

PROCYRNEA CHABAUD, 1958 (NEMATODA: HABRONEMATOIDEA: HABRONEMATIDAE) IN BIRDS FROM THE AREA DE CONSERVACIÓN GUANACASTE, COSTA RICA, INCLUDING DESCRIPTIONS OF 3 NEW SPECIES

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ABSTRACT: Four species of *Procyrnea* were collected in birds from the Area de Conservacion Guanacaste, Costa Rica. *Procyrnea brevicaudata* n. sp. in *Crypturellus cinnamomeus* resembles *P. fischeuri*, *P. murrayi*, *P. amerae*, *P. dollfusi*, and *P. aptera* in lacking lateral alae but differs from all these species in having 2 longitudinal ridges on the left side of the body, in having a sinistral rather than ventral vulvar opening, and in having dorsally bent rather than straight female tails. *Procyrnea mawsonae* n. sp., in *Buteo magnirostris*, is similar to *P. striolata* in body size and in having 2 transverse striated lateral alae, but differs by having longer and differently shaped spicules, and by lacking a single preanal sessile papilla. *Procyrnea mclennanae* n. sp., in *Heliomaster constantii*, is similar to *P. striolata* (Zhang, 1991) and *P. mawsonae* n. sp. in having 2 transverse striated lateral alae, but it can be distinguished from *P. striolata* and *P. mawsonae* in having 4 rather than 3 small teeth on the interior border of the pseudolabia, in having unequal rather than equal lateral alae, and in having longer spicules. *Procyrnea* sp., on the basis of a single adult male in *Campephilus guatemalensis*, resembles *P. suraiyae*, *P. tulostoma*, and *P. unilateralis* in possessing a single and long lateral ala, but can be distinguished from *P. suraiyae* and *P. tulostoma* in the length of the left spicule, in the left spicule having a bifid distal end, the right spicule having a rounded distal end rather than both spicules having pointed distal ends, and in having the lateral ala beginning at the lip region instead of posterior to the cervical papillae. It differs from *P. uncinipennis* in having a spicule ratio of 1:3.5 rather than 1:2.5, in the left spicule having a bifid rather than alate distal end, and in the absence of a single preanal papilla.

Chabaud (1958) proposed *Cyrnea* to accommodate nematode species assigned traditionally to *Habronema*, but inhabiting avian hosts and having dorsal and ventral median internal oral processes. He further proposed the subgenus *Procyrnea* for species of *Cyrnea* having lateral teeth inserted near the anterior border of the pseudolabia rather than on the posterior part of the pseudolabia, and cervical papillae anterior, rather than posterior, to the nerve ring. Ali (1961) proposed retaining in *Habronema* all those species placed in *Cyrnea* by Chabaud (1958), but in the subgenus *Aviabronema*. However, subsequent authors (e.g., Skrjabin and Sobolev, 1963; Skrjabin et al., 1967; Mawson, 1968; Wang, 1976; Zhang, 1991; Pinto et al., 1996), have accepted Chabaud's (1958) proposal. Chabaud (1975) subsequently raised *Procyrnea* to generic rank. At present, more than 40 species of *Procyrnea* have been described.

In this study based on the activities of the inventory of eukaryotic parasites of vertebrates inhabiting the Area de Conservacion Guanacaste (ACG) in northwestern Costa Rica (<http://brookswb.zoo.utoronto.ca/index.html>), we report 4 species of *Procyrnea*, all of which are apparently undescribed. Paucity of material permits us to name only 3 of these species, but we present information about the fourth as well.

MATERIALS AND METHODS

Roadside hawks, *Buteo magnirostris* (Gmelin, 1788) (n = 9), thicket tinamus, *Crypturellus cinnamomeus* (Lesson, 1842) (n = 3), plain-capped starkthroat, *Heliomaster constantii* (De Lattre, 1843) (n = 3), and pale-billed woodpecker, *Campephilus guatemalensis* (Hartlaub, 1844) (n = 4), were collected during February 1996, February 2001, and June 2002, and examined for parasites. 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) are given in micrometers, unless otherwise stated. TBL = total body length.

DESCRIPTIONS

Procyrnea brevicaudata n. sp.

(Figs. 1–12)

