

Acta Medica Okayama

Volume 8, Issue 4

1952

Article 7

MARCH 1954

Parasitic Worms from Celebes. Part 8. Acantho-cephala

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Abstract

Echinorhynchidae Cobbold, 1879 1. Acanthocephalus bufonis (Shiple, 1903) Rhadinorhynchidae Travassos, 1923 2. Rhadinorhynchus celebesensis n. sp. 3. Filisoma indicum van Cleave, 1928 Quadrigyridae van Cleave, 1920 4. Pallisentis gaboes (MacCallum, 1918) van Cleave, 1928 Gigantorhynchidae Hamann, 1892 5. Empodius sp. Neoechinorhynchidae Hamann, 1892 6. Neoechinorhynchus longilemniscus n. sp.

PARASITIC WORMS FROM CELEBES

Part 8. Acanthocephala

With 1 Plate

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Received for publication on April 22, 1953

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ECHINORHYNCHIDAE Cobbold, 1879

1. *Acanthocephalus bufonis* (Shiple, 1903)
syn. *Acanthocephalus sinensis* van Cleave, 1937

Habitat. Small intestine of *Rana tigrina* and *Bufo asper*.

Material. 14 males and 15 females fixed in 70% alcohol, stained with hematoxylin and mounted in balsam. They were subjected to cover glass pressure during dehydration.

Proboscis subcylindrical, 0.28-0.7 × 0.22-0.43 mm; proboscis hooks in 15-19 longitudinal rows of 5-6 each, 60-120 μ in length. Neck 0.12-0.15 mm long. Proboscis sheath 0.4-0.8 × 0.2-0.42 mm, with elliptical ganglion near its posterior end. Lemnisci 0.75-

1.45×0.056–0.17 mm. Testes oval, 0.5–0.8×0.25–0.66 mm, directly tandem in middle third of trunk which is 4.2–8.1 mm by 0.6–1.4 mm in the male and 4.3–17 mm by 0.9–1.8 mm in the female. Cement glands long and slender, reaching to posterior testis. Säftigen's pouch 0.25–0.42 mm in diameter. Ejaculatory duct provided with sphincter; digitiform posterior rays of muscular cap slender, 28 in number. Uterus 0.3–0.7 mm long, containing very long vaginal funnel. Vaginal sphincter 90–135 μ in diameter. Vaginal bulb 70–90 μ in diameter. Female genital pore ventro-terminal. As measured in life the outer egg shell containing filaments is 75–84 μ by 25–27 μ , the thick middle shell without polar prolongation is 60–62 μ by 18–21 μ , and the embryo 48–52 μ by 15–18 μ .

Van Cleave differentiated his species *A. sinensis* from *A. bufonis* Shipley merely by difference in size of the embryos, but the difference is too small to justify his procedure as is evident from the following table of comparison.

<i>A. sinensis</i> van Cleave	<i>A. bufonis</i> Shipley
Outer shell ?	76–78×23–27 μ (Joyeux et Baer) 75–84×25–27 μ (Yamaguti)
Embryo 45–60×12–15 μ	45–52×15–18 μ (Yamaguti)

RHADINORHYNCHIDAE Travassos, 1923

2. *Rhadinorhynchus celebesensis* n. sp. (Fig. 1)

Habitat. Intestine of *Caranx* sp. (type host) and *Synagris* sp.

Material. Four immature males (2 from each host).

Body slender, 6.25 mm in length, with maximum breadth of 0.4 mm at about level of posterior end of proboscis sheath. Proboscis approximately claviform, 0.52–0.6×0.28–0.4 mm; proboscis hooks in 22 longitudinal rows of 11–12 each, largest subapical ones 70–80 μ long, smallest basal ones 30–35 μ long. Neck 0.15–0.32×0.3–0.32 mm. Trunk armed anteriorly with spiniform hooks, which are 35–60 μ long, embedded in cuticular folds with the sharp point directed backward, and are arranged in 20–22 somewhat irregular rows of 7–10 each. 0.1–0.2 mm behind this patch at a distance of 0.5–0.75 mm from the anterior end of the trunk there is

an incomplete ring of 10-12 spines 40-65 μ long, which may or may not be followed by a transverse row of 2 or 3 spines 60-63 μ long. Proboscis sheath subcylindrical, 1.05-1.4 \times 0.15-0.3 mm, containing an elliptical ganglion (90-100 \times 30-50 μ) at about junction of anterior with middle third of its length. Lemnisci slender, folded upon itself or extending to anterior testis. Testes oval, 0.16-0.3 \times 0.1-0.15 mm, situated one behind the other behind middle of trunk. Cement glands and other terminal genitalia not yet definitely developed. Genital pore terminal.

