1990

Binder 006, Accacoeliidae [Trematoda Taxon Notebooks]

Harold W. Manter Laboratory of Parasitology

ACCACOELIIDAE Looss, 1912

Family diagnosis. — Elongate muscular distomes with prominent, usually pedunculate acetabulum near anterior extremity. Cuticle papillate or not, without spines. Oral sucker and pharynx well developed. Occasionally in front of the pharynx is a proboscis vesicle, whose ventral wall is produced into a proboscis projecting into the prepharynx. Esophagus long, with or without muscular bulb or glandular outgrowth. Intestine H-shaped; anterior ceca reaching as far as or nearly to pharynx, posterior ceca opening into excretory vesicle at posterior extremity. Testes obliquely tandem in lateral view, in anterior half of hindbody (anterior testis dorsal, posterior testis ventral). Vesicula seminalis tubular, long. Ductus hermaphroditicus and genital papilla present or absent. Ovary median, posttesticular. Vitellaria lateral or mostly dorsal, in hindbody, tubular or tubulo-acinous, branched. Uterus descending on ventral side to near posterior extremity, then ascending on dorsal side. Excretory vesicle communicating sideways with cecal ends at posterior extremity, V- or Y-shaped in lateral view, divided into a dorsal and a ventral collecting vessel. The latter vessels come to lie in the lateral fields as they pass the acetabular peduncle; they turn back on themselves at the anterior extremity without uniting with each other. Parasites of marine fishes.
Type genus: *Accacoelium* Monticelli, 1893.

Key to subfamilies of Accacoeliidae

1. Prepharyngeal proboscis vesicle and anterior esophageal bulb present; anterior cecum bifurcate; cloaca present ..... Rhynchopharynginae
   Prepharyngeal proboscis vesicle and anterior esophageal bulb absent; cloaca absent 2
2. Genital papilla or cone enclosing hermaphroditic duct Accacladiinae
   Genital papilla or cone enclosing hermaphroditic duct absent. 3
3. Acetabulum without muscular accessory lobes near its anterior free margin ..... Accacoeliinae
   Acetabulum with muscular accessory lobes .... Orophocotylinae

see Bray and Gibson, 1977 (reprint)
Key

Family Accacoeliidae Looss, 1912

The following description of the family is modified from Fuhrmann.

Medium-sized to large distomes with elongated muscular, more or less cylindrical bodies. Ventral sucker often more or less protuberant from the ventral surface. Cuticula without spines. Digestive system with strong pharynx, long esophagus and H-shaped ceca. Excretory bladder Y-shaped with short median stem and short branches. Cirrus sac lacking. Genital sinus sometimes developed to form a copulatory organ. Testes diagonal, behind ventral sucker. Ovary median, post-testicular. Seminal receptacle lacking. Lauer's canal present. Vitellaria lateral, tubular, branched with more or less swollen tips. Coils of uterus chiefly behind the testes. On gills or in digestive system of fishes.

Type genus: Accacoelium Monticelli

Other genera: Orophocotyle Looss

Tetrochetos Looss

Rhynchopharynx Odhner

Accacladocoelium Odhner

Accacladium Odhner

Odhneriun yamaguti, 1934

Key to genera of Accacoeliidae

Fore body with large papillae; genital sinus with muscular copulatory organ.....Accacoelium

Fore body smooth; genital sinus with or without copulatory organ

Anterior ceca unbranched

Genital sinus with well developed copulatory organ; genital pore midway between suckers.....Accacladium

Genital sinus simple without copulatory organ

Genital pore opposite oral sucker; cross piece of H-shaped ceca without branches...Orophocotyle

Genital pore at base of oral sucker; cross piece of H-shaped ceca with five small branches.....Tetrochetus

Anterior ceca branched at tips

Pharynx with anterior vestibule with ventral tube-like appendage.....Rhynchopharynx

Pharynx without such special structures.....Accacladocoelium

Accacladium nematulum Noble & Noble, 1937

Accacladocoelium alveolatum Robinson, 1934

Tetrochetus proctocolus Manter, 1940

Tetrochetus hamadai Fukui & Ogata, 1935

Tetrochetus sayneriius

Odhneriium calyptrocotyle (Montic. 1893) Yamaguti, 1934
(Syn. Dist. foliatum & Linton)

Odhner, T. 1928 Rhynchopharynx paradoxa n.g. n.sp., nebst Revision des Accacoeliiden von Orthagoriscus mola Zool. Anz. 77: 161-175.

Loos, A. 1902. Zur Kenntnis der Trematoden fauna des Triester Hafens, I. Über die Gattung Orophocotyle n.g. Ctbl. f. Bakt. etc. Abt I, Orig. 31: 637-644.

Loos,

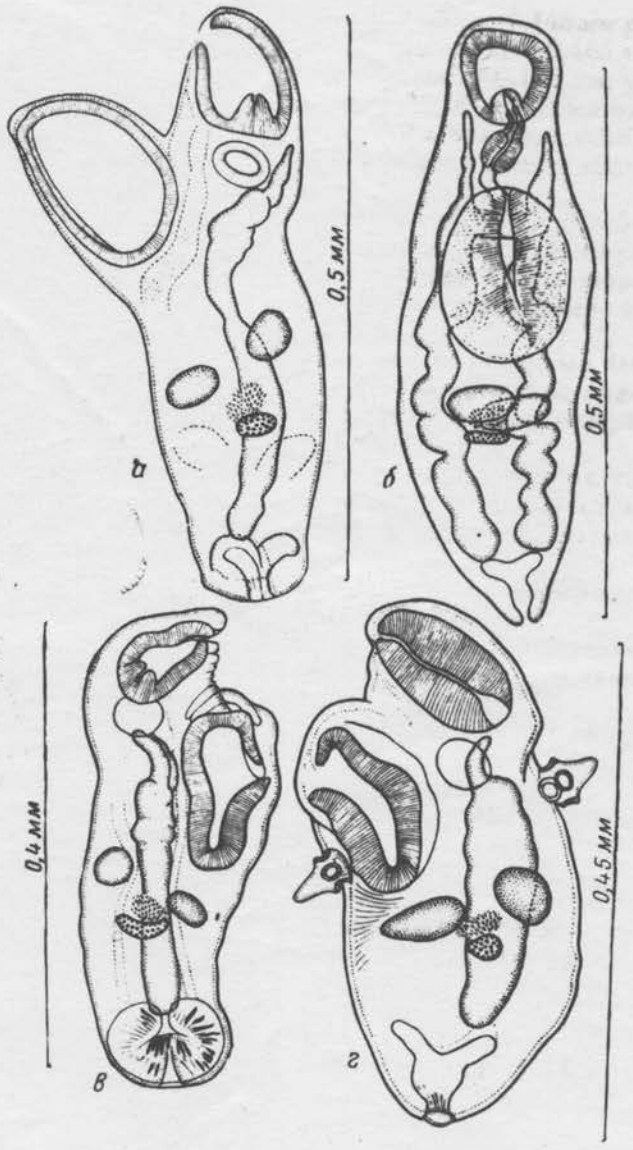


Рис. 45. Метацеркарии представителя семейства *Accacoeliidae* из рыбы *Sagitta inflata* (по Дольфю, Анантараману и Нейру, 1954)

а, б, в — метацеркарии в разных положениях; *г* — метацеркарий, с прикрепившимися к нему личинками цестоды сем. *Tetraphyllidae* (сверхпаразитизм)

ACCACOELIIDAE Looss, 1912

Family diagnosis. — Elongate muscular distomes with prominent, usually pedunculate acetabulum near anterior extremity. Cuticle papillate or not, without spines. Oral sucker and pharynx well developed. Occasionally in front of the pharynx is a proboscis vesicle, whose ventral wall is produced into a proboscis projecting into the prepharynx. Esophagus long, with or without muscular bulb or glandular outgrowth. Intestine H-shaped; anterior ceca reaching as far as or nearly to pharynx, posterior ceca opening into excretory vesicle at posterior extremity. Testes obliquely tandem in lateral view, in anterior half of hindbody (anterior testis dorsal, posterior testis ventral). Vesicula seminalis tubular, long. Ductus hermaphroditicus and genital papilla present or absent. Ovary median, posttesticular. Vitellaria lateral or mostly dorsal, in hindbody, tubular or tubulo-acinous, branched. Uterus descending on ventral side to near posterior extremity, then ascending on dorsal side. Excretory vesicle communicating sideways with cecal ends at posterior extremity, V- or Y-shaped in lateral view, divided into a dorsal and a ventral collecting vessel. The latter vessels come to lie in the lateral fields as they pass the acetabular peduncle; they turn back on themselves at the anterior extremity without uniting with each other. Parasites of marine fishes.
Type genus: *Accacoelium* Monticelli, 1893.

Key to subfamilies of Accacoeliidae

1. Prepharyngeal proboscis vesicle and anterior esophageal bulb present; anterior cecum bifurcate; cloaca present ..... Rhynchopharynginae
   Prepharyngeal proboscis vesicle and anterior esophageal bulb absent; cloaca absent 2
2. Genital papilla or cone enclosing hermaphroditic duct Accacladiinae
   Genital papilla or cone enclosing hermaphroditic duct absent. 3
3. Acetabulum without muscular accessory lobes near its anterior free margin ..... Accacoeliinae
   Acetabulum with muscular accessory lobes .... Orophocotylinae

see Bray and Gibson, 1977 (reprint)
Key

Accacoeliinae Odhner, 1911

Subfamily diagnosis. — Accacoeliidae: Body may be papillated anteriorly. Esophagus with or without glandular outgrowths at posterior end. Anterior and posterior ceca simple. Acetabulum more or less prominent, may be pedunculate. Testes dorsoventrally diagonal, in middle third of body. No genital papilla. Genital pore below oral sucker or pharynx. Ovary posttesticular. Vitellaria tubular, branched, extending in lateral fields of midregion of body or in posttesticular lateral fields. Excretory vesicle Y- or V-shaped.