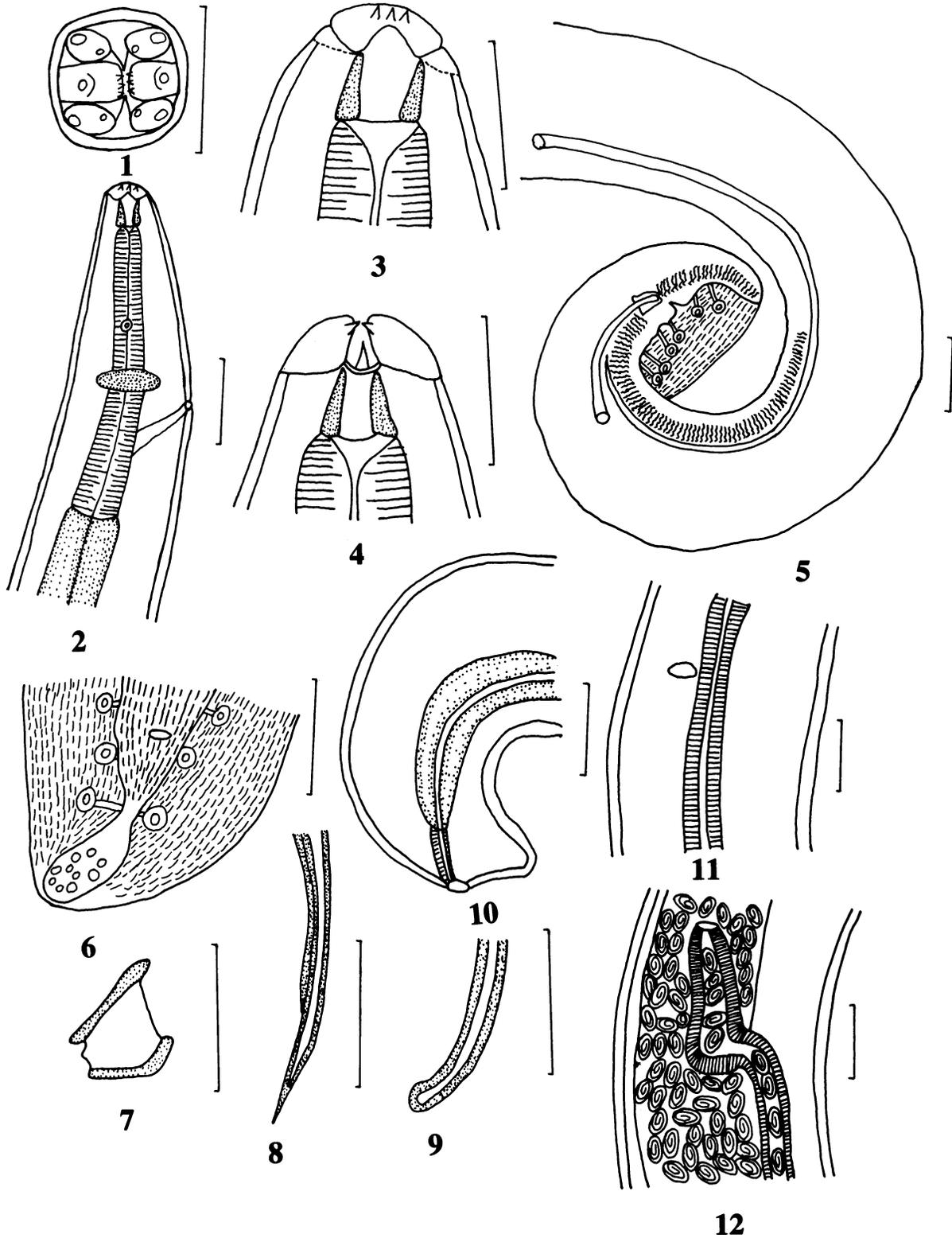
Diagnosis: Body small with distinct transverse striations. Lip region continuous with body contour, lacking constriction. Labial region consisting of 2 pseudolabia and dorsal and ventral labia. Pseudolabia wider at mouth than at base, amphid located on base of pseudolabia, 3 small teeth on interior border of pseudolabia; papillae not observed. Dorsal and ventral labia each consisting of 2 submedian lobes, with 2 papillae on each, and 1 median internal process. Lateral alae absent. Two longitudinal striated ridges present on left lateral side of body, extending from cervical papillae to posterior end of body. Cuticular striations absent between ridges. Buccal capsule laterally compressed. Esophagus clearly divided into short anterior muscular part and long posterior glandular part. Muscular esophagus 5.3–6.5% (5.9%) TBL in male and 4.0–4.6% (4.1%) TBL in female; glandular esophagus 39.3–51.5% (46.3%) TBL in male and 29.6–33.8% (31.2%) TBL in female. Nerve ring located at the middle of muscular esophagus. Cervical papillae anterior to nerve ring. Excretory pore immediately posterior to nerve ring.

Male (n = 3): Body length 4.70–5.27 mm (4.97 mm). Maximum width 214–229 (222). Buccal capsule 19–27 (24) long and 10–19 (15) wide. Muscular esophagus 277–304 (293) long and 34–38 (37) wide; glandular esophagus 2.07–2.55 mm (2.30 mm) long and 114–129 (120) wide. Nerve ring 209–213 (210) from anterior end; excretory pore 258–285 (270) from anterior end; and cervical papillae 156–163 (158) from anterior end. Posterior end of body curved. Caudal alae well developed and symmetrical, 390–539 (473) long. Caudal alae with longitudinal striations on ventral surface and transverse striations on dorsal surface. Ventral surface of caudal region with prominent longitudinal ridges. Tail with rounded tip, 117–164 (137) long,

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FIGURES 1–12. *Procyrnea brevicaudata* n. sp. 1. Anterior extremity, en face view. 2. Anterior end of female, lateral view. 3. Anterior extremity of female, lateral view. 4. Anterior extremity of female, ventral view. 5. Posterior end of male, lateral view. 6. Male tail, ventral view. 7. Gubernaculum. 8. Distal end of left spicule. 9. Distal end of right spicule. 10. Posterior end of female, lateral view. 11. Vulva region of female, lateral view (showing the vulvar opening and two lateral ridges). 12. Vulva region of female, lateral view. Bar = 50 μ m (Figures 1, 3, 4, 7, 8, 9); Bar = 100 μ m (Figures 2, 5, 6, 10, 11, 12).

with 4 pairs of symmetrically arranged pedunculate preanal papillae and 2 pairs of symmetrically arranged pedunculate post-anal papillae. Ten sessile papillae located near tail tip. Spicules unequal and dissimilar. Left spicule 1.01–1.52 mm (1.22 mm) long, with pointed distal end. Right spicule 209–236 (224) long, with rounded tip of distal end. Ratio of right spicule–left spicule, 1:4.8–6.7 (1:5.4). Gubernaculum trowel shaped, dextral side straight, sinistral side slightly bent in the middle (Fig. 7), 38–49 (44) long and 26–37(32) wide.

