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Binder 030, Cephalogonimidae A-Z [Trematoda Taxon Notebooks]

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CEPHALOGONIMIDAE Nicoll, 1915

Family diagnosis. — Body small, spined. Acetabulum small, in anterior half of body. Oral sucker subterminal. Pharynx present. Esophagus short. Testes one behind the other, in anterior part of hindbody. Cirrus pouch long, markedly tapered anteriorly, swollen at base. Genital pore anterodorsal to oral sucker or on its right side. Ovary submedian, pretesticular. Receptaculum seminis large. Laurer's canal present. Vitellaria follicular, lateral, not very extensive. Uterus in hindbody. Excretory vesicle Y-shaped. Parasites of fishes, amphibians and reptiles.

Type genus: *Cephalogonimus* Poirier, 1886.

Key to genera of Cephalogonimidae from reptiles

Vitellaria extending backward from acetabular or pre-acetabular level ..... *Cephalogonimus*

Vitellaria grouped in shoulder region ..... *Paracephalogonimus*

Cephalogonimus Poirier is the only genus of the family represented from amphibian hosts.

-From Gupta 1953

FAMILY CEPHALOGONIMIDAE NICOLL. 1914

There has been considerable difference of opinion in regard to the fact whether Cephalogonimidae should be regarded as a sub-family of Plagiorchiidae Luhe, 1901 or it should have an independent family status.

Looss (1899) created a new sub-family Cephalogoniminae for the reception of the genus *Cephalogonimus* Poirier, 1886 and *Emoleptalea* (Syn. *Leptalea*) on the character of the unique position of the genital pore dorso or ventro-lateral to the oral sucker. Nicoll (1914) raised it to the status of a family Cephalogonimidae and included in it the genus *Prosthogonimus* Luhe, 1899. Later (1924) he placed the genus *Cephalogonimus* under the family Prosthogonimidae which he created to include the sub-family Prosthogoniminae Luhe. Nicoll (1926) considers that the family Cephalogonimidae is a synonym of Prosthogonimidae. Poche (1925) and Fuhrmann (1928) accepted the family status Cephalogonimidae Nicoll for *Cephalogonimus* and *Emoleptalea* and transferred the genus *Prosthogonimus* to the family Plagiorchiidae Luhe, 1901 (Syn. Lepodermatidae Looss, 1901). Sinha (1932), however, contrary to the view removes *Prosthogonimus* from the family Plagiorchiidae and follows Nicoll, 1914, including it in the family Cephalogonimidae.

Poche (1932), Bhalerao (1936) and Mehra (1937) reduced the family Cephalogonimidae to the sub-family rank and have placed it under the family Plagiorchiidae. In support of this view Bhalerao, (1936) tried to show that the position of genital pore in some genera of Plagiorchiidae viz. *Ochetosoma* Braun, 1901, *Renifer* Pratt, 1902 and *Lechriorchis* Stafford, 1905 is lateral to pharynx and forms a near approach to the condition met with in Cephalogonimidae and further that there is a similarity in the nature of the excretory bladder in the two cases. Lal (1939) does not agree with the opinions of Pande (1932), Bhalerao (1936) and Mehra (1937) and maintains two distinct families Cephalogonimidae and Plagiorchiidae. The author is in perfect agreement with him, as the condition of the genital pore, coiling of uterus, the structure of the cirrus sac and other characters are very different from the members of the family Plagiorchiidae and therefore it would be more appropriate to regard it as a distinct family.

Witenberg and Eckmann (1939) revised the genus *Prosthogonimus* (Rudolphi, 1809) Braun, 1901 and placed it in the family Plagiorchiidae to which the author also agrees.

The genus *Emoleptalea* has been held synonymus to *Cephalogonimus* by the author in 1951 and reasons have already been given there.

Diagnosis of the family Cephalogonimidae Nicoll, 1914; emended.

Body small, cuticle spinose; oral sucker usually funnel-shaped much larger than ventral sucker; prepharynx absent, pharynx well developed, oesophagus of moderate length; intestinal caeca do not reach hinder end; genital pore marginal, dorsal or anterior to the oral sucker, cirrus sac long curved and extending upto or posterior to ventral sucker and divisible into a basal saccular part and a distal tubular portion; testes generally in the middle of the body lying obliquely or one behind the other; ovary in front of the testes near the ventral sucker; receptaculum seminis present; vitelline glands with few follicles in the middle region of the body; uterus very voluminous, convoluted occupying the hinder part of the body behind the testes; excretory bladder Y-shaped.

Hosts—amphibians, reptiles, birds and fresh-water fishes.

Habitat—gut.

Type genus—*Cephalogonimus*.

Cephalogonimus Poirier, 1886

Generic diagnosis. — Cephalogonimidae. Body flattened subcylindrical or tongue-shaped, spined. Acetabulum rather small, in anterior half of body. Prepharynx present. Esophagus short. Ceca not quite reaching to posterior extremity. Testes tandem or diagonal, usually in middle third of body. Cirrus pouch may or may not reach to acetabulum, enclosing seminal vesicle, prostatic complex and long ductus ejaculatorius. Genital pore terminal. Ovary a little to one side of median line posterolateral or lateral to acetabulum. Vitellaria variable in extent, commencing at acetabular level or in front of it. Uterine coils occupying most of hindbody, especially posttesticular region; eggs small. Excretory vesicle with numerous side branches. Parasitic in intestine of amphibians and reptiles.

Genotype: *C. lenoiri* Poirier, 1886, in *Tetrathyra vaillantii, Trionyx nilotica, T. triunguis;* Senegal.

Representatives from reptiles:

C. apolaimus Heymann, 1905, in intestine of *Kachuga tectum;* Burma.

C. burmanicus Chatterji, 1936, in *Emyda scutata;* Burma.

C. compactus Stunkard, 1924, in *Pseudemys floridana;* Florida.

C. emydalis Moghe, 1930, in *Emyda granosa;* India.

C. japonicus Ogata, 1934 (Pl. 46, Fig. 569), in *Amyda japonica;* Japan.

C. magnus Sinha, 1932, syn. *C. gangeticus* Pande, 1932, in *Trionyx gangeticus*. Regarded by Bhalerao (1942) as merely a large variety of *C. emydalis* Moghe, 1930.

C. machuricus Oguro, 1941, in *Amyda sinensis;* Manchuria.

C. mehrai Pande, 1932, in *Lissemys punctata;* India.

C. parvus Oguro, 1941, in *Amyda sinensis;* Manchuria.

C. thomasi Dollfus, 1950, in *Pelusios nigricans;* Gabon.

C. trachysauri MacCallum, 1921, in *Trachysaurus rugosus;* Australia.

C. vesicaudus Nickerson, 1912, in soft-shelled river turtles, *Aspidonectes* and *Amyda*, Mississippi.

C. asiaticus Gupta, 1954, in *Lissemys p. punctata;* India.

C. indicus Gupta, 1954, in *Lissemys p. punctata;* India.

C. kumarus Gupta, 1954, in *Lissemys p. punctata;* India.

Representatives from amphibian hosts:

C. americanus Stafford, 1902 (Pl. 41, Fig. 514), in *Rana virescens* and *R. clamata;* Canada, U.S.A. Also in *R. pipiens;* Brazil and Mexico.

C. amphiumae Chandler, 1923, syn. *C. magnus* Sinha, 1932; *C. gangeticus* Pande, 1932 — Bhalerao, 1936. Also in *Natrix rhombifera, Trionyx gangeticus, Lissemys punctata*, Nagpur; in *Amphiuma means;* La, U.S.A.

C. brevicirrus Ingles, 1932, in *Rana aurora draytoni;* U.S.A.

C. retusus (Duj., 1845) Odhner, 1910, syn. *C. europaeus* Blaizot, 1910, in *Rana temporaria;* France, Portugal, Canada, U.S.A. Also in *Tropidonotus natrix* v. *persa;* Egypt.

Cercaria armata develops in *Lymnaea* and *Planorbis*, especially in *L. stagnalis*, encysts on *Lymnaea* or in larvae of aquatic insects or may develop directly into adult in digestive tract of frogs — van Beneden (1861). Stafford (1931) found larvae of a *Cephalogonimus* sp. in the tail and muscles of *Cambarus*.

C. robustus Caballero et Sokoloff, 1936, in *Rana montezumae;* Mexico.

CLAVE PARA LAS ESPECIES DEL GENERO CEPHALOGONIMUS POIRIER, 1886 DADA POR RAI 1961, LIGERAMENTE MODIFICADA

Ventosa oral igual al acetábulo I
Ventosa oral más pequeña que el acetábulo II
Ventosa oral más grande que el acetábulo III

I. Testículos situados oblicuamente, redondos, las vitelogenas se extienden desde un poco enfrente del acetábulo al final de los ciegos intestinales, ovario y bolsa del cirro tocando al acetábulo; longitud total menor de 1 mm. ..... *C. compactus* Stukard, 1924

Testículos en tandem, la bolsa del cirro se extiende un poco abajo del acetábulo; longitud total de 2 a 3 mm. ..... *C. japonicus* Ogata, 1934.

Testículos en tandem transversalmente alargados, bolsa del cirro anterior al acetábulo, vitelogenas desde el borde posterior de la bolsa del cirro hasta el borde posterior del testículo posterior. Longitud total de 4 a 5 mm. ..... *C. robustus* Caballero y Sokoloff 1936.

II. Esófago presente ..... A 1

Esófago ausente ..... A 2

A 1. Medida máxima tres mm. de longitud, folículos vitelinos más pequeños en tamaño, extracecales y extendiéndose desde la mitad del acetábulo hasta el borde posterior del testículo posterior; ovario y bolsa del cirro tocando al acetábulo ..... *C. lenoiri* Poirier, 1886.

Medida máxima de 3.85 a 4.71 mm. en longitud, folículos vitelinos más grandes en tamaño, quedando sobre los ciegos intestinales, ovario y bolsa del cirro no tocando al acetábulo ..... *C. manchuricus* Oguro, 1941.

A 2. Testículos transversalmente alargados, situados oblicuamente, vitelogenas desde abajo del borde de la bifurcación intestinal hasta arriba del borde posterior del testículo posterior, bolsa del cirro y ovario tocando al acetábulo *C. vesicaudus* Nickerson, 1912.

III. Ciegos intestinales terminando en el campo postesticular .. B 1.

Ciegos intestinales terminando en el campo testicular ..... B 2.

B 1. Poro genital subterminal en el lado dorsal de la ventosa oral b 1.

Poro genital no en el lado dorsal de la ventosa oral, sino en frente de esta ..... b 2.

b 1. Poro genital medio ..... (i)
Poro genital no medio o del lado derecho de la linea media ..... (ii)

(i) Vesícula caudal y una pequeña vesícula en cada vaso eferente presente ..... *C. brevicirrus* Ingles, 1932.

Vesícula caudal y una pequeña vesícula en cada vaso eferente ausentes ..... (i) a.

(i) a. Testículos oblicuamente situados, ovario y bolsa del cirro tocando al acetábulo ..... *C. americanus* Stafford, 1902.

Testículos en tandem transversalmente alargados, solamente tocando la ventosa ventral la bolsa del cirro y no el ovario ..... *C. parvus* Oguro, 1941.

(ii) Testículos oblicuamente situados, los folículos vitelogenes se extienden desde la región posterior de la ventosa oral hasta arriba del borde posterior del testículo posterior, bolsa del cirro no se extiende de abajo del nivel del acetábulo, ovario sobre el acetábulo ..... *C. europaeus* Blaizot, 1910.

Testículos en tandem esófago presente, delgado y largo poro genital a la derecha de la ventosa oral y a nivel de la abertura oral *C. mukerjini* Rai 1961.

Testículos en tandem esófago ausente poro genital a la derecha de la línea media y a nivel de la faringe ..... *C. apolaimus* Heymann, 1905.

b 2. Testículos en posición de tandem ..... (iii).

Testículos en posición oblícua ..... (iv).

(iii). Esófago presente ..... (iii) a 1.
Esófago ausente ..... (iii) a 2.

(iii) a 1. Vitelógenas extendiéndose justo desde el borde anterior del acetábulo al nivel del testículo posterior; en el lado izquierdo los folículos son más extensos, los ciegos intestinales se extienden muy cerca de la extremidad posterior del cuerpo ..... *C. amphiumae* Chandler, 1923.

Vitelógenas extendiéndose desde la bifurcación intestinal hasta el nivel de la terminación de los ciegos; los ciegos intestinales terminan en la porción anterior del espacio postesticular ..... *C. thomasi* Dollfus, 1950.

(iii) a 2. Testículos transversalmente alargados folículos vitelinos extendiéndose desde el nivel del acetábulo hasta la mitad de la distancia entre los testículos y la terminación de los ciegos intestinales ..... *C. emydalis* Moghe, 1930. (Syn: C. gangeticus. Pande, 1932. (Syn: C. magnus Sinha, 1932.

Testículos redondos, folículos vitelinos se extienden desde inmediatamente anterior al acetábulo a un poco abajo del margen anterior del testículo posterior ..... *C. burmanica* Chatterji, 1936.

(iv). Esófago presente, vitelogenas desde la mitad de la distancia entre la ventosa oral y el acetábulo a cerca de la mitad del testículo anterior ..... *C. kumarus* Gupta, 1954.

Esófago ausente, vitelogenas se extienden acerca de la bifurcación intestinal al margen posterior del ovario ..... *C. mehri* Pande, 1932.

B 2. Esófago presente ..... (v)
Esófago ausente ..... (vi)

(v). Testículos oblicuamente situados poro genital en frente de la ventosa oral, vitelogenas extendiéndose desde la mitad de la distancia entre la ventosa oral y el acetábulo hasta arriba de la mitad del testículo anterior ..... *C. indicus* Gupta, 1954.

Testículos en tandem, acetábulo la mitad de la ventosa oral, ciegos intestinales extendiéndose, sólo ligeramente abajo del acetábulo, folículos vitelinos laterales distribuidos entre la terminación de los ciebos intestinales ..... *C. retusus* Dujardin, 1845.

(vi). Testículos en posición de tandem, transversalmente alargados, vitelogenas extendiéndose desde la bifurcación intestinal a la mitad del testículo anterior ..... *C. asiaticus* Gupta, 1953.

1. C. lenori Poirier, 1886.
2. C. americanus Stafford, 1902.
3. C. apolaimus Heymann, 1905.
4. C. retusus (Dujardin, 1845) Odhner, 1910.
5. C. europaeus Blaizot, 1910.
6. C. vesicaudus Nickerson, 1912.
7. C. amphiumae Chandler, 1923.
8. C. compactus Stunkard, 1924.
9. C. emydalis Moghe, 1930 Syn: C. gangeticus Pande 1932 y C. magnus Sinha, 1932.
10. C. brevicirrus Ingles, 1932.
11. C. mehri Pande, 1932.
12. C. japonicus Ogata, 1934.
13. C. burmanica Chatterji, 1936.
14. C. robustus Caballero y Sokoloff, 1936.
15. C. manchuricus Oguro, 1941.
16. C. parvus Oguro, 1941.
17. C. thomasi Dollfus, 1950.
18. C. asiaticus Gupta, 1953.
19. C. indicus Gupta, 1954.
20. C. kumarus Gupta, 1954.
21. C. mukerjius Rai, 1961.

FROM LAMOTHE. ARGUMEDO, 1964

Plagiorchidae
Cephalogoniminae

CEPHALOGONIMUS Poirier, 1886

Medium sized. Body flattened, rounded posteriorly, somewhat more narrowed anteriorly. Spined. Small prepharynx, pharynx, short esophagus, ceca not reaching to the extreme posterior end. Excretory vesicle Y-shaped, with long crura which like the stem possess side branches. Genital pore dorsal or anterior to the oral sucker. Testes oblique or tandem; ovary entire; uterus passes from ovarian complex directly posteriad between ceca and testes on right side of body, forms mass of coils behind the testes and passes anteriad on left to genital pore. Eggs numerous. Cirrus sac very long, containing a simple seminal vesicle.

Type species Cephalogonimus lenoiri Poirier.
Host: Tetrathyra vallantii, an African turtle.
also: Trionyx nilotica in Egypt

Pande ##### (1932) gives the following key:

Group I. Testes in tandem, one behind the other

A. Oral sucker smaller than ventral sucker...C.lenoiri Poir.
Oral sucker larger than ventral sucker.....B

B. Esophagus absent.....C.emydalis Moghe, 1930
Esophagus present.....C.

C. Testes nearly rounded.....C.amphiumae Chandler, 1923
Testes transversely elongated....C.gangeticus ##### , 1932 Pande

Group II. Testes placed obliquely behind each other. Genital opening at some distance behind anterior end on the dorsal side of the oral sucker.