Key to genera of Accacoeliinae

Esophagus with glandular posterior outgrowths; vitellaria in midregion of body ..... *Tetrochetus*

Esophagus without glandular posterior outgrowths; vitellaria extending backward from testicular zone to near posterior extremity ..... *Accacoelium*

Accacoelium Monticelli, 1893

Generic diagnosis. — Accacoeliidae, Accacoeliinae: Medium to large, elongate, muscular distomes. Cuticle papillate at anterior half. Oral sucker subterminal, pharynx pyriform; esophagus long, without outgrowths at its posterior end. Anterior and posterior ceca simple, without diverticles. Acetabulum more or less prominent. Testes large, more or less obliquely tandem behind acetabulum. Copulatory organ lacking. [1] Genital pore below pharynx. Ovary almost median, posttesticular. No receptaculum seminis. Laurer's canal present. Vitellaria well developed in posttesticular lateral fields. Main bulk of uterine coils posttesticular. Excretory vesicle Y-shaped, with short stem. Parasitic in marine fishes, occasionally in medusae.

Genotype: *A. contortum* (Rud., 1819) (Pl. 25, Fig. 334), in *Orthagoriscus mola;* Triest, Woods Hole, Açores.

Other species: *A. pelagiae* (Kölliker, 1849) Montic., 1893, in *Pelagia noctiluca* (Scyphozoa); Naples.

---

[1]) Odhner says that the genotype has a proboscis-like copulatory organ (Zool. Anz 77, p. 172).

ACCACOELIUM

Medium to large sized distomes, elongated, ventral sucker often protruding.-~~Pharynx pear-shaped~~ Cuticula with papillae on fore body. Pharynxn pear-shaped. esophagus reaching to the region of the ventral sucker. Digestive system H-shaped, ceca unbranched. Excretory bladder small Y-shaped. Genital pore opposite pharynx; copulatory organs lacking. Vitellaria well developed in the sides of body.

Type species: Accacoelium contortum

after Looss 1899

Accacoelium contortum (Rud.,1819)

Host: Mola mola ; Trieste; Woods Hole; Acores

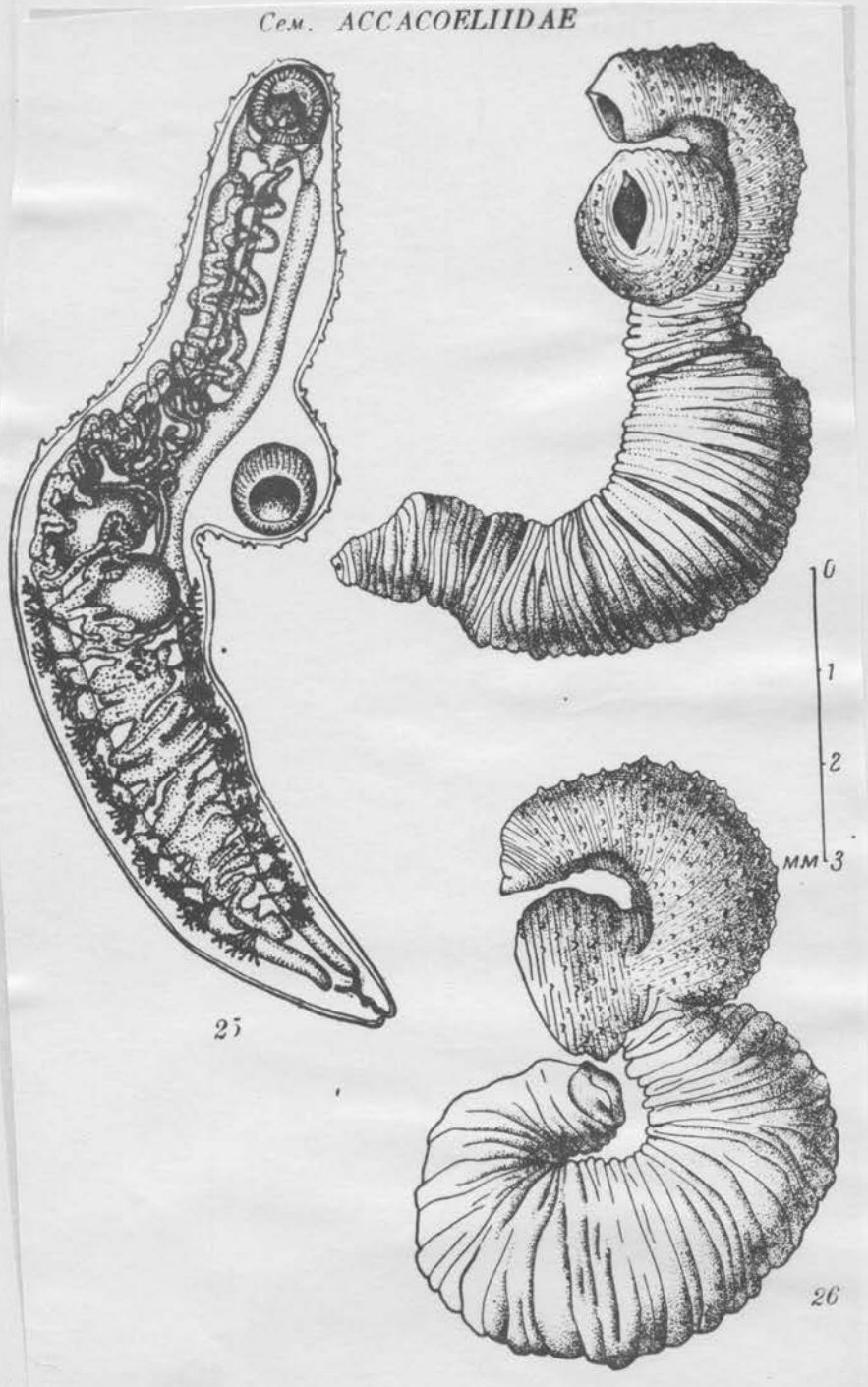


Рис. 25. *Accacoelium contortum* (Rud., 1819) (по Монтичелли, 1893)

Рис. 26. *Accacoelium contortum* (Rud., 1819)

see Bray and Gibson, 1977 (reprint)

Accacladiinae ~~n. subfam.~~ YAMAGUTI, 1958

Subfamily diagnosis. — Accacoeliidae: Body cylindrical, may be papillated anteriorly. Esophagus long, without posterior glandular outgrowths. Anterior ceca simple or with diverticles, posterior ceca with or without dorsal and ventral outgrowths. Acetabulum large, pedunculate. Testes in anterior half of hindbody. Genital papilla or cone enclosing hermaphroditic duct. Genital pore posterior to pharynx. Ovary postequatorial. Vitellaria tubular, extending in lateral fields of anterior half of hindbody or further anteriorly. Uterus descending to near posterior extremity.

Key to genera of Accacladiinae

Anterior ceca with diverticles; vitellaria commencing in forebody ..... *Accacladocoelium*

Anterior ceca simple; vitellaria commencing behind base of acetabulum ..... *Accacladium*

Accacladium Odhner, 1928

Generic diagnosis. — Accacoeliidae, Accacladiinae: Body slender, with pedunculate acetabulum. Esophagus very long. Anterior ceca simple, posterior ceca may have outgrowths dorsally and ventrally. Testes separated one from the other by uterus and vitellaria, some distance back of acetabulum. Vesicula seminalis convoluted. Genital papilla or cone enclosing hermaphroditic duct, projecting into genital atrium. Genital pore posterior to pharynx. Ovary a little behind posterior testis. Vitellaria tubular, mostly dorsal to uterus between base of acetabular peduncle and ovary, partly intruding into uterine coils which extend to near posterior extremity. Intestinal parasites of marine fishes.

Genotype: *A. serpentulus* Odhner, 1928, syn. *Distomum nigroflavum* Rud. of Linton, 1898, in *Orthagoriscus mola;* Atlantic and Pacific coast of Japan.

Other species: *A. nematulum* A. E. Noble et G. A. Noble, 1937 (Pl. 25, Fig. 332; Pl. 26, Fig. 347), in *Mola mola;* California.

ACCACLADIUM Odhner 1928

Body rather more narrow than in other genera. Cecal bifurcation just in front of anterior testis, esophagus therefore of very great length. Anterior ceca unbranched. Testes in Orophocotyle position. Genital pore more distant from oral sucker than in other ~~species~~ genera, about in the middle of forebody. Genital sinus filled by a large conical genital papilla. Vitellaria between ventral sucker and ovary.