Female (n = 5): Body length 6.80–8.42 mm (7.86 mm). Maximum width 266–303 (285). Buccal capsule 23–29 (25) long and 11–15 (13) wide. Muscular esophagus 312–346 (323) long and 38–49 (43) wide; glandular esophagus 2.19–2.85 mm (2.45 mm) long and 118–133 (128) wide. Nerve ring 217–236 (223) from anterior end; excretory pore 266–304 (374) from anterior end; and cervical papillae 171–209 (179) from anterior end. Didelphic. Vulva opening located on left lateral side of body (Figs. 11, 12), 4.10–4.16 mm (4.13 mm), or 49.0–52.4% (50.4%) TBL, from anterior end. Tail short and rounded, bent dorsally, 74–111 (88) long. Eggs ellipsoid, thick shelled, embryonated, 40.5–42.3 (42.0) long, 20.2–22.1 (21.0) wide.

Taxonomic summary

Type host: *Crypturellus cinnamomeus* (Lesson, 1842) (Aves: Passeriformes: Tinamidae).

Type locality: Camino a Santa Elena, Sector Santa Rosa, ACG, Guanacaste Province, Costa Rica (10°50'44"N, 85°36'26"W).

Site of infection: Under the lining of the gizzard.

Prevalence: 33.3% (1 of 3 birds).

Intensity: Three males and 8 females in host.

Type specimens: Holotype, USNPC 94016; allotype, USNPC 94017; paratypes USNPC 94018.

Etymology: The specific epithet refers to the short tail of females.

Remarks

Procyrnea brevicaudata resembles *P. fischeuri* (Seurat, 1916) Chabaud, 1958, *P. murrayi* (Ortlepp, 1934) Chabaud, 1958, *P. ameerae* (Ali, 1961) Chabaud, 1975, *P. dollfusi* (Mawson, 1968) Chabaud, 1975, and *P. aptera* Wang, 1976, in lacking lateral alae, but differs from all these species by having 2 longitudinal ridges on the left side of the body, in having a sinistral vulvar opening, and in having dorsally bent female tails. The new species also differs from *P. fischeuri* by having a left spicule with a pointed rather than double-barbed tip, a different spicule ratio (1:4.8–6.7 in *P. brevicaudata* vs. 1:4 in *P. fischeuri*), and in lacking a single preanal papilla. *Procyrnea brevicaudata* can be distinguished from *P. murrayi* and *P. ameerae* by having a longer left spicule (1.01–1.52 mm vs. 0.88–0.89 mm in *P. murrayi* and 0.78–0.89 mm in *P. ameerae*), and a different spicule ratio (1:4.8–6.7 in *P. brevicaudata* vs. 1:3 in *P. murrayi* and *P. ameerae*). Finally, the new species differs from *P. dollfusi* and *P. aptera* by having a shorter right spicule (209–236 long in *P. brevicaudata* vs. 550 long in *P. dollfusi* and 496 long in *P. aptera*), a different spicule ratio (1:4.8–6.7 in *P. brevicaudata* vs. 1:2.4–3.2 in *P. dollfusi* and 1:2.4 in *P. aptera*), and in having a shorter female tail (74–111 long in *P. brevicaudata* vs. 320–390 long in *P. dollfusi* and 240–260 in *P. aptera*).

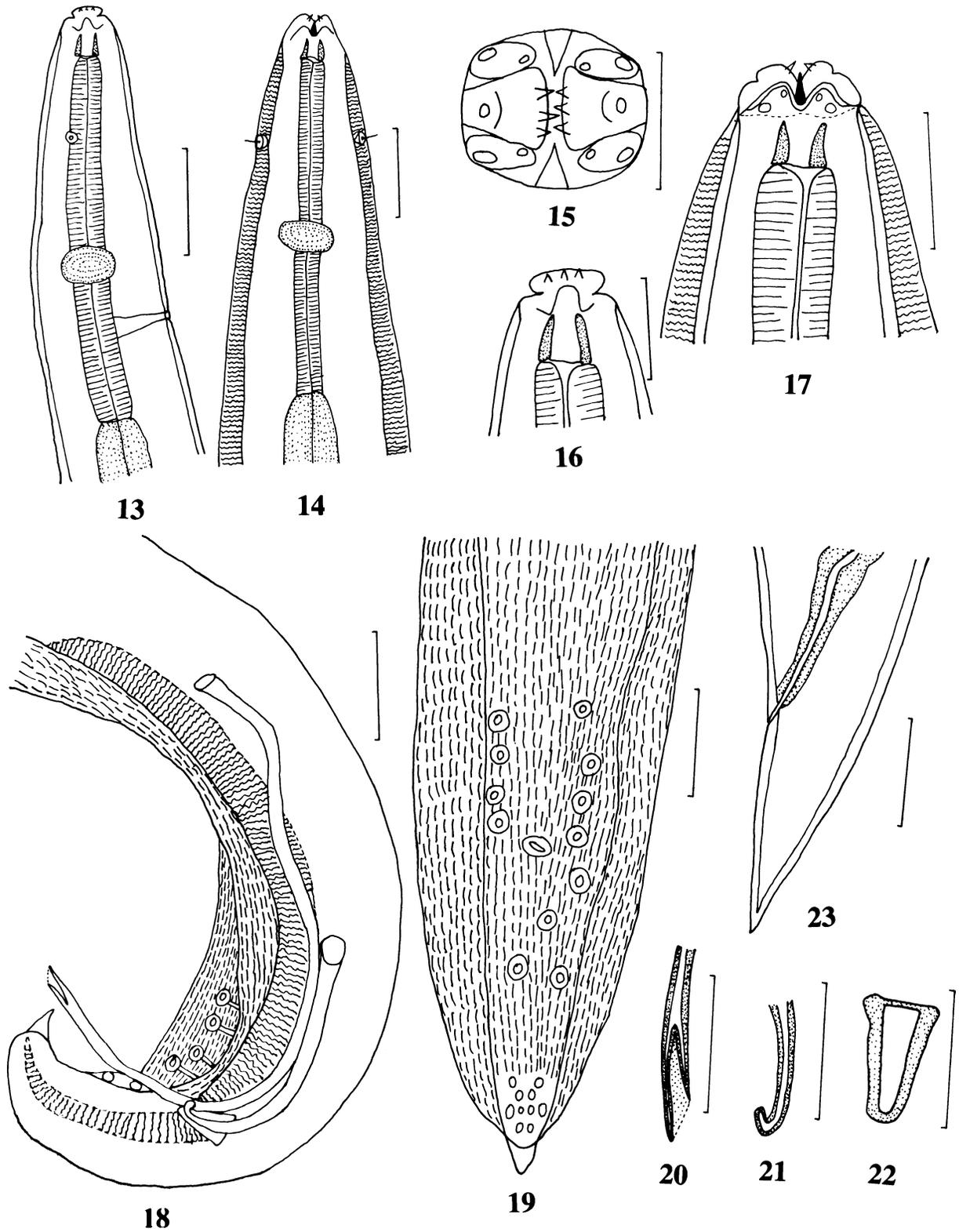
Procyrnea mawsonae n. sp.