A. Genital pore median.....C.americanus Stafford, 1902
Genital pore lateral to the right side ..C.europaeus Blaizot
Genital pore situated at anterior tip of body....B

B. Oral sucker smaller than ventral sucker...C.vesicaudus Nickerson, 1912
Both suckers of same size.....C.compactus Stunkard, 1924
Oral sucker larger than ventral sucker...C.mehri Pande#, 1932

Caballero & Sokoloff 1936:

Suckers equal
C. compactus Stunkard, 1924
C. japonicus Ogata 1936
C. robustus Cab. & Sok., 1936

Suckers unequal
C. lenoiri Poirier, 1886 acet. larger
C. americanus Stafford, 1902
C. europaeus Blaizot, 1910
C. vesicaudus Nickerson, 1912 acet larger
C. amphiumae Chandler, 1923
C. emydalis Moghe, 1930
C. brevicirrus Ingles, 1932
C. mehri Pandee, 1932 - ~~acet. larger~~
C. gangeticus Pandee, 1932

Key to species of Cephalogonimus
(after Ogata, 1934)

1.(8) (11). Oral sucker larger than ventral sucker.....2

2. (5). Testes directly one behind the other.....3

3. (4) Esophagus present; testes spherical; ceca to near posterior end; length 4.4 to 5.3, width 1.22 to 1.3; eggs 26 by 13 μ.....C.amphiumae

4. (3) Esophagus absent; ceca end in middle of post-testicular space; length 1.87 to 2.15; width 0.6 to 0.73; eggs 27 by 11μ.....C.emydalis

5. (2) Testes oblique.....6

6.(7) Ceca end shortly after the testicular zone; vitellaria extending to the ventral sucker; length 2.45; width 0.60; eggs 39 by 22 μ.....C.europaeus

7 (6) Ceca end in anterior third of posttesticular space; vitellaria in middle third of body; length 2.89 width 0.83 to 0.87; eggs 52 by 27....
C.americanus

8. (1) (11) Oral sucker same size as ventral sucker.....9

9.(10) Testes oblique; length0.69; width 0.23; eggs 30 to 34 by 20 to 23 μ.....C.compactus

10 (9) Testes tandem; length 2.49 to 2.59; width 0.58 to 0.84; eggs 38 by 16 μ.....C.japonicus

11 (1) (8) Oral sucker smaller than ventral sucker.....12

12 (13) Testes oblique; esophagus absent; length 1.5 to 2; width 0.8 to 1.; eggs 38-40 by 17-21.....
C.vesicaudus

13 (12) Testes tandem; esophagus present; length 3.; width 1.; eggs 35 by 17 μ.....C.lenoiri

Genus Cephalogonimus Poirier, 1886

Diagnosis

Cephalogonimidae Nicoll, 1914; Cephalogoniminae Looss, 1899. Body: elongated, elliptical, oval or rounded dorso-ventrally. Cuticle: spinous. Suckers: oral larger or smaller than the ventral sucker or both of the same size. Digestive system: oesophagus, if present, small, or absent; intestinal caeca not extending to the posterior extremity of the body. Reproductive systems: genital opening at the anterior end, median or lateral, to the right or left or slightly behind or dorsal to the oral sucker or at the anterior tip of the body; testes placed obliquely behind each other or in tandem one behind the other; cirrus sac long and curved, with posterior end broad and the anterior tubular; ovary spherical in front of the testes, to the right side or close behind the ventral sucker; receptaculum seminis and Laurer's canal present; uterus coiled particularly in the post-testicular region; vitellaria well developed, on the lateral sides of the body. Excretory system: excretory bladder Y-shaped with lateral branches.

Host ..	..	Fish, Frogs, Snakes and Chelonia.
Locality	..	Egypt, America, France, Congo Belge, Japan, Burma and India.
Type Species	..	*C. Lenoiri* Poirier, 1886.

Poirier (1886) established the genus *Cephalogonimus* for a digenetic trematode *Cephalogonimus lenoiri*, n.sp., obtained from the small intestine of an African turtle, *Tetrathyra vaillantii* in Senegal. Looss (1899) recorded the type species *C. lenoiri* from *Trionyx nilotica* in Egypt. From Canada, Stafford in 1902 described *C. americanus* which he got from the intestine of *Rana virescens* and *R. clamata*—common frogs of North America. From France, Blaizot in 1910 described the third species *C. europaeus* from the intestine of *Rana esculenta*. Luhe (1911) recorded *Distomum retusus* of Dujardin (1845) and included it in the genus. He, however, did not give any description. Nickerson (1912) added another species *C. vesicaudus* parasitic in the intestine of soft-shelled turtles (Amyda and Aspidonectes) collected from Minnesota. From the United States of America, two more species were added to the genus, one *C. amphiumae* described by Chandler in 1923 from the intestine of *Amphiuma means* and the other *C. compactus* by Stunkard in 1924 from the intestine of *Pseudemys floridana*.

From India, Moghe (1930) was the first to describe a representative of the genus—*C. emydalis*, n.sp.—from the alimentary canal of *Emyda granosa*. From California, Ingles (1932) described *C. brevicirrus* from the intestine of *Rana aurora draytoni*. In the same year from India, Sinha reported *C. magnus* from the intestine of *Trionyx gangeticus* and Pande described *C. mehri* from *Lissemys punctata punctata* and *C. gangeticus* from *Trionyx gangeticus*. In 1934, Sinha corrected the measurements of the species *C. magnus* already described by him in 1932. Ogata (1934) from Japan described a new species *C. japonicus* from the intestine of a turtle *L' Amyda japonica*. From Burma Chatterji (1936) described *C. burmanica* from the intestine of *Emyda scutata*. Caballero and Sokoloff (1936) got a new species *C. robustus* from *Rana montezumae* in Mexico. They held *C. europaeus* as a synonym of *C. retusus* (Dujardin, 1845) on page 119 of their paper published in 1936 but later on on page 126 in the same paper they described it as a distinct species. Even in the key to the species given by the joint authors, *C. europaeus* is held valid.

Mehra (1937) from Allahabad (India) gave the description of *C. minutum* from the intestine of *Lissemys punctata punctata*. Lent and Freitas (1940) held the three species, namely, *C. retusus*, *C. americanus* and *C. europaeus* as distinct species. They also pointed out the probable mistake made by Odhner (1910) who had recorded *C. retusus* from *Rana esculenta* whereas Dujardin (1845) had mentioned *R. temporaria* as its host.

-OVER-

They further stated that if the views of Odhner (1910) were accepted with regard to the size of eggs and incorrect measurements recorded by Dujardin, then *C. europaeus* should be treated as synonymous with *C. retusus* and *C. americanus* as a distinct species. If Dujardin's measurements were taken as correct, then *C. americanus* should be equal to *C. retusus* as had been shown by Whalton (1938). The joint authors, however, preferred not to accept these views and, therefore, they held the three species valid.

From France, Dollfus (1950) described *C. thomsi* from *Pelusios nigricans*. Gupta (1951) from Lucknow described *C. heteropneustus* from a fresh-water fish, *Heteropneustes fossilis* (Bloch.).

During the period from 1845–1921, three more species were assigned to this genus, but were removed from it because of their anatomical differences. These are *C. ovatus* (Rudolphi, 1803), *C. pellucidus* (V. Linstow, 1873) and *C. trachysauri* (MacCallum, 1921). The species *C. ovatus* and *C. pellucidus* have now been placed in the genus *Prosthogonimus* Luhe, 1899. Chandler (1923) rightly excluded *C. trachysauri* from the genus *Cephalogonimus*. He was, however, not aware of the work of Dollfus who had already assigned MacCallum's species *C. trachysauri* to the genus *Paradistomum* Kossack (1910). Johnston (1932) proposed that the specific name be replaced by *Paradistomum MacCallumi*.

Synonymity of the Species

Chandler (1923) pointed out that *C. retusus* (Dujardin, 1845) Odhner (1910) and *C. europaeus* Blaizot (1910) were identical and this identity was later confirmed by Stunkard (1924). Travassos (1932) and Bhalerao (1936) also expressed a similar opinion in regard to the synonymy of *C. europaeus* with *C. retusus*. Bhalerao (1936) further pointed out that Pande's (1932) species—*C. gangeticus* and Sinha's (1932) species—*C. magnus* were also identical. They were from the intestine of the same host, i.e., *Trionyx gangeticus*. But according to the law of priority the specific name *C. magnus* has precedence over the name of *C. gangeticus*. Therefore, *C. gangeticus* should fall into the synonymy of *C. magnus*. While commenting on the characters used in separating the species, Bhalerao pointed out that *C. magnus* should be treated as a synonym of *C. amphiumae* Chandler (1923). Therefore, both the species, i.e., *C. gangeticus* and *C. magnus* be merged into the synonymy of *C. amphiumae*.

Cabellero and Sokoloff (1936) and Lent and Freitas (1940) considered *C. europaeus* as a valid species. Bhalerao (1942) pointed out that *C. mehri* and *C. minutum* were quite distinct species. With regard to the synonymy of *C. magnus* with *C. amphiumae* he revised his earlier opinion and kept the former species as distinct from the latter. He, however, maintained *C. gangeticus* as synonym of *C. magnus*. In *C. amphiumae* the intestinal caeca end very close to the posterior extremity of the body, whereas in *C. magnus* the two caeca terminate midway between the posterior end of the body and the hinder margin of the posterior testis. He further proved that *C. magnus* was merely a large variety of *C. amygdalis* Moghe (1930).

From N. K. Gupta (1954)

Cephalogonimidae

A key to the identification of all the valid species of the genus *Cephalogonimus* Poirier (1886) based on the undermentioned characters has been prepared.

(i) Size of suckers.
(ii) Length of intestinal caeca.
(iii) Position of genital pore.
(iv) Extent of vitellaria.
(v) Shape and arrangement of testes.
(vi) Cirrus sac.
(vii) Oesophagus.
(viii) Caudal vesicle.
(ix) Vesicle in vas efferens.

From N. K. Gupta, 1954

KEY TO THE SPECIES OF THE GENUS *CEPHALOGONIMUS* POIRIER (1886)

	Oral sucker larger than the ventral sucker	A.
	Oral sucker smaller than the ventral sucker	B.
	Oral sucker equal to the ventral sucker	C.
A.	Intestinal caeca terminate in the post-testicular field	1.
	Intestinal caeca not terminating in the post-testicular field but in the testicular field	2.
1.	Genital pore subterminal on the dorsal side of the oral sucker ..	a.
	Genital pore not on the dorsal side of the oral sucker but in front of it	b.
a.	Genital pore median	ai.
	Genital pore not median, i.e., to the right side of median line ..	aii.
ai.	Caudal vesicle and a small vesicle in each vas efferens present ..	*C. brevicirrus* Ingles, 1932.
	Caudal vesicle and the vesicle in the vas efferens absent	*C. americanus* Stafford, 1902.
aii.	Testes irregular, tandem in position ..	*C. retusus* Dujardin, 1845.
	Testes entire, placed obliquely ..	*C. europaeus* Blaizot, 1910.
b.	Testes tandem in position ..	b i.
	Testes obliquely placed ..	b ii.
bi.	Oesophagus present	b iii.
	Oesophagus absent	b iv.
biii.	Vitellaria extend from just behind the anterior end of the ventral sucker to the level of the posterior testis, on the left side, the follicles are more extensive; intestinal caeca extend nearly to the posterior extremity of the body	*C. amphiumae* Chandler, 1923.
	Vitellaria extend from the intestinal bifurcation to the level of the ends of the caeca; intestinal caeca terminating in the anterior portion of the post-testicular space ..	*C. thomsi* Dollfus, 1950.

—OVER—

Cephalogonimus lenoiri Poirier, 1886

"AFTER POIRIER"
FROM PRATT, 1902

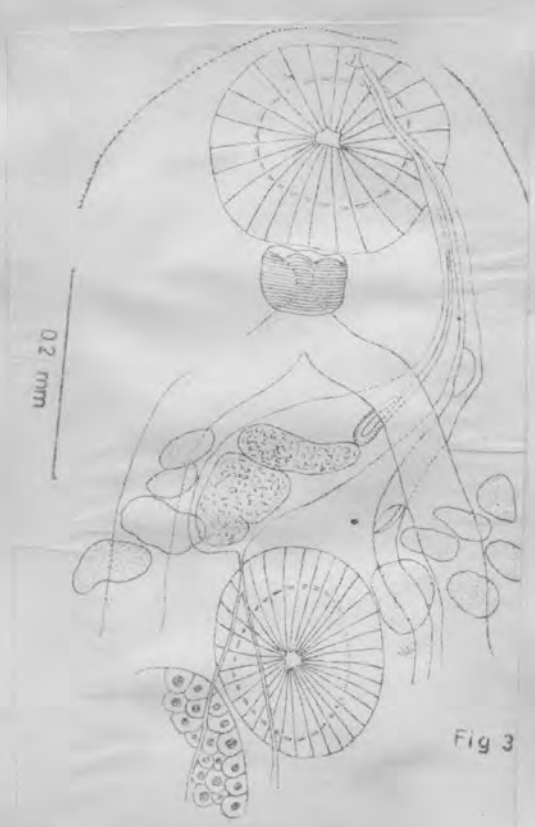
Cephalogonimus americanus Stafford, 1902

DESCRIPCION.—Son parasitos pequeños, de cuerpo alargado con los extremos redondeados, miden de 2.028 a 3.670 mm. de largo por 0.724 a 0.917 mm. de ancho, cutícula gruesa con pequeñas espinas que son muy numerosas en el extremo anterior, extendiéndose hacia el extremo posterior y terminando a la altura del borde posterior del testículo posterior, arregladas tanto dorsal como ventralmente en hileras oblicuas en relación al eje longitudinal del cuerpo.

La ventosa oral subterminal más grande que el acetábulo, mide de 0.296 a 0.257 mm. de largo por 0.220 a 0.273 mm. de ancho, en medio se abre la boca; el acetábulo es más pequeño que la ventosa oral, situado preecuatorialmente en el campo intercecal mide de 0.157 a 0.213 mm. de largo por 0.161 a 0.221 mm. de ancho.

La relación de diámetros entre las 2 ventosas es de 1:1.1 a 1:1.4 de largo por 1:1.2 a 1:1.3 de ancho. La boca se abre en medio de la ventosa oral, casi circular mide de 0.075 a 0.112 mm. de largo por 0.093 a 0.112 mm. de ancho. Existe una pequeña prefaringe de 0.018 mm. de largo; la faringe más o menos globoide mide de 0.068 a 0.086 mm. de largo por 0.075 a 0.105 mm. de ancho; el esófago practicamente no existe la bifurcación cecal tiene lugar inmediatamente, la distancia que existe entre la bifurcación cecal y la extremidad anterior es de 0.311 a 0.483 mm., los ciegos intestinales se extienden dorsalmente a todo lo largo del cuerpo, teniendo una anchura que varía de 0.046 a 0.096 mm. terminando un poco posteriores al testículo posterior a una distancia que varía de 0.567 a 0.892 mm de la extremidad posterior, en todos los ejemplares estudiados (12) se observó que uno de los ciegos es ligeramente más grande que el otro, generalmente el izquierdo.

El aparato reproductor masculino está representado por un par de testículos, postovíticos, postacetabulares, intercecales, oblicuos y transversalmente ovoides. El testículo anterior mide de 0.255 a 0.418 mm. de largo por 0.303 a 0.450 mm. de ancho y el posterior mide de 0.277 a 0.450 mm. de largo por 0.292 a 0.434 mm. de ancho, casi siempre muy juntos entre sí; de cada uno de ellos sale un conducto eferente muy fino que después de un corto recorrido ascendente se unen, por arriba del borde superior del acetábulo, formando el conducto deferente que desemboca a la extremidad posterior de la bolsa del cirro. Esta es un órgano en forma de clava que alberga en su extremidad más posterior a la vesícula seminal tripartita, a la glándula prostática y al conducto eyaculador; cruza ventralmente a uno de los ciegos y asciende hasta la extremidad anterior, se hace dorsal y desemboca en el poro genital que es dorsal y medio situado a una distancia de la extremidad anterior que varía de 0.037 a 0.075 mm.



Dibujo de la porción anterior de *Cephalogonimus americanus* Stafford, 1902, mostrando el complejo reproductor masculino. Vista dorsal.

Dibujo de la porción media de *Cephalogonimus americanus* Stafford, 1902 mostrando el complejo reproductor femenino. Vista dorsal.

La bolsa del cirro mide de 0.616 a 0.805 mm. de largo por 0.075 a 0.112 mm. de ancho en su porción posterior, cruza siempre el ciego contrario en relación a la posición del ovario y queda siempre por arriba del acetábulo.

El aparato reproductor femenino está representado por el ovario, que puede estar situado a la derecha o a la izquierda de la línea media a la altura del acetábulo o ligeramente posterior a este pero siempre tocándolo, es un órgano ovoide más largo que ancho, situado en el campo intercecal, entre el acetábulo y el testículo anterior, separado de este por el receptáculo seminal; mide el ovario de 0.243 a 0.318 mm. de largo por 0.187 a 0.270 mm. de ancho; de su borde interno sale el oviducto que dirigiéndose a la línea media recibe el conducto del receptáculo seminal, órgano ovoide situado entre el borde superior del testículo anterior y el borde inferior del ovario, dicho receptáculo seminal mide de 0.187 a 0.190 mm. de largo por 0.075 a 0.120 mm. de ancho, reconociéndose fácilmente por la gran cantidad de espermatozoides que contiene y que con la hematoxilina destacan notablemente.

La glándula de Mehlis situada en el lado contrario al ovario es una masa de células que en los ejemplares jóvenes está bien definida, situada entre el acetábulo, el testículo anterior y el receptáculo seminal, rodea la primera porción del útero y a esa altura recibe el conducto del reservorio vitelino. El canal de Laurer bien definido se inicia en la confluencia del oviducto, del conducto del receptáculo seminal y del útero, desciende ligeramente y a la altura del borde anterior del testículo anterior se hace dorsal y desemboca en la pared dorsal del cuerpo casi en la línea media. El útero muy desarrollado se inicia a la altura de la glándula de Mehlis, la rama desendente baja entre los testículos y el ciego correspondiente ocupando todo el campo postesticular; con un recorrido sinuoso asciende hasta el nivel del acetábulo y va por el lado externo de la bolsa del cirro, hasta el poro genital, presenta en todo su recorrido gran cantidad de huevecillos, estos son de cáscara amarillenta, operculados, miden de 0.046 a 0.056 mm. de largo por 0.018 a 0.022 mm. de ancho.

Las glándulas vitelógenas foliculares están situadas lateralmente por fuera de los ciegos intestinales, se inician a la altura del borde posterior de la bolsa del cirro y termina al nivel de la mitad del testículo posterior.

El aparato excretor está representado por el poro excretor situado ventroterminalmente en la extremidad posterior, por una vesícula excretora que se bifurca dos veces, una a nivel de la extremidad de los ciegos intestinales y la otra a nivel del borde inferior del testículo posterior, quedando enmascarado por la gran cantidad de huevecillos que se encuentran en esta región.

Huésped: Rhyacosiredon altamirani (Dugés). Urodela.

Habitat: Intestino.

Localidad: Salazar Edo. de México.

Número de ejemplares: doce en dos hospederos.

Ejemplares depositados: en la Colección Helmintológica del Instituto de Biología de la U.N.A.M. con el No. 219-24.

