1990

Binder 089, Hemiuridae Hemiurinae A-M [Trematoda Taxon Notebooks]

Harold W. Manter Laboratory of Parasitology

Genera of subfamilies of Hemiuridae

Sclerodistominae

Sclerodistomum Looss
Eurycoelum Brock
Hirudinella Garsin
Isoparorchis Southwell

Prosorchinae Yamaguti
Prosorchis Yamaguti

Derogenetinae

Derogenes Luhe
Porogonus Looss (syn. Genarches Looss)
Bunocotyle Odhner
Gonocerca Manter
Lecithophyllum Odhner
Genarchopsis Ozaki = Progonus?
Halipegus Looss
Vitellotrema Guberlet 1928 = Halipegus?
Hemipera Nicoll, 1913
Hemiperina Manter, 1934
Ophiocorchis Srivastava, 1933

Genolinea Manter, 1925
Liopyge Looss = Liocerca
Derogenoides Nicoll

Hemiurinae

Hemiurus Rud. (syn. Apoblema Dujardin)
Aphanurus Looss
Brachyphallus Odhner
Paraphanurus Yag. & Perera?
Pronoprymna Poche, 1925
Magnacetabulum Yamaguti

Sterrhurinae

Sterrhurus Looss
Lecithochirium Luhe (syn. Synaptobothrium von Linstow)
Plerurus Looss
Hypohepaticola Yamaguti
Tubulovesicula Yamaguti

Parasterrhurus Manter

Lecithasterinae

Lecithaster Luhe
Aponurus Looss

Dinurinae

Dinurus Looss
Ectenurus Looss
Lecithocladium Luhe
Stomachicola Yamaguti

Other genera:
Hysterolecitha Linton
Hysterolecithoides Yamaguti
Thelotrum Linton
Dictysarca Linton
Leuroderа Linton
Macradena Linton
Opisthodena Linton

Dichadena Linton
Brachadena Linton

The Superfamily Hemiuroidea

The family Hemiuridae (in the sense of Looss and Lühe) is a large group of Digenea almost wholly parasites of marine fishes. Several subfamilies have long been recognized. Recently, the trend has been to elevate these to families of a larger group, the Hemiuroidea or Hemiurata. Skrjabin and Guschanskaja (1954) included 17 families in the suborder Hemiurata (Markevitsch, 1951) Skr. & Gusch., 1954. In 1956, these same authors named the superfamily Azygioidea, placing in it the Azygiidae, Xenoperidae, Hirudinellidae, and Liocercidae. A new subfamily (of Liocercidae), Arnoldiinae, was named for the genus *Arnoldia* Vlasenko, 1931. Such a classification minimizes (incorrectly, we believe) the significance of the vitellaria. *Xenopera* has been generally considered to be a fellodistomid, and Yamaguti (1958) lists it as a synonym of *Proctoeces* Looss, 1901. Hirudinellidae have tubular vitellaria and seem better grouped in the Hemiuroidea. LaRue (1957) named a suborder Azygiata but included in it only the Azygiidae and Bivesiculidae.

We believe the family "Liocercidae" is unjustified; in any case, the name is incorrect. As noted by Ejsmont (1931) *Liopyge* Looss, 1899 is not invalidated by *Liopygus* Lewis, 1891 and its second name, *Liocerca* Looss, 1902, is a synonym of *Liopyge*. Yamaguti (1953) points out that the "cirrus sac" of Looss is actually a sinus sac (or hermaphroditic sac) as in other hemiurids. Although Ejsmont (1931) named the subfamily Liopyginae for this genus, we would classify it in the Lecithasterinae. A prestesticular ovary is known to occur in other genera of Lecithasterinae, e.g. *Gonocerca*.

The subfamily "Arnoldiinae" was based on the preoccupied name *Arnoldia* Vlasenko, 1931, which was renamed *Arnola* by Strand (1942). Yamaguti (1958) named for it the subfamily Arnolinae. Both the Russian authors and Yamaguti placed great importance on Vlasenko's description of a true cirrus sac in this genus; other characters are similar to the Lecithasterinae. Although Vlasenko's figure seems to show a cirrus sac, the terminal part of the uterus is not shown. This species should be restudied to make certain that the sac does not enclose an hermaphroditic duct. The genus is very distinct from Azygiidae, for example in the character of the vitellaria.

Chauhan's (1954) monograph on the Hemiuridae recognizes eight subfamilies and includes a history of the group.

LaRue (1957) accepts the suborder Hemiurata and includes in it nine families. He names a suborder Azygiata for the Azygiidae and the Bivesiculidae. His classification does not pretend to be complete and several families of Hemiurata (as Accacoeliidae, Syncoeliidae, Hirudinellidae) are not mentioned. He adds the family Didymozoidae to the Hemiurata.

Yamaguti (1958) does not attempt superfamily groupings but recognizes 19 subfamilies of Hemiuridae, of which 9 are new, 6 with a single genus.

Of these four major recent attempts to classify this group of trematodes, LaRue's is incomplete, while Skrjabin and Guschanskaja's and Yamaguti's differ in that the Russians recognize numerous families while Yamaguti prefers numerous subfamilies. Such numerous suprageneric groups, many with a single genus, do not seem justified to us at the present time.

The criteria used in this group to establish families, subfamilies, and genera have been, and probably must be, arbitrary. Most of them show intergradations. It is unsafe to emphasize a "cirrus sac" in this group because several times a structure so-called has proved to be a sinus sac (= hermaphroditic pouch = bursa hermaphroditicus) which the uterus enters to join the male duct. Any report of a hemiurid with a cirrus sac should be supported by serial sections. We believe important characters are (1) cuticular plications (as in *Hemiurus*) as compared with a smooth skin (as in *Derogenes*); (2) an ecsoma, or not; (3) vitellaria compact, lobed, digitate, or tubular. Although Yamaguti minimizes external features such as the cuticular plications and a preacetabular pit, these structures are rather easily seen and probably as dependable as most internal structures. Slusarski (1957) was troubled by what he considered to be a rudimentary ecsoma in *Aphanurus balticus*. The modified posterior portion of the excretory vesicle in this species does not appear to have an outer wall continuous with the cuticula of the body. Even a small ecsoma should be a retracted portion of the body.

The following taxa, similar to those of Chauhan (1954), are suggested:
Superfamily Hemiuroidea

Families: Hemiuridae Lühe, 1901; Accacoeliidae Dollfus, 1923; Aerobiotrematidae Yam., 1958; Didymozoidae Poche, 1907; Hirudinellidae Dollfus, 1932; Isoparorchidae Poche, 1925; Prosogonotrematidae Vigueras, 1940; Syncoeliidae Dollfus, 1923. (We prefer to assign the Ptychogonimidae Dollfus, 1936 to the Azygiata.)

Subfamilies of Hemiuridae: Hemiurinae Looss, 1907; Aphanurinae Skr. & Gusch., 1954, (syn. Ahemiurinae Chauhan, 1954); Dinurinae Looss, 1907; Lecithasterinae Odhner, 1905 (syn. Derogenetinae Odhner, 1921); Lecithochiriinae Lühe, 1901; Prosorchiinae Yam., 1934.

Subfamily Hemiurinae Looss, 1907. This subfamily is characterized by cuticular plications, ecsoma, and compact or lobed vitellaria. Genera: *Hemiurus* Rud., 1809; *Brachyphallus* Odhner, 1905; *Elytrophalloides* Szidat, 1955; *Glomericirrus* Yam., 1937; *Parahemiurus* Vaz & Pereira, 1930.

The genus *Brachyphallus* has been considered to lack a sinus sac, but Slusarski (1958) shows that the type species, *B. crenatus*, has both a sinus sac (= hermaphroditic sac) and a prostatic vesicle. A study of specimens of this same species collected at Friday Harbor, Washington, confirms this observation. *Brachyphallus* accordingly differs from *Hemiurus* chiefly in possessing a preacetabular pit.

Subfamily Lecithochiriinae Lühe, 1901 (syn. Sterrhurinae Looss, 1907). This subfamily is characterized by nonplicated cuticula; ecsoma; vitellaria compact, lobed or digitate. Genera: *Lecithochirium* Lühe, 1901; *Adinosoma* Manter, 1947; *Allostomachicola* Yam., 1958; *Ceratotrema* Jones, 1933; *Dinosoma* Manter, 1934; *Dissosaccus* Manter, 1947; *Elytrophallus* Manter, 1940; *Johniophyllum* Skr. & Gusch., 1954; *Lethadena* Manter, 1947; *Musculovesicula*

Yam., 1940; *Plerurus* Looss, 1907; *Plicatrium* n. gen. (for *Lecithochirium lycodontis* Myers and Wolfgang, 1953); *Separogermiductus* Skr. & Gusch., 1955; *Sterrhurus* Looss, 1907; *Stomachicola* Yam., 1934; *Synaptobothrium* v. Linstow, 1904; *Tricotyledonia* Fyfe, 1954 (syn. *Grassitrema* Yeh, 1955).*

From: Manter & Pritchard

1960

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Lecithochirium lycodontis (Figs. 1-3) from a moray eel in New Hebrides might appear from its figure to possess cuticular plications. A loan of type and paratype specimens permitted a restudy of this trematode. The type specimen is not the one figured in the original description. The spine-like structures are rounded papillae irregularly scattered but most common on the dorsal surface of the forebody and the ventral surface of the posterior half of the body. They were visible on 3 of 8 specimens. The vitellaria, viewed from a favorable angle, are typical, seven digitate lobes (Fig. 3) as in *Lecithochirium*. Our measurements of eggs of *P. lycodontis* are 15 to 19 by 8 to 11 microns. Because of pecularities of the terminal genital ducts, a new genus, *Plicatrium,* is proposed for this species.

Generic Diagnosis of Plicatrium: Non-plicated cuticula; ecsoma present; preacetabular pit absent; cuticular papillae sometimes present; testes near acetabulum, symmetrical or diagonal; vitellaria postovarian, consisting of seven digitate lobes narrowed proximally and joined at bases; seminal vesicle bipartite, dorsal to acetabulum, anterior part thick-walled; sinus sac globular, thick-walled, containing prostatic vesicle, prostatic cells, and terminal part of metraterm which joins the male system just anterior to prostatic vesicle; a short duct leads to a much folded, voluminous, eversible atrium; metraterm outside sinus sac surrounded by gland cells (Fig. 1).

This genus differs from *Lecithochirium* in its spacious, eversible genital atrium, prostatic cells inside sinus sac, and lack of preacetabular pit.

HEMIURIDAE Lühe, 1901

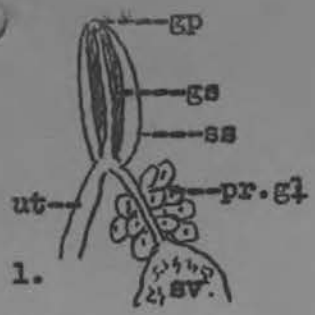
Family diagnosis. — Small to medium-sized distomes with tail-like portion or not. Cuticle smooth or finely annulated or serrated, rarely scaled. Oral sucker, pharynx, acetabulum well developed; latter more or less prominent, usually near oral sucker, sometimes far apart from it. Esophagus short. Ceca terminating blindly, occasionally united posteriorly. Testes tandem, diagonal or symmetrical, usually in hindbody, exceptionally in forebody. Vesicula seminalis usually free in parenchyma. Ductus hermaphroditicus usually present, occasionally absent. Hermaphroditic sac or cirrus pouch present or absent. Genital pore median, usually near oral sucker, pharynx or intestinal bifurcation. Ovary posttesticular, exceptionally pretesticular. Receptaculum seminis usually present; Laurer's canal present or absent. Vitellaria compact, lobed or tubular, usually postovarian. Uterus descending and then ascending, occasionally ascending only. Eggs numerous, usually non-filamented. Excretory vesicle Y-shaped; arms united anteriorly or not. Parasitic in esophagus and stomach, rarely in intestine or gall bladder, or outside intestinal tract of fishes, rarely in amphibians and reptiles.

Type genus: *Hemiurus* Rud., 1809.

Key to subfamilies of Hemiuridae from fishes

1. Testes in forebody; vitellaria divided into extremely long filiform tubules ..... Prosorchiinae
   Testes in hindbody; vitellaria otherwise 2
2. Ductus ejaculatorius strongly convoluted and enclosed in cirrus pouch 3
   Seminal vesicle convoluted and enclosed in cirrus pouch together with prostatic complex ..... Arnolinae
   No cirrus pouch 4
3. Vitellaria long, narrow, branched; excretory arms not united anteriorly ..... Lampritrematinae
   Vitellaria compact; excretory arms united anteriorly; tail present ..... Glomericirrinae
4. Tail present 5
   Tail absent 8
5. Testes and ovary confined to anterior fourth of body ..... Stomachicolinae
   Testes and ovary not confined to anterior fourth of body . 6
6. Seminal vesicle in forebody; vitelline lobes short, digitiform or compact ..... Sterrhurinae
   Seminal vesicle in hindbody; vitellaria usually long, narrow ..... Dinurinae
   Seminal vesicle entirely or mostly dorsal or posterior to acetabulum; vitellaria compact 7
7. Hermaphroditic pouch absent; pars prostatica free in parenchyma ..... Hemiurinae
   Hermaphroditic pouch strongly muscular, enclosing bulbous pars prostatica, metraterm and hermaphroditic duct ..... Dissosaccinae
8. Body encircled by transverse ridges; vitellaria compact, single ..... Bunocotylinae
   Body without circular ridges; vitellaria compact, single or double, lobate or digitiform 9
9. Seminal vesicle in forebody or dorsal to acetabulum 10
   Seminal vesicle in hindbody 14
10. Vitellaria anterior to testes 11
    Vitellaria posterior to testes 12
11. Seminal vesicle dorsal to acetabulum; pars prostatica long; uterus extending posterior to testes ..... Liopyginae
    Seminal vesicle postbifurcal; pars prostatica short; uterus not extending posterior to testes ..... Hemiperinae
12. Vitellaria divided into two compact masses, lobed or not . 13
    Vitellaria divided into seven rounded or rosette-shaped lobes; pars prostatica not enclosed in hermaphroditic pouch ..... Hysterolecithinae
    Vitellaria divided into seven tubular lobes; pars prostatica partly enclosed in hermaphroditic pouch .. Hypohepaticolinae
13. Vitellaria at posterior extremity ..... Halipeginae
    Vitellaria separated from posterior extremity by uterus
    a) Hermaphroditic pouch present ..... Derogenetinae
    b) Hermaphroditic pouch absent ..... Dictysarcinae
14. Ovary and vitellaria separated from posterior extremity by uterus ..... Lecithasterinae
    Ovary and vitellaria not separated from posterior extremity by uterus ..... Trifoliovariinae

TERMINAL GENITAL DUCTS OF THE HEMIURIDAE



1.