Type species: Accacladium serpentulus Odhner 1928

A. mematulum Noble & Noble, 1937

Accacladium serpentulus Odhner 1928

Synonym: Linton's (1898:530) "Dist. nigroflavum"

Length 20.-30. mm, width 0.9 -1.25 mm. Fore-body 2.4-3.3 mm.
Oral sucker diameter:0.7-0.83 mm. Ventral sucker length 1.-1.2 mm. by about 0.7 mm. deep.
Testes elongate oval. Ovary close behind testes.
Vitellaria dorsal between ventral sucker and ovary, winding with the uterus between the testes, with rather short, branched tubular branches from a long central tube.
Genital pore in middle of fore-body.
The large conical genital papilla often protruded.
Pars prostatica extends to the level of the ventral sucker.
Eggs 28-29 by 17-20μ.
Host: Orthagoriscus

Unnamed genus

Odhner (1928:174) indicates that Dist. foliatum Linton 1898 represents a new genus (which he does not name) He states that it is the same species as also occurs in Europe and which Monticelli had named Dist. calyptrocotyle from immature specimens.

Named Odhneria by Yamaguti, 1934
" Mneiodhneria by Dollfus, 1935

Accacladium serpentulum Odhner,1928

Host: Mola mola ; Atlantic, and Pacific Coast of Japan

Сем. ACCACOELIIDAE

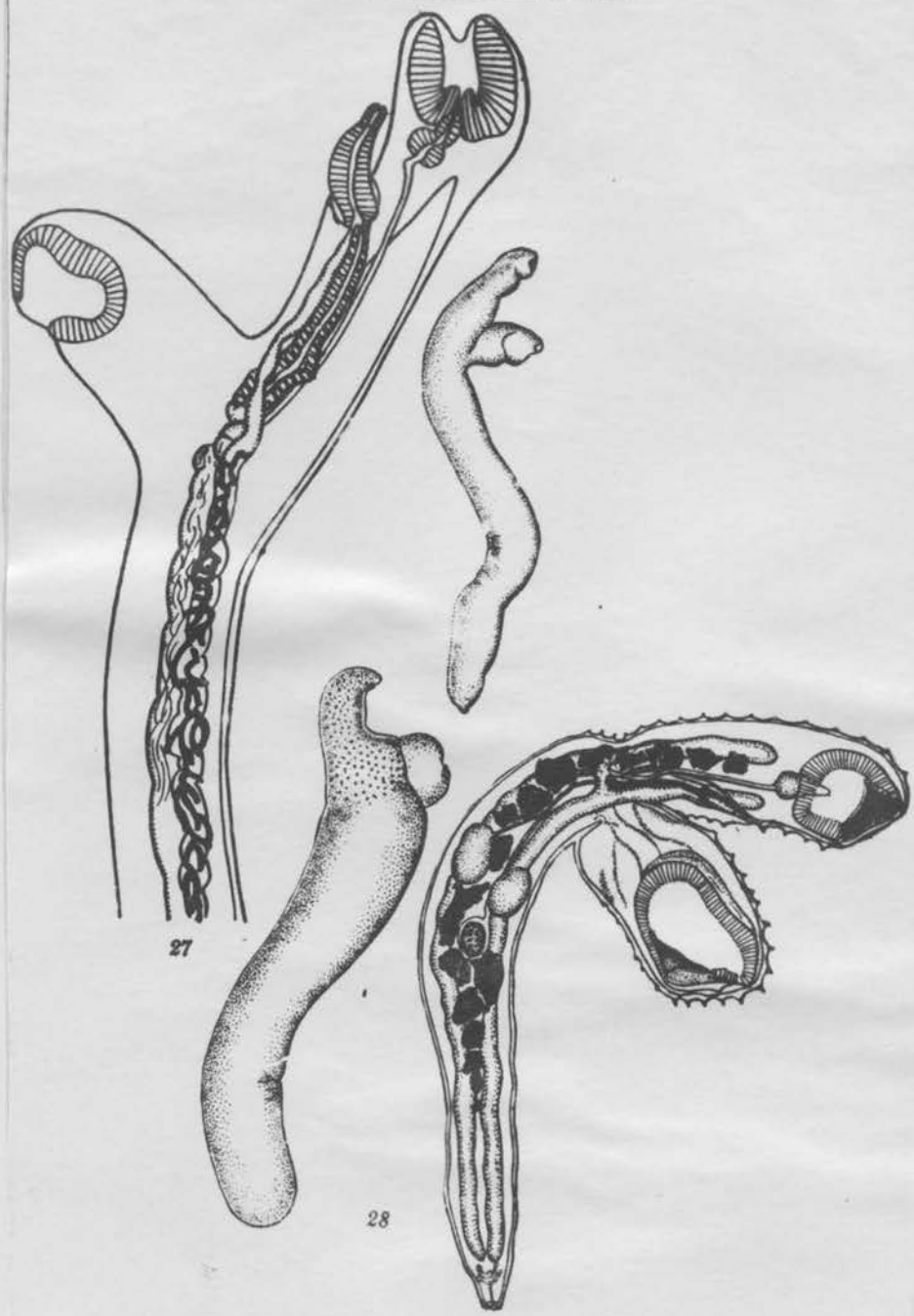


Рис. 27. *Accacladium serpentulum* Odhner, 1928
(по Одneру, 1928)
Рис. 28. *Accacladium serpentulum* Odhner, 1928
(Синоним: *Distomum nigroflavum* Monticelli, 1893, nec Rud., 1819
(по Монтичелли, 1893) [по мнению Однера (1928) ...

see Bray + Gibson 1977 (reprint)

ACCACLADIUM NEMATULUM N. SP., A TREMATODE FROM THE SUNFISH *MOLA MOLA*

ALDEN E. NOBLE AND GLENN A. NOBLE

Trans. Amer. Micros. Soc. 61, 1937

Department of Zoology, College of the Pacific

Seventy-nine trematodes of the family Accacoeliidae were taken from the digestive tract of a sunfish, *Mola mola*, which was obtained from Monterey Bay, California, on June 10, 1935. Forty-two of the worms were identified as *Mneiodhneria calyptrocotyle* (Monticelli) Dollfus (1935), and thirty-seven were found to be members of the related genus *Accacladium*. A study on the morphology of the latter specimens revealed characteristics at variance with those of the only described species of the genus, *Accacladium serpentulus* Odhner (1928), and it is believed that a new species has been found for which the name *Accacladium nematulum* is here proposed.

SPECIFIC DESCRIPTION

Body serpentine, 10.24 (8.22–17.60) mm. long, 0.60 (0.46–0.83) mm. in diameter. Pediculate acetabulum prominently projected and imparting forked appearance to anterior portion of body. Forebody 1.55 (0.96–2.37) mm. long, commonly flexed dorsally and, although usually longer than pediculate acetabulum, approximately equal to it in diameter. Body smooth and devoid of spines and other integumental modifications.

Acetabulum, apart from its stalk, 0.91 (0.53–1.59) mm. long in dorsoventral direction, 0.42 (0.31–0.60) mm. wide; posterior margin prolonged into two short lateral flaps (fig. 1) suggestive of early stages in development of foliate acetabulum of *Mneiodhneria calyptrocotyle*. Subterminal oral sucker 0.62 (0.46–1.02) mm. long, 0.45 (0.36–0.66) mm. wide, provided with small preoral lip. Posterior floor of oral sucker elevated as a conical projection through which a smaller prepharyngeal cone, 0.25 (0.18–0.37) mm. long, 0.19 (0.11–0.26) mm. in diameter, is usually thrust (fig. 6). Prepharyngeal cone appears to be highly modified portion of prepharynx which can be projected into cavity of oral sucker or, as seen in few specimens, can be almost completely withdrawn below it. In latter condition a definite thick-walled prepharynx appears to be present below oral sucker, whereas prepharynx can be seen otherwise in sections only.

Pharynx, 0.23 (0.20–0.29) mm. long, 0.15 (0.13–0.17) mm. wide, surrounded by numerous gland cells which also encircle anterior portion of extremely long esophagus. Immediately anterior to gonads, esophagus joins laterally with digestive caeca where, at their juncture, two dorsal and two ventral diverticula occur (fig. 5). These diverticula usually so irregular in outline as to present appearance of indefinite number of pouches of various sizes. Anteriorly caeca extend to pharynx, posteriorly to near end

of animal. From portions of caeca posterior to ovary small diverticula project alternately in ventral and dorsal directions (fig. 1). Because these diverticula decrease in size and regularity toward posterior ends of caeca where various folds and constrictions commonly occur, a constancy in their number has not been demonstrated. No less than eight and no more than fourteen have been counted in any one animal. Caeca communicate with thick-walled excretory bladder, 0.13 (0.06–0.18) mm. long, 0.07 (0.03–0.08) mm. wide, at posterior end of body. Two prominent excretory ducts, one dorsal and one ventral, join excretory bladder in region of union with laterally placed caeca (fig. 4). Excretory pore terminal.

Gonads form linear group of organs lying close together near center of body with ovary constituting posterior member of group. Testes elongated, approximately equal in size, 0.86 (0.63–1.37) mm. long, 0.44 (0.32–0.64) mm. thick; anterior testis dorsal, posterior testis ventral in position. Spermatic ducts join in front of anterior testis to form large coiled vas deferens which extends along ventral side of body and functions as seminal vesicle throughout greater part of its length. At a height level with anterior limits of acetabular stalk, seminal vesicle merges with pars prostatica, 0.45 (0.29–0.58) mm. long, which communicates with common genital duct at base of cirrus. Duct of pars prostatica courses through prostate cells in tortuous manner before joining common genital duct by means of very small papilla (fig. 3). Cirrus, 0.34 (0.27–0.41) mm. long, 0.14 (0.11–0.20) mm. wide at its base, lies within genital sinus. Genital pore opens to exterior on ventral surface of body midway between oral sucker and acetabulum.

