Chabaud, 1978, originally described in *Piaya cayana* from Venezuela, occurs in the small intestine of *P. cayana*, as well as the new hosts, *Crotophaga sulcirostris* and *Myiarchus tyrannulus*, in the ACG, a new locality. Our specimens differ from the original description in the body length of the female, the numbers of postanal papillae of male tail, and the size of eggs.

Gnedina (1933) proposed *Skrjabinura* for *S. spiralis*, collected in *Caprimulgus europaeus* Linnaeus, 1758, from Russia. Johnston and Mawson (1941a, 1941b) proposed *Seuratinema* for 3 new species from Australian birds, *Seuratinema brevicaudatum* Johnston and Mawson, 1941, in *Ninox connivens* (Latham, 1801); *S. pomatostomi* Johnston and Mawson, 1941, in *Pomatostomus superciliosus* (Vigors and Horsfield, 1827); and *Skrjabinura magnum* Johnston and Mawson, 1941, in *Dacelo gigas* (Herrman, 1783). After re-examining the spicules of *S. brevicaudatum*, Mawson (1960) considered *Seuratinema* a synonym of *Skrjabinura*. Inglis (1967) redescribed *S. brevicaudatum* and considered *Seuratinema* a valid genus. Guerrero (1971) proposed *Limonnema* for *L. vali*, inhabiting *Piaya cayana* Linneaus, 1766, from Venezuela. Chabaud (1978) noted that members of all 5 nominal species assigned to these 3 genera resemble each other, and differ from other seuratid genera in having spirally twisted female bodies, cephalic vesicles, short rounded male tails, and gubernacula that are larger than the spicules. He, therefore, regarded *Seuratinema* and *Limonnema* as synonyms of *Skrjabinura*. Recently, Pinto et al. (1994, 1996) regarded *S. magnum* as a synonym of *S. spiralis* and reported *S. spiralis* in *Falco r. rufigularis* Daudin, 1800, and *Galbula ruficauda rufoviridis* Cuvier, 1917, from Brazil.

During June 1998 and January 2003, as part of an ongoing biodiversity inventory of the eukaryotic parasites of vertebrates inhabiting the Area de Conservación Guanacaste (ACG) in northwestern Costa Rica, we collected specimens of *Skrjabinura vali* and an undescribed member of the genus in several bird species.

MATERIALS AND METHODS

Hosts Ruddy Woodcreepers *Dendrocincla homochroa* (Sclater, 1859) (n = 12), White-throated Magpie Jays *Calocitta formosa* (Swainson, 1827) (n = 5), Barred Woodcreepers *Dendrocolaptes certhia* (Boddaert, 1738) (n = 7), Rufous-capped Warblers *Basileuterus rufifrons* (Swainson, 1838) (n = 25), Lesser Nighthawks *Chordeiles acutipennis* (Hermann, 1783) (n = 3), Squirrel Cuckoos *P. cayana* (Linnaeus, 1766) (n = 4), Groove-billed Ani *Crotophaga sulcirostris* Swainson, 1827 (n = 5), and Brown Crested Flycatchers *Myiarchus tyrannulus* (Mueller, 1776) (n = 20) were collected during June 1998 and January 2003 and examined for parasites. Data concerning identification and disposition of host specimens can be found at http://brooksweb.zoo.utoronto.ca/index.html.

The nematodes forming the basis of this study were collected from the intestine, 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 (minimum and maximum followed by mean in parentheses) were given in micrometers, unless otherwise stated; TBL = total body length.

DESCRIPTIONS

Skrjabinura mesoamericana n. sp.
(Figs. 1–10)

General: Body large. Cephalic vesicle present, extending from anterior end of body to level of posterior end of esophagus in male, level of nerve ring in female. Head bearing 2 lateral labia, each bearing a pair of double cephalic papillae and 1 amphid. Mouth opening relatively small, dorsoventrally elongated slit. Buccal capsule absent. Shallow triangular cavity present at anterior end of esophagus, bounded along anterior edge by row of small denticles (Fig. 1). Esophagus short, somewhat constricted in middle, swollen posteriorly, with triradiate lumen and posterior appendage projecting into intestine (Figs. 2, 3). Nerve ring at midesophagus. Excretory pore near posterior end of esophagus.

