

## Studies on Indian Marine Cercariae: Two New Echinostome Cercariae

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**ABSTRACT:** Two new echinostome cercariae parasitizing *Cerithidea cingulata* Gmelin in India are described. *Cercaria bengalensis* II sp. n. is characterized by 23 collar spines and primary excretory tubules with lateral branches between the ventral sucker and pharynx. *Cercaria bengalensis* III sp. n. has 35 collar spines arranged in an uninterrupted semicircle with a gap on the ventral side and primary excretory tubules without lateral branches.

**KEY WORDS:** *Cercaria bengalensis* II sp.n., *Cercaria bengalensis* III sp. n., *Cerithidea cingulata*, Bay of Bengal, Echinostomatidae, Trematoda, India.

In a survey of marine and brackish water cercariae from the Coromandel coast, Bay of Bengal, India, 2 new species of echinostome cercariae were obtained from the snail *Cerithidea cingulata* Gmelin. One has 23 collar spines and may develop into adults of an *Acanthoparyphium* species; the other has 35 collar spines. The cercariae are designated here as *Cercaria bengalensis* II and *Cercaria bengalensis* III, respectively, after the geographical region from which the snails were collected.

### Materials and Methods

Naturally emerged cercariae and developmental stages were obtained from snails collected during 1975-1979. The methods of Cable (1956) were used to study cercariae. Azure I-Schiff stain was employed to determine the number of collar spines (Hanumantha Rao and Murthy, 1972). Measurements are in micrometers and were taken for each species from 10 heat-killed specimens. Figures were drawn with the aid of a camera lucida from heat-killed specimens to show general features; other details were added freehand.

### Results

#### *Cercaria bengalensis* II sp. n. (Figs. 1-4)

**HOST:** *Cerithidea cingulata* Gmelin.

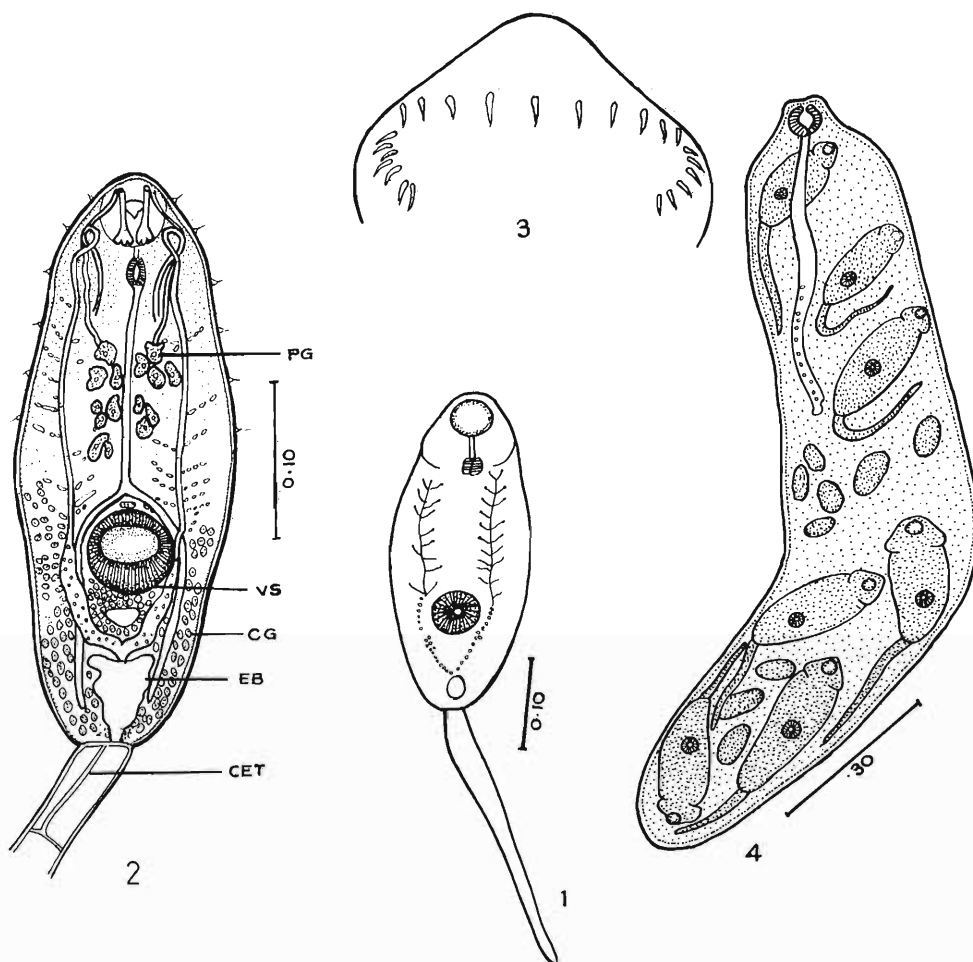
**LOCALITY:** Mangrove area near Visakhapatnam Harbour, brackish water of Bheemunipatnam (Bay of Bengal).