(Figs. 13–23)

Diagnosis: Body medium size with distinct transverse striations. Lip region continuous with body contour, lacking constriction. Labial region consisting of 2 pseudolabia and dorsal and ventral labia. Pseudolabia wider at mouth than at base, amphid located on base of pseudolabia; 3 small teeth on interior border of pseudolabia; papillae not observed. Dorsal and ventral labia each consisting of 2 submedian lobes, with 2 papillae on each, and a median internal process. Lateral alae well developed, with sinuous striations, extending from lip region to middle of male body and to anterior third of female body, respectively. Buccal capsule laterally compressed. Esophagus clearly divided into short anterior muscular part and long posterior glandular part. Muscular esophagus 3.1–5.9% (4.2%) TBL in male and 2.4–3.6% (2.9%) TBL in female; glandular esophagus 19.4–32.2% (24.5%) TBL in male and 14.7–22.3% (18.2%) TBL in female. Nerve ring located at the middle of muscular esophagus. Cervical papillae anterior to nerve ring. Excretory pore immediately posterior to nerve ring.

Male (n = 17): Body length 7.21–10.69 mm (9.05 mm). Maximum width 148–222 (191). Lateral alae 3.17–5.35 mm (4.44 mm) long, 39.6–53.8% (47.6%) TBL from anterior end. Buccal capsule 15–25 (20) long and 8–15 (11) wide. Muscular esophagus 312–444 (369) long and 25–34 (29) wide; glandular esophagus 1.56–2.43 mm (2.18 mm) long and 68–129 (90) wide. Nerve ring 213–266 (246) from anterior end; excretory pore 274–342 (312) from anterior end; and cervical papillae 106–163 (133) from anterior end. Posterior end of body curved. Caudal alae well developed and asymmetrical, left ala relatively long and narrow, 581–903 (700) long; right ala shorter and relatively wider, 460–742 (588) long. Caudal alae with longitudinal striations on ventral surface and transverse striations on dorsal surface. Ventral surface of caudal region with prominent longitudinal ridges. Tail with pointed tip, 175–220 (191) long, with 4 pairs of symmetrically arranged pedunculate preanal papillae and 2 pairs of asymmetrically arranged pedunculate post-anal papillae. Ten sessile papillae located near tail tip. Spicules unequal and dissimilar. Left spicule 665–874 (754) long, distal end divided into 2 branches connected by transparent membrane. Right spicule 247–323 (291) long, tip of distal end bent proximally, forming hooklike structure. Ratio of right spicule–left spicule, 1:2.2–2.9 (1:2.6). Gubernaculum trowel shaped, with small lateral projection at proximal end of dextral side, straight sinistral side (Fig. 22), 38–61 (47) long and 16–23 (20) wide.

Female (n = 13): Body length 11.42–16.04 mm (13.94 mm). Maximum width 222–326 (275). Lateral alae 4.07–6.59 mm (5.00 mm) long, 27.6–45.2% (34.1%) TBL from anterior end. Buccal capsule 18–23 (21) long and 13–19 (15) wide. Muscular esophagus 342–456 (406) long and 30–38 (34) wide; glandular esophagus 2.24–2.89 mm (2.50 mm) long and 68–141 (103) wide. Nerve ring 217–285 (267) from anterior end; excretory pore 270–395 (347) from anterior end; and cervical papillae 114–175 (140) from anterior end. Didelphic. Vulva 5.27–7.21 mm (6.60 mm) or 43.2–52.3% (47.6%) TBL from anterior end. Tail 182–266 (226) long, pointed. Eggs ellipsoid, thick shelled, embryonated, 31.3–38.6 (35.1) long, 16.6–22.1 (19.0) wide.