Male (n = 2): Body straight, 18.7, 25.0 mm long. Maximum width 710, 871. Esophagus 548, 619 long and 136, 161 wide. Cephalic vesicle 419, 568 from anterior end. Nerve ring 277, 310 from anterior end. Excretory pore 593, 548 from anterior end. Tail short and curved ventrally with rounded tip, 184, 200 long. Caudal alae absent. Ten pairs of caudal papillae, 3 precloacal, 1 paracloacal, and 6 postcloacal. One pair of precloacal

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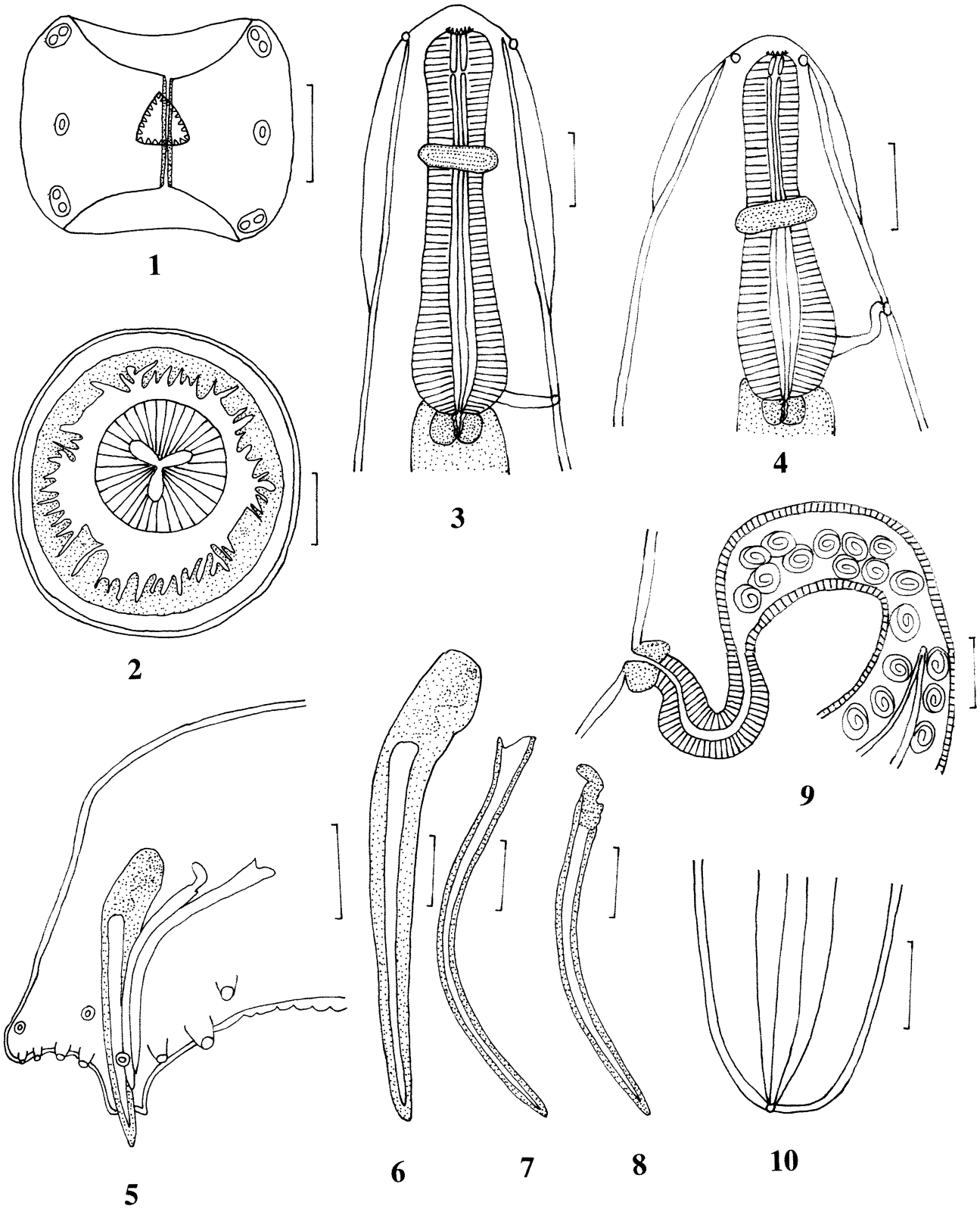