Discusión. — Cephalogonimus americanus Stafford, 1902, ha sido descrito por varios autores en América, reportándose en Canadá, Estados Unidos de Norte América, México, Costa Rica y Brasil; se ha encontrado parasitando el tracto digestivo de Anuros: Rana virences, R. clamata, R. pipiens y R. montezumae, pero hasta ahora no había sido reportada de Urodelos; Rhyacosiredon altamirani es un nuevo huésped para esta especie.

Hasta la fecha sólo se conocen seis especies del género Cephalogonimus que parasitan a Anfibios, estas son: C. amphiumae Chandler, 1923, C. americanus Stafford, 1902, C. brevicirrus Inglés, 1932, C. europaeus Blaïzot, 1910, C. retusus (Dujardin, 1845) Odhner, 1910 y C. robustus Caballero y Sokoloff, 1936.

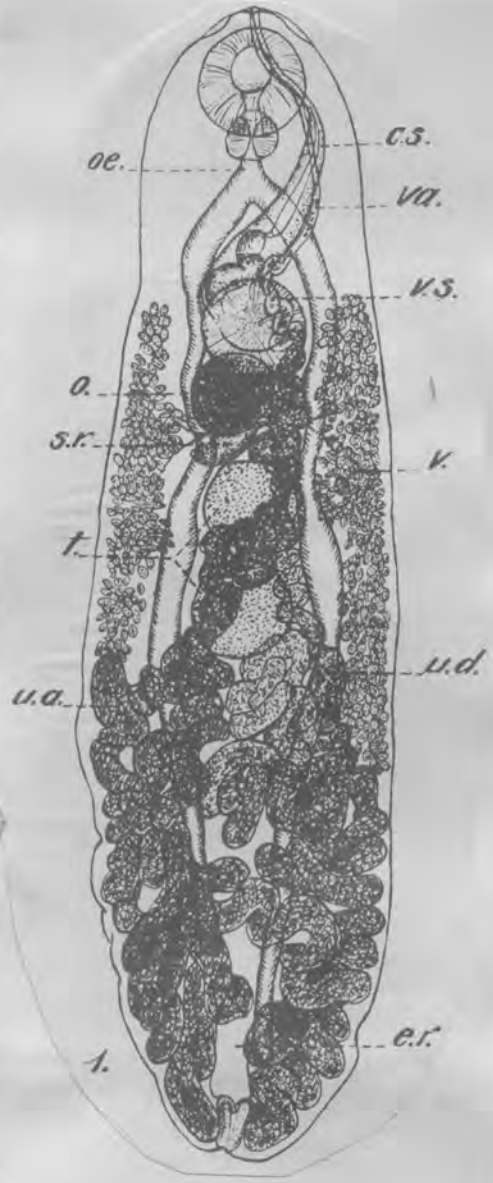
Para Rai (1961) las especies conocidas del género Cephalogonimus Poirier 1886 son veinte, aunque dicho autor no incluye en su clave a C. robustus y considera como sinónimos de C. emydalis a C. gangeticus Pande, 1932 y a C. magnus Sinha 1932; de acuerdo con él doy a continuación la lista de las especies del género Cephalogonimus conocidas y la clave que este autor propone ligeramente modificada incluyendo a C. robustus Caballero y Sokoloff, 1936.

SUMMARY.—In this paper is redescribed Cephalogonimus americanus Stafford, 1902, which was described by various authors in America a new record of host is given from a nem locality in México: Rhyacosiredon altamirani, from Salazar in the State of México.

ALL FROM LAMOTHE-ARGUMEDO, 1964

Also as Stafford (1902) reprint

Cephalogonimus amphiumae Chandler, 1923



Diagnosis.—Body 4.4 to 5.3 mm. in length, with a maximum width of from 1.22 to 1.3 mm., ovoid, flattened, widest in the third fifth of the body length, tapering thence toward both ends, which are bluntly rounded. Cuticle thickly covered with minute spines anteriorly, these becoming less numerous posteriorly, and absent entirely from the posterior third. Oral sucker 0.42 to 0.43 mm. in diameter, larger than the ventral sucker, which measures, when round, from 0.368 to 0.38 mm. in diameter. Center of ventral sucker about 1.2 mm., two-sevenths of body length, from anterior end. Pharynx about 0.192 mm. in diameter, preceded by a short prepharynx and followed by a barely distinct esophagus, the distance from the posterior border of the pharynx to the inner border of the intestinal ceca about one and one-half times diameter of ceca. Intestinal ceca long and not quite equal, the left one longer, reaching to about one-tenth of body length, the right one to one-fifth, from posterior end.

Ovary, from 0.32 to 0.36 mm. in diameter, situated just behind ventral sucker and partially overlapping it, slightly displaced toward right side, its center 1.5 mm., or about one-third of body length, from anterior end. A flask-shaped seminal receptacle lies just posterior to the ovary, also toward the right side, occupying the space between ovary and anterior testis. Ootype and shell gland not clearly visible, since they are covered ventrally by the seminal receptacle and dorsally by the egg-filled coils of the uterus. Transverse vitelline ducts receive anterior and posterior forks on either side, in region of intestinal ceca. Vitelline glands on left side more extensive than on right, extending from a level just behind anterior border of ventral sucker to level of posterior border or posterior testis on right side, and to junction of second and terminal thirds of body on left side. Uterus, irregularly coiled and filled with very numerous eggs, passes posteriorly from the ootype on the left side in three specimens, on the right in one, crosses to the opposite side usually at some distance from the posterior end, although loops pass back to the extreme tip, and ascends, crossing diagonally back to the left side, if not already there, in the region of the testes, continuing forward a little to the left of the midline to the anterior border of the ventral sucker, thence following the cirrus sac to the genital papilla at the extreme anterior end. Testes nearly round, one directly behind the other in median line, and in contact or nearly so; anterior one about 0.41 to 0.48 mm. in diameter, posterior one about 0.39 to 0.47 mm. Cirrus sac long and flask-shaped, its posterior end, at level of ventral sucker, bending toward the dorsal side. It crosses diagonally under the left intestinal cecum and, becoming narrow, turns forward, inward, and dorsad to open, in common with the vagina, on a papilla at the antero-dorsal extremity of the worm. Excretory system with thick muscular walls around pore, into which opens a broad reservoir. Eggs thick-shelled, yellow, relatively small; in mounted specimens, where they are more or less collapsed, they measure about 26μ by 13μ.

Habitat.—Middle portion of intestine of *Amphiuma means*, from Louisiana.

Type.—Deposited in United States National Museum, Helminthological Collections, No. 25171.

Cephalogonimus amphiumae is a typical representative of its genus. Including the present species, seven species have now been described in the genus, but one, *Cephalogonimus trachysauri* Mac-

—OVER—

C. amphiumae CHANDLER (1923) Syn: *C. magnus* SINHA (1932), *C. gangeticus* PANDE (1932). Many specimens of these distomes were collected from the intestine of *Kachuga kachuga* on several occasions. These flukes agree in every respect with those described by previous authors. Polymorphic conditions as pointed by BHALERAO (1936) were also observed.

FROM SINHA, 1958

description continued –

Callum 1921 differs in so many features of its anatomy from other members of the genus that it should undoubtedly be placed in a new genus, and two others, *C. retusus* (Dujardin) and *C. europaeus* Blaizot 1910, from *Rana esculenta* in Europe, are probably identical. The type species, *C. lenoiri*, was described by Poirier from a turtle, *Tetrathyra vaillantii*, from Senegal. Two American species have heretofore been described, one, *C. americanus*, by Stafford (1902) from the intestine of *Rana virescens* and *R. clamitans* in Canada, the other, *C. vesicaudus*, by Nickerson (1912) from the intestines of soft-shelled turtles, *Aspidonectes* and *Amyda*, in Minnesota. Both *C. americanus* and *C. vesicaudus* differ from the type species and from *C. restusus* in having the testes arranged in an oblique manner instead of one directly behind the other; *C. amphiumae* agrees with the type species in this respect. The ovary of *C. amphiumae* is situated much nearer the median line of the body than that of any of the other species. This species also differs from all the others in the more anterior position of the acetabulum and genital glands, and in the fact that the vitellaria do not extend forward beyond the anterior margin of the acetabulum. In addition to these differences it is of larger size than any of the other described species, and has a relatively larger pharynx. It resembles *C. americanus* in having the oral sucker a little larger than the acetabulum, but differs in having the genital opening situated on an anterior papilla instead of being at some distance from the anterior end, on the dorsel side. The very short, almost negligible esophagus is intermediate between the condition found in *C. lenoiri*, *C. retusus*, and *C. americanus* on the one hand, and *C. vesicaudus* on the other.

FROM CHANDLER, 1923

N. K. Gupta, 1954

Cephalogonimus asiaticus, ~~n.sp.~~ (Fig. 3.)

Host .. .. *Lissemys punctata punctata.*
Location .. Intestine.
Locality .. Hoshiarpur (India).

Only one specimen of *Cephalogonimus asiaticus*, n.sp., was found the small intestine of a tortoise collected from a local pond. The wo is elliptical in shape. It measures 0·762 mm. in length and 0·315 mm. breadth across the testicular region. It is rounded at the anterior e while the posterior end is slightly attenuated. The body is beset w backwardly directed spines, more densely in the first half of the body compared to the second half where they are scanty.

Fig. 3

There is a large oral sucker placed subterminally at the anterior end of the body and measuring 0·1156 mm. in length and 0·119 mm. in breadth. The ventral sucker measuring 0·085 × 0·085 mm. is situated at a distance of 0·195 mm. from the anterior end of the body. The pharynx is very small and is placed behind the oral sucker. The prepharynx and the oesophagus seem to be absent. The two caeca are almost straight running posteriorly along the lateral sides of the body and the inner side of the vitellaria. They terminate at the level of the anterior border of first 1/4th of the posterior testis.

The excretory pore is terminal, placed at the posterior end of the body. It opens into the main bladder of the Y-shaped excretory system. At the base of the posterior testis, the main excretory bladder forks into two lateral vessels—the cornua which run along the lateral sides of the testes.

The two testes are transversely elongated, placed almost one behind the other in the inter-caecal region. The anterior testis measures 0·075 mm. in length and 0·12 mm. in breadth, while the posterior testis 0·09 mm. in length and 0·12 mm. in breadth. The cirrus sac is an elongated structure measuring 0·240 mm. in length and 0·06 mm. in breadth at its basal portion. It is placed obliquely in between the ovary and the oral sucker. It encloses the vesicula seminalis which is bilobed and full of sperms. The pars prostatice and the ejaculatory duct are present. The former is surrounded by the prostate gland cells. The cirrus is protrusible and without any spine. The genital pore is situated in the space between the anterior margin of the body and the oral sucker.

The ovary is almost spherical 0·075 × 0·075 in dimensions and is placed to the right of the median line close to the right intestinal caecum and the postero-lateral side of the ventral sucker in front of the anterior testis. From the postero-lateral border arises the oviduct. The Mehlis' gland complex is situated just in front of the anterior testis, while the receptaculum seminis is placed behind the ovary. The uterus is full of eggs and is densely coiled in the post-testicular region. The coils are confined to the space between the body-wall and Y-shaped excretory system.

The vitellaria are compactly arranged along the lateral sides of the body. The vitelline glands on the right side extend for about 0·195 mm. while those of the left side for about 0·210 mm. They are at the level of forked intestinal caeca in front and at the level of the middle of the anterior testis behind. The eggs measure 0·032–0·036 × 0·012 mm.

Relationships

In having the oral sucker larger than the ventral sucker *C. asiaticus* n.sp., differs from *C. lenoiri*, *C. vesicaudus*, *C. compactus*, *C. japonicus* and *C. robustus* in which oral sucker is either smaller than or equal to the ventral

sucker. In having the oral sucker larger than the ventral sucker, the ne species resembles the remaining species, viz., *C. retusus*, *C. americanus*, *C. europaeus*, *C. amphiume*, *C. emydalis*, *C. brevicirrus*, *C. mehri*, *C. burmanic C. minutum*, *C. thomsi*, *C. heteropneustus*, *C. indicus* n.sp. and *C. kumari* n.sp. In the extent of the intestinal caeca it differs from all the specie of the group in which oral sucker is larger than the ventral sucker excep *C. heteropneustus* and *C. indicus* with which it resembles closely. But th new species stands apart from *C. heteropneustus* in the position of th genital pore and the extent of vitellaria and from *C. indicus* in the absen of the oesophagus, the extent of vitellaria, tandem and transversely elo gated position of the testes.

Cephalogonimus brevicirrus Ingles, 1932

abstracted by H.W.M.

Length 2.09
Width 0.64

Width about 1/3 length, more pointed anteriorly than posteriorly, often truncate posteriorly.

Oral sucker larger than acetabulum; 0.21 and 0.17
Acetabulum well foward in first half.
Prepharynx present; pharynx 0.08 wide, esophagus 0.12; ceca extend but a little behind hind testis (nearly 1/3 th body may be behind the ceca).
Excretory pore terminal. Caudal vesicle with folded epithelium. Excretory vesicle bifurcates behind the hind testis. Two main branches extend to level of acetabulum. Main stem also gives off lateral branches which in turn subdivide (variable).
Ovary to right or left of acetabulum
Seminal receptacle spherical, posterior and dorsal# .
Genital pore just above center of oral sucker.
Vitellaria inter- and extra-cecal, begin well anterior to acetabulum, end slightly anterior to end of ceca.
Testes spherical, oblique.
Cirrus sac is short extending only slightly posterior to cecal bifurcation and not reaching acetabulum.
Seminal vesicle bilobed.
Egg size not given.

Host: Rana aurora draytoni. California

Family Cephalogonimidae Nicoll 1915.

Cephalogonimus Poirier 1886.

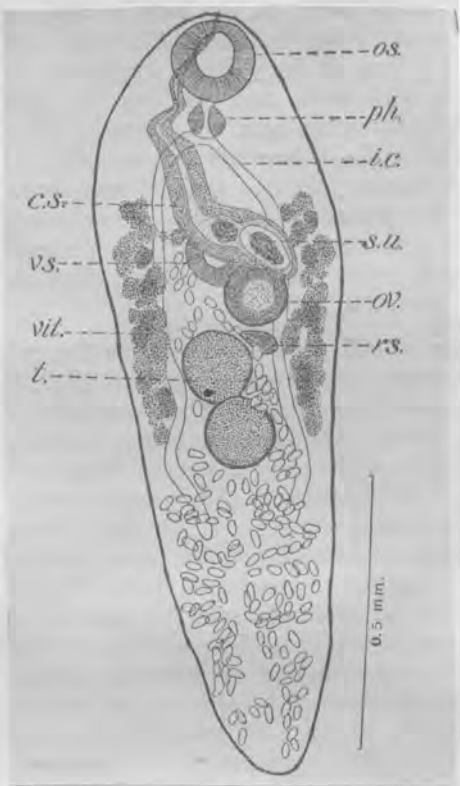
Cephalogonimus burmanica, sp. nov. Chatterji, 1936

Host :—*Emyda scutata.*

Over five hundred specimens obtained from the small intestine of one host. Body elongated with anterior end much broader than posterior. Length 0·83—1·52, maximum thickness 0·32—0·42 at the region of oral sucker. Cuticle posteriorly to anterior testis covered with sharp backwardly directed spines, the spines being progressively denser from the posterior to the anterior end. Oral sucker subventral, more powerful than ventral and slightly broader transversely than antero-posteriorly measuring 0·11—0·14 × 0·12—0·154. Ventral sucker

Testes large, slightly oblique, almost equal, contiguous, approximately 0·09—0·14 in diameter, situated between the caeca a little anterior to their blind ends. Cirrus sac large, 0·32—0·52 long, club-shaped, oblique, extending from near posterior margin of ventral sucker to almost the anterior margin of oral sucker. Near the pharynx it coils on itself and narrows into an elongated region that contains the pars prostatica and the ejaculatory duct. The basal sacular part contains the large convoluted vesicula seminalis, divisible into two portions —a large proximal and a small distal one which, by a narrow constriction, passes into the long pars prostatica.

Ovary on right side of median line, approximately spherical 0·08—0·12 in diameter, anterior to testes and partly overlapped anteriorly



0·1—0·13 in diameter lying a little anterior to middle of body. Prepharynx very small. Pharynx muscular, approximately spherical, 0·042—0·07 in diameter. Oesophagus absent. Intestinal bifurcation away from ventral sucker and closer to oral sucker. Intestinal caeca fairly uniform in width extending behind testes, ending a little anterior to posterior end of body. Genital pore at median anterior tip of body anterior to oral sucker.

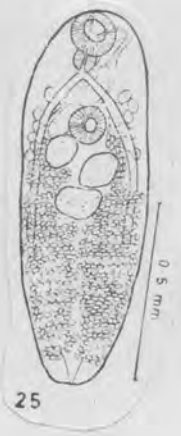
by the ventral sucker. Oviduct arises from the posterior margin and, running obliquely for a short distance, joins the receptaculum seminis. Immediately afterwards it receives the common vitelline duct and forms the ootype. Receptaculum seminis ovoid, 0·038—0·065 in length, on left side of body, between anterior testis and ovary. Vitellaria consists of large follicles, lateral, extra and over caecal, from immediate anterior of ventral sucker to a little behind anterior margin of posterior testis. Uterus arises from the left side of the ootype. Each lateral half of the post-testicular region of the body contains a descending and an ascending loop of the uterus. Beginning on the right side the uterus descends backwards and reaching the posterior end it turns forwards. On approaching near the posterior testis the coils turn to the left and there again it descends and ascends. The ascending uterus passes forwards taking a course parallel and dorsal to the cirrus sac on its way to the genital atrium. Eggs thin shelled, oval, 0·03—0·035 × 0·015—0·02. Excretory pore at the posterior end. Excretory bladder Y-shaped, occupying a median position and extending as far forward as the posterior testis.