**PREVALENCE OF INFECTION:** 108 out of 9,717 snails.

**SPECIMENS DEPOSITED:** USNM Helminthological Collection Accession No. 79547.

### Description

Body elongate 336-368 long, 140-160 wide, slightly tapering anteriorly; with distinct collar near pharyngeal level. Tegument spinulate, provided with few bristles set on papillae. Tail shorter than body, 288-304 long, 32 wide, attached subterminally. Oral sucker terminal, 42-44 in diameter, weakly muscular. Ventral sucker circular, 54-60 in diameter, about two-thirds body length from anterior end. Collar with 23 spines in single row forming a semicircle with wide ventral gap. Spines largest dorsally, decreasing in size toward ventral gap. Corner spines not distinct as such. Prepharynx short. Pharynx 20 in diameter followed by long, narrow esophagus bifurcating immediately anterior to ventral sucker. Ceca slender, extending to excretory bladder. Penetration glands of 2 types; 1 pair of lobed glands situated within and near posterior border of oral sucker, with ducts opening separately at pores near anterior end; the other type consisting of 12 large glands on either side of esophagus, with ducts passing anteriorly close to oral sucker to open at distinct pores near dorsal lip. Cystogenous glands with opaque, granular cytoplasm throughout body posterior to oral sucker. Excretory bladder expansive with thick muscular wall. Caudal excretory tubule extending into tail about one-fifth its length to bifurcate and open laterally. Primary excretory tubules voluminous, originating from midanterior portion of bladder but tapering gradually, tubules bearing lateral diverticula before turning posteriorly near oral sucker. Flame cells obscured by dense cystogenous glands. Genital rudiment represented by preacetabular and postacetabular cell masses.



Figures 1-4. *Cercaria bengalensis* II sp. n. Abbreviations: CET = caudal excretory tubule, CG = cystogenous gland, EB = excretory bladder, PG = penetration gland, VS = ventral sucker. 1. Entire cercaria, ventral view. Scale bar = 100  $\mu$ m. 2. Ventral view of cercarial body showing details (cystogenous glands omitted from preacetabular level). Scale bar = 100  $\mu$ m. 3. Collar showing arrangement of spines (freehand drawing). 4. Redia. Scale bar = 300  $\mu$ m.