FIGURES 1–10. *Skrjabinura mesoamericana* n. sp. **1.** Anterior extremity of female, enface view. **2.** Transverse section of female at anterior end of esophagus. **3.** Anterior end of male, lateral view. **4.** Anterior end of female, lateral view. **5.** Posterior end of male, lateral view. **6.** Gubernaculum. **7.** Left spicule. **8.** Right spicule. **9.** Vulva region. **10.** Posterior end of female, lateral view. **1–3, 5,** Bars = 100 μm; **4, 9, 10.** Bars = 200 μm; **6–8.** Bars = 50 μm.

and 2 pairs of postcloacal papillae lateral, others subventral (Fig. 5). Spicules subequal and dissimilar. Left spicule 301, 314 long and 18, 16 wide, proximal end slightly swollen. Right spicule 270, 285 long and 19, 18 wide, proximal end with thin and bent handle. Gubernaculum with expanded proximal end, 333, 355 long and 51, 67 wide.

Female (n = 10): Body spirally twisted 4 times, 27.9–67.8 mm (43.5 mm) long. Maximum width 1.2–1.9 mm (1.7 mm). Esophagus 710–839 (785) long and 194–245 (225) wide. Cephalic vesicle 384–613 (479) from anterior end. Nerve ring 387–578 (471) from anterior end. Excretory pore 593–839 (711) from anterior end. Vulva near middle of body, 13.6–28.2 mm (19 mm) from anterior end, 41.2–48.6% (44.4%) TBL from anterior end. Uteri not extending into anterior third of body. Anus at posterior end of body. Eggs nearly spherical, embryonated, 82–98 (90) long, 76–92 (81) wide.

Taxonomic summary

Type host: Dendrocincla homochroa (Sclater, 1859) (Aves: Passeriformes: Dendrocolaptidae).

Other hosts: Calocitta formosa (Swainson, 1827) (Aves: Passeriformes: Corvidae); *B. rufifrons* (Swainson, 1838) (Aves: Passeriformes: Parulidae); *D. certhia* (Boddaert, 1783) (Aves: Passeriformes: Dendrocolaptidae); *C. acutipennis* (Hermann, 1783) (Aves: Caprimulgiformes: Caprimulgidae).

Type locality: Estación Maritza, Sector Maritza, Area de Conservacion Guanacaste, Guanacaste Province, Costa Rica, 32°65′55″N, 37°27′68″W.

Other localities: Estación San Gerardo, San Gerardo, Area de Conservación Guanacaste, Guanacaste Province, Costa Rica, 10°52′50″N, 85°23′21″W; Las Mesas, Sector Santa Rosa, Area de Conservación Guanacaste, Guanacaste Province, Costa Rica, 10°50′44″N, 85°36′26″W; Cafetale, Santa Rosa, Area de Conservación Guanacaste, Guanacaste Province, Costa Rica, 10°51′19″N, 85°36′39″W.

Site of infection: Intestine.