Spheroidal ovary, 0.40 (0.22–0.81) mm. long, 0.36 (0.15–0.55) mm. thick, about half as long as adjacent testis and approximately equal to it

see Bray and Gibson, 1977 (reprints)

in thickness. Mehlis' gland, 0.16 (0.10–0.21) mm. in diameter, so closely applied to anterior surface of ovary that true oviduct does not appear to exist. Laurer's canal arises from ventral face of Mehlis' gland near its contact with ovary and, after proceeding in ventro-posterior direction across one third length of ovary, curves to left and proceeds in dorso-anterior direction until it reaches dorsal wall of body at height slightly anterior to Mehlis' gland. Vitelline duct enters ventral side of Mehlis' gland at point near emergence of Laurer's canal. Uterus emerges from right side of Mehlis' gland and, after making series of small but complex loops ventral and anterior to it (fig. 1), passes dorsal side of posterior testis and extends anteriorly along ventral face of anterior testis. Just posterior to seminal vesicle, uterus turns abruptly backward and, after reversing its course between gonads, forms conspicuous descending loop of uterus by extending posteriorly along dorsal side of body as a twisted and partially coiled tube. Near posterior end of animal (fig. 1) descending loop of uterus curves ventrally between caeca and then extends anteriorly along ventral body wall as an equally conspicuous ascending uterus. Ascending uterus passes ventral side of ovary and, paralleling its initial anterior course, extends to genital atrium. Ventral to pars prostatica, its straighter and thicker walled portion (metraterm?) joins common genital duct at base of cirrus (fig. 3). Vitellaria consist of branched tubules massed closely together and more or less intertwined with uterus and seminal vesicle. Anteriorly they reach acetabulum; posteriorly they pass over ventral face of anterior testis, follow path of uterus between testes, and merge into single vitelline duct a short distance from Mehlis' gland. Special vitelline reservoir not present. Uterine eggs 0.034 (0.031–0.037) mm. long, 0.022 (0.021–0.023) mm. wide.

Habitat.—Intestine of *Mola mola*.

Vicinity.—Monterey Bay, California.

Date.—June 10, 1935.

Type.—U. S. Nat. Mus. Cat. No. 9023.

Cotypes.—College of the Pacific, Stockton, California.

Comparisons

Although the authors are of the opinion that the assignment of a specific status to *Accacladium nematulum* is necessitated by their studies on the specimens at hand, they confess to some hesitancy in submitting their findings for publication because of the, as yet, incomplete knowledge of *Accacladium serpentulus* Odhner (1928), the only previously described species of the genus. They wish to draw attention to the possibility that, in a group of trematodes (Accacoeliidae) showing such remarkable speciation within a single host species, individual variations may be extreme and that the marked tendency toward speciation may also show misleading ontogenetic imprints. It is conceivable, for example, that the specimens comprising the subject matter of this paper differ from the animals described as *A. serpentulus* because of differences in their ages, intermediate hosts, physiological states of their definitive hosts, or other unknown factors, rather than because of true genetic differences. Nevertheless, the authors share the opinion expressed by Stunkard (1935) that, "if . . . differences are so pronounced as to render it improbable that the specimens belong to a known species, it is expedient to designate them with a new specific name, since in practice it is easier to drop a specific name in synonymy than to distinguish between two species which have been confused in a single common description." Should subsequent investigations reveal intermediate variations linking *A. nematulum* with *A. serpentulus* in a single species, this description will have served to make our knowledge of the species more nearly complete.

Accacladium nematulum may be distinguished from *Accacladium serpentulus* as follows:

1. *A. nematulum* averages one half the average length of *A. serpentulus* and it is less than sixteen times as long as it is thick, while the latter species is more than twenty times as long as it is thick.

2. Whereas the length of the body posterior to the gonads in *A. nematulum* is less than the length of the body anterior to them, the greater length of *A. serpentulus* is partially due to a disproportionate elongation of the body posterior to the gonads.

3. The acetabulum of *A. nematulum* is approximately twice as long, dorso-ventrally, as it is broad whereas the length of the acetabulum of *A. serpentulus* is only one and one half times its breadth. Furthermore, the distinct lateral flaps on the acetabulum of *A. nematulum* have not been described on *A. serpentulus*, unless Monticelli's (1893) figure of an acetabulum of "*Distomum nigroflavum*" (Pl. 4, fig. 41) can be interpreted as being an acetabulum of the species.

4. The uterine eggs of *A. nematulum* are distinctly larger than the eggs recorded by Odhner (1928) in his description of *A. serpentulus*. It should be noted, however, that if Odhner (1928) is correct in designating the "*D. nigroflavum*," described by Linton (1898), as *A. serpentulus*, and if Yamaguti's (1934) fragmentary description of an *Accacladium* referred to Odhner's species is indeed that of *A. serpentulus*, the comparison of egg sizes is without significance except as a further demonstration of variation. The eggs measured by Linton (1898) and Yamaguti (1934) are larger than those of the type *A. serpentulus*, and they are approximately the same size as those of *A. nematulum*.

5. While the cirrus of *A. nematulum* is relatively small, being about one half the length of the oral sucker, the larger cirrus of *A. serpentulus* is fully as long as the oral sucker. Furthermore, the cirrus of the latter species

Accacladium nematulum Noble & Noble, 1937

Host: Mola mola

California

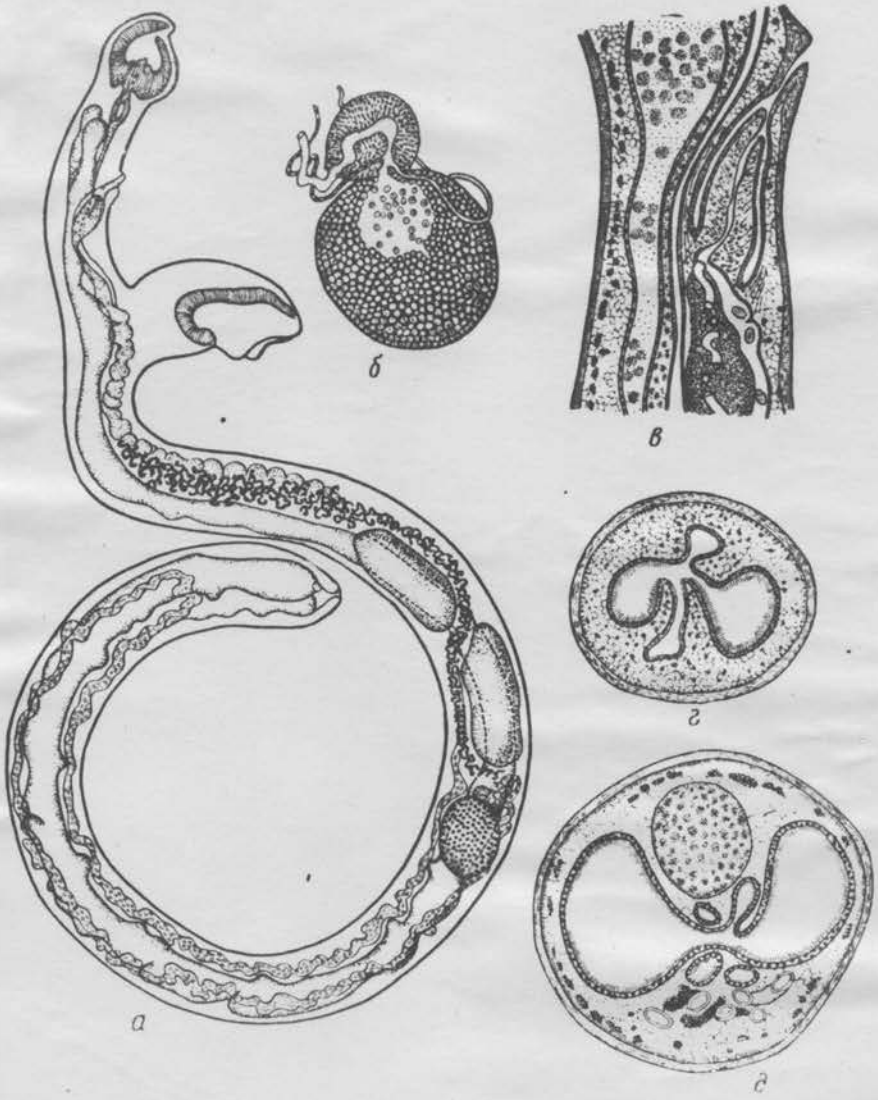


Рис. 29. *Accacladium nematulum* A. Noble et G. Noble, 1937 (по Нобль, 1937)

а — марита; *б* — комплекс женских органов; *в* — срез в области концевого полового аппарата; *г*, *д* — поперечные срезы тела на разных уровнях

Accacladocoelium Odhner, 1928

Generic diagnosis. — Accacoeliidae, Accacladiinae: Body cylindrical, tapering toward each end. Cuticle papillate in forebody. Oral sucker large, followed by pyriform pharynx. Esophagus long, without glandular outgrowths at its posterior end. Anterior cecum with six diverticles, posterior cecum with dorsal and ventral outgrowths. Acetabulum large, pedunculate. Testes diagonal or tandem, in anterior part of hindbody. Genital papilla enclosing ductus hermaphroditicus. Genital pore posterior to pharynx. Ovary postequatorial. Vitellaria tubular or acinous, extending in lateral fields from level of genital pore to beyond ovary, or may be confined to forebody. Uterus descending to near posterior extremity. Intestinal parasites of marine fishes.