FIGURES 13–23. *Procyrnea mawsonae* n. sp. **13.** Anterior end of female, lateral view. **14.** Anterior end of female, ventral view. **15.** Anterior extremity, en face view. **16.** Anterior extremity of female, lateral view. **17.** Anterior extremity of female, ventral view. **18.** Posterior end of male, lateral view. **19.** Posterior end of male, ventral view. **20.** Distal end of left spicule. **21.** Distal end of right spicule. **22.** Gubernaculum. **23.** Posterior end of female, lateral view. Bar = 100 μ m (Figures 13, 14, 18, 19, 23); Bar = 50 μ m (Figures 15, 16, 17, 20, 21, 22).

Taxonomic summary

Type host: *Buteo magnirostris* (Gmelin, 1788) (Aves: Falconiformes: Accipitridae).

Type locality: Camino de las Mesas, Sector Santa Rosa, ACG, Guanacaste Province, Costa Rica, 10°50'44"N, 85°36'26"W.

Other locality: Cafetal, Sector Santa Rosa, ACG, Guanacaste Province, Costa Rica (10°52'53"N, 85°36'42"W).

Site of infection: Under the lining of the gizzard.

Prevalence: 33% (3 of 9 birds).

Intensity: Six to 15.

Type specimens: Holotype, USNPC 94010; allotype, USNPC 94011; paratype, USNPC 94012.

Etymology: The new species is named for Professor Patricia M. Mawson, in recognition of her contributions to our knowledge of the nematode parasites of birds.

Remarks

Procyrnea mawsonae most closely resembles *P. strialata* Zhang, 1991, the only other member of the genus presently known to have 2 transverse striated lateral alae (Zhang, 1991). The new species is similar in body size to *P. strialata*, but differs by having longer spicules (left spicule 665–874 long, right spicule 247–323 long in *P. mawsonae* vs. left spicule 517–563 long, right spicule 184–220 long in *P. strialata*). In addition, the distal end of the left spicule is divided into 2 branches and the distal end of the right spicule is hooklike in *P. mawsonae*, whereas both spicules have pointed distal ends in *P. strialata*. Finally, *P. strialata* males possess a single preanal sessile papilla, which *P. mawsonae* males lack.

Procyrnea mclennanae n. sp.

(Figs. 23–33)

Diagnosis: Body medium size with distinct transverse striations. Lip region continuous with body contour, lacking constriction. Labial region consisting of 2 pseudolabia and dorsal and ventral labia. Pseudolabia strongly cuticularized at mouth and weakly cuticularized at base, amphid located on base of pseudolabia; 4 small teeth on interior border of pseudolabia; papillae not observed. Dorsal and ventral labia each consisting of 2 submedian lobes, with 2 papillae on each, and a median internal process. Lateral alae are present, with sinuous striations, extending from lip region to middle of male body, and to anterior third of female body, respectively. Right lateral ala wider than left one. Buccal capsule laterally compressed. Esophagus clearly divided into short anterior muscular part and long posterior glandular part. Muscular esophagus 3.1–3.8% (3.4%) TBL in male and 1.7–2.4% (2.1%) TBL in female; glandular esophagus 15.1–16.8% (16.1%) TBL in male and 9.4–10.6% (9.9%) TBL in female. Nerve ring located at posterior part of muscular esophagus. Cervical papillae anterior to nerve ring. Excretory pore posterior to nerve ring.

Male (n = 3): Body length 10.24–12.42 mm (11.53 mm). Maximum width 323–368 (350). Lateral alae 5.16–6.45 mm (5.86 mm) long, 50–52% (50.8%) TBL from anterior end. Right lateral ala 18–24 (22) wide and left lateral ala 6–10 (8) wide. Buccal capsule 32–38 (34) long and 14–16 (15) wide. Muscular esophagus 381–393 (387) long and 38–44 (42) wide; glandular

esophagus 1.68–2.00 mm (1.85 mm) long and 101–139 (126) wide. Nerve ring 290–323 (312) from anterior end; excretory pore 387–432 (402) from anterior end; and cervical papillae 168–190 (175) from anterior end. Posterior end of body curved. Caudal alae well developed and symmetrical, 1064–1097 (1082) long. Caudal alae with longitudinal striations on ventral surface and transverse striations on dorsal surface. Ventral surface of caudal region with prominent longitudinal ridges. Tail with rounded tip, 387–419 (403) long, with 4 pairs of symmetrically arranged pedunculate preanal papillae and 2 pairs of asymmetrically arranged pedunculate postanal papillae. Ten sessile papillae located near tail tip. Spicules unequal and dissimilar. Left spicule 1.52–1.66 mm (1.58 mm) long, with bifurcate distal end. Right spicule 460–539 (502) long, distal end with hooklike structure. Ratio of right spicule–left spicule, 1: 2.8–3.4 (1:3.2). Gubernaculum trowel shaped, with lateral projection from proximal end of sinistral side (Fig. 32), 29–37 (33) long and 31–32 (31) wide.

Female (n = 4): Body length 21.61–23.39 mm (22.70 mm). Maximum width 439–458 (448). Lateral alae 7.18–8.63 mm (7.58 mm) long, 30.9–39.9% (33.5%) TBL from anterior end. Right lateral ala 23–29 (25) wide and left one 8–10 (9) wide. Buccal capsule 32–38 (36) long and 13–19 (16) wide. Muscular esophagus 400–548 (479) long and 48–63 (56) wide; glandular esophagus 2.16–2.32 mm (2.24 mm) long and 152–159 (155) wide. Nerve ring 335–393 (356) from anterior end; excretory pore 419–529 (474) from anterior end; and cervical papillae 171–212 (193) from anterior end. Didelphic. Vulva located behind middle of body, 12.58–15.32 mm (13.76 mm) from anterior end. Tail rounded, 297–355 (321) long, tip of tail with a small rounded protuberance. Eggs ellipsoid, thick shelled, embryonated, 33.8–38.6 (36.2) long, 19.3–20.9 (20.4) wide.