Prevalence: Two of 12 birds (16.7%) in *D. homochroa*; 1 of 5 birds (20%) in *C. formosa*; 1 of 25 birds (4%) in *B. rufifrons*; 1 of 7 birds (14.3%) in *D. certhia*; 1 of 3 birds (33.3%) in *C. acutipennis*.

Intensity: One male and 8 females in 1 host and 1 female in another host in *D. homochroa*; 1 male and 1 female in *C. formosa*; 1 female in *B. rufifrons*; 1 immature female in *D. certhia*; 1 female in *C. acutipennis*.

Type specimens: Holotype: USNPC 94436 (male); Allotype: USNPC 94437 (female); Paratype: USNPC 94438–94442 (1 male and 13 females).

Etymology: The new species is named for its occurrence in Central America.

Remarks

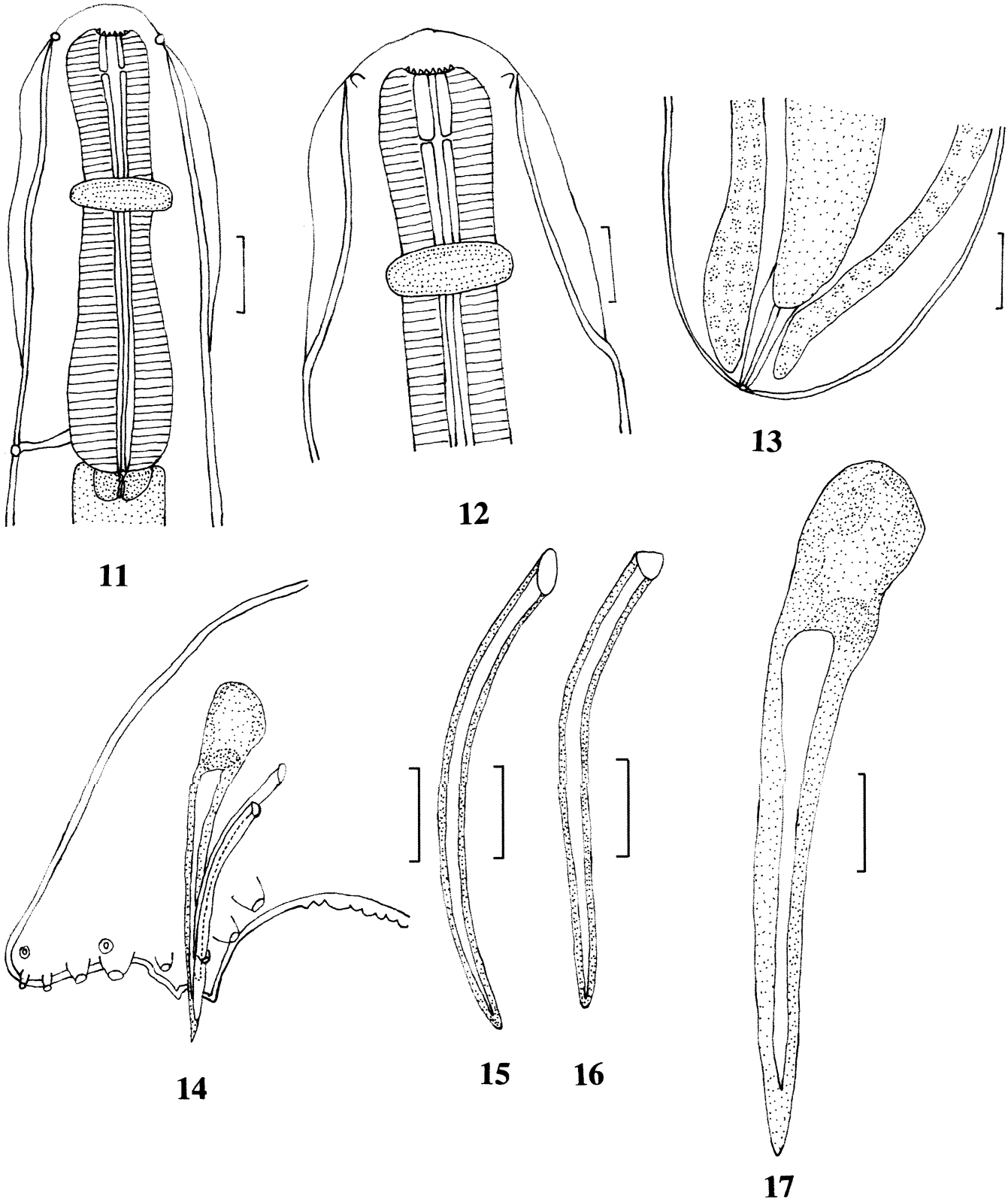
As mentioned in the introduction, 5 species of *Skrjabinura* have been described, 4 of which are currently considered valid (Pinto et al., 1994). The new species differs from all previously described species by having dissimilar spicules, with the right one having a distinctive thin and bent handle on the proximal end (Fig. 8). The new species can be further distinguished from *S. brevicaudatum* and *S. pomatostomi* by having subequal versus equal spicules. *Skrjabinura mesoamericana* resembles *S. brevicaudatum* in the number and arrangement of male caudal papillae but differs in having the vulva located closer to the middle of the body versus closer to the anterior third of the body and in having smaller eggs (82–98 × 76–92 vs. 122 × 130). The new species differs from *S. potamostomi* in having 6 versus 8 pairs of postcloacal papillae. Among those species having subequal spicules, the new species differs from *S. spiralis* in having 1 pair of paracloacal papillae and 6 pairs of postcloacal papillae versus no paracloacal papillae and 4 pairs of postcloacal papillae and in having the vulva located closer to the middle of the body versus closer to the anterior third of the body. *Skrjabinura mesoamericana* is perhaps most similar to *S. vali* but differs by having 3 pairs of precloacal, 1 pair of paracloacal, and 6 pairs of postcloacal versus 2 pairs of precloacal, 2 pairs of paracloacal, and 6 pairs of postcloacal papillae and in having spherical versus ellipsoid eggs. Finally, the vulva of *S. vali* was originally described as near the anterior ⅔ of the body (40% TBL from the anterior end), compared with 41–48% TBL in *S. mesoamericana*. Two female specimens of *S. vali* collected in the ACG have vulvas 38 and 39% TBL from the anterior end of the body (see next section).