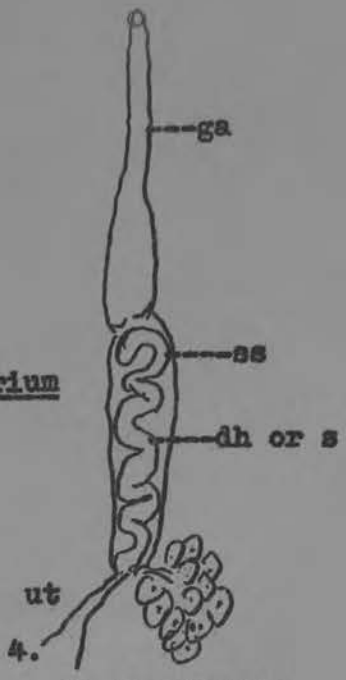
Hemiurus
Derogenes
many genera

2.

Sterrhurus
Lecithochirium

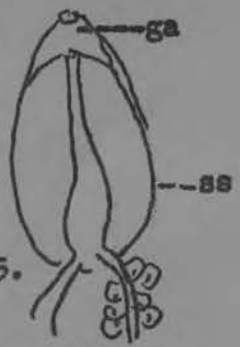
3.

Sterrhurus
Lecithochirium



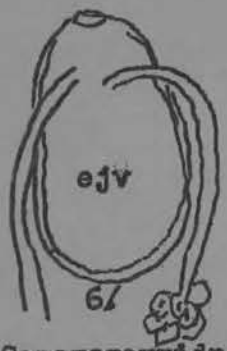
4.

Elytrophallus



5.

Leurodera
Musculovesicula

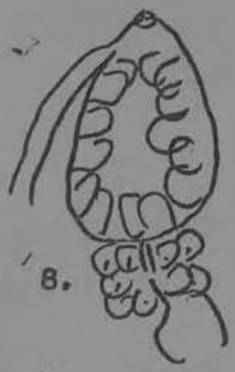


6.

Separogermiductus

7.

Dinosoma
Adinosoma



8.

Dissosacous

9.

Pleururus
Synaptobothrium

10.

Hypohepaticola

Parasitology 69 (2), v-vi

Gibson, D.I. & Bray, R.A. (1974)
Comments on the functional morphology and systematic importance of the terminal genitalia of the Hemiuroidea.

Our interest in the terminal genital apparatus of the hemiuroids began when we studied specimens of Elytrophalloides. This dinurine genus possesses a hermaphroditic duct which passes through a muscular sinus-sac into a deep genital atrium. Within the atrium, the hermaphroditic duct passes through a contractile, finger-like copulatory structure, the sinus-organ.

We examined many hemiuroids, including other dinurines, and found that we could relate the structure of their terminal genital apparatus to that in Elytrophalloides. This led us to produce a possible evolutionary picture for the development of the terminal genital apparatus of the hemiuroids. The ancestral sinus-organ develops as a small papilla which aids copulation. This later becomes withdrawn and assumes the shape found in many azygiids. It then becomes very contractile (as in Otodistomum and Syncoelium), and from its musculature a sinus-sac develops as a weak layer of muscle (as in Accacoelium and Prosogonotrema). The sinus-sac may aid the evertion of the sinus-organ and the ejection of eggs and sperm. In the dinurine Paradinurus the sinus-organ appears to be everted partly by hydrostatic pressure and partly by its own intrinsic musculature. In the related Elytrophalloides the sinus-organ is very weak and appears to be everted entirely by hydrostatic pressure. In the hemiurines the sinus-organ is lost altogether.

If the vitellarium of the same group is examined, a similar developmental pattern emerges. Commencing with a follicular distribution in the azygiids, it becomes filamentous, usually consisting of seven filiform lobes. The lobes become shorter and eventually fuse to form two separate oval lobes, as in Hemiurus.

Using the structure of the reproductuve system and gross morphology, we have produced a possible phylogenetic tree for some of the hemiuroids. The leuceruthrine azygiids are closest in morphology to our hypothetical ancestor.

upto 1956 (may)
755

HEMIURIDAE

1. HEMIURID GENERA WITH NO ECSOMA AND WITH COMPACT VITELLARIA.

BUNOCOTYLE Odhner,1928
GENARCHOPSIS Ozaki,1925
OPHIORCHIS Srivastava,1933
HEMIPERA Nicoll,1912
GONOCERCA Manter,1925
LIOPYGE Looss,1899
APHANURUS Looss,1907
INDODEROGENES Srivastava, 1937
OPISTHADENA Linton,1910
MORDVILKOVIASTER Pigulewsky
MITROSTOMA Manter, 1954
HALIPEGUS Looss,1899
DEROGENES Lühe,1900
DEROGENOIDES Nicoll,1912
LEURODERA Linton,1910
GONOCERCELLA Manter,1940
THELETRUM Linton,1910
DICTYSARCA Linton,1910
GENOLINEA Manter,1925
APONURUS Looss,1907
PRONOPYGE Looss,1899
INTUSCIRRUS Acena,1947

2. HEMIURID GENERA W ITH NO ECSOMA AND WITH DEEPLY LOBED VITELLARIA

MACRADENA Linton,1910
HYPOHEPATICOLA Yamaguti,1934
LECITHOPHYLUM Odhner, 1905
BRACHADENA Linton,1910
HYSTEROLECITHA Linton, 1910
TRIFOLIOVARIUM Yamaguti,1940
MACRADENINA Manter, 1947
HYSTEROLECITHOIDES Yamaguti, 1934

3. HEMIURID GENERA WITH NO ECSOMA AND WITH TUBULAR VITELLARIA

PROSORCHIS Yamaguti, 1934
ISOPARORCHIS Southwell, 1913
SCLERODISTOMUM Looss, 1912
HIRUDINELLA (Garsin,1730)
BATHYCOTYLE Darr, 1902
LAMPRITREMA Yamaguti,1940

4. HEMIURID GENERA WITH ECSOMA AND COMPACT VITELLARIA

LECITHASTER Lühe,1901
DISSOSACCUS Manter,1947
PARAHEMIURUS Vaz et Pereira, 1930
ANAHEMIURUS Manter,1947
DINOSOMA Manter, 1934
ADINOSOMA Manter, 1947
HEMIURUS Rudolphi, 1809
GLOMERICIRRUS Yamaguti, 1937
CERATOTREMA Jones, 1933
BRACHYPHALLUS Odhner, 1905

5. HEMIURID GENERA WITH ECSOMA AND DEEPLY LOBED VITELLARIA

ELYTROPHALLUS Manter, 1940
TRICOTYLEDONIA Fyfe, 1954
ELYTROPHALOIDES Szidat, 1955
LECITHOCHIRIUM Lühe, 1901
MUSCULOVESICULA Yamaguti, 1940
STERRHURUS Looss, 1907

6. HEMIURID GENERA WITH ECSOMA AND TUBULAR VITELLARIA

STOMACHICHOLA Yamaguti, 1934
MECODERUS Manter, 1940
DINURUS Looss, 1907
MAGNACETABULUM Yamaguti, 1934
LECITHOCLADIUM Lühe, 1901
TUBOVESICULA Yamaguti, 1934
ECTENURUS Looss, 1907

Looss's (1907) key to genera of Hemiuridae

1. A true cirrus sac present, well developed, with strong musculature, of cylindrical form and separated from the genital pore by a distinct atrium; skin with cross-folds. Body essentially cylindrical.....4

2. A true cirrus sac present, but weakly developed, short pear- or globular shaped; atrium exceptionally short. Skin smooth. Abdomen very little developed or absent. Branches of excretory vesicle uniting in head end.....12

3. A true cirrus sac lacking, in its place isolated muscular fibers, which enclose a cirrus-sac-like, pear- or tube-shaped body, the cirrus sack; seminal vesicle in the neighborhood of the sac, always in front of ventral sucker. Body cylindrical when elongated, when contracted thickest in middle of hindbody. Abdomen present. Branches of the excretory vesicle uniting in the head end.....16

4. Vitellaria compact. Branches of excretory vesicle unting in head end.....Hemiurinae.....6

5. Vitellaria split into long tubes. Abdomen well developed. Branches of excretory system not uniting in head.....8

6. Seminal vesicle of two parts, the anterior usually with muscular wall. Vitellaria of the two sides of the body separate. Abdomen present.....Hemiurus

7. Seminal vesicle simple. Vitellaria of both sides fused. Abdomen lacking.....Aphanurus

8. Oral sucker of ordinary form. Seminal vesicle of three parts, not especially muscular. Branches of excretory vesicle end beside the oral sucker....Dinurinae.....10

9. Oral sucker cup- or funnel-shaped, a median lip on its ventral wall. Seminal vesicle simple spindle-shaped with strong muscular wall. Ends of the excretory branches close together dorsal to the oral sucker.....Lecithocladium

10. Pars prostatica long and coiled, reaching behind the ventral sucker. Tubes of the vitellaria very long....Dinurus

11. Pars prostatica very short, the greatest part of the seminal tube free of prostatic cells. Tubes of vitellaria moderately long.....Ectenurus

12. Body spindle-shaped, thickest at level of ventral sucker, narrowing toward both ends. [illegible] Tubes of vitellaria with thin, stalk-like roots arising from a common point. Coils of uterus extending into the sides of the body up to the ventral sucker...Lecithasterinae...14

13. Body cylindrical or (when extended) thickes near the hind end. Vitelline tubes short and thick-pear-shaped, apparently separated into a group of 3 and a group of 4. No lateral uterine coils.....Aponurus

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14. Genital pore about half-way between the suckers. Ductus hermaphroditicus shorter than the pars prostatica. Eggs small (Odhner).....Lecithaster

15. Genital pore close to edge of mouth. Ductus hermaphroditicus longer than pars prostatica. Eggs large (to about 60 u) (Odhner).....Lecithophyllum

16. Skin sharply cross-folded. The muscular fibers replacing the cirrus sac lying close on the outer wall of the ductus hermaphroditicus and not enclosing the pars prostatica. Pars prostatica short, cylindrical, straight. Ventrally on the median line between the two suckers, there is a fold-like depression of the skin under which on the inside of the body is a nuclear-rich pad of cells.... .....Brachyphallus

17. Skin smooth...Sterrurhinae.....18

18. The muscular fibers replacing the cirrus sac lying on the outer wall of the ductus hermaphroditicus and not encroaching on the separated male and female ducts, forming a cylindrical body. Pars prostatica begins close behind the separation of the genital duct. Vitellaria tube-shaped, the tubes connected with broader bases.....20

19. The fibers replacing the cirrus sac distant from the wall of the ductus hermaphroditicus, forming a pear-shaped body. At its hind end a vesicle-like widening of the genital passage.....22

20. Pars prostatica short and wide, a groove in the median line ventrally with underlying cell-pad. Vitellaria of the two body sides widely separated, their tubes medium long.....Pleurus

21. Pars prostatica rather long, tube-like. Median, ventral groove, with cell-pad, present, small and round. Vitellaria near together, their tubes short and thick, partly straight.....Synaptobothrium

22. Oral sucker of ordinary form. Ventral grrove lacking...Sterrhurus

23. Oral sucker with two lateral, lobe-like thickenings of its wall extendinginto its lumen. Ventral groove present..... .....Lecithochirium

14. Genital pore about half-way between the suckers. Ductus hermaphroditicus shorter than the pars prostatica. Eggs small (Odhner).....Lecithaster

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Hemiuridae

Family HEMIURIDAE (Looss, 1899) Lühe, 1901

Key to subfamilies of Hemiuridae from Hawaiian fishes

1. Testes in forebody; vitellaria divided into extremely long filliform tubules . . . . . Prosorchiinae
   Testes in hindbody, occasionally in acetabular zone 2
2. Vitellaria long, narrow, branched; terminal genitalia unusually strongly developed; excretory arms not united anteriorly . . . . . Lampritrematinae
   Vitellaria and terminal genitalia otherwise 3
3. Tail present 4
   Tail absent 5
4. Seminal vesicle pre-acetabular; prostatic vesicle present or absent; when present the vesicle is free or enclosed in hermaphroditic pouch; ejaculatory vesicle present in *Sterrhurus* only; vitellaria rather compact or divided into short to digitiform lobes; excretory arms united anteriorly . . . . . Lecithochiriinae
   Seminal vesicle entirely or mostly postacetabular; vitellaria usually long, narrow, may be digitiform; excretory arms united anteriorly except in *Ectenurus* . . . . . Dinurinae
   Seminal vesicle entirely or mostly postacetabular, or partly pre-acetabular, partly postacetabular; vitellaria compact, indented or lobed, but never tubular; excretory arms united anteriorly . . . . . Hemiurinae
5. Body encircled by transverse ridges; seminal vesicle largely or entirely pre-acetabular; vitellaria compact, usually single; excretory arms united anteriorly . . . . . Bunocotylinae
   Body without circular ridges, though ventral acetabular fold is present in Opisthadeninae; vitellaria compact, single or double, lobate or digitate 6
6. Seminal vesicle in forebody or partly dorsal to acetabulum 7
   Seminal vesicle in hindbody; ovary and vitellaria some distance or farther away from posterior extremity; ovary lobed
   Vitellaria rosette-shaped or divided into two separate groups of follicles; postacetabular flaps absent; excretory arms not united anteriorly . . . . . Lecithasterinae
   Vitellaria divided into two separate groups of digitiform lobes; postacetabular flaps present; excretory arms united anteriorly . . . . . Quadrifoliovariinae
   Seminal vesicle and long pars prostatica in hindbody; ventral acetabular fold present; hermaphroditic vesicle present; ovary unlobed; vitellaria compact, double; ovary and vitellaria close to posterior extremity; excretory arms with numerous tubular or bulbous branches . . . . . Opisthadeninae
7. Vitellaria compact, single or double, postovarian; excretory arms united anteriorly, without numerous bulbous branches . . . . . Derogeninae
   Vitellaria rosette-shaped, postovarian; excretory arms united anteriorly or not . . . . . Hysterolecithinae
   Vitellaria divided into several compact lobes; excretory arms united anteriorly . . . . . Lecithophyllinae

Yam., 1970.