Taxonomic summary

Type host: *Heliomaster constantii* (De Lattre, 1843) (Aves: Apodiformes: Trochilidae).

Type locality: Bosque San Emilio, Sector Santa Rosa, ACG, Guanacaste Province, Costa Rica, 10°51'13"N, 85°36'32"W.

Other locality: Cafetal, Sector Santa Rosa, ACG, Guanacaste Province, Costa Rica (10°51'35"N, 85°36'37"W).

Site of infection: Under the lining of the gizzard.

Prevalence: Sixty-seven percent (2 of 3 birds).

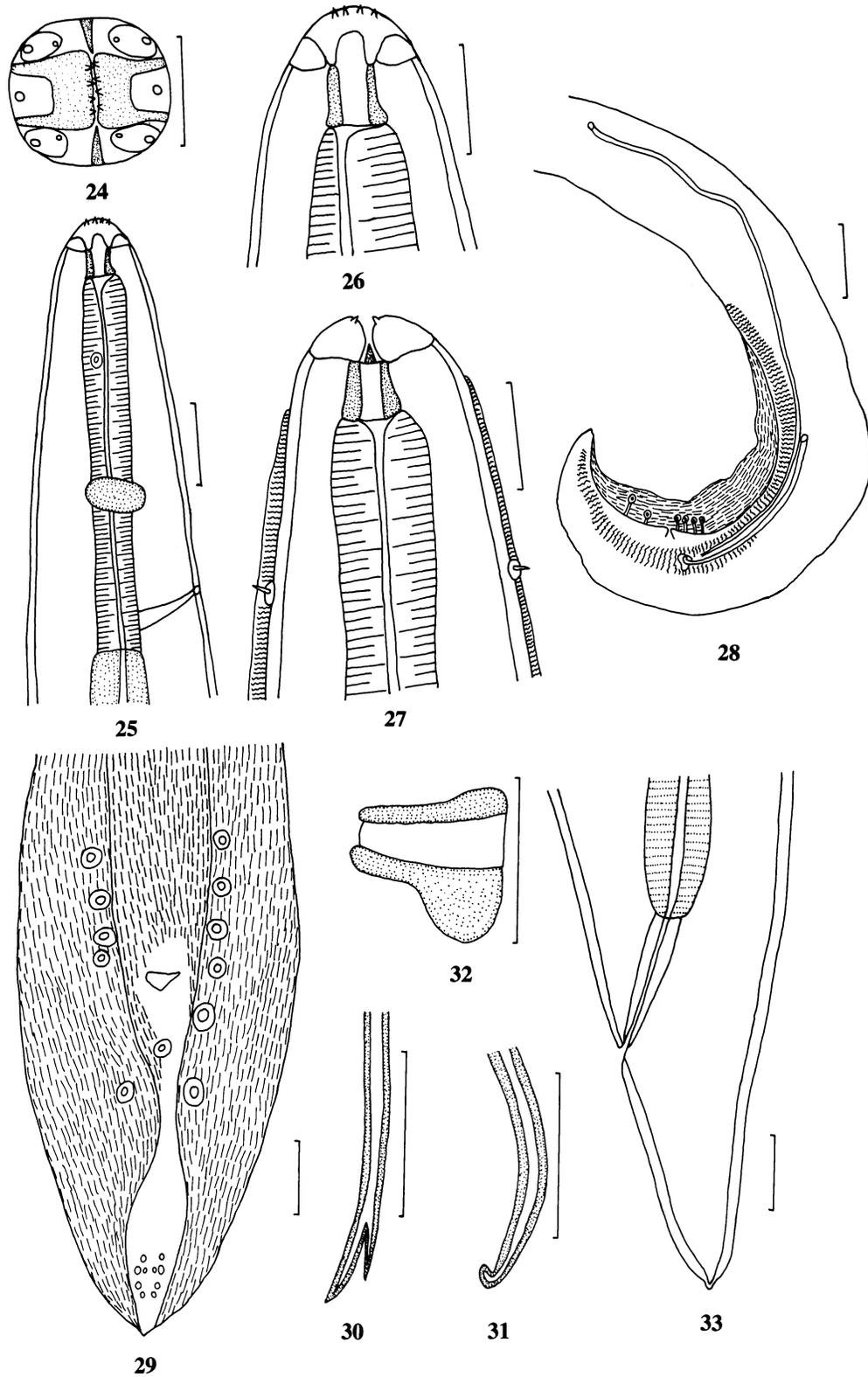
Intensity: Two to 5.

Type specimens: Holotype, USNPC 94013; allotype, USNPC 94014; paratype, USNPC 94015.

Etymology: The new species is named for Professor Deborah A. McLennan, Department of Zoology, University of Toronto, Canada.