Genotype: *A. nigroflavum* (Rud., 1819) Odhner, 1928 (Pl. 26, Fig. 344), in *Orthagoriscus mola;* Naples.

Other species:

A. alveolatum Robinson, 1934, in *Orthagoriscus mola;* Salcombe, England.

A. macrocotyle (Dies., 1858) Odhner, 1928, in *Orthagoriscus mola;* Ireland, Mediterranean, Scandinavia, N. America.

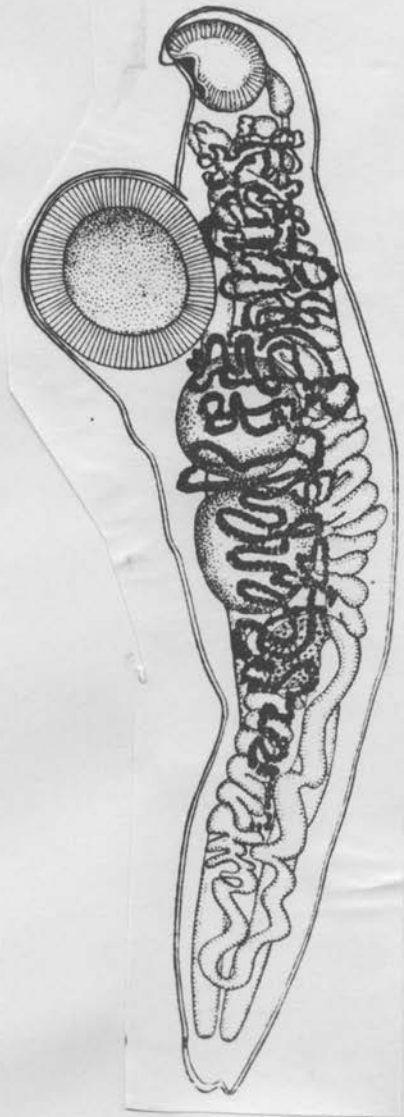
A. petasiporum Odhner, 1928, in *Orthagoriscus mola;* Atlantic, Mediterranean.

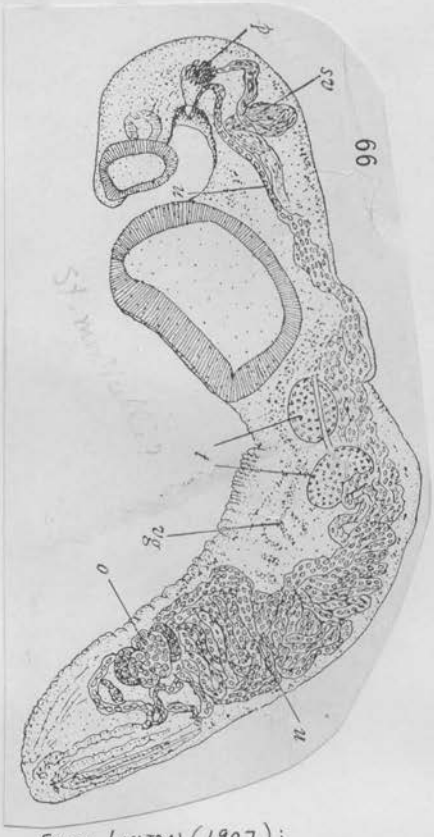
Accacladocoelium macrocotyle (Diesing,1858)

Syn.: Distomum macrocotyle Diesing,1858
Podocotyle macrocotyle (Diesing,1858) Stossich,1898
Accacoelium macrocotyle (Diesing,1858) Stafford,1904

Hosts: Mola mola
Mola nasus

Localities: Mediterranean; Ireland; Scandinavia; N.America.





FROM LINTON (1907):
Distomum (Accacoelium) macrocotyle
from Teuthis hepatus; Bermuda

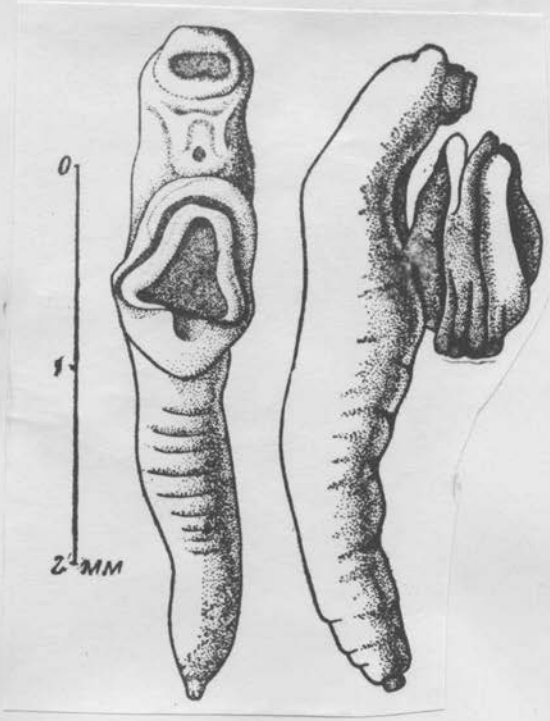
to Accacladocoelium by Odhner (1928)

see Bray & Gibson, 1977
(reprint)

Accacladocoelium petasiporum Odhner, 1928

Host: Mola mola

Atlantic; Mediterranean



see Bray + Gibson, 1977
(reprint)

Caballeriana lagodovsky Skrj & Guschanskaja,1959

######## Syn.: Odhnerium calyptrocotyle of Lloyd,1938
nec Monticelli,1893

Host: Mola mola

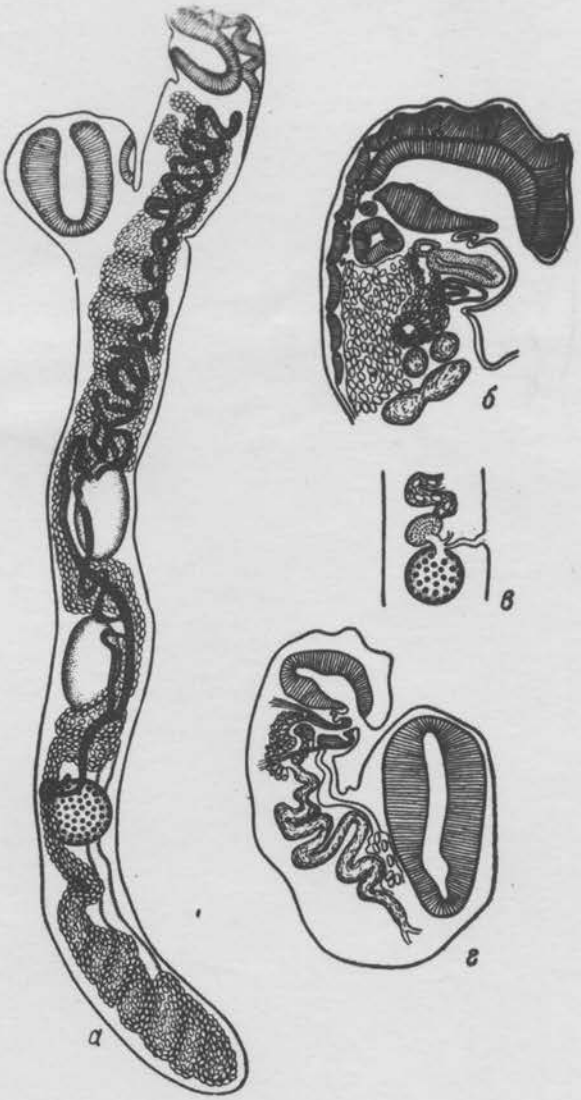


Рис. 44. *Caballeriana lagodovsky* Skrjabin et Guschanskaja, 1959
(по Ллойду, 1938)

а — марита; *б* — срез в области переднего конца тела — видны дорзальные мышечные гребни; *в* — срез в области отверстия лауреров канала; *г* — выводные половые протоки на срезе

ACCACOELIIDAE

1934

Accacladocoelium ## alveolatum Robinson, 19##

Diagnosis as given by Robinson in Parasit., 26:350

Characters of thegenus Accacladocoelium. Length 6.5 mm., maximum breadth 1.5 mm. Diameter of oral sucker 0.5 mm., of ventral sucker 1.0 mm. Ventral sucker prominent, about 1. mm. behind oral sucker. Encircling the body immediately in front of the wide excretory pore there is a zone about 0.25 mm. borad, which bears a peculiar cuticular structure, resembling a honeycomb, the septa of which are about 0.08 mm deep. The main vitelline mass is confined to the region anterior to the ventral sucker but there is one vitelline follicle at the level of the ovary; from this a short tube joins the main vitelline duct.

Host: sunfish (Orthagoriscus mola Bloch)

Other species

A. nigroflavum (Rud) - see Dollfus, 1935

~~A. petasiporin~~

A. petasiporum Odhner " " "

Accacladocoelium alveolatum Robinson, 1934

A NEW SPECIES OF ACCACOELIID TREMATODE (*ACCACLADOCOELIUM ALVEOLATUM* N.SP.) FROM THE INTESTINE OF A SUN-FISH (*ORTHAGORISCUS MOLA* BLOCH)

By V. C. ROBINSON

Molteno Institute for Research in Parasitology, Cambridge

(With Plate XIII)

The following is a description of a new species of Accacoeliid Trematode found in the intestine of a sun-fish (*Orthagoriscus mola* Bloch), caught by a fisherman in June, 1933, at Salcombe, Devon. The fish was examined by Mr J. W. Poulton of Downing College, Cambridge, to whom my thanks are due for bringing me the parasites for identification. In addition to the species described in this paper the host contained the following forms: on the skin, *Tristoma molae* and *Lepeophtheirus nordmanni*; in the intestine, *Ancistrocephalus microcephalus*.