Though imperfectly described from immature specimens this worm is easily distinguished from the related species, *R. selkirki* van Cleave, 1920 and *R. carangis* Yamaguti, 1939, from *Caranx*.

3. *Filisoma indicum* van Cleave, 1928. (Figs. 2-3)

Habitat. Intestine of *Scatophagus argus* (Cov. et Valenc.).

Material. Three males and three females, all mature, fixed in alcohol, stained with hematoxylin and subjected to cover glass pressure while dehydrated.

Body very slender, 28-34 \times 0.4-0.55 mm in male, 38-56 \times 0.65-0.95 mm in female. Proboscis very narrow, tubular, gently curved ventrally when extended, 0.6-0.8 mm long¹⁾, 60-100 μ wide; proboscis hooks 15-50 μ long, arranged in 14-17 longitudinal rows of 20-24 each. Though neither mentioned nor illustrated in the figure by van Cleave, the distal hooks of the two ventral rows (7-10 in each row) are stout, while the others are rather slender, the subapical hooks being the largest and the basal the smallest. Neck conical. Trunk uniform in width; hypodermic nuclei numerous, scattered, variable in size and shape. Proboscis sheath double-walled, cylindrical, 1.3-1.9 \times 0.15-0.2 mm in the male, 1.5-2.0 \times 0.2-0.23 mm in the female, containing ganglion at the posterior extremity. Lemnisci nearly as long as proboscis sheath (1.5-2.1 mm long), 0.1-0.15 mm wide, containing a series of elongated nuclei.

Testes elliptical, 1.7-2.2 \times 0.35-0.5 mm, placed at anterior part of posterior half of trunk, contiguous or only slightly separated. Vesicula seminalis forming a bulbous dilatation at posterior end. Cement glands 6 in number, very much elongated, extending

1) When fully extended the proboscis may probably attain a length of 1.5 mm even in the male as in van Cleave's type.

between posterior testis and Säfteigen's pouch, containing numerous rounded nuclei, their attenuated ducts running along Säfteigen's pouch, three on each side. Säfteigen's pouch inverted claviform, $1.3-1.45 \times 0.3-0.36$ mm. Bursal cap with two moderately large anterior pouches and about 20 digitiform posterior rays.

Floating ovaries elongated. Uterine bell cup-shaped, 0.12×0.12 mm; uterus tubular or fusiform, provided with thick wall of circular muscle fibers, $0.6-0.9$ mm long; vaginal funnel $0.14-0.15 \times 0.045-0.06$ mm, vaginal sphincter $72-90 \mu$ in diameter, vaginal bulb $55-90 \mu$ in diameter. Vulva ventroterminal. Between this pore and the extreme posterior end of the body is a hemispherical protuberance, but there are no blunt, ventrally produced, paired papillae as observed by van Cleave. As measured in life the elliptical outer egg shell is $54-57 \times 16-17 \mu$ and the middle shell with polar prolongations $42-45 \times 14-17 \mu$; the embryo enclosed in the elliptical inner shell is $27-33 \times 11-13 \mu$.

QUADRIGYRIDAE van Cleave, 1920

4. *Pallisentis gaboos* (MacCallum, 1918) van Cleave, 1928 (Figs. 4-5)

Syn. *Echinorhynchus gaboos* MacCallum, 1918

Habitat. Small intestine of *Ophiocephalus striatus* Bloch (ikan gaboos).

Material. A number of mature and immature specimens of both sexes, fixed in alcohol, stained with hematoxylin and mounted in balsam.