#### Behavior

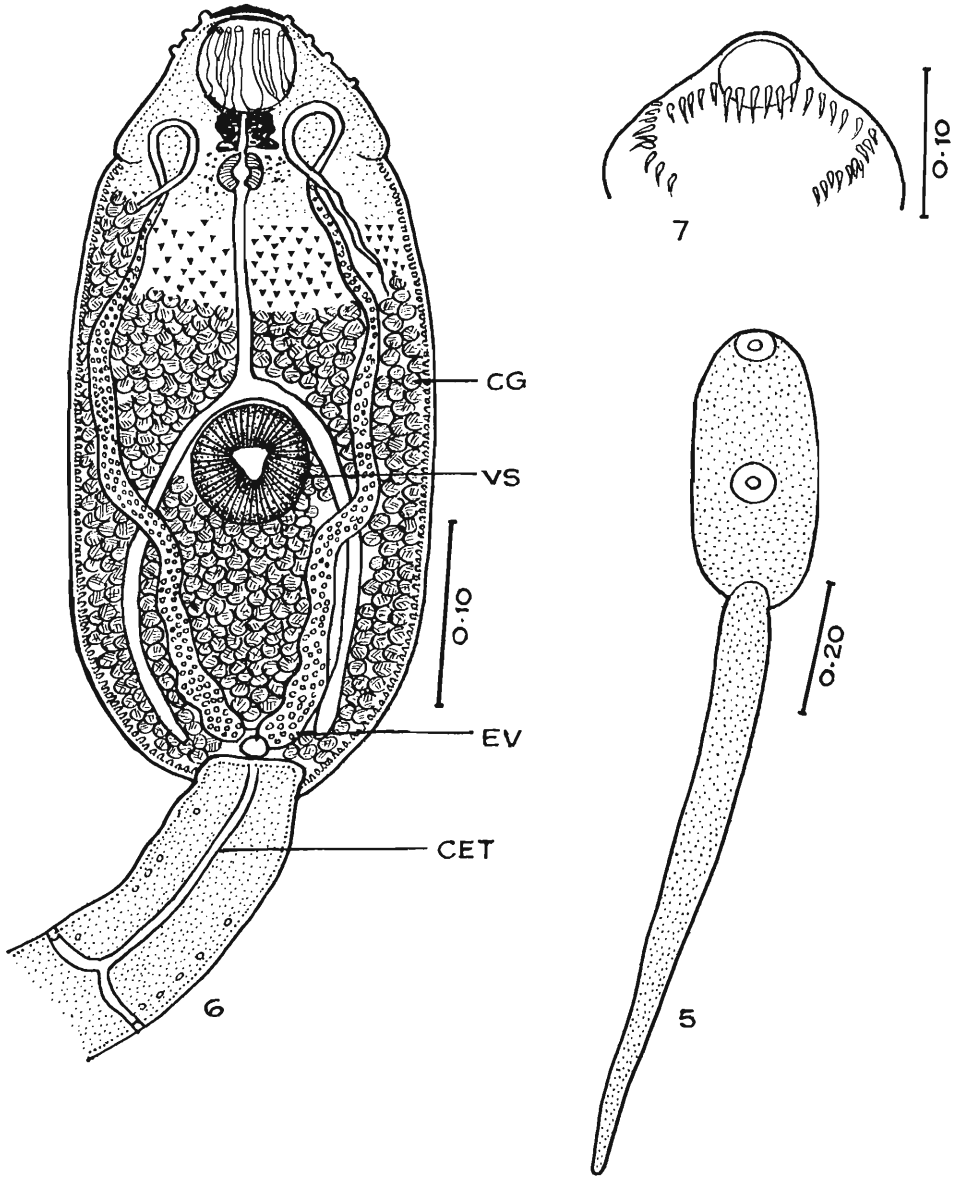
Cercariae emerging in large numbers throughout day and swimming actively with body strongly contracted and tail lashing vigorously. Rest periods very short with body stretching for a moment.

#### Redia

Redia sac-like, with distinct collar, 1,418-1,440 long by 293-336 wide; pharynx 52-54 long, gut narrow, one half body length long. Containing 10-15 cercariae and germ balls in various stages of development.

#### Discussion

Marine echinostome cercariae possessing 23 collar spines are *Acanthoparyphium cercaria* Yamaguti, 1934, *Cercaria yamagutii* Ito, 1957, *Cercaria* III Maxon and Pequegnat, 1949, and *Cercaria caribbea* II Cable, 1956; cercaria of *Acanthoparyphium spinulosum* Johnston described by Bearup (1960) from Australia and Martin and Adams (1961) from United States; and cercaria of *Acanthoparyphium paracharadrii* described by Velasquez (1964). *Cercaria caribbea* II and the cercaria of *A. paracharadrii* differ from *C. bengalensis* II in body-tail proportions,