Remarks

Procyrnea mclennanae is similar to *P. strialata* Zhang, 1991 and *P. mawsonae* n. sp. in having 2 transverse striated lateral alae, but it can be distinguished from *P. strialata* and *P. mawsonae* in having 4 rather than 3 small teeth on the interior border of the pseudolabia, in having unequal rather than equal lateral alae, and in having longer spicules (left spicule 1.52–1.66 mm long, right spicule 460–539 long in *P. mclennanae* vs. left spicule 517–563 long, right spicule 184–220 long in *P. strialata*, and left spicule 665–874 long, right spicule 247–323 long



FIGURES 23–33. *Procyrnea mclennanae* n. sp. 24. Anterior extremity, en face view. 25. Anterior end of female, lateral view. 26. Anterior extremity of female, lateral view. 27. Anterior extremity of female, ventral view. 28. Posterior end of male, lateral view. 29. Posterior end of male, ventral view. 30. Distal end of left spicule. 31. Distal end of right spicule. 32. Gubernaculum. 33. Posterior end of female, lateral view. Bar = 50 μm (Figures 24, 26, 27, 29, 30, 31, 32); Bar = 100 μm (Figures 25, 33); Bar = 200 μm (Figure 28).

in *P. mawsonae*). In addition, the distal end of the left spicule is divided into 2 branches, and the distal end of the right spicule is hooklike in *P. mclennanae*, whereas both spicules have pointed distal ends in *P. strialata*. Also, *P. strialata* males possess a single preanal sessile papilla, which *P. mclennanae* males lack. Finally, *P. mclennanae* has a rounded female tail, whereas *P. mawsonae* has a pointed female tail.

Procyrnea sp.

(Figs. 34–42)

Diagnosis: Body medium size with distinct transverse striations. Lip region continuous with body contour, lacking constriction. Labial region consisting of 2 pseudolabia and dorsal and ventral labia. Pseudolabia wider at mouth than at base, amphid located on base of pseudolabia; 3 small teeth on interior border of pseudolabia, papillae not observed. Dorsal and ventral labia each consisting of 2 submedian lobes, with 2 papillae on each, and a median internal process. Lateral ala on right side of body lacking sinuous striations, originating posterior to lips, extending posteriorly to middle of male body. Buccal capsule laterally compressed. Esophagus clearly divided into short anterior muscular part and long posterior glandular part. Muscular esophagus 4.4% TBL in male; glandular esophagus 22.2% TBL in male. Nerve ring located at the middle of muscular esophagus. Cervical papillae anterior to nerve ring. Excretory pore immediately posterior to nerve ring.

Male (n = 1): Body length 10.69 mm. Maximum width 326. Lateral ala 6.19 mm long, 58% TBL from anterior end. Buccal capsule 30 long and 27 wide. Muscular esophagus 475 long and 42 wide; glandular esophagus 2.38 mm long and 187 wide. Nerve ring 292 from anterior end; excretory pore 406 from anterior end; cervical papillae 182 from anterior end. Posterior end of body curved. Caudal alae well developed and symmetrical, 774 long. Caudal alae with longitudinal striations on ventral surface and transverse striations on dorsal surface. Ventral surface of caudal region with prominent longitudinal ridges. Tail 271 long, with pointed tip, with 4 pairs of pedunculate preanal papillae arranged symmetrically and 2 pairs of pedunculate postanal papillae arranged asymmetrically. Twelve sessile papillae located near the tail tip. Spicules unequal and dissimilar. Left spicule 1.43 mm long with bifid distal end. Right spicule 410 long, with rounded distal end. Ratio of right spicule–left spicule 1:3.5. Gubernaculum trowel shaped, with digitiform projection extending distally from sinistral side (Fig. 42), 49 long and 42 wide.

Taxonomic summary

Host: *Campephilus guatemalensis* (Hartlaub, 1844) (Aves: Piciformes: Picidae).

Locality: Estacion Maritza, Sector Maritza, ACG, Guanacaste Province, Costa Rica (32°65'55"N, 37°27'68"W).

Site of infection: Under the lining of the gizzard.

Prevalence: Twenty five percent (1 of 4 birds).

Intensity: One male in 1 host.

Voucher specimen: USNPC 94019.

Remarks

We are convinced this specimen represents an undescribed species but refrain from naming it at this time because of the