General appearance (Fig. 2)

The worms measure on the average 6·5 mm. in length and 1·5 mm. in maximum breadth. In these specimens, which had been killed and preserved in formol, the body is rather stout and does not taper very much towards either end. It is curved ventrally and circular in cross-section. The cuticle is much wrinkled, especially about the base of the ventral sucker. This organ therefore is very possibly pedunculated in life, and the whole animal is probably quite slender and capable of great extension and retraction. In correlation with this the body wall is thick and the muscular layers well developed. The two suckers lie at the anterior end of the body, about 1·0 mm. apart. The ventral sucker is 1·0 mm. across, the oral sucker 0·5 mm.

At first sight the worm appears to have a third sucker at its posterior end, but this appearance is due to the slight in-tucking of the part of the body bearing the wide excretory pore and it is accentuated by the presence in this region of a zone of close-set skin "papillae," which deepen the invagination. This zone is about 0·25 mm. wide and extends completely round the body.

The "papillae" are very peculiar structures (Figs. 4, 5). In sections they take up the stain rather strongly and present a finely granular appearance (*pa*). They contain no nuclei and lie entirely outside the cuticle. They are roughly spindle-shaped and are ragged at their free ends. They are closely crowded together and under an oil-immersion lens it is evident that the spaces between them are occupied by very thin layers of cuticle. In fact, serial sections show that the cuticle in this region is raised into a large number of ridges or partitions, which cross one another almost at right angles. The cuticle thus resembles a honeycomb, with "cells" about 0·08 mm. deep. The free edges of the partitions are in some places swollen into flanges, in which the cuticle exhibits a vesicular structure (Fig. 5, *ve*). Without access to living material it is impossible to determine the nature of the spindle-shaped "papillae." The absence of nuclei indicates that they may be simply small masses of débris from the intestine of the host, which have been trapped in the honeycomb spaces, or that they may consist of some kind of secretion. The latter hypothesis is probably not correct, since no gland cells were observed in the neighbouring tissues, and the most careful examination failed to reveal any connection between the "papillae" and the subcuticular structures.

Alimentary canal (Fig. 2)

The mouth opens on the ventral edge of the oral sucker. It leads into a poorly developed pharynx, from which the narrow oesophagus runs backwards for a short distance and then turns sharply in a dorsal direction. The oesophagus divides at the level of the anterior margin of the ventral sucker into right and left branches, which come off almost at right angles. From the point where these two transverse limbs arise four small diverticula are given off, which run forward for a short distance and then end blindly. Similar structures have been recorded in other Accacoeliidae (Looss, 1912; Odhner, 1927 and 1928). From the right and left limbs the anterior and posterior intestinal caeca run forwards and backwards. The whole intestine is thus H-shaped, as is typical of the family. As they run down the length of the body the caeca give off a number of blind diverticula, which are very voluminous and usually filled with brownish food material. They are very conspicuous features in a whole mount and push their way among the other organs. Each of the anterior caeca has six of these diverticula, while those borne by the posterior caeca are more numerous and larger.

The posterior caeca do not end blindly, but communicate by wide pores with the excretory bladder—a feature which Odhner (1928) has found to be common to the members of the Accacoeliidae. The specimens I have examined were considerably contracted, and it is possible that during life the so-called excretory bladder is really part of the outer surface of the animal, or at least is capable of being evaginated. Many of the closely allied Hemiuridae are able to tuck in or protrude the hind end of the body; and further the lining of the bladder in the species under discussion is indistinguishable microscopically from the general cuticle covering the body (Fig. 3). This cuticle ceases abruptly at the sites of entry of the two "ani" into the bladder.

Excretory system

The excretory tubes are Y-shaped, the stalk of the Y entering the bladder between the two ani. From the limbs of the Y a series of tubes ramifies all over the body.

Genital system (Fig. 1)

The genital pore is situated in the mid-ventral line immediately behind the mouth. There is a narrow genital atrium, or, to use Manter's term (1926), a "sinus sac," with a cuticular lining, and the walls of this sac closely invest the genital papilla which projects from its dorsal wall. The papilla is about 0·1 mm. long in the specimens examined and it is doubtless capable of protrusion from the sinus sac, since it is provided with muscle fibres. It contains the hermaphrodite duct or genital sinus, formed by the fusion of the male and female ducts.

Male organs. The anterior testis lies just behind the middle of the ventral sucker and is slightly more dorsal than the posterior testis, which is immediately behind it. The two testes are thus in what Odhner (1928) calls the "*Orophocotyle* position."

From its opening into the genital sinus the male duct runs dorsally and backwards, following a rather winding course through the centre of the body. Inside the genital papilla its calibre is very minute and it is invested by muscle fibres, but it soon becomes surrounded by an enormous prostate gland. After leaving the prostate the male duct turns backwards and becomes the seminal vesicle. This is a long coiled tube with wide calibre and very thin walls. At the front end of the anterior testis the seminal vesicle receives the two vasa deferentia. One vas deferens is short and issues from the dorsal surface of the anterior testis; the other is longer and comes from the left side of the posterior testis.

Female organs. The ovary lies immediately behind the posterior testis and is provided with a well-marked sheath. This sheath is distinct from that investing the shell gland, which lies near its right side.

In the genital papilla the metraterm is ventral to the male duct and it passes backwards, becoming rapidly wider. It runs ventral to the prostate, which is partially wrapped round it. About the middle of the ventral sucker the metraterm becomes the uterus. There are two sets of uterine coils. Those which form the continuation of the metraterm are confined to the dorsal half of the body and they extend to the posterior end of the worm. Here the uterus turns forwards again and its coils can be traced along the ventral half of the body until they reach a point just below the testes. Here the uterus turns backwards again, and, narrowing, becomes the oviduct. The intestinal caeca with their diverticula lie between the dorsal and ventral sets of uterine coils.

The oviduct is a thin-walled coiled tube which enters the right side of the ovary between this organ and the shell gland. It gives off Laurer's canal, which runs upwards and opens on the dorsal surface above the ovary.

The arrangement of the vitelline apparatus presents an interesting peculiarity. The main vitellarium is situated entirely in the anterior region above the oral sucker. It does not extend further back than the posterior margin of the ventral sucker. In a cleared specimen, mounted whole, the yolk tissue has the appearance of a dark hood or cap on the head end. A single vitelline duct runs backwards, dorsal to the testes. Just behind the shell gland it unites with another duct to form the common vitelline duct, which immediately enters the oviduct. This second vitelline duct is short and stout and it drains a single large vitelline follicle lying on the right side of the body just behind the level of the ovary. Thus one vitellarium is large and confined to the front end of the animal, while the other is reduced to a single follicle and lies in the posterior part of the body. This state of affairs recalls the description given by Looss of the vitelline arrangements in the Accacoeliid worm, *Tetrochetus raynerius*. Here there is one main vitellarium, which lies near the ventral sucker and is drained by a single duct. This is joined by another shorter duct draining only six or seven follicles, situated near the ovary. A few of the Accacoeliidae have gone further and completely lost one vitellarium and duct, possibly in correlation with a slender body form (*Accacladium serpentulus*, *Orophocotyle planci* and *O. divergens*).

Systematic position

The presence on the intestine of large, pouch-like diverticula, six of which spring from each anterior caecum, and the structure of the genital papilla show that the worm must be placed in the genus *Accacladocoelium* (Odhner, 1928). It differs, however, from the three known species of this genus in the following features:

(1) The peculiarities in the vitelline apparatus described above.

(2) The "honeycomb" at the hind end of the body.

The last-named structure being a prominent feature, the name *Accacladocoelium alveolatum* n.sp. is proposed for this worm.

Finally, since the literature relating to the Accacoeliidae is somewhat scattered, a list of the members of the family, with their hosts, is appended. They are all intestinal parasites:

In *Orthagoriscus mola*:

Accacladocoelium nigroflavum Rud. 1819.
A. macrocotyle Dies. 1858.
A. petasiporum Odhner 1928.
A. alveolatum n.sp.
Accacoelium contortum Rud. 1819.
Accacladium serpentulus Odhner 1928.
Orophocotyle foliatum Linton 1898.
Rhynchopharynx paradoxa Odhner 1928.

In *Ranzania truncata*:

Orophocotyle planci Stossich 1899.
O. divergens Looss 1902.

In *Ausonia cuvieri*:

Tetrochetus raynerius Looss 1912.

Diagnosis. Characters of the genus *Accacladocoelium*. Length 6·5 mm., maximum breadth 1·5 mm. Diameter of oral sucker 0·5 mm., of ventral sucker 1·0 mm. Ventral sucker prominent, about 1·0 mm. behind oral sucker. Encircling the body immediately in front of the wide excretory pore there is a zone about 0·25 mm. broad, which bears a peculiar cuticular structure, resembling a honeycomb, the septa of which are about 0·08 mm. deep. The main vitelline mass is confined to the region anterior to the ventral sucker, but there is one vitelline follicle at the level of the ovary; from this a short tube joins the main vitelline duct.