The presence of oblique testes separates the present form from all other species except *C. americanus* Stafford 1902, *C. europoeus* Blazoit 1910, *C. vesicaudus* Nickerson 1912, *C. compactus* Stunkard 1924 and *C. mehri* Pande 1932. The situation of the genital pore at the anterior tip of the body brings the present species closer to the last three of the aforesaid forms. Of these it is closely allied to *C. mehri* Pande 1932 on account of the shape of the body, a higher ratio in size of oral sucker to ventral, absence of oesophagus, left sided position of anterior testis and the median position of posterior testis. It differs from *C. mehri* in the distribution of vitellaria and the position of ovary and testes. The former extend from immediate anterior of the ventral sucker to a little behind anterior margin of posterior testis. Of the latter the ovary is partially overlapped by the ventral sucker and the testes are contiguous with one another. These differences necessitate the creation of a new species for the reception of the present forms.

Cephalogonimus burmanicus Chatterji, 1936
(Fig. 25)

The following description is based upon 10 specimens of this species recovered from the intestine of one specimen of *Lissemys punctata* examined at Lahore.

The body of the worm is elliptical with broadly rounded extremities. Maximum breadth of the body obtains at about equator or the acetabular region. The tegument is provided with small backwardly directed spines which become gradually sparse posteriorly. The oral sucker is subterminal and almost spherical. The ventral sucker is situated at a distance of 0.26 – 0.28 mm from the anterior extremity and is smaller than the oral sucker. A short prepharynx is present. The pharynx is small and oval. A very short oesophagus is present but it becomes completely obliterated from the view in the mounted specimens. The intestinal bifurcation is at about midway between the ventral sucker and the anterior extremity. The intestinal caeca extend to a short distance beyond the posterior testis.



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The testes are situated in the middle third of the worm. They are diagonal and lie close to each other. In some specimens the posterior testis is slightly larger than the anterior testis. The shape of testes is variable. The cirrus sac is well-developed, elongated and extends from the posterior level of the ventral sucker to the anterior tip of the body where it opens through a common genital opening. Enclosed within the cirrus sac are a well-developed vesicula seminalis, ductus ejaculatorius, pars prostatica and an unarmed cirrus. The ovary lies on the posterolateral side of the venral sucker. The vitellaria are follicular, extending from the level of the cirrus sac to the middle of the ventral sucker. The uterus is fairly extensive, occupying most of the space between the ventral sucker and the posterior extremity. The eggs are fairly numerous, yellow in colour, oval, operculate and unembryonated. The excretory vesicle is Y-shaped.

Host: *Lissemys punctata*
Location: Intestine
Locality: Lahore (river Ravi)

MEASUREMENTS

(All measurements in millimetres)

Body length	1.090 – 1.181
Body breadth	0.363 – 0.393
Oral sucker	0.117 – 0.137 × 0.117 – 0.127
Ventral sucker	0.099 – 0.114 × 0.104 – 0.112
Pharynx	0.051 – 0.076 × 0.045 – 0.063
Ovary	0.068 – 0.098 × 0.088 – 0.107
Anterior testis	0.088 – 0.117 × 0.098 – 0.117
Posterior testis	0.098 – 0.107 × 0 098 – 0.147
Cirrus sac	0.294 – 0.392
Eggs	0.028 – 0.035 × 0.035 – 0.017

Chatterji (1936) has figured *Cephalogonimus burmanicus* with its intestinal caeca terminating a little behind the testes but in his account he states that the intestinal caeca terminate a little in front of the posterior end of the body. Ths species under study resembles *C. burmanicus* in all essential features. The extent of the intestinal caeca is variable. These may terminate any where between the level of the posterior end of the posterior testis and nearly the middle of the post-testicular region of the body. The description of Chatterji is most probably defective whereas his figure of *C. burmanicus* is correct. The species under study has been identified as *Cephalogonimus burmanicus* Chatterji, 1936. However, this is a new record from Pakistan.

From BHUTTA AND KHAN, 1975

Cephalogonimus compactus Stunkard, 1924

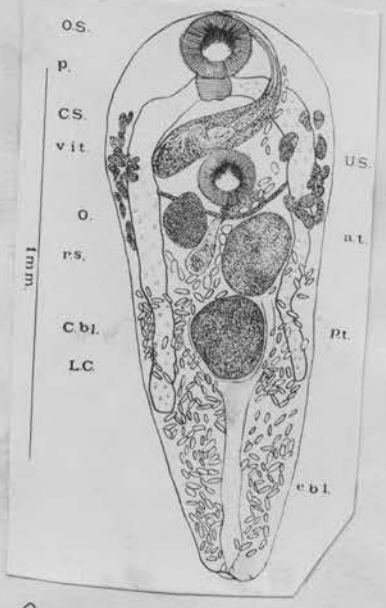
abstracted by H.W.M.

Length 0.69
Width).23 to 0.35 at midbody
Anterior end tapers to a point; posterior end broadly rounded.
Acetabulum and oral sucker about the same size, 0.09
Acetabulum slight anterior to midbody
Short prepharynx; pharynx 0.036 in diameter; esophagus present; ceca end 1.6 to 1.7 body from posterior end.
Ovary dextral, immediately behind acetabulum.
Eggs 30 to 34 by 20 to 23μ
Vitellaria extracecal from a level slightly anterior to the cephalic margin of the acetabulum almost to the ends of the ceca.
Testes spherical, slightly oblique.
Cirrus sac flask-shaped, posterior end at antero-lateral margin of acetabulum.
Excretory pore terminal. Excretory vesicle with small lateral branches.
Genital pore at median anterior tip.
Host: Pseudemys floridana

Florida.

Plagiorchidae
Cephalogoniminae

Cephalogonimus gangeticus
Pande, 1932



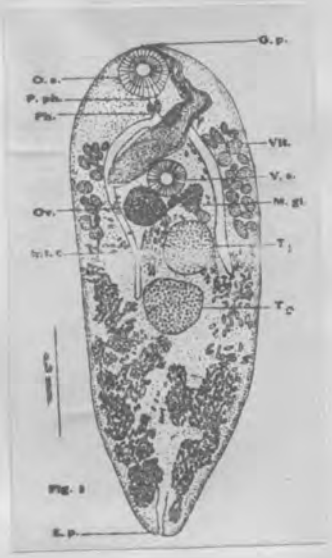
Cephalogonimus mehri
Pande, 1932

N. K. Gupta, 1954

Cephalogonimus indicus, n.sp. (Fig. 1.)

Host .. .. *Lissemys punctata punctata.*
Location .. Small intestine.
Locality .. Hoshiarpur (India).

A dozen specimens of this parasite were obtained from the small intestine of *Lissemys punctata punctata* examined at Hoshiarpur. The trematode is elliptical in shape with broad anterior and narrow posterior ends. The live worm is yellowish in colour. The cuticle is beset with very minute backwardly directed spines. They are more closely arranged in the preovarian region than behind it. In the latter region they gradually decrease in number till they disappear altogether in the posterior region of the body. The oral sucker is spherical or globular, situated subterminally at the anterior extremity with its opening facing ventrally. It measures 0·0952–0·135 × 0·135–0·1425 mm. in size. It is slightly larger than the ventral sucker. The ventral sucker, measuring 0·085–0·135 × 0·09–0·1275 mm. in size, is situated at a distance of 0·240–0·285 mm. from the anterior extremity of the body.



The oral sucker is followed by a small prepharynx which leads into a muscular pharynx, oval in outline and measuring 0·03 × 0·0578 mm. The oesophagus is inconspicuous. In specimens where it is visible, it is never more than 0·008 mm. in length. The intestinal caeca run backward terminating at the level of either the anterior margin or middle of the posterior testis. The intestinal bifurcation lies far in front of the ventral sucker.

The excretory pore is terminal at the posterior extremity of the body. The excretory bladder is Y-shaped, the main stem which is median in position extends up to the posterior border of the posterior testis where it bifurcates into lateral cornua. In some specimens the distal end of the main excretory bladder has been seen forming a small caudal vesicle. The right and left cornua extend up to the level of the base of the ovary.

The two testes may be rounded or oval and are placed somewhat obliquely one behind the other in the middle region of the body partly in between the two intestinal caeca. The anterior testis lies slightly to the left of the median line close to the left intestinal caecum and 0·048–0·06 mm. behind the ventral sucker. The posterior testis is median in position close to the blind end of the right intestinal caecum. The former testis measures 0·095–0·15 × 0·09–0·165 mm. and the latter measures 0·105–0·150 × 0·135–0·165 mm. in size. From the anterior border of each testis arises a vas efferens, the two vasa efferentia unite near the base of the cirrus sac to form a small inconspicuous vas deferens. The cirrus sac is obliquely placed in the space between the oral sucker and the ovary with its posterior end touching or over-lapping the right intestinal caecum. It is broader posteriorly and towards the anterior end it becomes narrower. The vesicula seminalis lies in the basal part of the cirrus sac and consists of two distinct portions which are demarcated by a constriction. The proximal part is longer than the distal. The pars prostatica and ejaculatory duct are long tubular structures, the first being surrounded by the prostate gland cells. The cirrus is protrusible and without any spine. The genital pore is median in position lying at the anterior end of the body in front of the oral sucker.

The ovary is situated close to the postero-lateral border of the ventral sucker, to the right of the median line. It is almost spherical in appearance measuring 0·075–0·120 × 0·075–0·1275 mm. From its left lateral side, there arises the oviduct which soon dilates to form the ootype surrounded by the Mehlis' glands. The whole complex lies to the left of the median line, close to the postero-lateral side of the ventral sucker and in front of the anterior testis. In some specimens it has been observed that the ovary and Mehlis' gland complex are partly overlapped by the ventral

sucker. The receptaculum seminis lies just behind the Mehlis' gland complex. The Laurer's canal is present. The vitelline reservior lies between the ovary and the Mehlis' gland complex. The uterus is much coiled, its descending limb passes through a space between the ovary and the anterior testis and is confined to the right side of the body, while the ascending limb to the left side, proceeds forward along the left intestinal caecum, terminating into the metraterm which opens close to the male genital opening into the genital atrium. In the post-testicular region of some specimens the coils of the uterus are arranged in such a way and are so full of eggs that their descending and ascending limbs cannot be made out.

The vitelline glands are extra-caecal and confined to the lateral sides. They commence midway between the oral and ventral suckers and extend up to the level of the middle of the anterior testis. At some places they may overlap the intestinal caeca. The number of follicles varies from 13–21 on the left and 10–21 on the right sides. The eggs are dark-brown or yellowish in colour, oval in shape, measure 0·0306–0·035 mm. in length and 0·0102–0·0105 mm. in breadth.

Relationships

Sixteen valid species have been described under the genus *Cephalogoninus*. Of these, *C. indicus*, n.sp., resembles *C. retusus* (Dujardin, 1845), *C. americanus* Stafford (1902), *C. europaeus* Blaizot (1910), *C. amphiumae* Chandler (1923), *C. emydalis* Moghe (1930), *C. brevicirrus* Ingles (1932), *C. mehri* Pande (1932), *C. burmanica* Chatterji (1936), *C. minutus* Mehra (1937), *C. thomsi* Dollfus (1950) and *C. heteropneustus* Gupta (1951) in having the oral sucker larger than the ventral sucker. It further resembles *C. amphiumae*, *C. emydalis*, *C. mehri*, *C. burmanica*, *C. minutum* and *C. thomsi* in the position of the genital pore which is placed in front of the oral sucker, i.e., at the anterior extremity and differs from *C. retusus*, *C. americanus*, *C. europaeus*, *C. brevicirrus* and *C. heteropneutus* in which the genital pore is subterminal and lies on the dorsal side of the oral sucker.

In its oblique position of testes, the new species resembles *C. minutum* and *C. mehri* and differs from the other species in which the genital pore is situated in front of the oral sucker. It stands apart from *C. minutum* in which the body is rounded, the vitellaria are pre-acetabular in position and the intestinal caeca reaching behind the posterior testis and from *C. mehri* in the length of intestinal caeca and distribution of vitellaria. In the remaining species, i.e., *C. lenoiri* Poirier (1886), *C. vesicaudus* Nickerson (1912), *C. compactus* Stunkard (1924), *C. japonicus* Ogata (1934) and *C. robustus* Caballero and Sokoloff (1936) the oral sucker is either smaller than or equal to the ventral sucker.

Plagiorchidae
Cephalogoninae

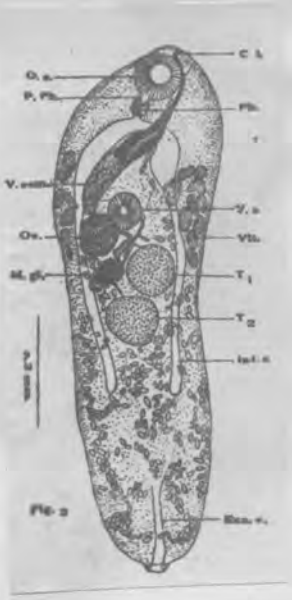
Cephalogonimus japonicus Ogata ,1934

Body elongate and flattened with parallel margins and rounded extremities; Length 2.49, greatest width in region of testes, 0.64 . Suckers equal in diameter, 0.17 to 0.24. Prepharynx 0.016; pharynx spherical 0.055; esophagus fairly long, 0.087; intestinal bifurcation midway between the suckers; ceca simple straight extending into the anterior part of the posttesticular space. Ventral sucker cicular, median, about midway between intestinal bifurcation and the anterior testis. The two testes about in the middle region of the body, tandem, anterior testis transversly ellipsoidal, 0.23 by 0.35; posterior testis a little larger than the anterior, 0.25 by 0.45. Cirrus sac well developed, containing a voluminous seminal vesicle, opening at the extreme anterior tip of the body dorsal to the oral sucker, 0.87 by 0.14. Ovary spherical to the right, 0.175 to 0.240. Seminal receptacle fairly large, postero-dorsal to ovary, oval, 0.11 by 0.127. Laurer's canal opens dorsally in the region of the anterior testis. Coils of the uterus descend on the left side to the posterior end, ascend onnthe right side. Vitelline glands extend along the sides of the body in the middle third (from about the ventral sucker to the end of the ceca well posterior to the testes). Eggs oval, 38 by 16 µ. Excretory vesicle in posterior third of body, with four pairs of symmetrical branches, each branch with short simple branches.
Host: Amyda japonica , intestine
Locality: Osaka, Japan.

N.K. GUPTA, 1954

Cephalogonimus kumarus, ~~n.sp.~~ (Fig. 2.)

Host ..	..	*Lissemys punctata punctata.*
Location	..	Intestine.
Locality	..	Hoshiarpur (India).



Only three mature specimens of *Cephalogonimus kumarus*, n.sp were found in the intestine of a tortoise dissected in the Zoological Laboratory of the Panjab University College, Hoshiarpur. The live worms were light yellow in colour. The body is elongated, broad anteriorly and narrower posteriorly. The cuticle is spinous. The spines are sparsely distributed and are directed either posteriorly or sidewardly or even anteriorly. A few spines are also seen in the post-testicular region in which region they are mostly absent as in other species.

The worm is 1·305–1·815 mm. in length and 0·420–0·495 mm. in maximum breadth, which is across the level of the cirrus sac. The oral sucker is subterminal, measuring 0·135–0·153 mm. in length and 0·135–0·153 mm. in breadth. It is larger than the ventral sucker which measures 0·1088–0·1156 mm. in length and 0·102–0·1088 mm. in breadth. The ventral sucker is situated at a distance of 0·375–0·540 mm. from the anterior extremity. A small prepharynx is present. The pharynx is a small muscular pear-shaped structure lying behind the prepharynx and measures 0·0374–0·051 mm. in length and 0·0544 mm. in breadth. The oesophagus is an exceedingly small tubular structure arising from the base of the pharynx and soon bifurcates into two intestinal caeca which run posteriorly along the lateral sides of the body terminating at a little distance beyond the posterior testis at a distance of 0·405–0·45 mm. in front of the posterior end of the body.

The excretory system is Y-shaped, the main bladder bifurcates into two cornua at half-way between the posterior testis and the hinder end of the body. The excretory pore opens to the outside at the posterior end of the body.

The testes are spherical, placed obliquely either in the middle region or slightly anterior to it. The anterior testis is to the left of the median line close to the left intestinal caecum, measuring 0·135–0·165 × 0·135–0·165 mm. The posterior testis is almost in the median line measuring 0·135–0·165 × 0·135–0·150 mm. Both the testes are situated close together. From the anterior aspect of each testis is given off a vas efferens and the two vasa efferentia unite at the base of the cirrus sac to form a short vas deferens. The cirrus sac is a long curved structure lying obliquely in the space between the oral and the ventral suckers. The vesicula seminalis lies at the basal part of the cirrus sac. It shows a constriction at its middle region, thus dividing it into two equal portions, the proximal and the distal. The latter portion is followed by the prostatic duct which is surrounded by the prostate gland cells.

The ovary is situated to the right of the median line in the pre-testicular region, posterior to the ventral sucker. It measures 0·12–0·15 × 0·12 mm. in size. It is slightly overlapped by the ventral sucker. The oviduct arises from the left margin of the ovary and proceeds backwards and soon dilates to form the ootype which is surrounded by the Mehlis' glands. The Mehlis' gland complex lies behind the ovary and to the right of the anterior testis. The receptaculum seminis lies partly dorsal to the Mehlis' gland complex. In some specimens Mehlis' gland

complex lies opposite to the ovary and is just behind the ventral sucke The receptaculum seminis, however, remains to the right of the medi line behind the ovary. The vitelline glands are mostly extra-caecal a extend from the level of the middle of the cirrus sac to the anterior 1/4 of the anterior testis. The uterus is densely coiled in the post-testicul region. The genital pore lies subterminally a little behind the anteri extremity just in front of the oral sucker. The eggs measure 0·021 0·034×0·012–0·0136 mm. in size. They are dark-brown or yellow in colou

Relationships

In possessing oral sucker larger in size than the ventral sucker *Cepha gonimus kumarus*, n.sp., differs from *C. lenoiri* and *C. vesicaudus* in whi oral sucker is smaller than the ventral sucker and from *C. compactus*, *japonicus* and *C. robustus* in which both the oral and ventral suckers a of the same size. In having the oral sucker larger than the ventral suck the new species resembles the remaining species, viz., *C. retusus*, *C. ame canus*, *C. europaeus*, *C. amphiumae*, *C. emydalis*, *C. brevicirrus*, *C. meh C. burmanica*, *C. minutum*, *C. thomsi*, *C. heteropneustus* and *C. indicus* n. It, however, differs from *C. retusus*, *C. americanus*, *C. europaeus*, *C. bre cirrus* and *C. heteropneustus* in the position of the genital pore which in t latter species is placed subterminally dorsal to the oral sucker and fr *C. amphiumae*, *C. emydalis* and *C. thomsi* in which the testes are placed tandem. In the oblique position of testes *C. kumarus* resembles *C. meh C. burmanica*, *C. minutum* and *C. indicus*. But it stands apart from *indicus* in which the intestinal caeca terminate in the testicular region a from *C. minutum* in the shape of the body and distribution of the vitella The new species *C. kumarus* differs from *C. burmanica* in the presence oesophagus and the extent of vitelline glands. It closely resembles *mehri*, but it differs from it in the absence in latter of the prepharynx a oesophagus and also in the extension of vitellaria. Therefore, the n species is distinct from all the existing species. This new species has be named after my old teacher Prof. Dewan Anand Kumar at present Vi Chancellor of the Panjab (India) University.