HEMIURINAE ~~Luhe~~ Looss ?

From Odhner,1905:

"Elongate,cylindrical forms with regularly cross-ringed body and a smoothbtail appendage of varying length retractable into the body. . Suckers near together. Prepharynx lacking. Pharynx and short esophagus present. Ceca reaching the hind end of the body and usually also entering the tail appendage. Excretory vesicle Y-shaped with fork between the testes, the branches uniting dorsal to the pharynx. Genital pore median between the suckers. Genital sinus tube-like, serving as cirrus sac and copulatory organ. Pars prostatica and seminal vesicle free in parenchyma. Testes more or less distant behind the ventral sucker and directly behind the seminal vesicle, obliquely behind one another. Ovary median and more posterior, smooth and cross-oval. Directly behind it lies the shell gland and the paried symmetrically located vitellaria. Seminal receptacle present, Laurer's canal lacking. Eggs about 25 to 30 μ, numerous, shells fairly thin. In stomach of marine fishes".

Genera: Hemiurus
Brachyphallus Odhner
Aphanurus Looss
Ectenurus Looss,1907
Dinurus
Glomericirrus Yamaguti,1937

In 1927, Odhner adds:

"Small forms,usually with tail appendage, with long tube-like genital sinus which is surrounded partly or wholly by a cirrus-sac-like muscualr membrane and which can be everted like a cirrus; vitellaria as a rule compact,sometimes tubular, in the latter case 4 unbranched tubes on one side, 3 on the other."

Key to genera of Hemiurinae

Genital pore at base of oral sucker, genital sinus long, pars prostatica long.....Hemiurus

Genital pore approximately halfway between suckers, genital sinus short, pars prostatica short....Brachyphallus

Aphanurus ?

Key to species of Hemiurus

Suckers almost equal .....H. levinseni

Ventral sucker larger than oral sucker

Body rings are limited dorsally to region of oral sucker or shortly behind it

Pars prostatica not extending far posterior to ventral sucker.....H. communis

Pars prostatica extending far posterior to ventral sucker.....H. appendiculatus

Body rings extend dorsally to region of testes or at least posterior to ventral sucker

Body rings end dorsally in front of testes, sinus sac only a little longer than diameter of ventral sucker.....H. luhei

Body rings end dorsally posterior to testes usually in region of ovary, sinus sac 1½ times the diameter of ventral sucker.. .....H. rugosus

In H. communis the ventral sucker is 1/6 to 1/9 the length of the soma. In H. luhei the ventral sucker rarely exceeds 1/11 the length of the soma

Hemiurinae Looss, 1899

Subfamily diagnosis. — Hemiuridae: Body elongate, with tail of variable length. Cuticle with annular denticulations or scaled. Ceca reaching to near posterior extremity. Acetabulum near anterior extremity. Testes postacetabular. Seminal vesicle divided or not, with thin or thick walls, largely or entirely in hindbody. Pars prostatica long or short. Ductus hermaphroditicus slender, without pouch. Ovary equatorial or postequatorial. Receptaculum seminis present. No Laurer's canal. Vitellaria in two compact masses, lobed or not, immediately postovarian. Uterus extending back of ovarian complex. Excretory arms united anteriorly.

Key to genera of Hemiurinae

1. Body scaled 2
   Body annulated 3

2. Seminal vesicle tubular, divided or not; pars prostatica short ..... *Dinosoma*
   Seminal vesicle saccular, undivided, thick-walled; pars prostatica long ..... *Anahemiurus*
3. Seminal vesicle divided, anterior portion with thick muscular wall; ..... *Hemiurus*
   Seminal vesicle undivided, may be thick-walled . . *Parahemiurus*

Hemiurus Rudolphi, 1809

Syn. *Apoblema* (Duj., 1845)

Eurycoelum Brock, 1886, nec Chaudoir, 1848

Generic diagnosis. — Hemiuridae, Hemiurinae: Body small to medium-sized, with tail. Cuticular denticulations present. Oral sucker almost terminal, followed by pharynx. Esophagus short. Ceca extending into tail. Acetabulum larger or smaller than oral sucker, near anterior extremity. Testes diagonal, some distance behind acetabulum. Vesicula seminalis pretesticular, constricted into two portions, of which the anterior is provided with more or less thick muscular coat. Pars prostatica long, winding. Ductus hermaphroditicus slender. Genital pore ventral to oral sucker or pharynx. Ovary behind testes, from which it is separated by the uterus. Vitellaria immediately behind ovary, consisting of two compact or somewhat indented lobes. Uterus intruding into tail or not; eggs small, numerous, without polar filaments. Excretory arms united anteriorly. Stomach parasites of marine fishes.

Genotype: ***H. appendiculatus*** (Rud., 1802) Looss, 1899, syn. ***Apoblema appendiculatum*** (Rud.) Blanch., 1847, (Pl. 25, Fig. 333), in *Clupea alosa;* Europe. Also in *Salmo salar, Osmerus mordax, Clupea harengus, Gadus callarius, Pollachius virens, Ammodytes tobianus, Anguilla anguilla, Acanthocottus scorpius, Hippoglossus hippoglossus* and *Platysomatichthys hippoglossoides* of Canada, *Gadus merlangus* of Australia, *Alosa finta* of Egypt, *Caspialosa* spp. of Black Sea. Additional hosts — Nicoll (1907), Mola (1928), Zschokke (1933).

Metacercaria in copepods (Acartia) — Stafford (1905). Steuer (1928) states that the trematodes parasitizing copepods are not the young of *H. appendiculatus*, but they belong, as far as they occur in the northern seas, more likely to *H. luehei* and *communis*. In the Mediterranean the worms in question have not been found in copepods but principally in chaetognaths (*Sagitta*) or free in the sea and very likely belong to *H. rugosus*, which in the adult state parasitizes the intestine of the pilchard. L. J. Thomas (1932) found a cystophorous cercaria (*C. sphaerula* n. sp.), a larval trematode of Hemiuridae infesting *Cyclops*, in *Helisoma*

trivolvis, and stated that the tube-like appendage with refringent granules seems to serve as a lure for the copepod, *Cyclops vulgaris*. Pratt's account (1898) on life history of appendiculate distomes is of mere historical interest.

Other species:

Skrjabin and Guschanskaja (1954) included *levinseni* Odhner, 1905, and *odhneri* Yamaguti, 1934, in subgenus *Metahemiurus* Skrjabin et Guschanskaya, 1954, with *levinseni* as type of the subgenus.

H. arelisci Yamaguti, 1938, in *Areliscus purpureomaculatus;* Sea of Aniake, Japan.

H. communis Odhner, 1905, in numerous Skandinavian fishes. *Molva, Lophius, Gadus, Trigla, Conger, Cottus, Ammodytes, Sebastes;* Atlantic. Also in *Odontogadus merlangus euxinus;* Black Sea — Pogorelcheva, 1952. Larva in *Acartia clausa* and on *Polygordius* (trochophore larva), Plymouth Sound — Lebour (1935).

H. levinseni Odhner, 1905, in *Gadus saida;* Greenland. Also in other species of *Gadus, Sebastodes, Ophiodon, Oncorhynchus, Urophycis, Cyclopterus, Lopholatilus, Merlucius, Pollachius, Salvelinus, Myxocephalus, Gymnacanthus, Artedicellus, Boreogadus, Cottus, Salmo*, etc.; Russia, North America.

H. luehei Odhner, 1905 (syn. *H. stossichi* Lühe, 1901, nec Montic., 1891), in *Clupea harengus* and *C. sprattus;* Arctic. Also in *Clupea harengus*, Europe.

H. microporus (Montic., 1889) Looss, 1899, in *Plagyodus ferox;* Madeira.

H. monticellii (Lint., 1898) Looss, 1899, in *Remora remora;* Woods Hole.

H. odhneri Yamaguti, 1934, in *Thelagra chalcogramma;* Toyama Bay, Japan.

H. rugosus Looss, 1907, in *Clupea pichardus, C. sardina, Rhombus maximus, Engraulis encrassicholus;* Mediterranean.

H. sluiteri (Brock, 1886) Looss, 1899, syn. *Eurycoelum s.* B., in *Diacope metallicus;* Java.

Hemiuridae

Hemiurus (Rud)

"Genital pore at the posterior edge of the oral sucker. Genital sinus very elongate, reaching the ventral sucker. Pars prostatica tube-like, very long. Seminal vesicle of two parts, behind the ventral sucker, the posterior part always thin-walled. Vitellaria smooth. Uterus usually reaching into the tail appendage."

Odhner 1905

Type species: H. appendiculatus Rud.
Others: H. luhei
H. communis
H. Rugosus
~~H. merus~~
H. levinseni
H. odhneri Yamaguti, 1934
H. arelisci Yamaguti, 1938
H. oatesi Leiper & Atkinson, 1914
to Parahemiurus

EURYCOELUM Brock, 1886 *

(diagnosis as given by Luhe 1901)

Above medium size to large, with cylindrical hind body (behind the large ventral sucker lying about in the middle) and somewhat widened, ventrally flattened forebody. Skin very thick, smooth, not ringed and unspined. Genital pore close behind the oral sucker; cirrus sac present, including in addition to the ductus hermaphroditicus (as in Lecithochirium and Dergogenes) also the end section of the vas deferens and metraterm. Pars prostatica outside the cirrus sac, long, much coiled. Ovary behind the testes, globular. Vitellaria very well developed (chiefly behind the ovary) branched, tubular. Seminal receptacle lacking, Lauer's canal present, very long, opening rather far foward far in front of ovary but behind the testes. Eggs 26-28 by 16μ with 2μ thick shell.

Type species: Eurycoelum sluiteri Brock
Host: Diacope metallicus, a fish, family "Barsche"
Locality: Java

Stiles & Hass. 1898a 88, 90, 91 - syn. of Hemiurus.

* preoccupied by Eurycoelum Chaudoir, 1848

Pronopyge Looss, 1899

Generic diagnosis. — Hemiuridae, Liopyginae: Body fusiform or pyriform when the hindbody is contracted; tail small, indistinct. Oral sucker subterminal, followed by pharynx; esophagus long, distinct. Acetabulum larger than oral sucker, in anterior half of body. Testes symmetrical, postacetabular. Vesicula seminalis hardly overreaching acetabulum posteriorly. Pars prostatica fairly long. Ductus hermaphroditicus? Genital pore postbifurcal. Ovary situated within triangle formed by acetabulum and testes. Vitellaria of two compact lobes each lying just in front of testis. Uterus reaching to near posterior extremity. Excretory arms not united anteriorly over oral sucker. Stomach parasites of marine fishes.

Genotype: *P. ocreata* (Rud., 1802) Looss, 1899 (Pl. 31, Fig. 404), in *Clupea harengus;* Europe.

Distoma ventricosum van Beneden, 1871 from *Alosa finta* is regarded by Monticelli as a synonym of *Apoblema ocreatum* Rud.

PRONOPRYMNA Poche, 1925

Syn. Pronopyge Looss, 1899

From Looss : " Differs from Hemiurus in tail appendage very small, consisting of a small knob-like appendage. Long esophagus. Branches of excretory system not uniting. Genital pore a short distance in front of ventral sucker at the intestinal bifurcation. Pars prostatica fairly long; seminal vesicle scarcely over-reaching ventral sucker. Vitellaria paired, compact, distant from ovary, lying in front of ovary and to the side of ventral sucker. Type species: Pronopyge ocreata (Rud.) (= Dist. carolinae Stossich)

Odhner (1911:528) says Pr.ocreata (Rud.) is a species of Hemiurus and that the genus Pronopyge is represented by Dist. ventricosum Rud. Poche (1925) points out that Pr.ocreata (Rud.) being selected as type of Pronopyge forces Pronopyge to become a synonym of Hemiurus. He gives the name Pronoprymna to the genus described by Looss as Pronopyge and names Dist.ventricosum Rud. as type , in accordance with Odhner's (1911:528) data. Poche does not attept to describe the genus but states the diagnosis will be essentially as given by Looss.