Eight specimens of this worm were taken from the sun-fish. One of these is in the possession of the collector, Mr Poulton, and two complete specimens are in the collection of the Molteno Institute (No. 773). In addition one specimen has been deposited in the Museum of Comparative Anatomy, Cambridge.

~~Accacladocoelium~~ *Guschanskiana* alvealatum (Robinson, 1934) Skrjabin, 1959

Host: Mola mola

Salcombe, England

Сем. *ACCACOELIIDAE*

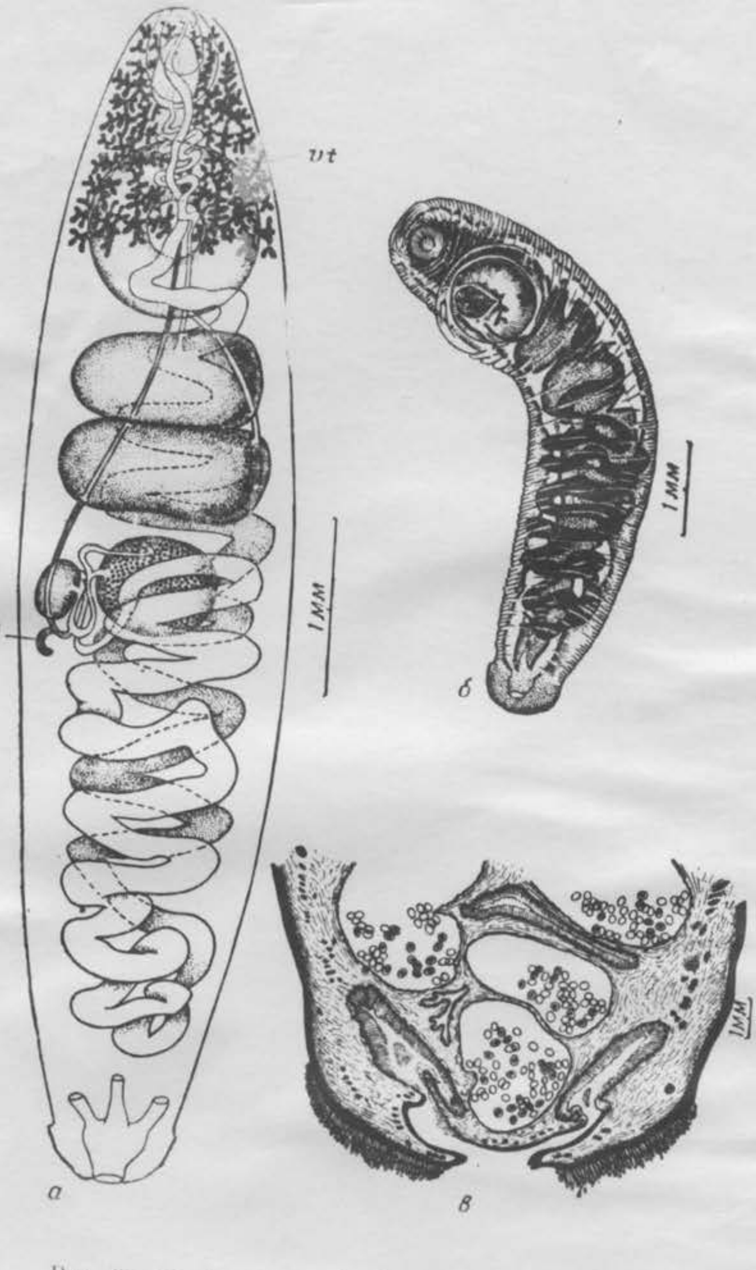


Рис. 32. *Guschanskiana alveolata* (Robinson, 1934)
(по Робинзону, 1934)

б — марита; в — продольный срез заднего конца тела (задние концы кишечника открываются в экскреторный пузырь); vt — передняя группа желточников; vf — задний желточный фолликул

Guschanskiana (?) sp. metacercaria SHIMAZU, 1978

(Figs. 5–6)

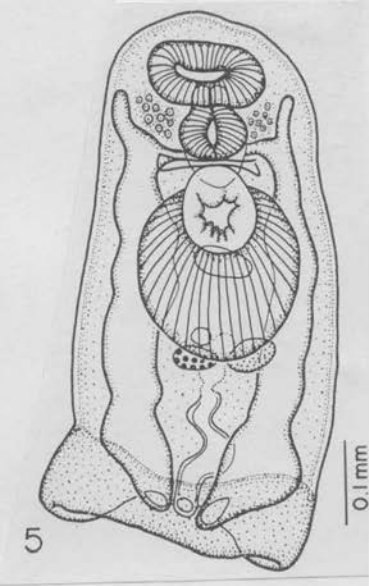
A single specimen was found free in the trunk coelom of *S. enflata* (13 June 1976).

Specimen No. NSMT–Pl–1805.

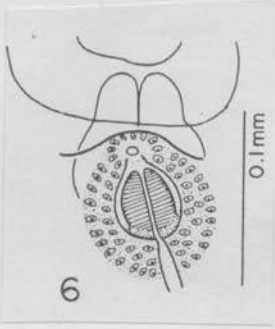
Description. Metacercaria, not encysted. Body bell-shaped, 0.612 mm long by 0.340 mm wide in hindbody, with a ventral depression anterior to ventral sucker. Cuticle thick, smooth. Sucker-like cuticular thickening present at posterior end of body, deeply stained with carmine, inverted dish-shaped, large, not papillate, 0.110 mm long by 0.340 mm wide. Oral sucker 0.069 mm long by 0.147 mm wide, surmounted with a ventrally folded perioral lip. Ventral sucker globular, 0.204 mm in diameter, near middle of body; its aperture located in its anterior third, with a muscular collar. Prepharynx probably present. Pharynx pear-shaped, 0.072 mm long by 0.063 mm wide, anteriorly inserted into oral sucker. Oesophagus probably recurved, enclosed with a mass of cells in its descending part; oesophageal glandular outgrowths not seen. Intestines H-shaped; main intestines thick, somewhat sinuous, not diverticulate, separately opening into uroproct; anterior caeca simple. Testes double, diagonal, located a short distance from each other; anterior one 0.036 mm long by 0.072 mm wide, dorsal to ventral sucker; posterior one 0.024 mm long by 0.054 mm wide, just dorsal to postero-lateral margin of ventral sucker. Seminal vesicle, pars prostatica, cirrus pouch, and cirrus not observed. Ovary 0.018 mm long by 0.054 mm wide, a little post-testicular, submedian. Mehlis' gland compact, 0.024 mm in diameter, immediately anterior to ovary. Genital atrium oval, ventral to oesophagus and pharynx, containing at its base a muscular genital cone measuring 0.026 mm long by 0.023 mm wide. Genital pore median, slightly posterior to oral sucker. Excretory vesicle tubular, sinuous, short; main collecting canals possibly running forward at least to ventral sucker in median field; uroproct very large, located in sucker-like cuticular thickening; pore very wide, terminal.

Discussion. The present accacoeliid metacercaria is tentatively assigned to the *Guschanskiana* owing mainly to the sucker-like cuticular thickening at the posterior end of the body and the genital cone, although neither the main intestines nor their anterior caeca are branched.

DOLLFUS (1960 a) briefly described unidentified accacoeliid metacercariae found in *S. inflata* [sic] from Villefranche-sur-Mer, Alpes-Maritimes. In his worms stained with carmine, the main intestines and their anterior caeca are both devoid of diverticula, and the posterior end of the body is occupied by "une masse annulaire, intensément colorée, nettement délimitée, . . . , qui correspond peut être à une invagination de la partie terminale." If the region occupied by the masse is not an invagination of the posteriormost portion of the body but corresponds to the sucker-like cucticular thickening, then DOLLFUS' worms may be similar to the present metacercaria.



5



6

Guschanskiana sp. metacercaria SHIMAZU, 1978

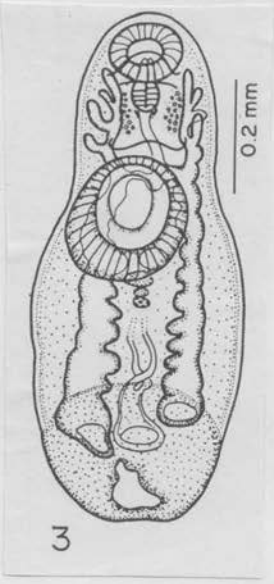
(Figs. 3–4)

The following description is based on one specimen obtained free from the trunk coelom of *S. enflata* (2 Nov. 1972).

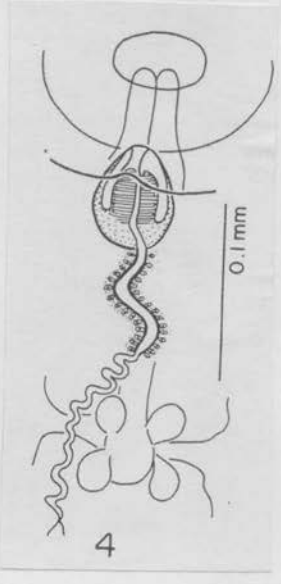
Specimen No. NSMT–Pl–1804.