Cephalogonimus minutum Mehra, 1937

Body nearly rounded, 0.52 to 0.63 by 0.38 to 0.49. Spined. Oral sucker 0.09 to 0.12; ventral sucker 0.07 to 0.1, near midbody. Pharynx 0.03 by 0.04. Ceca end a little behind posterior testes. Testes smooth, oblique, anterior testis overlapping ventral sucker. Cirrus sac extending nearly to ovary. Seminal vesicle bipartite. Eggs 30 to 37 by 17 to 20µ. Vitellaria lateral, from middle of oral sucker almost to ventral sucker.

Host: Lissemip punctata

Locality: India

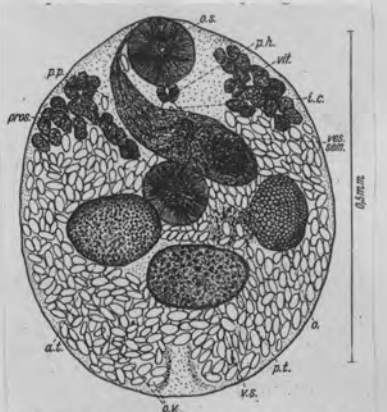


Fig. 12. Dorsal view of *Cephalogonimus minutum* sp. n. Lettering see Fig. 1.

Cephalogonimus retusus (Dujardin, 1845)

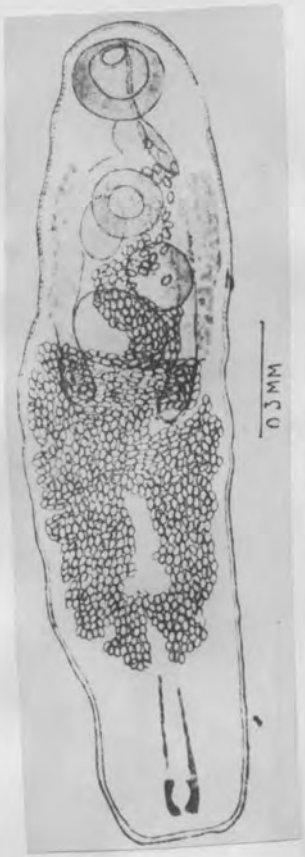
Distomum (*Brachycoelium*) *retusum* Dujardin, 1845, p. 404.
Cephalogonimus europaeus Blaizot, 1910, p. 34.
Cephalogonimus rotusus Chandler, 1924, p. 3.

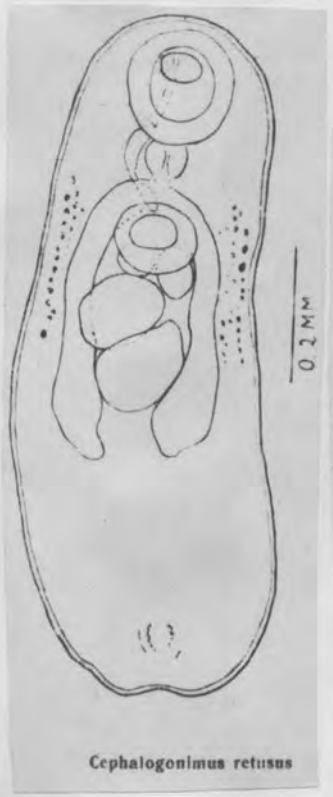
QUADRO DE DIMENSÕES:

	Dujardin	Blaizot	Travassos
Comprimento	2,4 mm.	2,45 mm.	1,1 a 2,28 mm.
Largura	0,5 mm.	0,6 mm.	0,61 a 0,82 mm.
Ventosa	0,35 mm.	0,30 mm.	0,19×0,16 a 0,20×0,24 mm.
Acetabulo	0,19 mm.	0,20 mm.	0,14×0,12 a 0,20×0,18 mm
Faringe	0,09 mm.	———	0,06×0,06 a 0,07×0 07 mm.
Cecos	———	0,85 mm.	0,40 a 0,80 mm.
Ovario	———	———	0,07 mm.
Testiculos	———	———	0,16×0,12 mm
Ovos	0,054 a 0,056×0,36	0,039×0,022 mm	0,032×0,018 a 0,040×0,025

HOST: RANA SP.
LOC.: PORTUGAL

REPORTED AS C. EUROPAEUS BLAIZOT, 1910 FROM RANA RIDIBUNDA PEREZI SEOANE, 1885 AT HOYOS DEL ESPINO (SIERRA DE GREDOS, ESPAGNE) BY COMBES AND KNOEPFFLER (1965)





FROM TRAVASSOS (1932)

Cephalogonimus robustus Caballero & Sokoloff, 1936

Body flattened, both ends rounded, posterior end more broadly so.
Length 5.280 to 5.390
Width 1.870 to 1.925
Oral and ventral sucker equal, average 0.385 to 0.402, ratio 1:1.
Pharynx globular, short, 0.105 by 0.157.
Esophagus short; ceca extend a short distance posterior to testes.
Testes usually extended transversely. Tandem.
Base of cirrus sac near acetabulum or overlapping it.
Cirrus sac bends across the cecum then extends staright foward curving medianly opposite anterior half of oral sucker.
Length of cirrus sac 1.312, terminating in papilla.
Genital pore at extreme anterior tip of body.
Ovary to one side, a short distance posterior to acetabulum.
Seminal receptacle between ovary and testis.
Vitellaria, chiefly extracecal, extend from region of acetabulum to posterior border of posterior testis.
Eggs 42 to 52 by 21 to 24 μ.
Excretory vesicle gives off a pair of branches about 1/3 the distance from posterior end to posterior testis and forks again a short distance behind the testis.

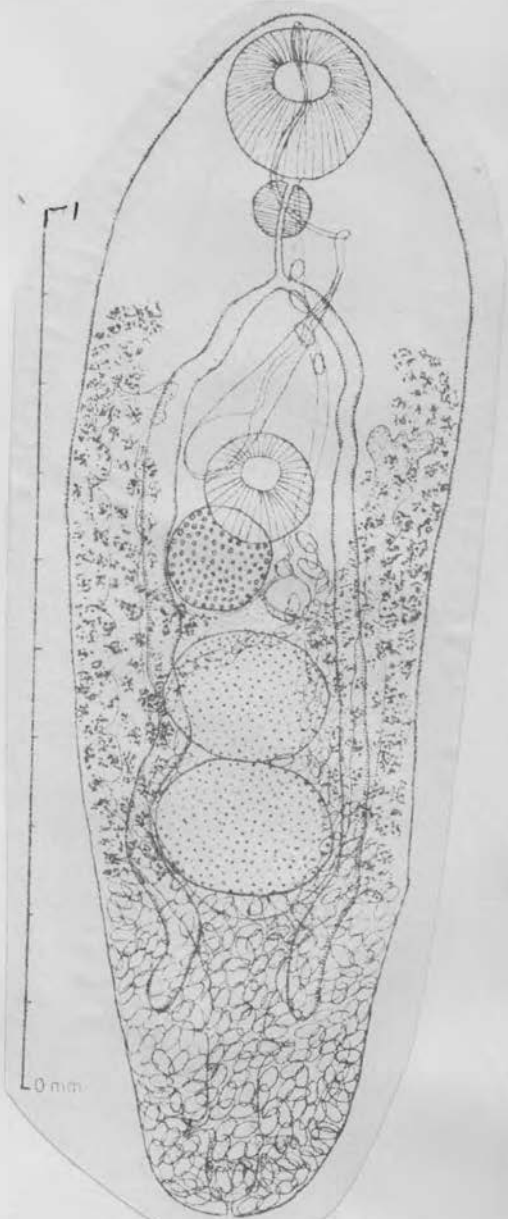
Host: Rana montezumae
Mexico.

Cephalogonimus thomasi Dollfus, 1950

Host: Pelusios nigricans (Donsdorff) = Sternothaerus derbianus Gray

Loc.: Belgian Congo

See publication for description.



From Dollfus, 1950

Length	2.997	2.430	2.767	2.430	1.984
Width	.972	.810	.890	.585	.562
diam. of oral s.	.367	?	.352	.300 (4)	.277
" " V.S.	.285	?	.270	.225 (3)	.225
forebody	.702	.630	.600	.712	.660
post testis	1.282	1,000	1.417	.830	.802
pharynx	.135 × .135	?	.105 × .127	.127 × .110	.110 × .110
eggs	25 × 17 24 × 14	25 × 17	25 × 15	few	24 × 14

– Cephalogonimus –

	a 1	a 2	c 3	d 4	TYPE e 5	large spec. 6
length	2.182mm.	1.971	2.214mm.	2.160 ~~2.314~~mm.	3.375	3.726
width	.660	.675	.742mm.	.972	0.800	0.904
diam of oral s.	.300	.307	.300	.315	0.367	0.352
" " vent. s.	.210	.240	.262	.255	0.300	0.277
forebody	.750mm	.555	.630	.607	.787	~~.765~~ .765
post testis	.652	.750	.787	~~.712~~	~~1.458~~	~~1.890~~ 1.890
pharynx (~~width~~)	.120	.112	.112			.165 x .165
eggs. – L – W.	.024 X .017 .024 X .014 .024 X .017	.024 X .017 .031 X .019 .022 X .017	.022 X .019 .024 X .017 ~~.020 X .012~~	25 x 14 25 x 17	25 x 16 26 x 16	25 x 17

a specimen 1.687 mm long contained no eggs.

2.052 well filled with eggs.

With the author's compliments H. W. Manter

dup

Indian Journal of Helminthology, Vol. III., No. 1, March, 1951, pp. 13—20.

STUDIES ON THE TREMATODE PARASITES OF FOOD FISHES OF U. P., A NEW TREMATODE *CEPHALOGONIMUS HETEROPNEUSTUS* N. SP. FROM A FRESH-WATER FISH *HETEROPNEUSTES FOSSILIS* (BLOCH).

By

S. P. Gupta. M. Sc.

Department of Zoology, University of Lucknow.

The genus *Cephalogonimus* was created by Poirier in 1886 for a trematode *Cephalogonimus lenoiri*, obtained from the intestine of an African turtle, *Tetrathrys vaillanti*. The most striking feature of the genus is the position of the genital pore at the extreme anterior end of the body on the dorsal surface in the region of the oral sucker, and Y-shaped excretory bladder with a long median stem. The genus comprises more than a dozen species described from time to time. The new form, *C. heteropneustus*, was recovered from the intestine of a fresh-water fish *Heteropneustes fossilis* (Bloch.).

The work was carried out in the Department of Zoology under the guidance of Dr. J. Dayal. The writer is thankful to him for his valuable suggestions and helpful criticism. I am thankful to Uttar Pradesh Government for Research grant under which the present work was being carried out. My thanks are also due to Dr. G. S. Thapar for his interest in the work and for allowing me free access to his valuable library. I also thank Dr. Mrs. A. Kashyap for translating literature in German language.

Cephalogonimus heteropneustus n. sp.

(Figs. 1-3.)

A number of specimens were collected from the intestine of *Heteropneustes fossilis* (Bloch.) from ponds of Lucknow

district. The number of fishes dissected was about 100 and out of these, only five were infected with these worms. The worms are new and belong to the genus *Cephalogonimus*.

The new forms are of small size with well developed suckers. The body is elongated and cylindrical with the posterior end broader than the anterior. The cuticle is covered with small backwardly directed spines which are denser in the anterior region of the body. The length of the worm varies from 0.88—1.35 mm. and the maximum breadth is from 0.26—0.4 mm. in the posterior half of the body. The region of the greatest breadth varies in different specimens, but in most cases the area of maximum breadth is some distance behind the posterior testis. The type specimen measures 1.16 mm. in length by 0.3 mm. in maximum breadth.

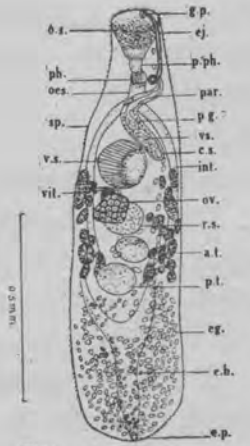


Fig.1.

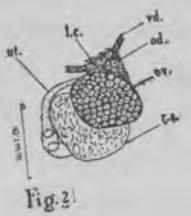


Fig.2.


Fig.3.

The oral sucker is terminal and funnel-shaped and measures 0.13 mm. in length by 0.131 mm. in breadth. The ventral sucker is nearly circular in outline and is smaller than the oral sucker. It is 0.128 mm. in diameter and is situated at a distance of 0.36 mm. from the anterior end of the body, approximately in the hinder region of the anterior

third of the body. The distance of the ventral sucker from the anterior end varies from 0.34—0.36 mm..

The mouth is an oval aperture at the anterior end of the funnel-shaped oral sucker. It opens into a small prepharynx, 0.04 mm. long by 0.03 mm. broad. The muscular pharynx is oval in shape and measures 0.028 mm. in length by 0.04 mm in breadth. The pharynx opens into an oesophagus which is 0.045 mm. long by 0.04 mm. broad. The oesophagus bifurcates into two intestinal cæca which extend upto the posterior end of anterior testis. Both the cæca are of equal length and there is no variation in the extension of the cæca.

The excretory pore opens on the dorsal side at the posterior end of the body. It leads into an elongated Y-shaped excretory bladder. The median limb of the bladder is long and extends to about $\frac{1}{4}$ (one fourth) the length of the body, a short distance behind the posterior testis where it receives the two lateral branches. The two lateral ducts extend upto the level of the anterior testis.

The genital pore is situated at the anterior end of the body on the dorsal side of the oral sucker a little to the right of the median line.

The two testes are oval in shape and lie obliquely one behind the other, posterior to the ovary in the middle third of the body. The anterior testis is situated a little to the right side of the median line at a distance of 0.61 mm. from the anterior end of the body. It is 0.07 mm. long by 0.09 mm broad. The posterior testis is larger than the anterior testis and is 0.085 mm. long by 0.11 mm. broad. It lies at a distance of 0.68 mm. from the anterior end of the body close behind the anterior testis. In some cases the testis are very near each other and the anterior testis may partially overlap the posterior testis.

9. Cirrus sac tubular and extending from the anterior end of the body to the anterior margin or to the middle of the ventral sucker.

10. Vesicula seminalis divided by a constriction into two. Pars prostatica and ejaculatory duct present.

11. Vitelline glands extending from the middle of the ventral sucker to the posterior region of the hind testis.

12 Excretory bladder Y-shaped, excretory pore at the posterior end on the dorsal side.

13. Eggs with thick shell, operculated and with miracidia.

Discussion—The form described above resembles *Cephalogonimus* in the shape of the body, in the position and structure of the genital organs, in the position and structure of the cirrus sac, in the position of the genital pore, and in the shape of the excretory bladder. It, however, differs from all the known species of the genus in the possession of short intestinal caeca which extend upto the posterior end of the anterior testis, in the structure of seminal vesicle which is cylindrical and bi-partite, in the position of the excretory pore which is on the dorsal side at the posterior end of the body, and in the absence of lateral branches in the median stem of the excretory bladder. These differences are enough to create a new species, *Cephalogonimus heteropneustus* for these forms.

The family CEPHALOGONIMIDAE contains two genera, *Cephalogonimus* Poirier, 1886, and *Emoleptalea* (syn. *Leptalea*) Looss, 1899. The differences between the two genera are in the position of the genital pore, in the extent of vitelline glands, and in the presence or absence of lateral branches of the main stem of the excretory bladder. These differences are only of specific value and POCHE (1926)

and SINHA (1932) regarded *Emoleptalea* as synonym to *Cephalogonimus* while MEHRA (1937) regarded them as separate genera. BHALERAO (1936 and 1942) pointed out that even within the genus *Cephalogonimus* there is variation in the position of the genital pore, in the extent of vitelline glands, in the relative position of testes, cirrus sac and ventral sucker. The genital pore in *Cephalogonimus* is also at the anterior end of the body as in *Emoleptalea* but it may be median or on the right or the left side of the median line. Further LENT & FREITAS (1940) have shown that the position of the genital pore is variable even within *Cephalogonimus americanus*. Therefore, this variation can only be of specific value. The variation in the extent of vitelline glands is only specific and not a generic difference. The presence of lateral branches in the main stem of the excretory bladder is the only difference which separates the two genera. But in view of the fact that the two genera resemble each other in all characters and also in the possession of a Y-shaped excretory bladder, this one character should be taken only of specific variation. Further the new form *Cephalogonimus heteropneustus* resembles *Cephalogonimus* in all characters except the possession of lateral branches in the main stem of the excretory bladder and therefore *Emoleptalea* is regarded as synonym to *Cephalogonimus* as already pointed out by POCHE and SINHA.

Host—*Hetropneustes fossilis* (Bloch.).

Habitat—Intestine.

Locality—Lucknow.

Type specimen is deposited in Dr. G. S. Thapar's Helminthological collection.

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LETTERING IN THE FIGURES

All figures were drawn with the aid of camera lucida. The projected scale has the value indicated in each figure. The following abbreviations are used :—

Fig. 1. *Cephalogonimus heteropneustus* n. sp. dorsal view.