There is some confusion here since the Dist.ventricosum of Wagener (1860) does not agree with the description of the genus. The genus seems to be a ringed hemiurid, with very small tail, long esophagus, branches of excretory vesicle not uniting, and (strangely) vitellaria anterior to ovary. Although Looss (1899:) named the genus as a relative of Hemiurus, he does not include it in his monograph on the hemiruids in 1907. The present status of the genus needs to be made more clear. Fuhrmann (1928) lists Pronoprymna in the family Syncoeliidae, but evidence to justify this allocation is lacking.

Hemiurus appendiculatus (Rud)

Length according to extension, 3- 4 mm, width and thickness, 0.4- 0.5. Ventral sucker almost twice as large as the oral sucker; their size averaging 0,2 and 0.4 mm. The rings of the skin disappear over or somewhat behind the pharynx. Atrium very short, not longer than the cross section of the cirrus sac; this latter is relatively narrowreaching a length of about 3/4 the diameter of the ventral sucker. Anterior part of the seminal vesicle with very thick muscular wall. Vitellaria irregularly round often with completely smooth edge, sometimes with one or more loghtly indented spots, sometimes with one or more short indentations of the edge. The uterine coils can extend relatively far into the abdomen and the edns of the ceca come fairly near. Eggs 20 to 23 μ long and 10 to 12 μ thick.

Host: frequent in Alosa finta
also in Gadus euxinus and onee in the gill slime of Mugil capito

Tail extended 3/ 4;body suckers 1:2 or 1:3. Ventral suckers a t end of first body fourth. Vitellaria a little wider than long. Ceca and uterus extend into tail.

Eggs showing eye-spots. From Nicoll, 1907.

-OVER-

Hemiurus appendiculatus (Rud., 1802) Looss, 1899

Host and locality : stomach of *Alosa fallax*, Stn. 41. Bay of Biscay

Seven specimens were found. This is a common parasite of shads and has been recorded in *A. fallax* [*A. finta*] in various localities in the Mediterranean and north-eastern Atlantic. Nevertheless, *H. appendiculatus* of de Oliveira Rodrigues *et al.* (1972) recorded from *A. fallax* from the coast of Portugal may not belong to this species, as it has, judging from the authors' figure, a relatively short pars prostatica and an undivided seminal vesicle. The normal condition appears to be that represented by the present specimens, in which the pars prostatica is convoluted posteriorly to the ventral sucker, and in which the anterior part of the bipartite seminal vesicle has a thick muscular wall.

From BRAY, 1973

Hemiuridae

Hemiurus arelisci Yamaguti, 1938

Length: 2.1 mm.
Width : 0.43 mm at about middle.
Oral sucker: 57 X 93 μ
Acetabulum (size): 0.2 X 0.22 mm.
(location) : Anterior margin 0.1 mm back of oral sucker.

Esophagus: Short

Pharynx: 45 X 54 μ.

Genital pore: Opposite oral sucker

Testes (shape): Subglobular.
(location) : Diagonal, about midway between acetabulum and ovary.
Cirrus sac:
Ovary (shape): Transversely elongated oval.
(location): Immediately pre-equatorial.

Vitellaria: Slightly indented, juxtaposed; the right slightly larger.
Eggs: Elongate oval, only slightly bowed, 26-30 X 12-14 μ.
Other features:

Host: Areliscus purpureomaculatus (Regan)

Locality: Okinohata, Hukuoka Prefecture, Japan.
Comparisons: Hemiurus odhneri Yamaguti, 1934

Reference: Yamaguti, S. Studies on the Helminth Fauna of Japan Part 21. Trematodes of Fishes, IV. Kyoto, Japan. 1938
Life cycle:

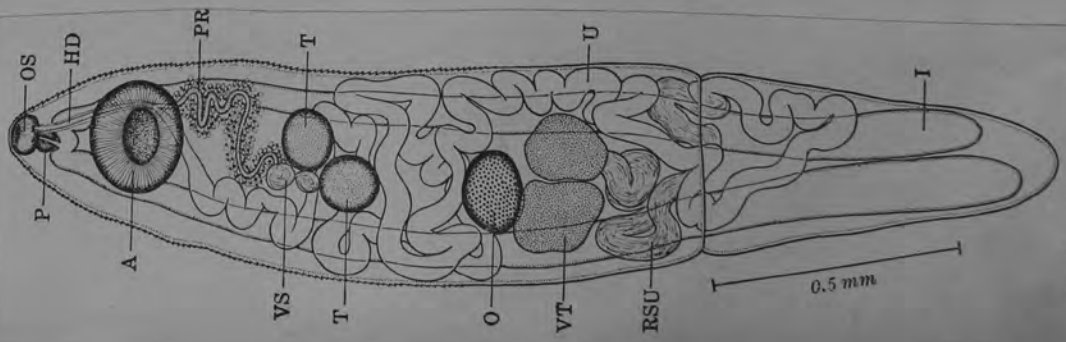


Fig. 60. *Hemiurus arelisci*; ventral view.

Hemirus communis Odhner 1905
Syn: Dist appendiculatum Olsson ex.p., Dist.appendiculatum ex.p. nec Rud.

Length with abdomen retracted about 1.3mm., extended 2.mm.; width and thickness 0.4 -0.45mm. a little less anteriorly; this species is relatively thick and plumb in comparison with its length. Rings of the skin on the ventral surface sharply distinct to near the end of the soma, on the back, however, they end at about half the level of the oral sucker so that the back in profile has almost an entirely smooth appearance. Ventral sucker almost exactly twice the size of the oral sucker as in H.appendiculatus, average measurements: 0.14 and 0.3 mm. Ductus hermaphorditicus about as long as the diameter of the ventral sucker, cirrus sac relatively thick appearing almost bladder-like. Anterior part of the seminal vesicle with thin muscular wall. Vitellaria irregularly round with only occasionally indentations of wall. eggs 19-21 by 10-12 u.
In Gadus morrhua and numerous northern fishes.

Tail when extended 2/3 body length. Center of ve ntral sucker at end of first body third. Ceca and uterus entering tail. Pratts species must belong here if to any known species (according to Odhner). Eggs (according to Lebour 26 by 10 u).

In rega rd to H. communis Odhner, Nicoll 1909: 21 says: "The length of soma is 1-3 mm. The average breadth is about about ⅓ of the length of the soma, the ecsoma is at most 2/ 3 frequently less of the length of the soma. The neck is about 1/3 the length of the soma.

Odhner and Miss Lebour give the sucker ratio as 1:2, but Nicoll found it always greater and often as much as 2:3. No difference in this respect between H. communis and H. lühei. The suckers are proportionally much smaller than in H. communis. In the latter, the diameter of the ventral sucker is about 1/7 of the length of the soma, but it may be as small as 1/9 or as large as 1/6. In H. lühei, the ventral sucker rarely exceeds 1/11 of the length of the soma. In H. communis, the esophagus is nearly equal to the pharynx, the genital sinus does not extend backwards as far as the ventral sucker; the pars prostatica is of moderate length. The sem. ves. is bipartite, thin-walled, and situated just behind the ventral sucker.

H. lühei Odhner is readily distinguished from H. communis by the relatively enormous length of the pars prostatica, put this does not serve to separate it from H. appendiculatum. The sucker ratio is 3:5. In some specimens 2:3, but in other, 1:2.

Esophagus almost entirely absent. Genital sinus extends a s far aback as the anterior border of the ventral sucker; seminal vesicle bipartite, anterior part muscular, it is situated far behind the ventral sucker.

after Lebour, 1908

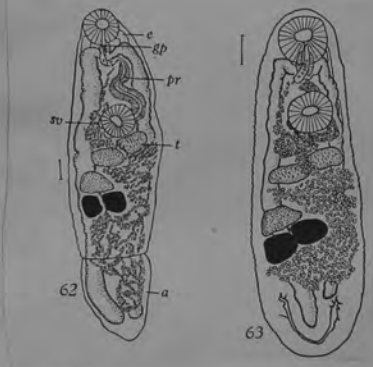
HEMIURUS LEVINSENI ODHNER 1905

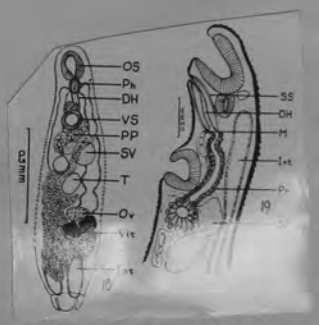
[Figs. 62–63]

From stomach, *Gadus callarias* (Cod)
From stomach, *Urophycis chuss* (Squirrel hake)

Species of the genus Hemiurus are among the most common trematodes of marine fish. Distinction between species is, however, rather difficult. Looss in 1907 perhaps drew the most careful lines between species. It has been customary, especially previous to 1907, to refer most specimens which are clearly Hemiurus to the species *appendiculatus*. Thus, Stafford (1904) lists *H. appendiculatus* from ten different fish of Canadian waters. His only comment is: "Suckers of equal size." Looss shows that true *H. appendiculatus* up to 1907 had probably been found only in *Alosa finta*. He adds the additional hosts, *Gadus euxinus* and *Mugil capito*, in the latter of which the parasite might be accidental.

The following are some of the most distinctive characters of *H. appendiculatus* as given by Looss: Ventral sucker about twice as large as oral sucker; ringing of the cuticula disappearing dorsally at about the level of the pharynx; cirrus sac elongate, reaching a length about 3/4 the diameter of the ventral sucker; anterior part of the seminal vesicle very muscular; coils of uterus can stretch relatively far into the tail appendage, and come near the ends of the ceca.





FROM LLOYD, 1928

Length 0.99 - 1.68
Width 0.37 - 0.467
oral s 0.142 - 0.176
acetab 0.136 - 0.188 subequal
eggs 23-26 by 10-13 μ

Myers (1956) reports a Hemiurus sp. probably levinseni progenetic in Sagitta elegans at St. Andrews, N.B.

—OVER—

6. *Hemiurus levinseni* Odhner, 1905

This widely distributed species has been reported from the European Arctic (Odhner, 1905; Issaitschikow, 1928; Schullman and Schullman-Albova, 1953; Layman, 1930; and Poljansky, 1955), England (Nicoll, 1915), the Atlantic Coast of North America (Cooper, 1915; Manter, 1925, 1926; Linton, 1940; and Heller, 1949), and Puget Sound, Washington (Lloyd, 1938). Four of 6 tomcod, *Microgadus proximus*, from Oregon yielded 17 specimens of *H. levinseni*.

FROM McCAULEY, 1960

Hemiurus levinseni Odhner, 1905

SYNONYMS: *Distomum appendiculatum* (Rudolphi) of Olsson (1868) in part and Levinsen (1881).
Hemiurus appendiculatus (Rudolphi) of Stafford (1904) in part.
Distomum cerealinum (Molin) of Linton (1900, 1901) in part.
Hemiurus (Metahemiurus) levinseni (Odhner) Skrjabin and Guschanskaja, 1954.
Metahemiurus levinseni (Odhner) of Bainkmann (1975).
Hemiurus odhneri Yamaguti, 1934.

HOSTS AND LOCALITIES

Boreogadus saida, stomach, (6/6).
Hamilton Inlet Bank (54°N., 54°W; depth 188 and 192 m).
Grand Bank (49°N., 51°W.; depth 188 m).
(47°N., 52°W.; depth 172 m).

Gadus morhua, stomach, (4/7).
Funk Island Bank (51°N., 52°W.; depth 226 m).
Banquereau (45°N., 57°W.; depth unknown).
(44°N., 57°W.; depth 76 m).

Hemitripterus americanus, stomach, (2/2).
Sable Island Bank (43°N., 61°W.; depth 72 m).

Hippoglossus hippoglossus, stomach, (1/5).
Hamilton Inlet Bank (54°N., 55°W.; depth 176 m).

Myoxocephalus octodecemspinosus, stomach, (1/2).
Sable Island Bank (43°N., 61°W.; depth 72 m).

Reinhardtius hippoglossoides, stomach, (1/4).
Hamilton Inlet Bank (54°N., 54°W.; depth 192 m).

Other known hosts in eastern Canadian waters are *Argentina silus*, *Clupea harengus*, *Hippoglossoides platessoides*, *Melanogrammus aeglefinus* and *Tautogolabrus adspersus*. Also in this area Myers (1959) records it as a 'pseudoparasite' in the elasmobranchs *Raja laevis* and *Squalus acanthias*, and Weinstein (1966, 1967) reports progenetic larvae in the chaetognath *Sagitta elegans*. This species is found in the north Atlantic Ocean, the Arctic Ocean and the north Pacific Ocean. Its reported recovery in the Indian Ocean (Parukhin 1976) needs confirmation.

From BRAY, 1979

H. ocreatus ? Hemiuridae

Hemiuris luhei Odhner 1905

Body slender, with abdomen retracted 1.5-1.7 mm, with abdomen extended 2.5- 2.8 mm. long; width and thickness about 0.23-0.27 mm, reaching 0.3 mm posteriorly with abdomen retracted. The rings of the skin end dorsally in front of the testes, usually about halfway between the ventral sucker and testes. Diameter of ventral sucker about 1¾ as large as the oral sucker. Average measurements: 0.1-0.12 to 0.17- 0.21 mm. Cirrus sac not especially slender in comparison with its length, together with the atrium just as long as or at most a litle longer than the diameter of the ventral sucker. Vitellaria irregularly round, with weakly indented edge. Anterior part of the seminal vesicle with moderately thick muscular wall. Eggs 20 to 22 by 11 to 12 μ.

Length: 1.5-2.75 mm.
Tail when extended is ½ body length.
Ventral sucker 1½ x oral sukker, at end of first 1/10 or 1/ 12 body length. Intestine and uterus reaching into tail.