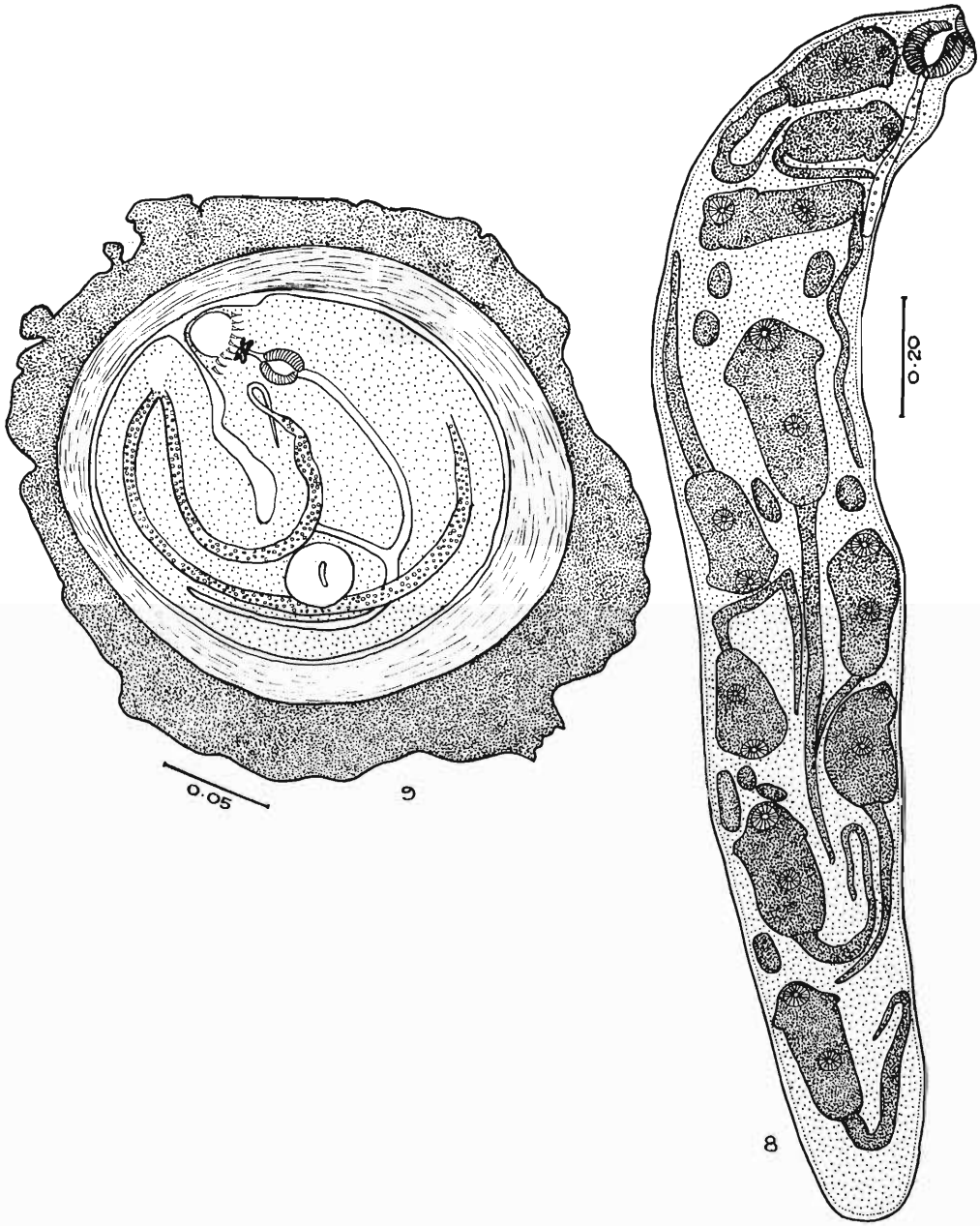


Figs. 5-7. *Cercaria bengalensis* III sp. n. Abbreviations: CET = caudal excretory tubule, CG = cystogenous gland, EV = excretory vesicle, VS = ventral sucker. 5. Entire cercaria, ventral view. Scale bar = 200 µm. 6. Ventral view of body of cercaria. Scale bar = 100 µm. 7. Ventral view of cephalic end showing collar spines. Scale bar = 100 µm.

by having a smooth tegument and in lacking cephalic glands. *Cercaria yamagutii* differs in the larger size of body and tail and in having 3 pairs of penetration glands (Ito, 1957). The cercaria of *A. spinulosum* has 4 penetration glands. *Cercaria* III differs in body-tail measurements, sucker ra-

tio, and its encystment within and outside rediae (Maxon and Pequegnat, 1949).