Male. Body slender, tubular, $2.8-9.7$ mm in length, $0.3-0.45$ mm in width. Proboscis subcylindrical or subglobular, $0.14-0.18 \times 0.16-0.25$ mm, armed with 10 oblique rows of 4 hooks each; anteriormost hooks the largest, well curved, $60-90 \mu$ from anterior end of root to tip of blade; posteriormost hooks gently curved, rather spiniform, $22-30 \mu$ long. Neck cylindrical, smooth, $0.12-0.25$ mm long. Trunk may show false segmentation when contracted, provided anteriorly with two patches of spines which are $18-45 \mu$ long and enclosed in cuticular sheath; the anterior patch commencing at the anterior end of the trunk extends for a distance of $0.2-0.4$ mm and consists of spines which are set for the most part in regular longitudinal rows and much more closely than those of the

posterior patch. The number of the rows or of the spines in each row is unable to determine owing to irregular arrangement in the anterior part. The posterior patch following the anterior extends as far back as the region of the anterior testis for a distance of 1.15-3.5 mm and consists of spines which are narrower and sparser posteriorly.

Proboscis sheath subcylindrical, $0.42-0.7 \times 0.095-0.22$ mm, containing an elliptical ganglion near its posterior end. Lemnisci narrow, 1.0-3.0 mm long. Testes cylindrical to elliptical, $0.175-1.2 \times 0.08-0.21$ mm, situated one immediately behind the other, commencing at about midbody or a little anterior or posterior to it. Cement gland syncytial, cylindrical, $0.21-1.9 \times 0.08-0.28$ mm; cement reservoir oval or elliptical, $0.135-0.5 \times 0.06-0.25$ mm, with symmetrical efferent ducts running backward dorsal to vesicula seminalis which extends ventrally between the cement reservoir and the bursal cap. Säfftigen's pouch elongated longitudinally dorsal to cement ducts and vesicula seminalis.

Female. Body $5.2-16 \times 0.2-0.55$ mm. Proboscis $0.15-0.2 \times 0.18-0.26$ mm; proboscis hooks arranged as in male, the largest anterior $75-90 \mu$ long, the smallest posterior 30μ long. Neck $0.18-0.25$ mm long. Trunk forming one or more constriction ring between transverse rows of posterior spines; anterior spines closely set in irregular longitudinal rows of up to 13 each, up to $34-48 \mu$ long, covering a stretch of $0.25-0.4$ mm; posterior spines $20-30 \mu$ long, disposed in $41-53$ transverse rows of up to 13 each, covering a stretch of $3-7.5$ mm, number of spines in each transverse row decreasing posteriorly. Proboscis sheath $0.6-0.75 \times 0.15-0.18$ mm. Lemnisci up to 3 mm long. As measured in life the elliptical outer egg shell is $93-130 \mu$ by $33-45 \mu$, the middle shell without polar prolongation, $84-117 \mu$ by $30-42 \mu$, and the inner covering the embryo directly, $57-90 \mu$ by $25-39 \mu$.

MacCallum's description of the species being inadequate, the present identification should be looked upon as provisional.

GIGANTORHYNCHIDAE Hamann, 1892

5. *Empodius* sp. (Figs. 6-7)

Habitat. Small intestine of *Gallus gallus*.