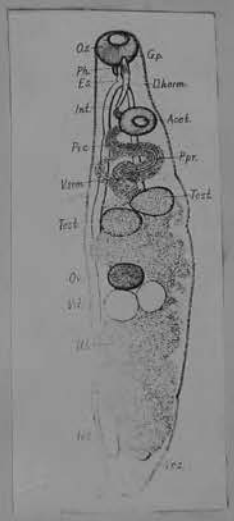
In Clupea harengus and Clupea sprattus west coast of Sweden Found by Looss in Trutta salar--Salmo salar.

HEMIURIDAE
Hemiurinae

Hemiurus odhneri Yamaguti,1934

2.3 to 2.6 by 0.5 ,, more or less distinctly constricted about midway between vitellaria and posterior end. Cuticular denticulations extending to near posterior demarcation, Oral sucker about 0.18 by 0.2 mm.
Acetabulum 0.16 by 0.19 mm. (smaller than oral sucker).
Pharynx 0.084 by 0.095 mm.
Testes closely oblique, pre-equatorial, transversely oval, about 0.13 to 0.15 long
Seminal vesicle longitudinal,
Ovary transversely oblong, about 0.16 by 0.21, postequatorial.
Uterus extending posteriorly to level of cecal termination and not passing between the testes.
Eggs: 27 to 29 by 13 μ

Host: Theragra chalcogramma (Pallas)
Locality: Toyama Bay, Japan.

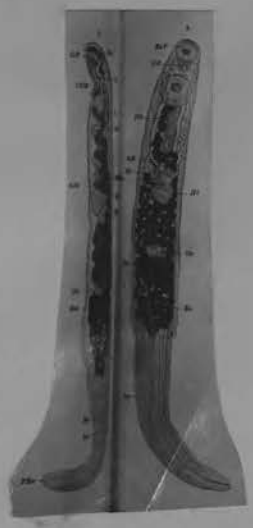


Hemiurus rugosus Looss 1907

Syn: Hemiurus stossichi Luhe 1901 nec Apoblema stossichi Mont.

Not much large than H.luhei. Body length with abdomen retracted about 3. mm., extended up to 4.mm. width and thickness according to contraction 0.4 -0.6 mm., decreasing anteriorly. Skin rings always extending dorsally over the testes, usually extending into the region of the ovary. Ventral sucker about 1½ times as large as oral sucker; average size 0.17-0.19 and 0.24-0.28 mm. Ductus hermaphroditicus about 1½ times as long as the diameter of the ventral sucker, cirrus sac very slender in comparison with its length. Muscular layer of the anterior part of the seminal vesicle consisting of but a single layer of fibers. Edges of the vitellaria with a varying number of sharp deep indentations which are to be seen only by careful scrutiny and in pressing the animal lightly they disappear. Eggs 19-21 by 11-12 u

In Clupea pilchardus and Clupea sardina Triest



Hemiuridae

Hemiurus rugosus Looss 1907

Les grands individus mesurent 4,5mm de long et 0,5mm de large. L'extrémité antérieure est un peu amincie. Les téguments sont striés de façon très apparente sur les deux tiers antérieurs du corps. Les deux ventouses sont très rapprochées l'une de l'autre : orale 160 μ, ventrale 270 μ. Le pore génital s'ouvre exactement sous la ventouse orale. Le pharynx mesure 120 μ × 80 μ. Les cæcums intestinaux s'étendent jusque dans le voisinage de l'extrémité postérieure.

Les deux testicules sont situés l'un en devant de l'autre, un peu après le milieu du corps ; leur grand axe, transversal, mesure 180 à 200 μ. Devant le testicule antérieur se trouve la vésicule séminale (160 μ). La *pars prostatica*, décrit quelques circonvolutions ; la poche du cirre est très étroite. L'ovaire est

(747)

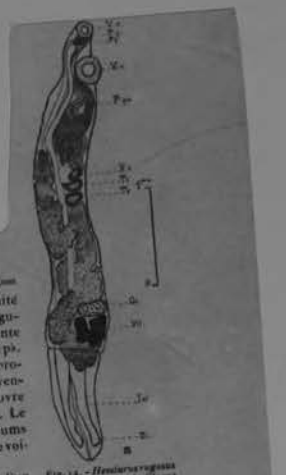


Fig. 14. — *Hemiurus rugosus* Looss. Intestin de *Clupea sardina* Cuv.

— 18 —

placé vers la fin du deuxième tiers du parasite, il est ovale ; son diamètre transversal atteint 280 μ ; il est immédiatement suivi de deux glandes vitellogènes profondément lobées (300 μ × 200 μ).

Les œufs, très petits, mesurent 19 μ × 11 μ.

HABITAT. — Dans l'intestin de la Sardine (*Clupea sardina*) 2 à 5 parasites par poisson.

From Timon-David, 1937

Steur, A. 1928

On the Geographical Distribution and Affinites of the Appendiculus trematodes parasitizing Marine Plankton Copepods.

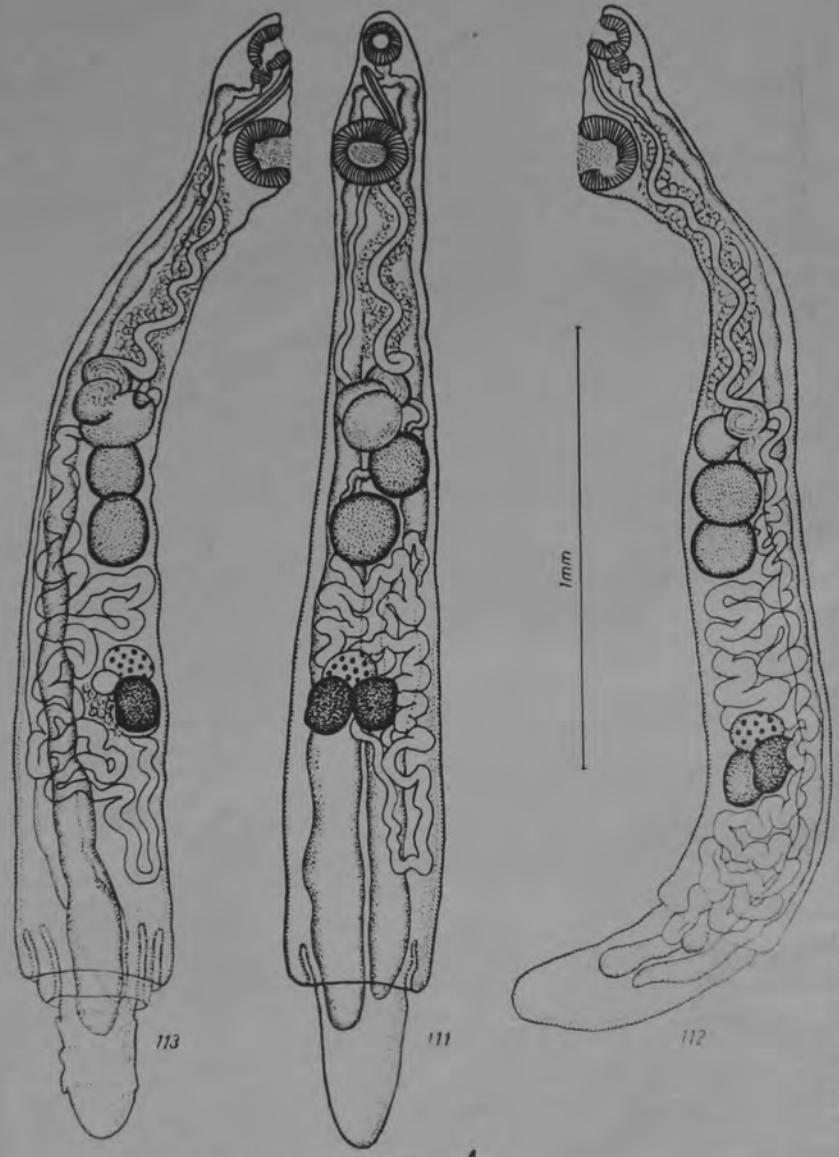
Journ. Pa rasit. 15: 115-120

"According to our present knowledge the trematodes parasitizing copepods are not the young of Hemiurus appendiculatus, but they belong as far as they occur in the northern seas, more likely to H. lühei and communis.

In the Mediterranean the worms in question have as yet never been found in copepods but principally in Chaetognaths (Sagitta) or free in the sea and very likely belong to the species H. rugosus, which in the adult state parasitises the intestine of the pilchard.

Pratt H. S. 1898. A contribution to the Life-History and anatomy of the appendiculate distomes.

Zool. Jahrb., Abt. Anat., 11:351-388



H. (Neohemiurus) raabei
Slusarski, 1958

From Slusarski, 1958
Hemiurus (N.) raabei Slusarski, 1958

FAMILY HEMIURIDAE

Hemiuris sigani n. sp. (Fig. 1) FISCHTHAL AND KUNTZ, 1964

HOST: *Siganus strialatus* (Siganidae).

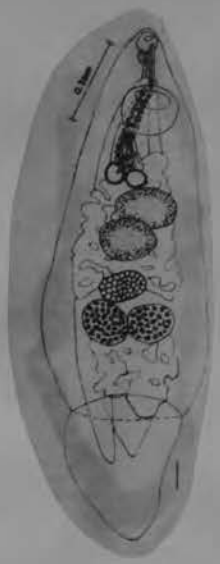
HABITAT: Small intestine.

LOCALITY: Puerto Princesa, Palawan Island, Philippines.

DATE: 21 May 1962.

TYPE: USNM Helm. Coll. No. 60401.

DESCRIPTION (based on single specimen): Body elongate, widest at vitellaria, with cesoma; total length 1,809; body proper 1,254 by 595, cesoma 555 by 425. Preoral lobe 11, forebody 184, acetabulum to posterior extremity of body proper 892. Cuticular plications visible laterally to level of anterior portion of posterior testis on right and anterior portion of ovary on left; dorsal and ventral surfaces with plications over entire worm, less distinct on body proper posterior to disappearance of lateral plications and on cesoma. Oral sucker 73 by 77, subterminal, ventral. Acetabulum 178 by 206, at about level of anterior fifth of body proper. Sucker length ratio 1:2.45. No visible prepharynx; pharynx 53 by 56, partially overlapping oral sucker dorsally; esophagus 41 long; bifurcation at anterior margin of acetabulum; ceca extending into cesoma slightly more than half way, postcecal space 255 (right) and 290 (left). Excretory bladder tubular, sinuous, extending to ovarian region; arms uniting dorsal to oral sucker-pharynx junction; pore terminal.



Testes two, smooth, transversely elongate, slightly oblique, postacetabular, anterior testis slightly overlapping posterior one dorsally; anterior testis 150 by 230, posterior 152 to 213; acetabulum to anterior testis 172, to posterior testis 295; latter to ovary 22. Seminal vesicle postacetabular, bipartite, both chambers thick-walled and muscular, transversely oriented left (proximal) to right (distal); left chamber 73 by 96, slightly overlapping anterior testis dorsally, right chamber 77 by 61; acetabulum to seminal vesicle 116. Pars prostatica dextral, slightly sinuous, long, extending from ventral surface of right chamber of seminal vesicle to short distance preacetabular, thick-walled, muscular; surrounded by prostate gland cells throughout length but more prominently postacetabular. Sinus sac 196 by 31, extending anteriorly from just preacetabular to genital pore on oral sucker, relatively thin-walled. Union of pars prostatica with metratern at proximal end of sinus sac, entering latter as hermaphroditic duct; duct 106 by 15, relatively thick-walled, muscular. Genital pore a transverse slit, ventral, submedian to left, between posterior lip and posterior margin of oral sucker, 16 anterior to posterior margin of latter.

Ovary 133 by 172, transversely elongate, smooth, in tandem with testes, close to posterior testis, 467 postacetabular. Oötype complex posterodorsal to ovary. Seminal receptacle 92 by 66, posterosinistral to ovary, overlapping latter and left vitellarium ventrally. Vitelline lobes two, symmetrical, compact, smooth, in contact; right vitellarium 165 by 167, in contact with ovary, left vitellarium 145 by 165; acetabulum to vitellaria 587, latter to cesoma 138 (right), 153 (left). Uterus much coiled, dorsal to gonads and vitellaria but may overlap some of margins ventrally, separating posterior testis from ovary; uterus extending into cesoma 111, one fifth length of latter; metratern long, extending over most of acetabulum. Eggs numerous, 10 measuring 20 to 23 by 10 to 12.

DISCUSSION: *Hemiuris sigani* differs from all known species of the genus in having both chambers of the seminal vesicle thick-walled and muscular. It appears closest to *H. appendiculatus* (Rudolphi, 1802) Looss, 1899.

LOOSE LEAF
ORGANIZER

HEMIURUS

SCHEDULE

RIOD TIME								
RSE ON. TRUCTOR								
RSE IE. TRUCTOR								
RSE ED. TRUCTOR								
RSE IU. TRUCTOR								
RSE RI. TRUCTOR								
RSE AT. TRUCTOR								

NAME _____

ADDRESS _____

SCHOOL _____ TELEPHONE _____

PRINTED IN U. S. A.

Anahemiurus Manter, 1947

Generic diagnosis. — Hemiuridae, Hemiurinae: Body small, with few to many conspicuous scales rather than annular denticulations. Tail present but small. Oral sucker and pharynx small. Ceca not extending into tail. Acetabulum larger than oral sucker, near anterior extremity. Testes postacetabular, obliquely tandem. Vesicula seminalis posterodorsal to acetabulum, thick-walled, ovoid, undivided; pars prostatica long, not coiled; ductus hermaphroditicus fairly long, straight. Genital pore opposite oral sucker. Ovary posterior to midbody, posttesticular; vitellaria consisting of two large compact masses. Seminal receptacle present. Uterus extending to posterior end of body proper; eggs small. Excretory arms uniting dorsal to pharynx. Gastrointestinal parasites of marine fishes.