Fig. 2. *Cephalogonimus heteropneustus* n. sp. ovary and ootype, ventral view.

Fig. 3. *Cephologonimus heteropneustus* n. sp. eggs.

a. t.—anterior testis; c. s.—cirrus sac; e. b.—excretory bladder; e. g.—eggs; e. j.—ejaculatory duct; e. p.—excretory pore; g. p.—genital pore; int.—intestinal caeca; l. c.—Laurer's canal; od.—oviduct; oes.—oesophagus; os.—oral sucker; ov.—ovary; par.—pars prostatica; p. g.—prostate glands; ph.—pharynx; p. ph.—prepharynx; p. t.—posterior testis; r. s.—receptaculum seminis; sp.—spines; ut.—uterus; vd.—vitelline duct. vit.—vitelline glands; v. s.—ventral sucker; vs.—vesicula seminalis.

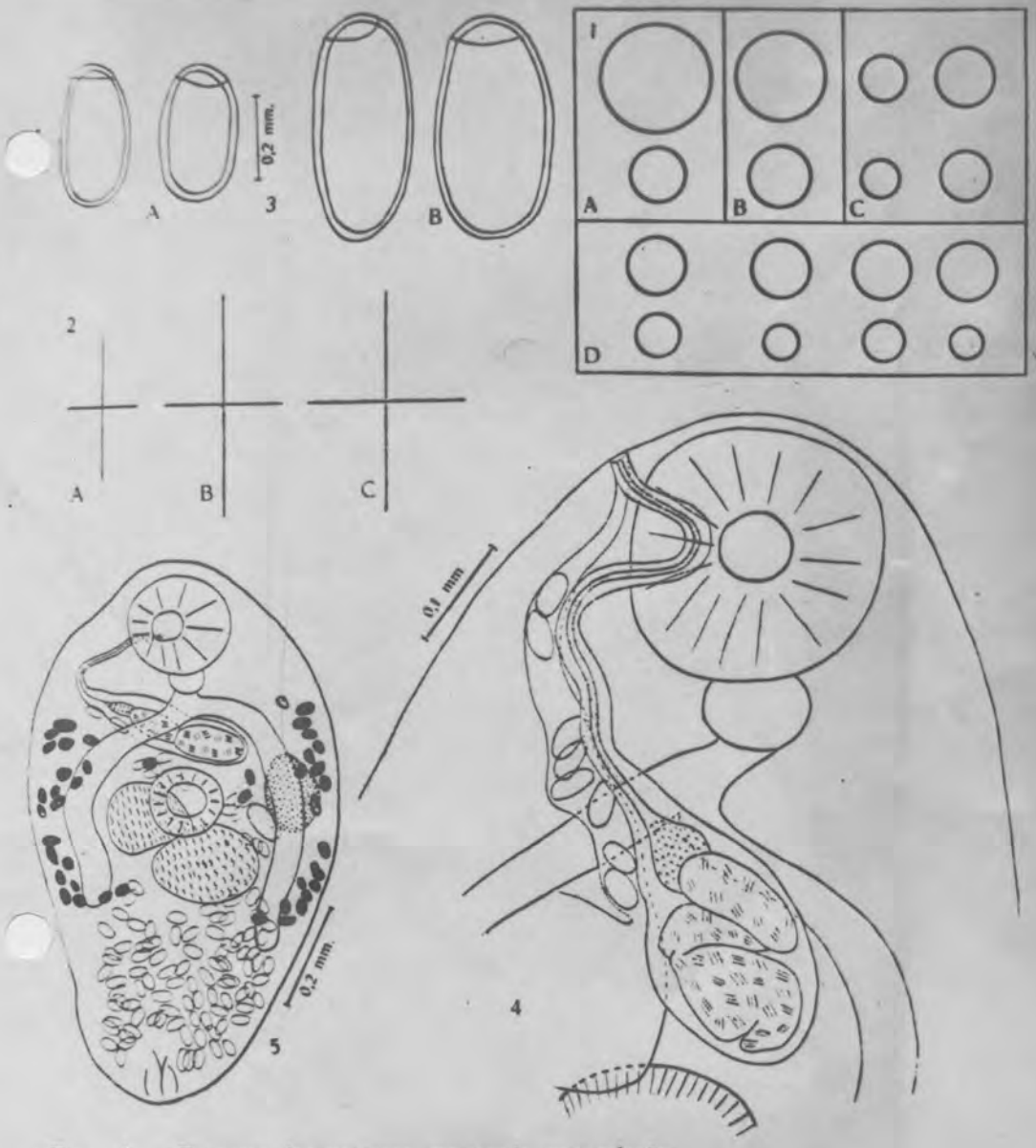

Fig. 1 — Esquema das ventosas, mostrando suas relações
A — *Cephalogonimus retusus* (DUJ., 1845) — Segundo as medidas de Dujardin.
B — *Cephalogonimus europaeus* BLAIZOT, 1910 — Segundo as medidas de Blaizot.
C — *Cephalogonimus europaeus* BLAIZOT, 1910 — Segundo as medidas de Travassos
D — *Cephalogonimus americanus* STAFFORD, 1902 Segundo nossas medidas.

Fig. 2 — Esquema dos diametros dos ovos
A — *Cephalogonimus europaeus* BLAIZOT, 1910 — Segundo nossas medidas: material proveniente de *Rana sp.* de Portugal.
B — *Cephalogonimus americanus* STAFFORD, 1902 — Segundo nossas medidas
C — *Cephalogonimus retusus* (DUJ., 1845) — Segundo medidas de Dujardin

Fig. 3 — A. *Cephalogonimus europaeus* BLAIZOT, 1910 — Ovos. Material proveniente de *Rana sp.* de Portugal. Original.
B. *Cephalogonimus americanus* STAFFORD, 1902 — Ovos. Original.

Fig. 4 — *Cephalogonimus americanus* STAFFORD, 1902 — Região da bolsa do cirro, vista dorsal. Original.

Fig. 5 — *Cephalogonimus americanus* STAFFORD, 1902 — Aspecto total. Original.

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Cephalogonimoides ~~gen. n.~~ BROOKS AND BUCKNER, 1976

Diagnosis: Cephalogonimidae. Body elongate, spinose. Oral sucker subterminal. Prepharynx muscular; pharynx present; esophagus short; ceca extending to posterior end of body. Acetabulum large, equatorial. Testes postacetabular, symmetrical. Cirrus sac may or may not reach acetabulum, enclosing tubular seminal vesicle, prostatic complex, and long ejaculatory duct. Genital pore terminal to oral sucker. Ovary submedian, posterolateral or lateral to acetabulum, lobed. Seminal receptacle absent. Laurer's canal and Mehlis' gland present. Vitellaria follicular, variable in extent, beginning at preacetabular level. Uterine coils occupying most available space in hind body. Eggs small. Excretory vesicle Y-shaped with lateral diverticula. Parasites in intestine of amphibians. Type and only known species: *Cephalogonimoides sireni* (Premvati 1969) comb. n.; syn. *Cephalogonimus sireni* Premvati 1969.

CEPHALOGONIMOIDES SIRENI (PREMVATI, 1969) BROOKS AND BUCKNER, 1976

SYN: *Cephalogonimus sireni* ~~sp. nov.~~ PREMVATI, 1969

(Fig. 1)

HOST: *Siren lacertina* Linnaeus, 1766.

LOCALITY: Lake Munson, Leon County, Florida.

LOCATION: Latter half of intestine.

NUMBER OF WORMS: Five from one host.

SPECIMENS: Holotype and one paratype in USNM Helm. Coll. Nos. 71236, 71237.

Description

Body oval, spinous, small, 1.04–1.44 mm long, and 760–870 wide. Oral sucker subterminal, 170 in diameter; ventral sucker very large, 340 in diameter; both suckers have three to six rows of spines on their margins. Prepharynx thick and muscular; pharynx 125–130 by 110, very muscular, globular, resembling a sucker; esophagus absent; intestinal ceca terminate almost at posterior end of body. Distance between ceca and posterior end of body 140–150.

Genital pore median and terminal. Testes 230–270 by 200–230, ovoid to spherical, symmetrically opposite, immediately posterior to ventral sucker. Vasa efferentia join in acetabular region to form the vas deferens. Cirrus sac preacetabular, elongated; enclosing elongated seminal vesicle, ejaculatory duct, cirrus and prostatic cells; runs toward left of pharynx and then joins uterus to form hermaphroditic duct that runs dorsal to oral sucker. Ovary submedian, ovoid to lobed, dorsal and to right of ventral sucker, measures 160–170 by 100–110. Laurer's canal and seminal receptacle present. Vitellaria follicular, extends from intestinal bifurcation to testicular level. Two transverse vitelline ducts dorsal to ventral sucker and join to form an elongated vitelline reservoir. Whole female genital complex lies in acetabular region. Uterus extends posteriorly and then runs anteriorly on left of ventral sucker. Excretory bladder Y-shaped, stem of Y being small. Eggs small, numerous, and measure 23–25 by 14–15 (30 measured).

Discussion

The subfamily Cephalogoniminae Looss (1899), subsequently raised to family Cephalogonimidae Nicoll (1914), includes four genera: *Cephalogonimus* Poirier, 1886, *Emoleptalea* Looss, 1900 (Syn.: *Leptalea* Looss, 1899), *Paracephalogonimus* Skrjabin, 1950 and *Oudhia* Dayal and Gupta, 1954.

Oral sucker is larger than ventral sucker in the three genera, *Emoleptalea*, *Paracephalogonimus*, and *Oudhia*, and in all species except five, of the genus *Cephalogonimus*. Two of these five species, namely *C. compactus* Stunkard, 1924 and *C. japonicus* Ogata, 1934, have oral sucker equal to ventral sucker. In the remaining three species, the oral sucker is only slightly smaller than the ventral sucker, the sizes being: 240 and 290 in *C. lenoiri* Poirier, 1886; 220 and 270 in *C. vesicaudus* Nickerson, 1912; 220–270 and 310–330 in *C. manchuricus* Oguro, 1941. But in *C. sireni*, the oral sucker is half the size of ventral sucker and they measure 170 and 340. This ratio of 1:2 in the sizes of the two suckers is not seen in any species of the genus *Cephalogonimus*.

The position of testes in all species of the genus *Cephalogonimus* is tandem or diagonal. But in *C. sireni*, the testes are symmetrically opposite.

In all species of the genus *Cephalogonimus*, the shape of the ovary is entire. But ovary is lobed in *C. sireni*.

The position of testes and shape of ovary are two of the major characteristics used to distinguish the two families Prosthogonimidae and Cephalogonimidae: the former has symmetrically opposite testes and lobed ovary, while the latter has tandem or diagonal testes and entire ovary. *Cephalogonimus sireni* shows prosthogonimid characters in having symmetrically opposite testes and lobed ovary; but it has typical cephalogonimid shape of the body, elongated cirrus sac, genital pore at anterior extremity on the dorsal side, and an amphibian host.

Thus *C. sireni* differs from all the present species of the genus *Cephalogonimus* in the following: (1) ventral sucker very large, twice the size of oral sucker; (2) symmetrically opposite testes, and (3) lobed ovary. It is, accordingly, regarded as a new species.

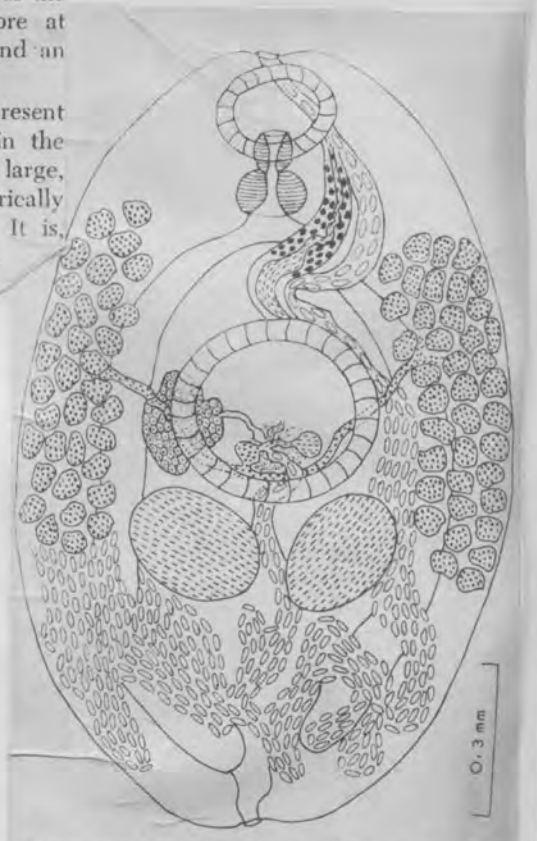

Figure 1. ***Cephalogonimus sireni*** **sp. nov. from Florida mud eel,** ***Siren lacertina*****. Holotype: ventral view.**

—OVER—

Premvati (1969) described *Cephalogonimus sireni* from five specimens collected from *Siren lacertina* in Florida. Examination of the holotype and paratype from the U. S. National Museum revealed the unique nature of the species. It resembles members of *Cephalogonimus* in possessing a terminal genital pore, large vitelline follicles, and Y-shaped excretory vesicle with lateral diverticula. It differs by having symmetrical testes, a lobed ovary, an acetabulum much larger than the oral sucker, ceca extending to the posterior end of the body, and a muscular prepharynx; and by lacking a seminal receptacle. *Cephalogonimoides sireni* was originally described as possessing a seminal receptacle, but examination of the type material showed that the structure described and figured as the seminal receptacle was in fact a loop of the uterus. The ootype region has been redrawn (Fig. 3). A ventral view of the holotype is figured in the original description. The holotype is mounted dorsal side up and drawn in this position, but captioned a ventral view (Premvati, 1969).

3

BROOKS AND BUCKNER, 1976

Paracephalogonimus Skrjabin, 1950

Generic diagnosis. — Cephalogonimidae: Body nearly rounded, very small, spinose. Oral sucker subterminal, larger than acetabulum; prepharynx present, pharynx small, esophagus practically absent, ceca terminating a little behind posterior testis. Acetabulum in midregion of body. Testes oblique, postacetabular, posterior testis almost median; cirrus pouch large, elongate, with its base anterodextral to acetabulum and its attenuated distal portion curving round left side of oral sucker, containing large, bipartite seminal vesicle, prostate complex and ejaculatory duct. Genital pore at extreme anterior end. Ovary oval, dextral to acetabulum, at equatorial level. Vitelline follicles massed together in shoulder region. Uterus occupying most of body posterior to vitellaria; eggs small. Excretory vesicle? Parasitic in intestine of chelonians.

Genotype: *P. minutus* (Mehra, 1937) (Pl. 54, Fig. 660), in *Lissemys punctata;* India.

CEPHALOGONIMIDAE Nicoll, 1915

Family diagnosis. — See p. 480

Key to genera of Cephalogonimidae from fishes

Genital pore level with prepharynx, vitellaria largely post-acetabular ..... *Oudhia*

Genital pore level with oral sucker; vitellaria largely acetabular ..... *Emoleptalea*

Emoleptalea Looss, 1900

Syn. *Leptalea* Looss, 1899 preoccupied

Generic diagnosis. — Cephalogonimidae. Body small, elongate, delicate, covered anteriorly with spines. Oral sucker comparatively large; prepharynx present, pharynx small, esophagus and ceca slender. Acetabulum small, pre-equatorial. Testes tandem postequatorial. Cirrus pouch elongate claviform, enclosing bipartite seminal vesicle, small pars prostatica and narrow ductus ejaculatorius, extending nearly throughout forebody. Genital pore on the right of oral sucker. Ovary a little to left of median line between acetabulum and anterior testis, with receptaculum seminis behind. Vitellaria forming a bunch on each side of acetabulum. Uterus winding backward as far as posterior extremity, then forward, occupying most of hindbody. Excretory vesicle Y-shaped, with long stem, short arms and terminal pore. Intestinal parasites of fishes.

Genotype: *E. exilis* (Looss, 1899) Looss, 1900 (syn. *Leptalea e.* L.) (Pl. 2, Fig. 22), in *Bagrus bayad;* Cairo.

Other species:

E. heteropneustus (Gupta, 1951), in *Heteropneustes fossilis*, *India.*

E. synodontidos Dollfus, 1950, in *Synodontis notatus ocellatus;* Belgian Congo.

CEPHALOGONIMIDAE Nicoll, 1915

Family diagnosis. — See p. 480.

Key to genera of Cephalogonimidae from fishes

Genital pore level with prepharynx, vitellaria largely post-acetabular ..... *Oudhia*

Genital pore level with oral sucker; vitellaria largely acetabular ..... *Emoleptalea*

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Syn. *Leptalea* Looss, 1899 preoccupied

Generic diagnosis.—Cephalogonimidae: Body small, elongate, delicate, covered anteriorly with spines. Oral sucker comparatively large, prepharynx present, pharynx small, esophagus and ceca slender. Acetabulum small, pre-equatorial. Testes tandem, postequatorial. Cirrus pouch elongate claviform, enclosing bipartite seminal vesicle, small pars prostatica and narrow ductus ejaculatorius, extending nearly throughout forebody. Genital pore on the right of oral sucker. Ovary a little to left of median line between acetabulum and anterior testis, with receptaculum seminis behind. Vitellaria forming a bunch on each side of acetabulum. Uterus winding backward as far as posterior extremity, then forward, occupying most of hindbody. Excretory vesicle Y-shaped, with long stem, short arms and terminal pore. Intestinal parasites of fishes.

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ON TWO NEW SPECIES OF THE GENUS *EMOLEPTALEA* LOOSS, 1900 (TREMATODA : CEPHALOGONIMIDAE) FROM FRESH WATER FISH *SACCOBRANCHUS FOSSILIS.*

By

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Research Scholar, College of Science, Raipur.

(Communicated by Dr. B. S. Chauhan)

Received on 26-3-1960.