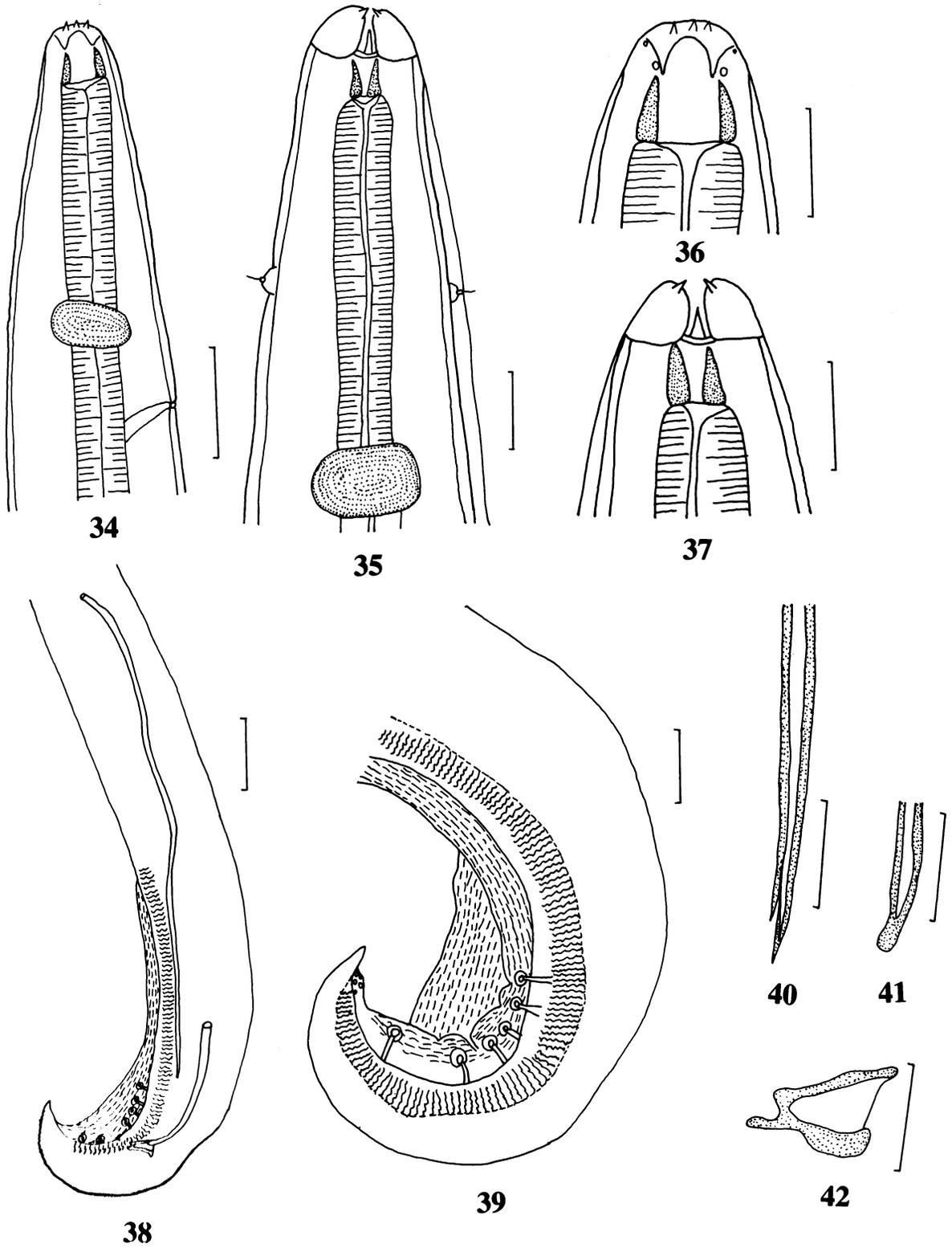
paucity of material. The single male resembles *P. suraiyae* (Ali, 1961) Chabaud, 1975, *P. tulostoma* (Hemprich and Ehrenberg, 1866) Chabaud, 1958 and *P. unilateralis* (Molin, 1860) Chabaud, 1958 in possessing a single and long lateral ala, but can be distinguished from *P. suraiyae* and *P. tulostoma* in the length of the left spicule (1.43 mm long in *Procyrnea* sp. vs. 0.93–1.12 mm in *P. suraiyae* and 1.9 mm in *P. tulostoma*), in having complex spicule morphology (left spicule with bifid distal end and right spicule with rounded distal end) rather than spicules with simple pointed distal ends, and in having lateral alae extending from the lip region rather than from immediately posterior to the cervical papillae. The new species differs from *P. uncinipenis* in having a spicule ratio of 1:3.5 rather than 1:2.5, in having the left spicule with a bifid rather than alate distal end, and in lacking a single preanal papilla.

DISCUSSION

Each species of *Procyrnea* reported in this study was collected in a single host species, each of which is similar in having well-defined territories, visiting feeding areas on a continual daily basis. However, beyond that, the 4 host species represent a diverse sample of tropical dry forest birds, habitats, and feeding ecologies. The roadside hawk (*B. magnirostris*), so called because of its habit of perching high in trees near open fields and roads, is a small (38 cm, 290 g) predator of large insects, reptiles, and small mammals. It is rarely found in deep or humid parts of the forest, preferring more xeric and open habitats. In contrast, the thicket tinamu (*C. cinnamomeus*) is rarely seen away from the dense understory of old-growth and secondary forest, and is an omnivore of many different foods picked up from the ground and low vegetation. Tinamus can be found throughout the tropical dry forest but are most commonly encountered around water-dominated terrestrial habitats, such as riparian edges and emergent shrubbery. The pale-billed woodpecker (*C. guatemalensis*), like all climbing woodpeckers, is found mostly in the upper canopy of old-growth and mature secondary growth forests, feeding on boring beetles and their larvae. The plain-capped starkthroat, *H. constantii*, like all hummingbirds, is generally assumed to be a florivore and nectarivore. Whereas this is likely to be true during the time of year when flowers are present, some specimens of *H. constantii* infected with *P. mclennanae* were collected in the dry forest during the dry season, when there are no flowers available. During such periods, hummingbirds likely sustain themselves on a diet of insects. We previously reported a prosthognomid digenean, *Whallwachsia illuminata* Zamparo et al., 2003, in another hummingbird of the tropical dry forest region of the ACG (Zamparo et al., 2003). Known prosthognomid life cycles involve insect second intermediate hosts, and we suspect *P. mclennanae* is also transmitted by insect intermediate hosts.

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FIGURES 34–42. *Procyrnea* sp. 34. Anterior region of female, lateral view. 35. Anterior end of female, dorsal view. 36. Anterior extremity of female, lateral view. 37. Anterior extremity of female, ventral view. 38, 39. Posterior end of male, lateral view. 40. Distal end of left spicule. 41. Distal end of right spicule. 42. Gubernaculum. Bars = 100 μ m (Figures 34, 39); Bar = 50 μ m (Figures 35, 36, 37, 40, 41, 42); Bar = 200 μ m (Figure 38).

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