Genotype: *A. microcercus* Manter, 1947 (Pl. 24, Fig. 308), in *Calamus bajonado, C. calamus* and *Eucinostomus lefroyi;* Florida.

144. Anahemiurus microcercus n. gen., n. sp.

Figs. 102, 103

HOSTS: *Calamus bajonado* (Bloch & Schneider), grass porgy; in 1 of 15 hosts examined. *Calamus calamus* (Cuv. & Val.), saucer-eye porgy; in 4 of 20 hosts examined. *Eucinostomus lefroyi* (Goode), mojarra; type host; in 2 of 12 hosts examined; numerous specimens.

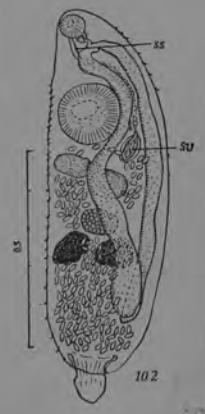
LOCATION: Stomach and intestine.

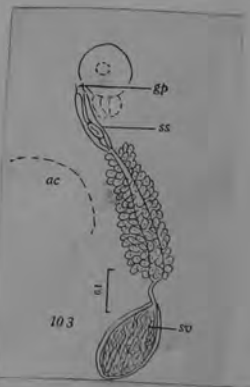
Description: Body small, elongate-oval, plump, almost equally wide along most of its length; 0.375 to 0.926 by 0.150 to 0.331 mm. The 0.375 mm specimen filled with eggs. Cuticula with large, conspicuous scales not clearly arranged in rows; scales present dorsally on the forebody and ventrally on the postacetabular part of body, sparse and widely separated or absent on dorsal surface of hindbody; sometimes reduced (by loss ?) to a few scales posterior to acetabulum. Oral sucker 0.036 to 0.070 mm in diameter; forebody 0.085 to 0.187 mm or about 1/4 to 1/5 body length. Acetabulum 0.082 to 0.174 mm in diameter. Sucker ratio 1:2.16 to 2.48. Ecsoma very small, retracted or partially extended (perhaps due to pressure in killing), about 1/8 to 1/10 body length.

Genital pore ventral to oral sucker, near mouth. Testes oblique but almost symmetrical, immediately postacetabular, wider than long, often overlapping medianly. Seminal vesicle a thick-walled, muscular, ovoid sac, with posterior end almost in contact with testes, is size 0.042 to 0.116 by 0.022 to 0.062 mm, or 1/8 to 1/11 body length. Pars prostatica a long, almost straight tube extending to level of bifurcation of ceca. Genital sinus tubular, long. Ovary ovoid, wider than long, immediately behind midbody, separated from testes by uterus. Vitellaria consisting of two large, compact, unlobed masses, almost or quite meeting medianly, immediately postovarian. A small, spherical seminal receptacle surrounded by gland cells is present, but it usually appears empty while sperm cells may occur within the uterus. Uterus extending to posterior end of body. Eggs 19 to 28 by 10 to 12 μ (29 by 13 μ in a live specimen). Egg size is not correlated with body size as the largest eggs were in the smallest specimens. Excretory vesicle forking just posterior to acetabulum; the crura uniting dorsal to pharynx.

Slight differences were noted in the specimens from the two hosts. Those from *Calamus calamus* were somewhat smaller, had fewer body scales, and larger eggs.

Generic Diagnosis of Anahemiurus: Hemiuridae of small size; body with few to many conspicuous scales rather than annular denticulations. Ecsoma present but small. Genital pore opposite oral sucker. Seminal vesicle posterior to middle of acetabulum, thick-walled, ovoid and undivided; pars prostatica long, not coiled; ductus hermaphroditicus fairly long and straight. Ovary posterior to midbody, posttesticular, ovoid; vitellaria consisting of two large, compact, unlobed, postovarian masses. Seminal receptacle present but sperm cells occur in uterus. Type species: *Anahemiurus microcercus*.





The name *Anahemiurus* is from *an*, near; and *hemiurus*, referring to similarity to *Hemiurus*.

This genus is like *Parahemiurus* notably in the reproductive organs, but differs in possessing scales rather than annular denticulations. In possessing scales it is like *Dinosoma* but differs in shape of seminal vesicle, the pars prostatica, and in unlobed vitellaria.

ANAHEMIURUS

Brachyphallus Odhner, 1905

Generic diagnosis. — Hemiuridae Sterrhurinae: Body elongate, tailed, often with ventral pit between acetabulum and genital pore. Oral sucker subterminal, comparatively large, pharynx globular, esophagus short, ceca reaching to near tail end. Acetabulum nearly as long as oral sucker near anterior extremity. Testes diagonal, postacetabular. Vesicula seminalis constricted into two portions, anterior or anterodorsal to acetabulum. Pars prostatica short, very poorly developed. Ductus hermaphroditicus short; genital pore ventral to pharynx or esophagus. Ovary in middle third of body. Vitellaria divided into two indented or somewhat lobed masses. Uterus not extending into tail. Excretory arms united dorsal to pharynx. Parasites of freshwater and marine fishes.

Genotype: *B. crenatus* (Rud., 1802) Odhner, 1905 (Pl. 21, Fig. 263), in *Gasterosteus aculeatus* and *Pleuronectes maximus;* also in *Cottus scorpius, Pleuronectes limanda, Acipenser sturio, Gasterosteus aculeatus, Ammodytes tobianus, Salmo salar, S. trutta, Osmerus eperlanus;* Scandinavia, Britain, Russia, N. America. Also in *Oncorhynchus milktschitsch*, Japan; *O. tschawytscha*, Puget Sound. Additional hosts from Woods Hole — Linton (1940), from White Sea — Schulman and Schulman-Albowa (1953). Manter (1926, p. 59) says that the herring is the normal host for the parasite and not an intermediate host as suggested by Cooper. For American hosts see Linton (1940).

Other species:

B. amuriensis Babaskin, 1928, in *Oncorhynchus keta;* Russia. Also in *O. gorbuscha, O. masou, Clupea harengus, Osmerus eperlanus.*

B. anurus Layman, 1930, should be transferred to *Genolinea* Manter 1925.

B. brachygobii Reichenbach-Klinke, 1925, in *Brachygobius xanthozona;* Southeast Asia?

B. parvus (Manter, 1947), syn. *Lecithochirium p.* M., in *Epinephelus striatus, Euthynnus alletteratus, Diplectrum formosum, Polymixia lowei, Priacanthus arenatus, P. cruentatus, Prionodes* sp., *Pseudupeneus maculatus, Synodus foetens;* Tortugas, Florida.

Brachyphallus Odhner, 1905

Genital pore approximately halfway between the suckers. Genital sinus much shorter than in Hemiurus Pars prostatica very weakly developed and of very short length. Seminal vesicle of two parts, dorsal to the ventral sucker, thin-walled. Vitellaria weakly lobed. Uterus not reaching into the tail appendage. Between the genital pore and ventral sucker a groove-like depression with special arrangement of muscles.

Type species: Br. crenatus (Rud.)

From Odhner, 1905

Odhner records the following hosts:
Cottus scorpius
Pleuronectes limanda
Gasterosteus aculeatus
Ammodytes tobianus
Salmo salar
S. trutta
Asmerus eperlanus

Lander (1904) considers the American form the same species. This he collected from Asmerus morda x; Anguilla chrysypa.

Manter (1926) records it from Asmerus mordax; Pollachias virens; Clupea harengus

Price (Journ. Parasit., 15:220), 1929; considers Distomum gastrocodum Leidy, 1891 from the skip-jack, Trichiuris lepturus as a species of Brachyphallus differing from B. crenatus in that the oral sucker is ⅔ size of ventral sucker. This species becomes thus B. gastrocolum(Leidy) Price. It may be a species of Hemiurus.

Yamaguti (1934) records B. crenatus from:
Oncorhynchus milktschitsch (Walbum) from Japan

Other species: B. amuriensis Babaskin, 1928
Yamaguti transfers B. anurus Layman to Genolinea.

B. crenatus recorded by Lloyd (1938) from "spring salmon". Oncorhynchus tschawytscha from Puget Sound

Russian Pacific - see M.P. & B. 1963

BRACHYPHALLUS CRENATUS (RUDOLPHI 1802)
[Fig. 53]

From stomach and intestine, *Osmerus mordax* (smelt)
" " " " *Pollachias virens* (Pollack)
" " " " *Clupea harengus* (Herring)

Lander (1904) has described the morphology of this form in detail. His material was also obtained from the smelt. In the present collection thirteen specimens were obtained from the stomachs and intestines of three smelt. Two other fish examined did not contain the trematode. The worms usually occur in the stomach.

53

Looss (1907:158) expresses the view that the American form of this parasite represents a new species which he names *B. affinis*. He finds the chief distinction to be the elongate and less lobed condition of the vitellaria and that the host and geographical occurrence differ widely from the European *B. crenatus* from *Salmo salar*. Lander figures the vitellaria as about twice as long as wide in an extended specimen, and his description indicates that this is the usual condition. In regard to lobation of these organs, Lander says: "They are commonly slightly lobulated, though they sometimes have a regular oval outline." Cooper (1915) describes and figures one specimen from a small herring. This specimen agreed with *B. crenatus* in having definitely lobed vitellaria (right, four lobed; left, three lobed). He also points out that either gland may appear entire when viewed obliquely. He suggests that the herring may represent an intermediate host and that the trematode might be discovered in *Salmo salar* from America.

The present material from the smelt agrees with descriptions of *B. crenatus* (Rud.). It is probably the same species collected by Lander from the same host. The vitellaria, however, in my specimens from the smelt were always distinctly lobed (Fig. 53), usually one being four-lobed, the other three-lobed. In none of the specimens were the vitellaria noticeably longer than wide. On the basis of these thirteen specimens from the smelt, it would appear that the American species is not distinguishable from the European species, *B. crenatus*. For hosts of *Brachyphallus crenatus* Odhner gives: *Cottus scorpius*, *Pleuronectes limanda*, *Gasterosteus aculeatus*, *Ammodytes tobianus*, *Salmo salar* and *trutta*, and *Osmerus eperlanus*. Lander's material was from *Osmerus mordax* and *Anguilla chrysypa*.


"BRACHYPHALLUS CRENATUS"

The smelt from which the present material was collected occurred in large numbers, together with small cod and pollack beneath the fishing wharf at Manset. All these fish were about the same size and evidently had similar feeding habits. The same trematode, *Brachyphallus crenatus*, was obtained from the stomach of the pollack, *Pollachius virens*, but not from the cod. Specimens from the pollack agreed in every respect with those from the smelt. They were relatively small and usually contracted. The vitellaria were constantly lobed. Four fish yielded eleven trematodes.


From Looss, 1907

Eight or nine specimens were obtained from the examination of 28 herring (*Clupea harengris*). The much larger size of most of these trematodes gave the impression of a different species, but the details of anatomy agreed with *Brachyphallus crenatus*. Moreover, the sizes agree with known limits for the species (Odhner recording a variation of 0.8 mm. to 2.5 mm. in body length, while Olsson gives 5 mm. as maximum length). Cooper (1915) found one small specimen in the stomach of the herring. The present collection of large mature specimens from this host indicates that the herring is a normal host for the parasite and not, at least exclusively, an intermediate host as suggested by Cooper.

Only in material from the herring was variation in vitellaria shape noted. In these specimens, lobing of the vitellaria was not common. The characteristic four- and three-lobed condition was clearly evident, however, in one specimen. The material from the herring agrees in this respect with Lander's description, although an elongate condition of the vitellaria was not common.

Brachyphallus crenatus (Rudolphi, 1802) Odhner, 1905

SYNONYMS: *Fasciola crenata* Rudolphi, 1802.
Distoma crenatum (Rudolphi) Rudolphi, 1809.
Hemiurus crenatus (Rudolphi) Lühe, 1901.
Distoma appendiculatum, cuticosum, serratum of authors (see Dawes, 1947).
Brachyphallus affinis Looss, 1908.

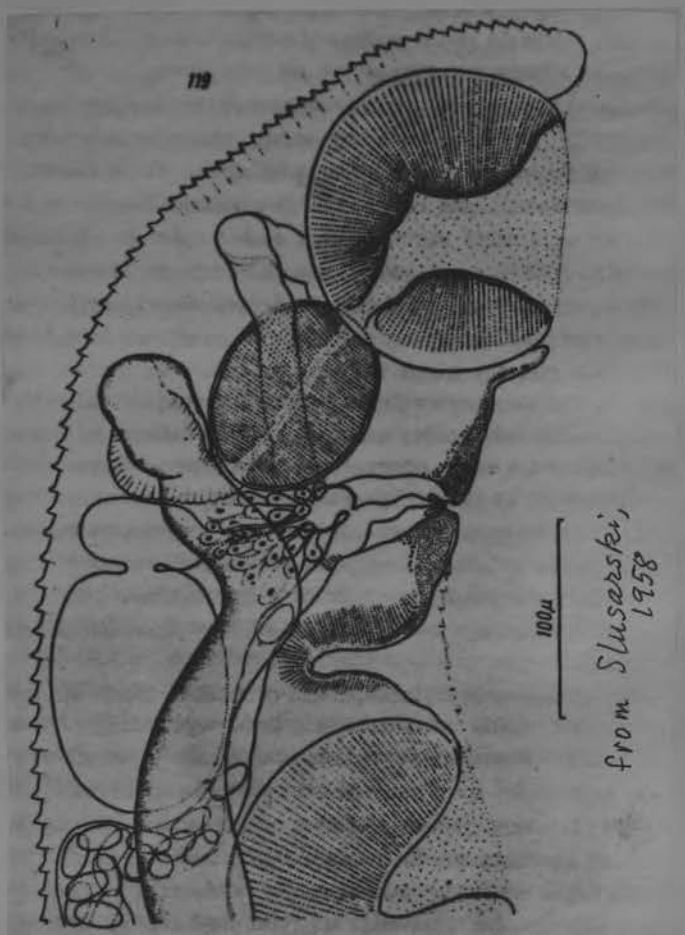
†To avoid confusion the author has accepted a wide concept of this family. It is hoped that a reclassification of the group will be presented in the near future (Gibson and Bray 1979).