Skrjabinura vali (Guerrero, 1971) Chabaud, 1978
(Figs.11–17)

General: Body large. Cephalic vesicle present, extending to posterior end of esophagus in male and to level of nerve ring in female. Head bearing 2 lateral labia, each bearing 1 pair of double cephalic papillae and 1 amphid. Mouth opening a relatively small, dorsoventrally elongated slit. Buccal capsule absent. Shallow triangular cavity present at anterior end of esophagus, bounded along anterior edge by row of small denticles. Esophagus short, somewhat constricted in front of middle, swollen posteriorly, with triradiate lumen and posterior appendage projecting into intestine. Nerve ring located at midesophagus. Excretory pore located near conjunction of esophagus and intestine.

Male (n = 2): Body straight, 18.2, 18.3 mm long. Maximum width 484, 565. Esophagus 581, 516 long and 127, 155 wide. Cephalic vesicle 451, 419 from anterior end. Nerve ring 252, 239 from anterior end. Excretory pore 581, 619 from anterior end. Tail curved ventrally with rounded tip, 282, 266 long. Caudal alae absent. Ten pairs of caudal papillae, 2 pairs precloacal, 2 pairs paracloacal, and 6 pairs postcloacal. Precloacal papillae larger than paracloacal papillae. Four pairs of postcloacal papillae subventral, 2 pairs lateral. Two pairs of very small subventral papillae near tip of tail. Spicules subequal and similar, with slightly swollen proximal end and narrow and rounded distal end. Left spicule 282, 266 long, Right spicule 269, 254 long. Gubernaculum larger than spicules, with expanded proximal end and pointed distal end, 349, 390 long and 50, 63 wide.