Cercariae of species of *Acanthoparyphium* so far recorded have 23 collar spines in a single row and a characteristic excretory system with the primary excretory tubules bearing about 10 pairs



Figures 8, 9. *Cercaria bengalensis* III sp. n. 8. Redia. Scale bar = 200  $\mu$ m. 9. Metacercaria. Scale bar = 50  $\mu$ m.

of lateral diverticula filled with concretions. The available knowledge on the life cycles of *Acanthoparyphium* species indicates that larval stages develop in prosobranch snails and encyst as

metacercariae either in the same snail or in lamellibranchs, and that the adults occur in birds. It is likely that *Cercaria bengalensis* II sp. n. may develop into a species of *Acanthoparyphium* in

local birds, but neither adults nor metacercariae belonging to this genus have so far been recorded from India.

*Cercaria bengalensis* III sp. n.  
(Figs. 5–9)

HOST: *Cerithidea cingulata* Gmelin.

LOCALITY: Mangroves near harbor area of Visakhapatnam, brackish water area of Bheemunipatnam, Balacheruvu and Kakinada (Bay of Bengal).

PREVALENCE OF INFECTION: 9 out of 9,717 snails.

SPECIMENS DEPOSITED: USNM Helminthological Collection Accession No. 79548.

### Description

Body 400–422 long and 160–208 wide, region posterior to pharyngeal level with triangular spines in quincuncial arrangement, diminishing in size and density toward posterior end. Pigment granules brownish, scattered throughout body, concentrated near posterior border of oral sucker. Tail simple, 896–914 long and 64–80 wide, twice as long as body, attached subventrally. Oral sucker terminal, 45–48 in diameter. Ventral sucker circular, 60–69 in diameter, situated below midline. Mouth subterminal, leading into small prepharynx and globular pharynx, 18–20 in diameter, situated beneath pigment mass. Esophagus long, bifurcating just anterior to ventral sucker; ceca narrow extending to posterior end of body. Collar with 35 rod-shaped spines, nonuniform in size, in single continuous row ending with irregularly arranged corner spines with gap on ventral side. Cephalic glands limited to oral sucker, their number not determined but with ducts opening as 12 distinct pores at tip of oral sucker. Body with dense, rod-filled cystogenous cells. Excretory bladder small, oval, thin-walled. Primary excretory tubules broad at base, ascending segment filled with numerous refractile bodies. Descending segment ciliated, extending to posterior end of body and turning anteriorly before receiving secondary tubules. Caudal excretory duct extending one-sixth of tail length, bifurcating to open at lateral pores on tail.

### Behavior

Cercariae negatively phototactic, emerging in moderate numbers throughout day and swimming actively with body contracted into spherical mass and tail lashing vigorously, describing characteristic 8-shaped movements.

### Redia

Elongate, 1,952–2,128 long by 320–400 wide; with distinct collar and procruscula at level of posterior third of body. Pharynx well developed, 96–108 by 86–100. Cecum one-sixth body length containing yellowish-orange pigment granules. Birth pore below pharynx.

### Metacercaria

Cercariae encysting freely on solid objects and on sides, as well as bottom, of container. Metacercarial cysts spherical, 240–272 by 240–256 in size, provided with thin hyaline layer and thick fibrous inner layer. Metacercaria lying folded and showing active movements inside cyst.