HOSTS AND LOCALITIES

Hippoglossus hippoglossus, stomach, (1/5).
Banquereau (45 N., 57 W.; depth 180 m).
Reinhardtius hippoglossoides, stomach, (1/4).
Grand Bank (48 N., 50 W.; depth 168 m).

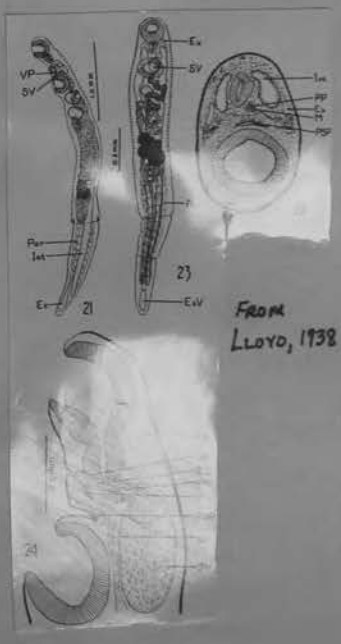
Other known hosts in eastern Canadian waters are *Ammodytes dubius, Clupea harengus, Gasterosteus aculeatus, Osmerus mordax, Pungitius pungitius, Salmo salar, Salvelinus alpinus, S. fontinalis* and *S. namaycush*. *B. crenatus* is a widespread parasite with an apparent predeliction for inshore and brackish water fishes. It is found in the north Atlantic Ocean, Arctic Ocean, north Pacific Ocean, and the Baltic, Mediterranean and Black Seas.

From BRAY, 1979



from Slusarski, 1958

Rys. 119. Okolica międzyprzyssawkowa *Brachyphallus crenatus* od strony bocznej, widoczny końcowy odcinek dróg płciowych wraz z torebką obojnaczą.
Anterior end of *Brachyphallus crenatus*, lateral view, terminal part of genital ducts with bursa-hermaphroditica.

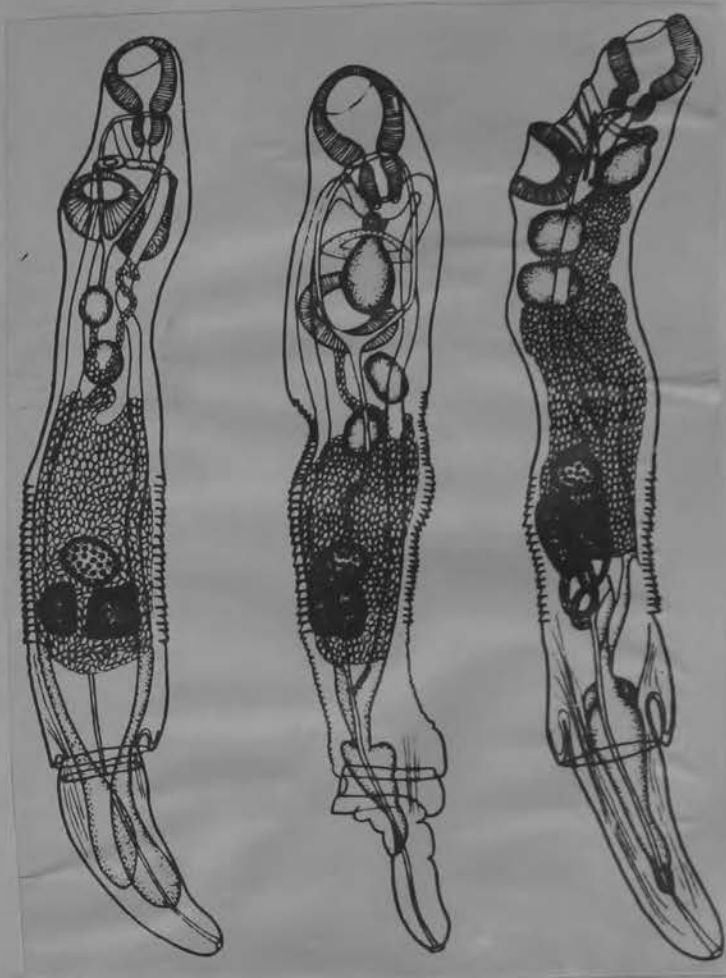


FROM LLOYD, 1938

Brachyphallus amuriensis Babaskin, 1928

Hosts: Clupea harengus pallasi Cuv. & Val.; Osmerus eperlanus dentex Steindachn., Oncorhynchus keta, O. masu Brevoort, O. gorbuscha.

Locality: Amur River, Russia



133 *Brachyphallus amuriensis* Babaskin, 1928 (no. Бабаскину, 1928)

Brachyphallus brachygobii Reichenbach-Klinke, 1952

Length without ecsoma 0.72 to 1.092 mm.
Width 0.22 to 0.252 mm.
Skin with denticulations in anterior part.
Oral sucker 0.11 to 0.126 mm.
Acetabulum 0.17 to 0.248 mm.
Sucker ratio 1:1.54 to 2.
Between the suckers is a slit-like very small depression
Ecsoma very short.
Pharynx 0.07 long; 0.05 wide
Genital pore in front of acetabulum
Eggs 20 by 10 u; without filament.
Host: Brachygobius xanthzona Bleeker
a freshwater fish of South Asia and Indonesia.
Imported into Germany

Most like B.crenatus but has smooth vitellaria
"Differentiated by the small round, paired vitellaria, the size, the relatively short tail, the host, and occurrence in freshwater."

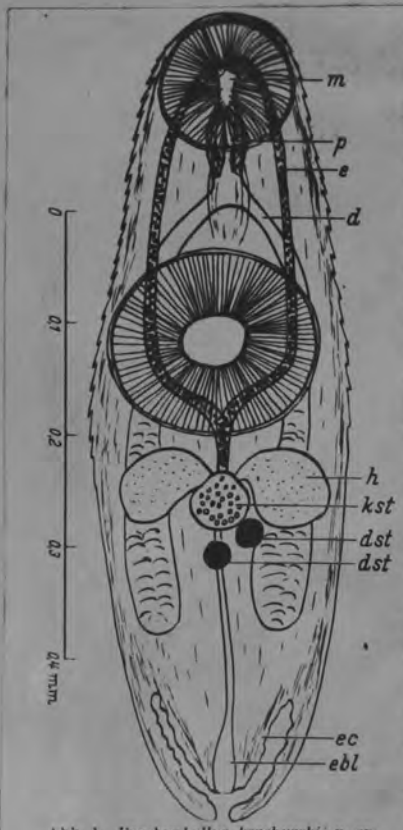


Abb. 1. *Brachyphallus brachygobii* n. sp. Stark vergrößertes Exemplar aus dem Darm der Ringelgrundel *Brachygobius xanthozona* BLEEKER. Original. *d* Darmschenkel; *dst* Dotterstock; *e* Exkretionskanäle; *ebl* Exkretionsblase; *ec* eingestülptes Ecsoma; *h* Hoden; *kst* Keimstock; *m* Mundöffnung mit dorsalen „Lippen"; *p* Pharynx.

schmarotzern den Anlaß für die Verfallserscheinungen im Körper des Fisches bildete. Bei der neuaufgefundenen Trematodenart handelte es sich um einen Vertreter der *Hemiuridae*, einer Familie, die zumeist in Meeresfischen verbreitet ist, aber auch mit einigen Arten in Süßwasserbewohnern vorkommt. Die Art selbst wurde als zu der Gattung *Brachyphallus* ODHNER gehörig bestimmt. Nach der Gattungsbezeichnung des Wirtstiers benenne ich sie *Brachyphallus brachygobii n. sp.* (Abb. 1) und gebe dazu folgende Beschreibung:

Name: brachygobii nach der Gattung des Wirtstieres.

Vorkommen. Im Darm des hinterindisch-indonesischen Süßwasserfisches *Brachygobius xanthozona* BLEEKER (Ringelgrundel). Gefunden im Darm eines über Hamburg frisch importierten Exemplars in einem Mannheimer Aquarium, also wahrscheinlich aus Südostasien eingeschleppt.

Typus. Im Zoologischen Institut der Technischen Hochschule Braunschweig.

Paratypen. Zugleich mit dem Typus im Zoologischen Institut.

Diagnose: Eine Art der Gattung *Brachyphallus* ODHNER der digenen Trematodenfamilie *Hemiuridae* mit folgenden Besonderheiten: Sehr kleine, flache, spindelförmige Trematoden, länger als breit, vorn in einen schmalen „Halsteil" auslaufend, hinten abgerundet mit kurzem, meist eingezogenem Ecsoma (Schwanzteil). Länge ohne Ecsoma etwa 1 mm.

BRACHYPHALLUS NASAE ~~n. sp.~~ Nagaty and Abdel Aal, 1962

(Fig. 1) not genus Brachyphallus

Decription based on whole mount of eight specimens from *Nasa* sp locally called "Dakkara" and from *Holocntrus spiniferus* locally called "Kahaya". Body clongate measuring from 2.45-4.16 long and from 0.50-0.92 wide: anterior end narrow: ecsoma present, may be partly or entirly extending to the outside measuring 0.46-0.71 long; cuticle smooth and may be slightly undulating. Oral sucker small measuring 0.21-0.29 by 0.21-0.32, slightly subterminal. Pharynx 0.12-0.15 by 0.11-0.15 anterior border may be overlapped by oral sucker. Intestinal caeca slightly undulating, extending in the ecsoma, terminating at 0.18-1.11 from posterior extremitv; in some specimens the blind ends of the two caeca are not equal and one longer than the other. Ventral sucker may be median or submedian measuring 0.41-0.63 by 0.36-0.65, nearly in posterior part of anterior third of body length; 0.46-0.71 from oral sucker. Ratio of oral to ventral suckers nearly 2 : 1 1:2

Testes two, intercaecal, smooth, transversely elongate and may be wedge-shaped, diagonal and may be separated by uterus. Anterior testis 0.23-0.32 by 0.18-0.38 and posterior testis 0.20-0.42 by 0.23-0.42 a short distance behind acetabulum, nearly in anterior part of middle third of body length. Vesicula seminalis preacetabular, undulating and broad posteriorly; ductus hermaphrodilicus short. Genital pore immediately behind intestinal bifurcation.

Ovary intercaecal, submedian, smooth, transversely elongate, measuring 0.15-0.23 by 0.10-0.33, post-testicular far from it; nearly in middle third of body length. Distance between posterior testis and ovary 0.17-0.76 long, vitellaria consist of two indented lobes, irrigularly branched and immediately behind ovary, measuring 0.20-0.32 by 0.15-0.26. Uterus coiled extending to near posterior end of body but not extending in the ecsoma, overlapping testes and caeca, anteriorly reaching to acetabulum then the metraterm open in common duct with the male genitalia. Eggs very small, oval, averaging 0.019 by 0.011. Excretory vesicle not distinct.

Comparisons:

This species differs from all the others belonging to the genus *Brachyphallus* Odhner, 1905, mainly in that the acetabulum nearly as twice as that of oral sucker instead of being nearly the same.

FIG. 1

BRACHYPHALLUS

Magnacetabulum Yamaguti, 1934
Syn. *Parectenurus* Manter, 1947

Generic diagnosis. — Hemiuridae, Dinurinae: Body small, with tail appendage and cuticular denticulations. Oral sucker subterminal, followed by pharynx, esophagus short, ceca extending into tail. Acetabulum large and prominent, in anterior third of body. Testes diagonal, posterodorsal or posterior to acetabulum. Seminal vesicle saccular or tubular, pretesticular, attenuated anteriorly. Pars prostatica tubular. Ductus hermaphroditicus thick-walled, opening into tubular genital atrium. Genital pore ventral to pharynx or oral sucker. Ovary posttesticular, pre-equatorial. Receptaculum seminis? No Laurer's canal. Vitellaria of seven slender tubular lobes, postovarian. Uterus may or may not extend into tail. Excretory arms not united anteriorly. Stomach parasites of marine fishes.

Genotype: *M. trachuri* Yamaguti, 1934 (Pl. 20, Fig. 260; Pl. 21, Fig. 275), in *Trachurus japonicus;* Inland Sea of Japan.

Other species:
M. americanum (Manter, 1947), syn. *Parectenurus americanus* Manter, 1947, in *Caranx bartholomaei* and *Synodus foetens;* Florida.
M. leiognathi Yamaguti, 1953, in *Leiognathus* sp., Macassar, Celebes.

Hemiuridae

Magnacetabulum [redacted] Yamaguti, 1934

GENERIC DIAGNOSIS. Hemiuridae Lühe, 1901. Body small with tail appendage. Conspicuous cuticular denticulations on body proper. Preoral lip and cervical glands present. Refractive substance present in cortical parenchyma. Oral sucker subterminal. Acetabulum bowl-shaped, prominent, of enormous size relatively to oral sucker, in anterior third of body. Pharynx contiguous to oral sucker. Esophagus short. Ceca extending to near posterior extremity of body. Testes contiguous, one obliquely behind the other, postacetabular, ventral. Vesicula seminalis tubular, enlarged posteriorly. Pars prostatica indistinct. Ductus hermaphroditicus present. Ovary ventral, posttesticular, pre-equatorial. No receptaculum seminis. No Laurer's canal. Shell gland directly behind ovary. Vitelline gland ventral, consisting of seven slender tubular lobes. Uterus extending into tail in fully mature worms, dorsal to male and female reproductive organs. Main excretory system Y-shaped, bifurcating at level of anterior testis. Parasitic in marine fishes.