The genus *Leptalea*, erected by Looss (1899) to include his species *L. exilis*, was placed by him in the subfamily Cephalogoniminae Looss, 1899. He in 1900, subsequently discovered that the genus *Leptalea* was preoccupied and, therefore, placed *L. exilis* in the new genus *Emoleptalea* under the same subfamily. Nicoll (1914) raised this subfamily to the status of a family Cephalogonimidae. However, he did not give the family diagnosis, but later in 1926, he considered Cephalogonimidae to be synonymous with the family Prosthogonimidae. Poche (1925) followed Odhner (1911) in assigning the genus *Prosthogonimus* to the family Lepodermatidae (=Plagiorchiidae) and accepted the family Cephalogonimidae for the inclusion of the two genera *Cephalogonimus* and *Emoleptalea*. Poche (1926), Sinha (1932) and Gupta (1951) regarded the genus *Emoleptalea* as an objective synonym of the genus *Cephalogonimus*, taking into consideration that the differences between these two genera, in regard to the position of the genital pore, variation in the extent of vitelline glands and in the presence and absence of lateral branches of the main stem of the excretory bladder, are only of specific value and not of generic value.

However, Mehra (1937), Dollfus (1952), Yamaguti (1953) and Thomas (1958) regarded *Emoleptalea* and *Cephalogonimus* as separate genera. Yamaguti (1958), while classifying the family Cephalogonimdiae has retained the genus *Emoleptalea* and *Cephalogonimus heteropneustus* Gupta, 1951 has been included by him under the genus *Emoleptalea* as *E. heteropneustus*.

Only four species have so far been described under this genus. They are :—*E. exilis* Looss, 1900; *E. synodontis* Dollfus, 1950; *E. heteropneustus* (Gupta, 1951) Yamaguti, 1958; and *E. proteropora* Thomas, 1958.

The present paper gives an account of two more species of the genus *Emoleptalea* obtained from the intestine of a fresh water fish—*Saccobranchus fossilis* at Raipur. Out of 16 hosts examined, only one was found to be infected with these parasites. Their study reveals that they differ from each other and also from the above known species and hence, are described as new species by the writer.

Emoleptalea exilis (Looss, 1899) Looss, 1900
syn. Leptalea exilis Looss, 1899

"AFTER LOOSS"
FROM PRATT, 1902

EMOLEPTALEA DOLLFUSI n. sp. Srivastava, 1960
(Fig. 2)

The distome is small, oval in outline and 0.90 mm. 0.99 mm. long and 0.543 mm.-0.561 mm. at the widest point, which lies behind the acetabulum. Body surface, except for cuticular linings of the suckers, is armed with conical, backwardly directed spines arranged in transverse rows.

The oral sucker is subterminal, almost spherical in shape and measures 0.096 mm. × 0.09 mm. in size. The ventral sucker is comparatively larger than the oral sucker, measuring 0.135 mm. × 0.138 mm. in diameter. It is located at 0.238 mm. from the anterior end.

The opening of the oral sucker is ventrally directed, its cavity leading into a very short prepharynx. The pharynx is small, pyriform, muscular and measures 0.027 mm. in length and 0.03 mm. in breadth. The oesophagus is short, slender and 0.036 mm. long. It bifurcates in front of the acetabulum into two intestinal cacca which terminate at the posterior margin of the posterior testis.

The excretory bladder is Y shaped, the median stem of which extends upto the level of the posterior testis. The bladder opens subventrally at the hinder end through a small excretory pore.

The male and female genital pores are located on a common genital papilla, at the anterior end slightly on the right side of the mid line of the body. The testes are more broader than long, with entire margins, and are situated diagonally one behind the other in the posterior half of the body. The anterior testis is 0.075 mm. × 0.12 mm. in size and 0.476 mm. behind the anterior end. The posterior testis is 0.072 mm. × 0.117 mm. in size and situated at a distance of 0.561 mm. from the anterior end.

The cirrus sac is claviform, elongate, extending upto the posterior border of the acetabulum. The bipartite vesicula seminalis lies at the basal portion of the cirrus sac. Anterior to the vesicula seminalis is a 0.081 mm. long pars prostatica The narrow terminal part of the cirrus sac is occupied by an ejaculatory duct, which extends below the gut caecum before opening into the genital atrium.

The ovary is pretesticular, transversely elongated, and submedian, lying on the left side of the midline. It measures 0.06 mm. in length and 0.108 mm. in breadth and is 0.307 mm. from the anterior extremity. The oviduct is directed obliquely to the centre of the body, to form an ootype, after receiving a duct from the receptaculum seminis and the median vitelline duct. The shell gland is poorly developed. The receptaculum seminis is large, globular, measuring 0.045 mm. × 0.024 mm. The uterus emerges from the ootype and fills the post acetabular zone of the body. The ascending limb of the uterus runs marginally, beneath the vitelline glands in front of the ventral sucker. The metraterm is weekly developed, and opens at the genital atrium,

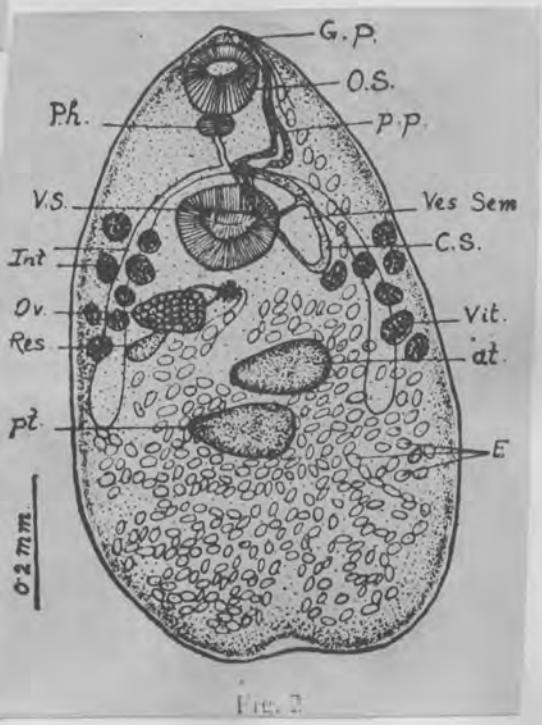

Fig. 2

behind the male opening. The eggs are oval and small, measuring 0.018 mm. × 0.014 mm. in size.

The vitelline follicles are globular, few in number forming a group on each side of the acetabulum. The two vitelline ducts, one from each side, pass centrally and meet to form a vitelline reservoir.

Host—*Saccobranchus fossilis*.
Location—Intestine.
Locality—Raipur.

DISCUSSION

The forms described above resemble the genus *Emoleptalea* in the shape of the body, in the position and structure of genital organs, in the structure of the cirrus sac and the excretory bladder, in the diposition of the vitellaria and the extension of the intestinal caeca. They, however, differ from the other known species in many characters. *E. loossi* n. sp. differs from *E. exilis*; *E. synodontis*; *E. heteropneustus*; *E. proteropora* and *E. dollfusi* n. sp. in having symmetrical testes, in the ratio of the suckers in the position of the genital pore and relative size of the body.

E. dollfusi n. sp. differs, from the above mentioned species and *E. loossi* n. sp. in the ratio of the suckers, in more posterior extension of the cirrus sac, in the size and shape of the testes, and the position of the genital pore and the excretory pore.

Key to the species of the genus *Emoleptalea*.

1. Ventral sucker smaller than the oral.....*E. exilis*
   Ventral sucker larger than the oral..... 2
2. Genital pore in the median line immediately behind the oral sucker .....*E. synodontis*
   Gcnital pore anterior to the oral sucker in the median line.....3
   Genital pore submedian, slightly on the right side of the oral sucker.....4
3. Vitellaria forming two groups on either side of acetabulum.....*E. proteropora*
   Vitellaria extending from the middle of the acetabulum to the hind region of the posterior testis.....*E. heteropneustus*
4. Testes juxtaposed.....*E. loossi* n. sp.
   Testes diagonally tandem .....*E. dollfusi* n. sp.

EMOLEPTALEA DOLLFUSI n. sp. Srivastava, 1960
(Fig. 2)

The distome is small, oval in outline and 0.90 mm. 0.99 mm. long and 0.543 mm.-0.561 mm. at the widest point, which lies behind the acetabulum. Body surface, except for cuticular linings of the suckers, is armed with conical, backwardly directed spines arranged in transverse rows.

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The cirrus sac is claviform, elongate, extending upto the posterior border of the acetabulum. The bipartite vesicula seminalis lies at the basal portion of the cirrus sac. Anterior to the vesicula seminalis is a 0.081 mm. long pars prostatica The narrow terminal part of the cirrus sac is occupied by an ejaculatory duct, which extends below the gut caecum before opening into the genital atrium.

The ovary is pretesticular, transversely elongated, and submedian, lying on the left side of the midline. It measures 0.06 mm. in length and 0.108 mm. in breadth and is 0.307 mm. from the anterior extremity. The oviduct is directed obliquely to the centre of the body, to form an ootype, after receiving a duct from the receptaculum seminis and the median vitelline duct. The shell gland is poorly developed. The receptaculum seminis is large, globular, measuring 0.045 mm. × 0.024 mm. The uterus emerges from the ootype and fills the post acetabular zone of the body. The ascending limb of the uterus runs marginally, beneath the vitelline glands in front of the ventral sucker. The metraterm is weekly developed, and opens at the genital atrium.

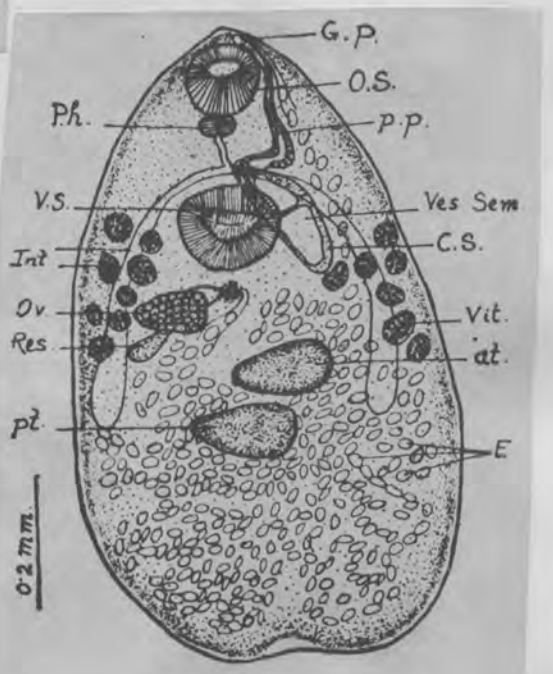


Fig. 2

behind the male opening. The eggs are oval and small, measuring 0.018 mm. × 0.014 mm. in size.

The vitelline follicles are globular, few in number forming a group on each side of the acetabulum. The two vitelline ducts, one from each side, pass centrally and meet to form a vitelline reservoir.

Host—*Saccobranchus fossilis*.
Location—Intestine.
Locality—Raipur.

DISCUSSION

The forms described above resemble the genus *Emoleptalea* in the shape of the body, in the position and structure of genital organs, in the structure of the cirrus sac and the excretory bladder, in the diposition of the vitellaria and the extension of the intestinal caeca. They, however, differ from the other known species in many characters. *E. loossi* n. sp. differs from *E. exilis*; *E. synodontis*; *E. heteropneustus*; *E. proteropora* and *E. dollfusi* n. sp. in having symmetrical testes, in the ratio of the suckers in the position of the genital pore and relative size of the body.

E. dollfusi n. sp. differs, from the above mentioned species and *E. loossi* n. sp. in the ratio of the suckers, in more posterior extension of the cirrus sac, in the size and shape of the testes, and the position of the genital pore and the excretory pore.

Key to the species of the genus *Emoleptalea*.

1. Ventral sucker smaller than the oral.....*E. exilis*
   Ventral sucker larger than the oral..... 2
2. Genital pore in the median line immediately behind the oral sucker .....*E. synodontis*
   Genital pore anterior to the oral sucker in the median line.....3
   Genital pore submedian, slightly on the right side of the oral sucker.....4
3. Vitellaria forming two groups on either side of acetabulum.....*E. proteropora*
   Vitellaria extending from the middle of the acetabulum to the hind region of the posterior testis.....*E. heteropneustus*
4. Testes juxtaposed.....*E. loossi* n. sp.
   Testes diagonally tandem .....*E. dollfusi* n. sp.

EMOLEPTALEA LOOSSI n.sp. Srivastava, 1960
(Fig. 1)

The worms are very small, dorso-ventrally flattened, measuring 1.02 mm.-1.19 mm. in length and 0.189 mm.-0.26 mm. in maximum breadth, which lies at the acetabular region. The body is somewhat elliptical with broader posterior and narrow anterior extremities.

The body is covered with spines, which hardly project out of the thick cuticle. They are larger on the ventral surface of the body than the dorsal surface, where they disappear entirely behind the ventral sucker.

The oral sucker is globular and lies sub-terminally at the anterior end. It is smaller than the ventral sucker measuring 0.075 mm.-0.099 mm. × 0.078 mm. 0.081 mm. in diameter. The ventral sucker is at about one-third distance from the anterior end and measures 0.105 mm.-0 135 mm. × 0 09 mm.-0.122 mm. in size.

The mouth faces ventrally and opens into a thin walled prepharynx. The latter leads into a muscular oval pharynx, 0.033 mm.-0.036 mm. long and 0.03 mm.-0.027 mm. broad. A short oesophagus of 0.03 mm.-0.036 mm. length is present. The intestinal bifurcation lies in front of the ventral sucker. The intestinal caeca terminate just behind the posterior border of the testes.

The excretory pore is subterminal and ventral, opening through a small vesicle into a Y shaped excretory bladder. The median stem of the bladder extends upto the posterior border of the testes.

The genital pore lies at the end of a papilla situated at the anterior extremity slightly on the right side of the median line. The testes are symmetrical, rounded, postovarian, and more or less equal in size and are situated at a distance of 0.595 mm.-0.604 mm. from the anterior end. The left testis measures 0.096 mm.-0.102 mm. in length and 0.078 mm.-0.081 mm. in breadth. The right testis is 0.087 mm.-0.093 mm. × 0.075 mm.-0.081 mm. in size.

The cirrus sac is elongated, claviform and extends upto the posterior margin of the ventral sucker. It is narrow anteriorly and broad posteriorly. The bipartite vesicula seminalis lies in the basal part of the cirrus sac. Anterior to the vesicula seminalis is a long pars prostatica and a narrow ejeculatory duct, which extends anteriorly below the gut caeca to open in the genital atrium. The prostrate gland cells form a huge mass filling entirely the intervening space between the distal part of the vesicula seminalis, parsprostatica and the cirrus sac.

The ovary is subspherical, lying submedianally to the left of the median line between the acetabulum and the testes. It measures 0.045 mm.-0.051 mm. × 0.054 mm.-0.06 mm. From its inner side arises the oviduct which after running towards the median line turn backwards to dilate into a ootype. The ootype is surrounded by a shell gland mass. The receptaculum seminis is ovoid in shape and measures 0.048 mm. × 0.024 mm.

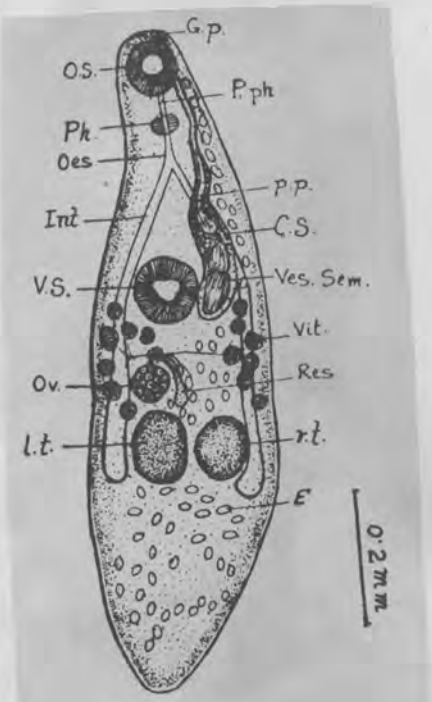


Fig. 1

The uterus after arising from the ôotype passes a little forwards before it turns backwards to form a loop, which extends upto the hinder end as the descending limb of the uterus. The ascending limb runs parallel with the descending limb towards the anterior extremity. The metraterm is weakly muscular and opens at the genital papilla behind the male genital opening. The eggs are small and oval in shape, measuring 0.015 mm.-0.018 mm. in length and 0 012 mm.-0.015 mm. in breadth.

The vitelline follicles are globular, few in number and extend from the level of the acetabulum upto the anterior margin of the testes. The two vitelline ducts, one from each side pass transversely and unite in the median line to form a common yolk reservoir, which discharges into the ôotype.

Host—*Saccobranchus fossilis.*
Location—Intestine.
Locality—Raipur.

Emoleptalea heteropneustus (Gupta, 1951)

CEPHALOGONIMUS HETEROPNEUSTUS ~~N. SP.~~ GUPTA, 1951

(Figs. 1-3.)

A number of specimens were collected from the intestine of *Heteropneustes fossilis* (Bloch.) from ponds of Lucknow district. The number of fishes dissected was about 100 and out of these, only five were infected with these worms. The worms are new and belong to the genus *Cephalogonimus*.

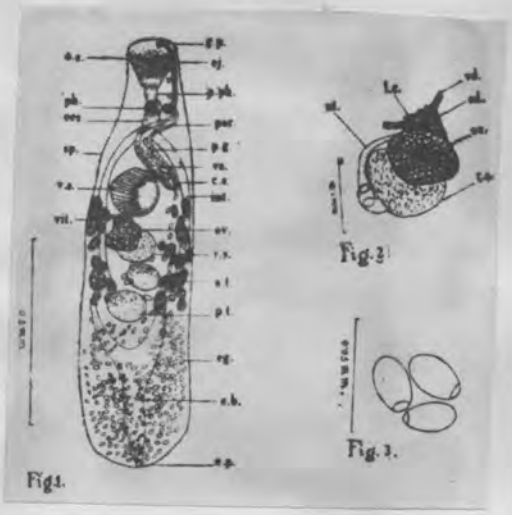


Fig. 1.

Fig. 2.

Fig. 3.