### Discussion

*Cercaria bengalensis* III sp. n. closely resembles *Cercaria* I, described by Maxon and Pequegnat (1949) from *Cerithidea californica*, in possessing 35 collar spines and in other body features, but it clearly differs from the latter in lacking lytic gland cells between oral and ventral suckers, in the larger size of the tail, and in showing negative phototaxis. Among the other known echinostome cercariae bearing collar spines, the present cercaria shows resemblance to *Cercaria fuscata* described by Holliman (1961) and to cercaria of *Himasthla rhigedana* described by Adams and Martin (1963) and *Himasthla littorinae* described by Stunkard (1966). However, unlike *C. bengalensis* III sp. n., *C. fuscata* has 49 collar spines, with smooth tegument. The cercaria of *H. rhigedana* has 39 collar spines and a saccular excretory bladder, and that of *H. littorinae* has 29 collar spines.

### Literature Cited

- Adams, J. E., and W. E. Martin. 1963. Life cycle of *Himasthla rhigedana* Dietz, 1909 (Trematoda: Echinostomatidae). Transactions of the American Microscopical Society 82:1–6.
- Bearup, A. J. 1960. Life history of *Acanthoparyphium spinulosum* Johnston, 1917 (Trematoda: Echinostomatidae). Australian Journal of Zoology 8:217–225.
- Cable, R. M. 1956. Scientific survey of Porto Rico and the Virgin Islands. Marine Cercariae of Porto Rico. The New York Academy of Sciences. Scientific Survey of Porto Rico and the Virgin Islands, Part 4 16:490–577.
- Hanumantha Rao, K., and A. S. Murthy. 1972. Staining spines of echinostomes by application of Azure I–Schiff direct reaction. Stain Technology 47:163.
- Holliman, R. B. 1961. Larval trematodes from the Apalachee Bay area, Florida with a check list of

- known marine cercariae arranged in a key to their super-families. *Tulane Studies in Zoology* 9:1-74.
- Ito, J.** 1957. Studies on the brackish water cercariae in Japan. III. Three new echinostome cercariae in Tokyo bay, with a list of Japanese echinostome cercariae (Trematoda). *Japanese Journal of Medical Science and Biology* 10:439-453.
- Martin, W. E., and J. E. Adams.** 1961. Life-cycle of *Acanthoparyphium spinulosum* Johnston, 1917 (Echinostomatidae: Trematoda). *Journal of Parasitology* 47:777-782.
- Maxon, W. E., and W. E. Pequegnat.** 1949. Cercariae from upper Newport Bay. *Journal of Entomology and Zoology* 41:30-55.
- Stunkard, H. W.** 1966. The morphology and life history of the digenetic trematode, *Himasthla littorinae* sp. n. (Echinostomatidae). *Journal of Parasitology* 52:367-372.
- Velasquez, C. C.** 1964. Life history of *Acanthoparyphium parachadrii* sp. nov. (Trematoda: Echinostomatidae). *Journal of Parasitology* 50:261-265.

### Presentation of the 1991 Anniversary Award to Dr. Frank G. Tromba

It is indeed an honor and an immense pleasure to have the privilege of presenting to Dr. Frank G. Tromba the 1991 Anniversary Award. Dr. Tromba was elected to membership in 1951 and has since served the Helminthological Society of Washington in a variety of capacities. He was elected Recording Secretary in 1957, served as Council Member-at-Large from 1960 through 1961, elected Vice-President in 1962, and President in 1963.

It is of interest to note, that his election to President of this Society occurred on November 16, 1962, almost 30 years to the date of this present meeting. The election took place at the Log Lodge on the campus of the Agricultural Research Station. Dr. Tromba continued to serve the Helminthological Society in a selfless manner and was Editor of the Proceedings from 1966 to 1970. He authored or co-authored about a dozen papers in the Proceedings, many of them on sundry aspects of the biology of *Ascaris*, and also contributed several presentations at our local meetings. He was elected a Life Member in 1983.

On behalf of the membership of the Helminthological Society of Washington and the Anniversary Award Committee, I would like to thank Dr. Tromba for his contributions to the Society and congratulate him on receiving this award.

Edward H. Michelson  
Chairman,  
Anniversary Award Committee, 1991