Genotype. *Magnacetabulum trachuri.*

Magnacetabulum trachuri [redacted] Yamaguti, 1934

SPECIFIC DIAGNOSIS. *Magnacetabulum*; with generic characters. Body 1.2–2.5 × 0.2–0.35 mm, broadest at tail invagination. Tail shorter than body proper. Oral sucker 0.074–

DISCUSSION. This species is characterized by the large bowl-shaped acetabulum, the absence of the receptaculum seminis and by the Y-shaped excretory system. With the exception of these features the worm is evidently a hemiurid, but can not be assigned to any known genus of Hemiuridae.

0.11 mm in diameter. Pharynx 0.042–0.053 × 0.042–0.047 mm. Acetabulum 0.26–0.35 mm wide by 0.15–0.19 mm thick. Testes 0.063–0.13 mm long by 0.053–0.095 mm thick. Ovary 0.063–0.13 mm long by 0.042–0.11 mm thick. Uterine eggs numerous, elongate oval, about 0.0237 × 0.0105 mm.

Habitat. Stomach of *Trachurus japonicus* (Temm. et Schl.).
Locality and date. Inland Sea; August 4, 1929.

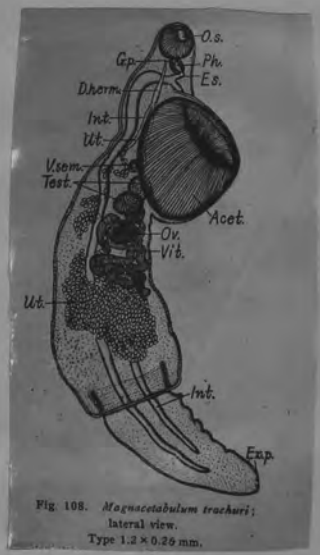
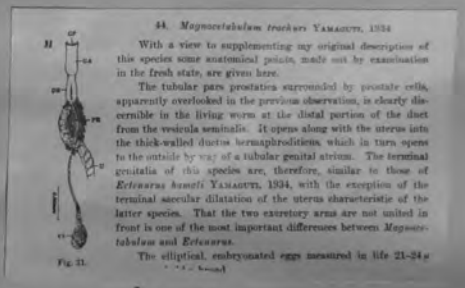


Fig. 108. *Magnacetabulum trachuri*; lateral view.
Type 1.2 × 0.26 mm.


54. *Magnacetabulum trachuri* YAMAGUTI, 1934

With a view to supplementing my original description of this species some anatomical points, made out by examination in the fresh state, are given here.

The tubular pars prostatica surrounded by prostate cells, apparently overlooked in the previous observation, is clearly discernible in the living worm at the distal portion of the duct from the vesicula seminalis. It opens along with the uterus into the thick-walled ductus hermaphroditicus, which in turn opens to the outside by way of a tubular genital atrium. The terminal genitalia of this species are, therefore, similar to those of *Ectenurus hamoli* YAMAGUTI, 1934, with the exception of the terminal saccular dilatation of the uterus characteristic of the latter species. That the two excretory arms are not united in front is one of the most important differences between *Magnacetabulum* and *Ectenurus*.

The elliptical, embryonated eggs measured in life 21-24 μ

Fig. 21.

from Yamaguti, 1942

M. Seiyonathi Yam. 1953

Magnacetabulum trachuri Yamaguti, 1934
(Fig. 27)

Host: *Harpodon nehereus*
Location: Intestine
Locality: Fish Harbour, Karachi (Arabian Sea)

In January, 1968 twenty five specimens of *Harpodon nehereus* collected from Karachi Coast, were examined, out of these fishes only one harboured two parasites in its intestine. One worm was mature while other was immature.

27

Description

The body of the worm is moderately elongated and fairly thick with a distinct, invagi nable tail at the posterior end. The tail is shorter than the body. The investing tegument of the body is thick and aspinose. The oral sucker is subterminal and rounded in shape. The prepharynx is absent. The pharynx is well developed and slightly broader than long. The oesophagus is short and narrow. The intestinal caeca are long extending into the anterior two third of the tail. The ventral sucker is well developed larger than the oral sucker, and situated near the anterior extremity of the body.

The testes are nearly rounded, tandem, on one side of median line, at the level of ventral sucker. The ovary is also spherical postero-lateral to the posterior testis towards the median line. The vitellaria are in the form of seven broad lobes, situated immediately behind the ovary. The uterus is well developed, extending from the level of ovary to the junction of the tail and body. The genital pore is situated at the side of the pharynx. The eggs are numerous, light brown in colour and broadly oval in shape. The excretory bladder is Y shaped with a long stem.

Measurements (In Mm.)

Body length (without tail) 1.360-1.400, Body width 0.400-0.412, Tail length 0.370-0.390, Oral sucker diameter 0.138-0.139, Ventral sucker 0.334-0.341 × 0.265-0.271, Pharynx 0.071-0.072 × 0.082-0.92, Anterior testis 0.147 × 0.138, Posterior testis 0.147 × 0.138 Shell gland 0.088 × 0.078, Body including partly invaginated tial, 1.789-1.896, Eggs 0.025-0.029 × 0.012-0.013.

Discussion

The specimen under study resembles with *Magnacetabulum trachuri* Yamaguti, 1934 in all essential features except for a larger oral sucker. It is however, identified as *M. trachuri* Yamaguti, 1934. It is recorded from a new host and for the first time from Pakistan.

From ZAIDI AND KHAN, 1977

MAGNACETABULUM GLANDOCAUDUM, ~~n. sp.~~ BILQEES 1971

(Figs. 50A—C)

Habitat—stomach, Locality—Karachi, Number—4 specimen in 1; 50 host examined.

Description : Body elongated, with tail and cuticular denticulations which are more prominent in the anterior region. Body length with tail 4.0, width 1.4. Oral sucker small, subterminal 0.23×0.25 in size. Pharynx well developed 0.10×0.13 in size followed by a short oesophagus. Ceca long extending into tail where these become dilated containing some granular and glandular structures. Acetabulum large and prominent 0.92×0.92 in size and situated in the anterior third of the body. It consists of two distinct musular layers, the outer in which the fibres are arranged longitudinally, and the inner has the fibres running transversely and longitudinally crossing each other. It is distinctly different in structure from the previously described species.

Testes postacetabular, closed together oval to rounded in shape measuring 0.19×0.18 and 0.17×0.18 in size. Seminal vesicle saccular posteriorly, tubular anteriorly, and pretesticular in position. Pars prostatica tubular surrounded by numerous prostate cells. Hermaphroditic duct thick walled and opens in the tubular genital atrium which in turn opens on the ventral side of the pharynx by a small pore.

The female reproductive organs essentially consist of a bilobed ovary each lobe measuring 0.10×0.11 and 0.09×0.10 in size. Vitellaria composed of seven tubular lobes almost anterior to ovary except one which extends behind it. The free ends of vitelline tubes are thicker. The main body of the uterus is in the middle which does not extend into tail. Excretory arms united anteriorly and the excretory pore is visible in the center of the posterior dilatation of the ceca forming a cloaca like structure.

The genus *Magnacetabulum* was erected by Yamaguti (1934) who first described *M. trachuri* from *Trachurus japonicus* of Inland sea of Japan. Later Manter (1947) and Yamaguti (1953) described two more species *M. americanus* and *M. leognathi* from Florida and Celebes in *Caranx bartholomari*, *Synodus foetus* and *Leiognathus* sp. respectively. Manter (1947) has also synonymised the genus as *Parectenurus*. The trematode *Magnacetabulum glandocaudum* described here from the fish *Arius serratus* can be differentiated on the basis of size, bilobed ovary, ceca modified posteriorly into a cloaca and surrounded by glandular and granular structures, position of the vitelline tubes, and the egg size, measuring 0.04—0.05 in length and 0.02—0.03 in width.

Be skeptical-

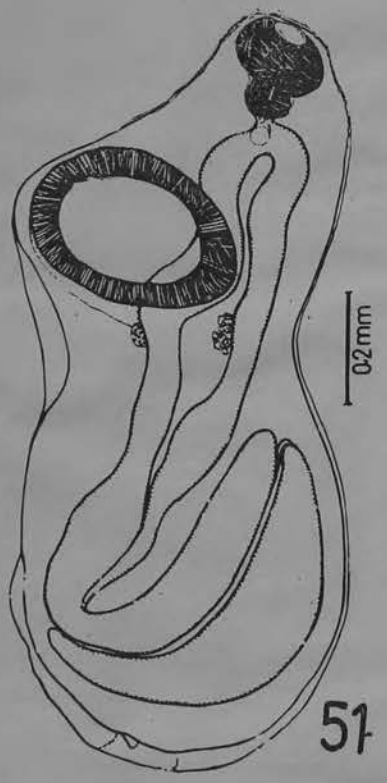
50

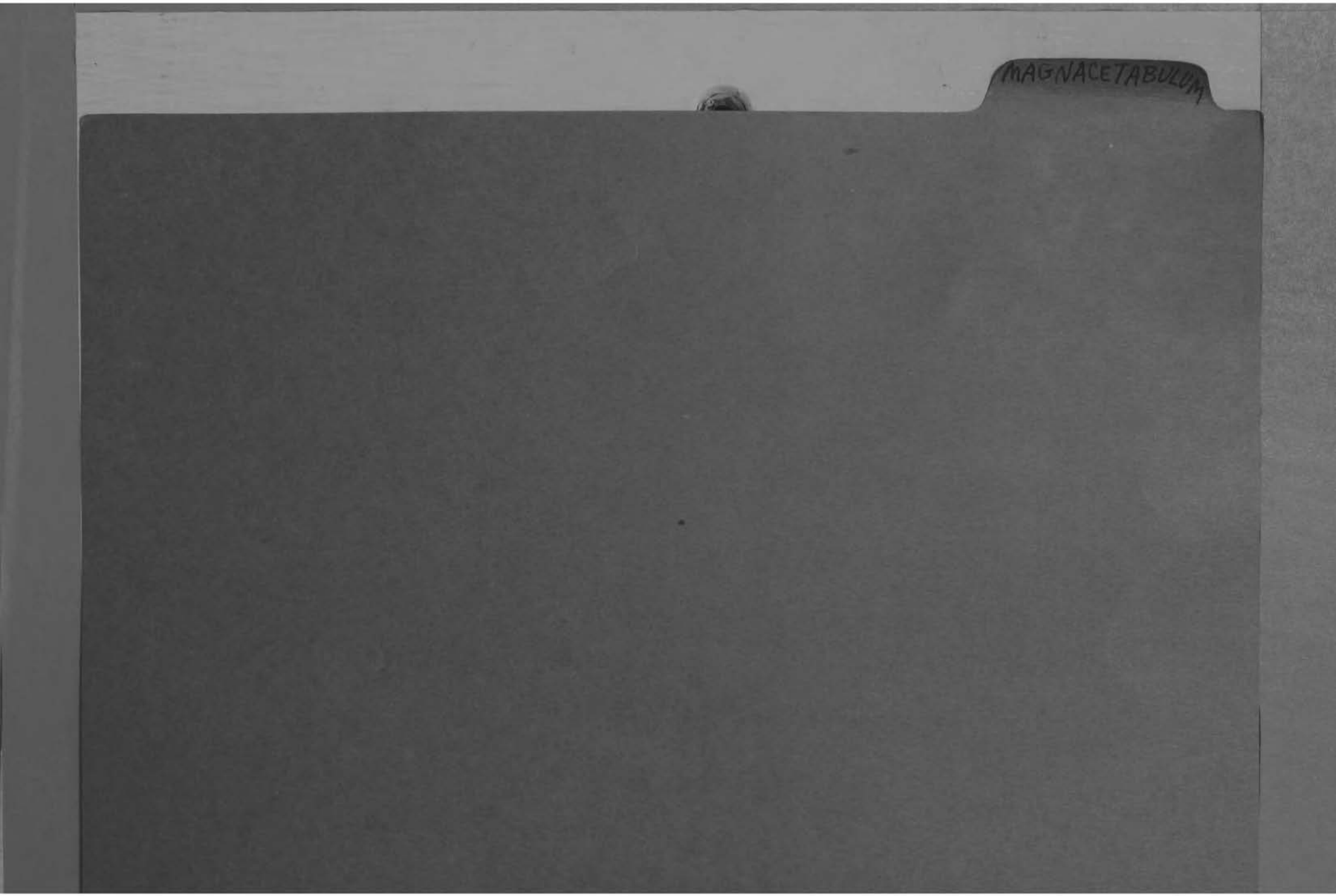
- over -

METACERCARIA OF *MAGNACETABULUM* sp. BILQEES, 1971

(Fig. 51)

A metacercaria of *Magnacetabulum* sp. was recovered from the fish *Otolithus argenteus*. It was enclosed in a transparent membranous cyst measuring 2.5 × 0.33 in size. Oral sucker 0.18 × 0.15, and pharynx 0.03 × 0.05 in size. Oesophagus short, ceca long dilated posteriorly. Acetabulum near anterior extremity, large 0.25 × 0.13 in size. Developing gonads were prominent in the postacetabular region. The metacercaria was identified belonging to the genus *Magnacetabulum* due to the relative sizes and position of suckers and gonads. Most probably it is of the new species *M. glandocaudum* as the ceca appear dilated posteriorly. Its recovery from the fish *Otolithus argenteus* indicates that this fish serves one of the intermediate hosts for *Magnacetabulum* sp., most probably for *M. glandocaudum* of *Arius serratus*.




MAGNACETABULUM