The new forms are of small size with well developed suckers. The body is elongated and cylindrical with the posterior end broader than the anterior. The cuticle is covered with small backwardly directed spines which are denser in the anterior region of the body. The length of the worm varies from 0.88—1.35 mm. and the maximum breadth is from 0.26—0.4 mm. in the posterior half of the body. The region of the greatest breadth varies in different specimens, but in most cases the area of maximum breadth is some distance behind the posterior testis. The type specimen measures 1.16 mm. in length by 0.3 mm. in maximum breadth.

The oral sucker is terminal and funnel-shaped and measures 0.13 mm. in length by 0.131 mm. in breadth. The ventral sucker is nearly circular in outline and is smaller than the oral sucker. It is 0.128 mm. in diameter and is situated at a distance of 0.36 mm. from the anterior end of the body, approximately in the hinder region of the anterior third of the body. The distance of the ventral sucker from the anterior end varies from 0.34 -0.36 mm..

The mouth is an oval aperture at the anterior end of the funnel-shaped oral sucker. It opens into a small prepharynx, 0.04 mm. long by 0.03 mm. broad. The muscular pharynx is oval in shape and measures 0.028 mm. in length by 0.04 mm in breadth. The pharynx opens into an oesophagus which is 0.045 mm. long by 0.04 mm. broad. The oesophagus bifurcates into two intestinal caeca which extend upto the posterior end of anterior testis. Both the caeca are of equal length and there is no variation in the extension of the cæca.

The excretory pore opens on the dorsal side at the posterior end of the body. It leads into an elongated Y-shaped excretory bladder. The median limb of the bladder is long and extends to about ¼ (one fourth) the length of the body, a short distance behind the posterior testis where it receives the two lateral branches. The two lateral ducts extend upto the level of the anterior testis.

The genital pore is situated at the anterior end of the body on the dorsal side of the oral sucker a little to the right of the median line.

-OVER-

The two testes are oval in shape and lie obliquely one behind the other, posterior to the ovary in the middle third of the body. The anterior testis is situated a little to the right side of the median line at a distance of 0.61 mm. from the anterior end of the body. It is 0.07 mm. long by 0.09 mm. broad. The posterior testis is larger than the anterior testis and is 0.085 mm. long by 0.11 mm. broad. It lies at a distance of 0.68 mm. from the anterior end of the body close behind the anterior testis. In some cases the testis are very near each other and the anterior testis may partially overlap the posterior testis.

The cirrus sac is a long tubular organ extending in a zig zag manner from the genital pore to the anterior or middle region of the ventral sucker to a distance of about 0.4(mm. from the anterior end of the body. The posterior third of the cirrus sac is cylindrical and broader while the anterior portion is drawn out into a long narrow tube running dorsal to the right intestinal cæcum and the oral sucker to the anterior end of the body where it opens at the genital pore. It is 0.5 mm. long and the greatest breadth in the region of the vesicula seminalis is 0.04 mm. The vesicula seminalis is cylindrical in form and lies in the posterior region of the cirrus sac. It consists of two parts, a large proximal portion separated by a constriction from a smaller distal portion. The proximal part of the vesicula seminalis is 0.11 mm. long by 0.025 mm broad, while the distal part is 0.06 mm. long by 0.035 mm. broad. It opens into a tubular pars prostatica measuring 0.11 mm. in length by 0.02 mm. in breadth. The pars prostatica is surrounded by prostate gland cells and is continued forward into a long narrow tubular ejaculatory duct which opens into a shallow depression, the common genital atrium which is surrounded by a muscular band.

The ovary lies in the middle third of the body a little to the left of the median line, behind the ventral sucker, at a distance of 0.49 mm. from the anterior end of the body. It is 0.08 mm. long by 0.11 mm. broad. In some cases the ovary is spherical and lies close to the anterior testis The shell gland cells surrounding the ootype lie between the ovary and the ventral sucker and are partly covered over by the ovary. The receptaculum seminis is sac-like and lies partly on the dorsal side and partly on the right side of the ovary Posteriorly it extends upto the anterior testis, and is 0.09 mm. long by 0.11 mm. broad. A Laurer's canal is present. The vitelline glands are few in number and extend from the middle of the ventral sucker to the hind region of the posterior testis.

The uterus arises from the right side of the ootype and runs backward on the ventral side of the testis to the left side of the body upto the posterior region where it bends and

CONTINUED NEXT PAGE

runs towards the anterior region on the right side of the body. The descending and the ascending coils of the uterus are arranged transversely behind the posterior testis. In the anterior region the uterus runs parallel to the cirrus sac and opens to the outside through the common genital atrium lying on the dorsal side of the oral sucker at the anterior end.

The eggs are oval and operculated with a thick yellowish-brown shell. In fully developed eggs, miracidia are present. They are 0.023-0.027 mm. in length by 0.013-0.017 mm. in breadth.

The distinguishing characters of the new form may be summarised thus :—

1. Body elongated, cylindrical with the posterior end broader than the anterior.
2. Skin covered by spines.
3. Ventral sucker in the hinder region of the anterior third of the body and smaller than the oral sucker.
4. Prepharynx, pharynx and oesophagus present.
5. Intestinal caeca extending upto the posterior region of the anterior testis.
6. Testes posterior to ovary and oblique in position.
7. Ovary posterior to the ventral sucker.
8. Genital pore at the anterior end of the body on the dorsal side of the oral sucker a little to the right of the median line.
9. Cirrus sac tubular and extending from the anterior end of the body to the anterior margin or to the middle of the ventral sucker.
10. Vesicula seminalis divided by a constriction into two. Pars prostatica and ejaculatory duct present.
11. Vitelline glands extending from the middle of the ventral sucker to the posterior region of the hind testis.
12. Excretory bladder Y-shaped, excretory pore at the posterior end on the dorsal side.
13. Eggs with thick shell, operculated and with miracidia.

Discussion—The form described above resembles *Cephalogonimus* in the shape of the body, in the position and structure of the genital organs, in the position and structure of the cirrus sac, in the position of the genital pore, and in the shape of the excretory bladder. It, however, differs from all the known species of the genus in the possession of short intestinal caeca which extend upto the posterior end of the

- OVER -

anterior testis, in the structure of seminal vesicle which is cylindrical and bi-partite, in the position of the excretory pore which is on the dorsal side at the posterior end of the body, and in the absence of lateral branches in the median stem of the excretory bladder. These differences are enough to create a new species, *Cephalogonimus heteropneustus* for these forms.

The family CEPHALOGONIMIDAE contains two genera, *Cephalogonimus* Poirier, 1886, and *Emoleptalea* (syn. *Leptalea*) Looss, 1899. The differences between the two genera are in the position of the genital pore, in the extent of vitelline glands, and in the presence or absence of lateral branches of the main stem of the excretory bladder. These differences are only of specific value and POCHE (1926) and SINHA (1932) regarded *Emoleptalea* as synonym to *Cephalogonimus* while MEHRA (1937) regarded them as separate genera. BHALERAO (1936 and 1942) pointed out that even within the genus *Cephalogonimus* there is variation in the position of the genital pore, in the extent of vitelline glands, in the relative position of testes, cirrus sac and ventral sucker. The genital pore in *Cephalogonimus* is also at the anterior end of the body as in *Emoleptalea* but it may be median or on the right or the left side of the median line. Further LENT & FREITAS (1940) have shown that the position of the genital pore is variable even within *Cephalogonimus americanus*. Therefore, this variation can only be of specific value. The variation in the extent of vitelline glands is only specific and not a generic difference. The presence of lateral branches in the main stem of the excretory bladder is the only difference which separates the two genera. But in view of the fact that the two genera resemble each other in all characters and also in the possession of a Y-shaped excretory bladder, this one character should be taken only of specific variation. Further the new form *Cephalogonimus heteropneustus* resembles *Cephalogonimus* in all characters except the possession of lateral branches in the main stem of the excretory bladder and therefore *Emoleptalea* is regarded as synonym to *Cephalogonimus* as already pointed out by POCHE and SINHA.

Host—*Hetropneustes fossilis* (Bloch.).

Habitat—Intestine.

Locality—Lucknow.

Type specimen is deposited in Dr. G. S. Thapar's Helminthological collection.

From Gupta,1961

Yamaguti (1958) considered the genera *Cephalogonimus* and *Emoleptalea* as distinct, and placed *C. heteropneustus* Gupta, 1951 under *Emoleptalea*. The two genera are distinguished in the position of genital pore, in the extent of vitelline glands and in the presence or absence of lateral branches of the main stem of excretory bladder. These differences are of specific value although Poche (1926) and Sinha (1932) regarded them as being of (separate) generic value. Bhalerao (1936 and 1942) pointed out that even within the genus *Cephalogonimus* there is variation in the position of the genital pore, in the extent of the vitelline glands, in the relative position of the testes, cirrus sac and ventral sucker. The genital pore in *Cephalogonimus* is at the anterior end of the body as in *Emoleptalea* but it may be either median or on the right or left side of the median line. Lent and Freitas (1940) are of the opinion that the position of genital pore is variable even within *Cephalogonimus americanus*. The presence of lateral branches is the only specific difference which separates the two genera. But in view of the fact that the two genera resemble each other in all characters, as well as in the possession of Y-shaped excretory bladder, this one character can be taken as only a specific variation. *Emoleptalea* is, therefore, regarded as a synonym of *Cephalogonimus*.

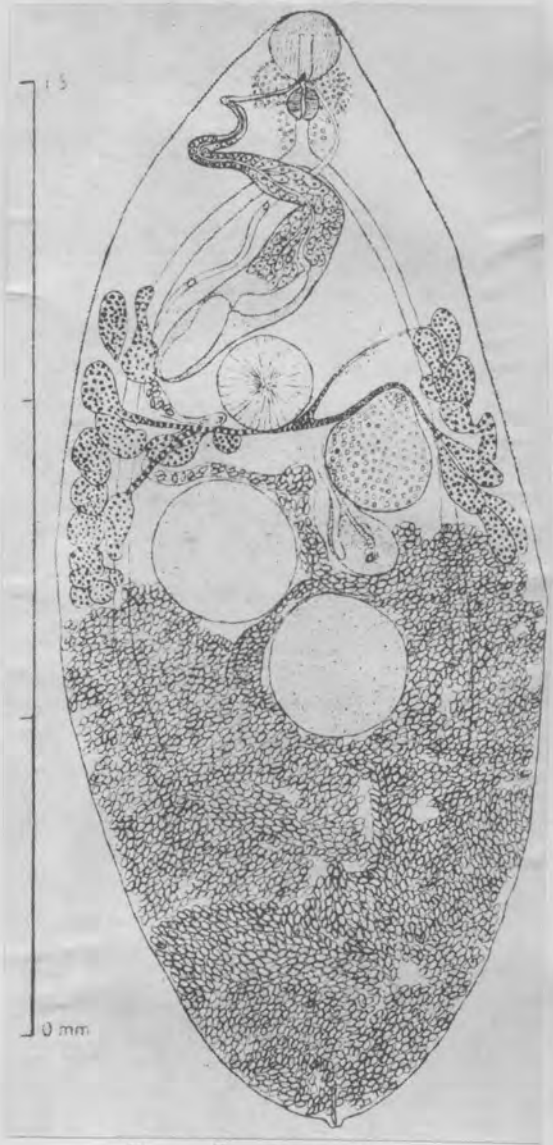
Cephalogonimidae

Emoleptalea synodontidos Dollfus, 1950

Host: Synodontis notatus Vaillant, 1893 var. ocellatus Poll, 1938

Loc.: Belgian Congo

See publication for description.



From Dollfus, 1950

Oudhia Dayal et Gupta, 1954

Generic diagnosis. — Cephalogonimidae: Body plump, spinose. Oral sucker funnel-shaped, prepharynx present, pharynx small, esophagus very short, ceca terminating at level of ovary. Acetabulum in anterior half of body. Testes obliquely overlapping each other behind ovary. Cirrus pouch long, claviform, enclosing bipartite seminal vesicle, well developed prostatic complex and long ejaculatory duct. Genital pore

sinistral to prepharynx. Ovary submedian, pretesticular, postacetabular. Receptaculum seminis large, sinistral to ovary. Laurer's canal present. Vitellarian acini few in number, extending in lateral fields from level of acetabulum to testicular zone. Uterus filling up hindbody; metraterm weakly developed; eggs small. Parasites of freshwater fishes.

Genotype: *O. horai* Dayal et Gupta, 1954 (Pl. 106, Fig. 1299), in *Heteropneustes fossilis*; India.

SUPER-FAMILY PLAGIORCHIOIDEA DOLFUS 1930.
FAMILY RENIFERIDAE BAER, 1924. EMEND. MC MULLEN, 1937.
SUB-FAMILY RENIFERINAE PRATT, 1902.
GENUS OUDHIA N. G. Gupta, 1953
OUDHIA HORAI N. SP.,

(Figs. 35-36).

Only one specimen was obtained from the intestine of a fresh-water fish, *Heteropneustes fossilis* (Bloch), from the ponds of Imphal (Manipur state) in January 1952. It is a small elongated trematode with rounded anterior and posterior ends. It bears small, cuticular spines all over the body. The spines are closely set anteriorly and become sparse towards the hinder end. It measures 0.82 mm. in length by 0.3 mm. in maximum breadth in the region of the ovary.

The oral sucker is sub-terminal and funnel shaped and measures 0.12 mm. in length by 0.11 mm. in breadth. The ventral sucker is circular in outline and smaller than the oral sucker. It measures 0.13 mm. in diameter, and is situated at a distance of 0.26 mm. from the anterior end of the body at the junction of the anterior and middle third of the body.

The mouth is an oval aperture at the anterior end of the funnel shaped oral sucker. It opens into a small prepharynx, 0.024 mm. in length by 0.028 mm. in breadth The muscular pharynx is oval in shape and measures 0.026 mm. in length by 0.03 mm. in breadth. The pharynx opens into an small oesophagus which bifurcates at a distance of 0.075 mm. from the anterior end of the ventral sucker into two intestinal caeca, extending upto the hind end of the ovary.

Fig 35

The excretory pore opens on the dorsal side at the posterior end of the body. It leads into Y-shaped excretory bladder with cornua extending upto the ventral sucker.

The genital pore lies on the left side in level with prepharynx, at a distance of 0.14 mm. from the anterior end of the body.

The two testes are oval in shape, intercaecal in position and lie obliquely one behind the other posterior to ovary. They overlap each other. The anterior testis lies on the left side of the median line and measures 0.085 mm. in length by 0.09 mm. in breadth. It lies at a distance of 0.46 mm. from the anterior end of the body. The posterior testis is smaller than the anterior and lies immediately on the right posterior side of the anterior testis partly overlapped by it. It measures 0.07 mm. in length by 0.09 mm. in breadth and is situated at a distance of 0.5 mm. from the anterior end of the body. The cirrus sac is much elongated structure, extending from the genital pore to the hinder end of the ventral sucker. It measures 0.255 mm. in length by 0.045 mm. in breadth in the region of the vesicula seminalis. It is divisible into two distinct parts—the posterior cylindrical and broader while the anterior portion is drawn out into a narrow tube running ventral to the left intestinal caecum and the pharynx where it

opens at the genital pore. The vesicula seminalis lies at the basal part of the cirrus sac and is divided into two parts transversely. The posterior part is large and cylindrical and measures 0.095 mm. in length by 0.038 mm. in breadth. Its anterior part is smaller than the posterior and measures 0.04 mm. in length by 0.02 mm. in breadth. It opens into a tubular pars prostatica, measuring 0.06 mm. in length by 0.018 mm. in breadth. The pars prostatica is surrounded by prostate gland cells and is continued forward into a long narrow ejaculatory duct which opens at the genital pore on the left side of the prepharynx.

The ovary is oval, situated in the middle to the right of the median line behind the ventral sucker at a distance of 0.38 mm. from the anterior end of the body. It measures 0.095 mm. in length by 0.085 mm. in breadth. The oviduct arises from the anterior region of the ovary and runs towards the left to open at the oötype. The receptaculum seminis is a sac like organ lying on the left side of the ovary and extending upto the anterior testis. It measures 0.09 mm. in length by 0.11 mm. in breadth. A Laurer's canal is present. The vitelline glands are composed of follicular acini, few in number and extend from the middle region of the ventral sucker upto the anterior end of the posterior testis. They are mainly lateral in position but cover the intestinal caeca and extend in the middle just behind the ventral sucker. The two transverse vitelline ducts formed by the union of lateral ducts unite with each other before opening at the oötype. The uterus runs towards the hind end forming a large number of coils between the ventral sucker and the posterior end of the body. It then runs forwards almost parallel to the cirrus sac forming weakly developed metraterm and opens at the genital pore.

The eggs are oval and operculated. They measure 0.024-0.028 mm. in length by 0.016-0.018 mm. in breadth.

Discussion.—The present form is closely related to the genus *Neorenifer* of the sub-family *Reinferinae* Pratt, 1902 in the forward position of the genital pore located to one side in level with the prepharynx posterior to oral sucker but can be separated from it in the presence of a well developed receptaculum seminis, in having a well developed cirrus sac extending upto the hind end of the ventral sucker, in having vesicula seminalis divided into two parts, in the presence of ventral sucker smaller than oral sucker, in the distribution of vitelline glands, in having the funnel shaped oral sucker and in the relative position of testes and ovary. These differences are sufficient to create a new genus *Oudhia* for its reception.

Generic diagnosis of *Oudhia* N. G.

RENIFERINAE: Body elongated, cylindrical with rounded ends; cuticle spinose; oral sucker funnel shaped and larger than the ventral sucker, intestinal caeca extending upto the hind region of the ovary; testes posterior to ovary, oblique in position and overlap each other; cirrus sac elongated extending upto the hind end of the ventral sucker; ovary posterior to ventral sucker; genital pore on the left side of the body in level with the prepharynx behind the oral sucker; vitelline glands extending from the middle of the ventral sucker to the posterior region of the anterior testis; excretory bladder Y-shaped; eggs oval and operculated.

Parasites of fresh water-fishes.

Type species *Oudhia horai* n. sp.,