Material. 3 immature females

Body 40-60×2 mm, corrugated transversely and apparently pseudosegmented. It seems probable that mature worms may attain a length of 100 mm when fully extended. Proboscis rounded conical, 0.5×0.5-0.6 mm; proboscis hooks strongly curved, arranged in 18-20 longitudinal rows of 5-6 each, measuring 50-70 μ from base to height of curve. They are embedded in the cuticle for more than half their length, with the backwardly directed point projecting over the cuticle and the nodular base provided with lamellar thickenings on each side. Neck much broader than proboscis over which it may be folded, provided for its greater anterior part with over 30 (32?) rather irregular longitudinal rows of 5-6 curved spines each. The integument of the neck is directly continuous with that of the proboscis and somewhat thickened posteriorly, with a line of demarcation or a circular fold by which it is marked off distinctly from the trunk. The neck spines are slender and embedded for the greater part in the cuticle over which projects the gently curved point. Proboscis sheath subcylindrical, 1.3-1.4 mm long, divided into two portions; the anterior portion occupying the greater part of the organ has a thick (about 80 μ dorsally) wall of circular muscle fibers outside the inner wall and contains an elliptical ganglion about 0.2 mm long behind its middle dorsal to the proboscis retractor; the posterior portion is devoid of this thick outer wall of circular muscle, so that the inner wall of fine circular muscle fibers enclosed in a thin capsule is exposed to the body cavity. The proboscis retractor attached to the apex of the proboscis penetrates the outer wall of the sheath ventrally at its posterior end, while the paired retinacula leave the sheath laterally at the junction of the two portions. Lemnisci 3.8-4.1 mm long by 0.3 mm wide, containing 6 oval to elliptical nuclei.

Trunk with numerous lacunar rings. Uterine bell funnel-shaped, 0.25×0.5 mm. Uterus cylindrical, 0.6 mm long. Vaginal sphincter dumb-bell-shaped, 0.18×0.1 mm. Vaginal bulb 0.13 mm in diameter, opening ventroterminally. Eggs not yet developed. Numerous, elliptical germ-balls scattered in body cavity.

From the arrangement of the proboscis hooks it seems certain that the present worm represents a new species of the genus *Empodius*. The specific determination is reserved for a later author who will have more complete material at his disposal.

NEOECHINORHYNCHIDAE Hamann, 18926. *Neoechinorhynchus longilemniscus* n. sp.

(Figs. 8-9)

Habitat. Small intestine of *Cynoglossus* sp.**Material.** Two males and one female, all not yet fully mature.

Body very slender, 5-9×0.4 mm in male, 12×0.5 mm in female. Proboscis subglobular, 0.12-0.15×0.14-0.15 mm. Proboscis hooks in 3 circles of 6 each, anterior one 70-75 μ from tip of blade to height of curve; middle and posterior one spiniform, without backward root, 33-40 μ and 25-30 μ in respective length. Neck absent. Trunk uniform in width, rather pointed at posterior extremity, with two median (a dorsal and a ventral) bands of oval to elliptical nuclei throughout its length in inner muscle wall. Proboscis sheath cylindrical, about 3 mm long by 0.1-0.11 mm wide, containing ganglion at base. Lemnisci filiform, excessively long, reaching to near posterior extremity.

Testes oval, elliptical or more elongate, situated one behind the other in posterior half of trunk. Cement gland and cement reservoir much elongated. Details of male and female terminal genitalia are unable to make out owing to poor state of preservation. Genital pore terminal in both sexes.

This species is characterized by the excessive length of the lemnisci, hence the specific name.

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Explanation of Plate

- Fig. 1. Anterior extremity of male of *Rhadinorhynchus celebesensis*.
- Fig. 2. Posterior extremity of male of *Filisoma indicum*.
- Fig. 3. Posterior extremity of female of *Filisoma indicum*.
- Fig. 4. Male of *Pallisentis gaboos*.
- Fig. 5. Proboscis of male of *Pallisentis gaboos*.
- Fig. 6. Anterior extremity of female of *Empodius* sp.
- Fig. 7. Posterior extremity of female of *Empodius* sp.
- Fig. 8. Male of *Neoechinorhynchus longilemniscus*.
- Fig. 9. Proboscis of male of *Neoechinorhynchus longilemniscus*.

Abbreviations used in Figures

bc = bursa copulatrix, c = bursal cap, cg = cement gland, cr = cement reservoir, e = egg, g = ganglion, gp = genital pore, l = lemniscus, n = neck, o = ovary, prr = proboscis retractor, ps = proboscis sheath, r = retinaculum, sp = Säfteigen's pouch, sph = vaginal sphincter, t = testis, u = uterus, ub = uterine bell, v = vulva, vb = vaginal bulb, vf = vaginal funnel, vs = vesicula seminalis.

YAMAGUTI: PARASITIC WORMS MAINLY FROM CELEBES—ACANTHOCEPHALA