Female (n = 2): Body spirally twisted 4 times, 44.4, 48.4 mm long. Maximum width 1.4, 1.2 mm. Esophagus 774, 697 long and 190, 139 wide. Cephalic vesicle 484, 387 from anterior end. Nerve ring 471, 303 from anterior end. Excretory pore 710, 805 from anterior end. Vulva near anterior ⅔ of body, 17.3, 18.2 mm from anterior end, 38.9, 37.7% TBL from anterior end. Uteri not extending into anterior third of body. Anus at posterior end of body. Eggs ellipsoid, embryonated, 79–95 (87) long and 44–57 (50) wide.



FIGURES 11–17. *Skrjabinura vali* (Guerrero, 1971) Chabaud, 1978. **11.** Anterior end of male, lateral view. **12.** Anterior end of female, lateral view. **13.** posterior end of female, lateral view. **14.** Posterior end of male, lateral view. **15.** Left spicule. **16.** Right spicule. **17.** Gubernaculum. **11, 12, 14.** Bars = 100 μm; **13.** Bar = 200 μm; **15–17.** Bars = 50 μm.

Taxonomic summary

Hosts: Piaya cayana (Linnaeus, 1766) (Aves: Cuculiformes: Cuculidae); *C. sulcirostris* Swainson, 1827 (Aves: Cuculiformes: Cuculidae), new host; *M. tyrannulus* (Mueller, 1776) (Aves: Passeriformes: Tyrannidae), new host.

Localities: Cafetal, Sector Santa Rosa, Area de Conservación Guanacaste, Guanacaste Province, Costa Rica, 10°51′19″N, 85°36′39″W; Laguna Los Jicaros, Sector Santa Elena, Area de Conservación Guanacaste, Guanacaste Province, Costa Rica, 10°52′4″N, 85°38′35″W; Estación n Maritza, Sector Maritza, Area de Conservación Guanacaste, Guanacaste Province, Costa Rica, 32°65′55″N, 37°27′68″W, *all new localities.*

Site of infection: Small intestine.

Prevalence: One of 4 birds (25%) in *P. cayana*; 1 of 5 birds (20%) in *C. sulcirostris*; 1 of 20 birds (5%) in *M. tyrannulus*.

Intensity: One male in *P. cayana*; 1 male and 1 female in *C. sulcirostris*; 1 female in *M. tyrannulus*.

Voucher specimens: USNPC 94443.

Remarks

Guerrero (1971) described *S. vali* from specimens inhabiting *P. cayana* from Venezuela. In this study, we collected 1 male in the type host, *P. cayana*, 1 male and 1 female in *C. sulcirostris*, and 1 female in *M. tyrannulus*. Our specimens agree with the original description of *S. vali* (the whereabouts of the type specimens are unknown at present) in most regards but differ in a few traits. Guerrero (1971) reported that males of *S. vali* have equal spicules and 5 pairs of postcloacal papillae; our specimens have subequal spicules and 6 pairs of postcloacal papillae, one of which is very small and easily overlooked. In addition, our specimens have longer female bodies (up to 48.4 mm vs. up to 29.5 mm) and smaller eggs (79–95 × 44–57 vs. 120 × 80) than those reported by Guerrero (1971). Finally, Guerrero (1971) described *S. vali* as having a long female tail, but our specimens, like those of other members of the genus, have relatively short female tails.

DISCUSSION

Given the broad geographic and host distribution of *Skrjabinura* species known to date, we believe it is possible that the group is much more species rich than presently known. In addition, there is no explicit phylogenetic hypothesis for seuratids that might give us insights into the evolutionary origins of *Skrjabinura* spp., especially into the developmental mechanism producing, and the function of, the spirally twisted female bodies characteristic of members of the genus.

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