Description. Metacercaria, not encysted. Body elongate-pyriform, 0.914 mm long, 0.247 mm wide in forebody, 0.370 mm wide in hindbody, with a ventral pit in front of ventral sucker. Cuticle aspinose, transversely striated. "Sucker-like cuticular thickening" present at posterior end of body, deeply stained with carmine, not papillate, 0.136 mm long by 0.306 mm wide. Oral sucker subterminal, 0.097 mm long by 0.126 mm wide, surmounted with a ventrally bending perioral lip. Ventral sucker slightly anterior to mid-level of body, 0.217 mm long by 0.213 mm wide; its opening situated in its anterior half, with a thick collar 0.032 mm high. Prepharynx muscular, short. Pharynx club-shaped, 0.099 mm long by 0.046 mm wide, anteriorly protrudent into oral sucker through prepharynx. Oesophagus undulating, 0.147 mm long, extending to level of anterior wall of ventral sucker, encircled with a mass of cells in its anteriormost portion, giving off four small glandular outgrowths from its posterior end. Intestines H-shaped; main intestines with many, short, wide diverticula, separately opening into uroproct; each of anterior extensions consisting of at least four, moderately long diverticula. Testes double, transversely ovoid, diagonal, close to each other; anterior one 0.027 mm long by 0.045 mm wide; posterior one 0.020 mm long by 0.063 mm wide, just dorsal to posterior border of ventral sucker. Seminal vesicle external, coiling, lateral to intestinal bifurcation. Pars prostatica somewhat S-shaped, surrounded by prostatic cells free in parenchyma in a dense layer, ventral to oesophagus. Cirrus pouch and cirrus absent. Ovary spherical, median, slightly behind posterior testis, 0.015 mm long by 0.032 mm wide. Mehlis' gland compact, 0.020 mm long by 0.030 mm wide, immediately anterior to ovary. Genital atrium muscular, ventrally curved, containing at its base a muscular genital cone measuring 0.045 mm long by 0.034 mm wide. Genital pore median, slightly posterior to oral sucker. Vitellaria not observed; a mass of larger cells present on each side of pharynx and oesophagus, possibly representing a developing vitellarium. Excretory vesicle thick-walled, about 0.120 mm long; main collecting canals dorso-ventrally oblique; uroproct large, situated in sucker-like cuticular thickening; pore ventro-terminal.

Discussion. The present accacoeliid metacercaria is referred to the genus *Guschanskiana* SKRJABIN, 1959, for the following reasons: The conspicuous sucker-like cuticular thickening is present at the posterior end of the body; both the main intestines and their anterior extensions are diverticulate; and the genital cone is well developed. The genus contains only one species, *G. alveolata* (ROBINSON, 1934) SKRJABIN, 1959, which was first placed in the *Accacladocoelium* by ROBINSON (1934) but later transferred to a new genus *Guschanskiana* by SKRJABIN (1959). In the adult worms of *G. alveolata* from the intestine of the sun-fish, *Orthagoriscus mola* BLOCH, caught in Britain, the anterior intestinal extensions have six diverticula each, and the sucker-like cuticular thickening is densely papillate and honeycomb in tangenital sections (ROBINSON, 1934). In the present metacercaria, on the other hand, each of the anterior intestinal extensions is provided with four diverticula, and the sucker-like cuticular thickening is not papillate. It remains uncertain whether the present specimen is the metacercaria of *G. alveolata* or that of an undescribed species of the genus.



3



4

Odhnerium Yamaguti, 1934

Syn. *Mneidodhneria* Dollfus, 1935 [1])

Generic diagnosis. — Accacoeliidae, Orophocotylinae: Body elongate, rather slender, with a median row of sucker-like nodules on dorsal side of forebody. Acetabulum very large, pedunculate, consisting of lip-like muscular flaps, with a bipartite, muscular cap-like accessory lobe near its anterior free margin. Oral sucker subterminal, followed by pyriform pharynx. Esophagus with glandular outgrowths at its posterior end. Anterior and posterior ceca simple. Testes diagonal or tandem, in middle third of body. Vesicula seminalis long, winding. Pars prostatica present. Neither genital papilla nor cirrus pouch. Genital atrium opening posterior to oral sucker. Ovary postequatorial. Vitellaria tubular, extending along ceca from behind pharynx to ovary. Uterine coils reaching to near posterior extremity. Excretory vesicle forming spacious cloaca, with wide terminal aperture. Intestinal parasites of marine fishes.

Genotype: *O. calyptocotyle* (Monticelli, 1893) Yamaguti, 1934, syn. *Distomum foliatum* Linton 1898 (Pl. 26, Fig. 343), in *Beroe ovata;* Naples. Also in *Mola mola,* Japan, Woods Hole, New Zealand.

---

[1]) Dollfus' renaming is contrary to the Recommendations for Article 36 of the International Code of Zoological Nomenclature.

Genus Odhnerium Yamaguti, 1934

Synonym: Mneiodhneria Dollfus, 1935

Body cylindrical, with slightly tapering posterior end. Forebody curved ventrally, covered with small cone-shaped cuticular papillae. Subcuticular musculature well developed. Conspicuous nuchal crest ofmuscular ~~papillae. Subcuticular~~ nodules present. Oral sucker muscular, subterminal. Acetabulum very large, pediculate, directed posteroventrally, consisting of lip-like muscular flaps. A cap-like muscle plate on dorsal side of acetabulum. Prepharyns muscular. Pharynx longitudinally elongate. Intestine H-shaped; anterior diverticula extending to pharynx, posterior crura opening into cloaca at posterior end of body. Testes ovoid, tandem, in middle of body; anterior one dorsal, posterior ventral. Vesicula seminalis long, convoluted. Pars prostatica short. No cirrus pouch. Genital atrium opening some distance behind oral sucker. Ovary transversely oblong, at posterior end of middle third of body. Shell gland anteroventral to ovary. Receptaculum seminis uterinum convoluted, just in front of ovary. Laurer's canal present. Vitellaria tubular, extending along ceca from behind pharynx to ovary. Uterine coils reaching to near posteror extremity of body. Eggs elongate oval, numerous. Excretory vesicle forming cloaca, with wide aperture at posterior tip of body. Parasitic in marine fishes, particularly in Mola.

Genotype. Odhnerium calyptrocotyle (Montic., 1893)

not figured.

p. 208-209)

Dollfus (1935) discusses this genus. He considers Odhnerium preoccupied by Odhneria Travassos, 1922 and Odhneria Baer, 1924. He imagines a possible Odhnerius and a possible four subfamilies Odhnerinae, all different. He renames the genus Mneiodhneria.

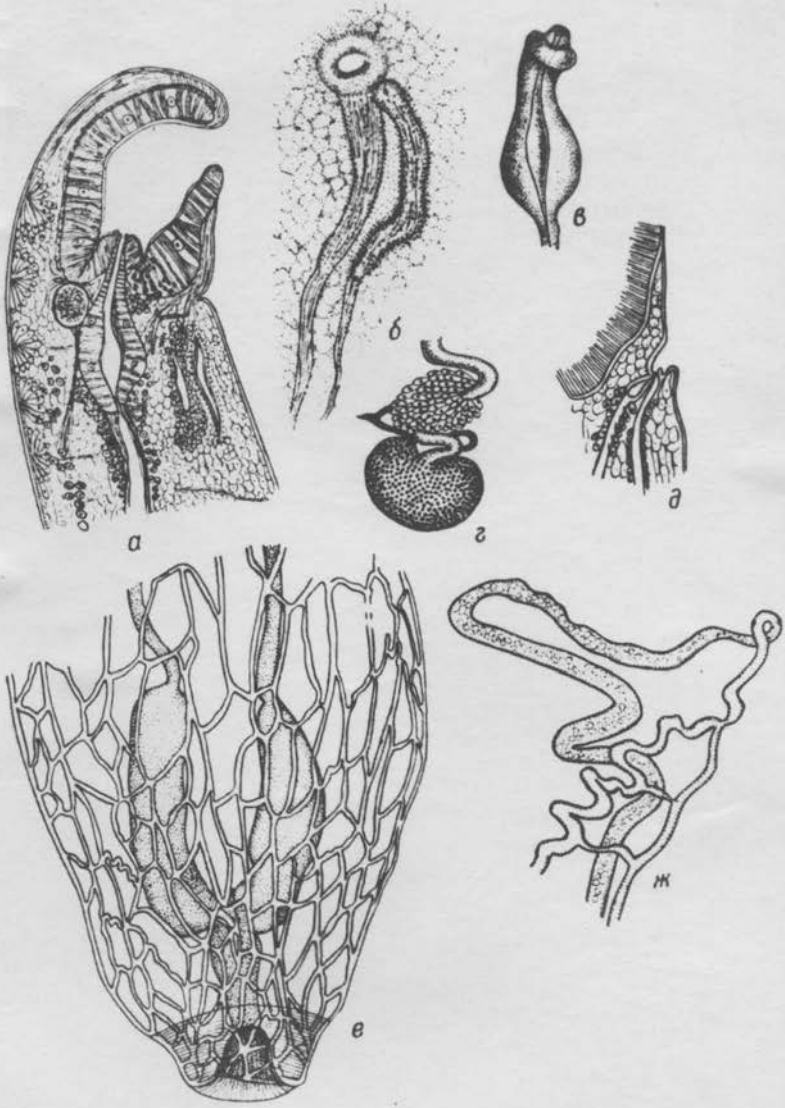


Рис. 43. *Meelodlineria calyptrocotyle* (Monticelli, 1893)
(по Монтичелли, 1893)

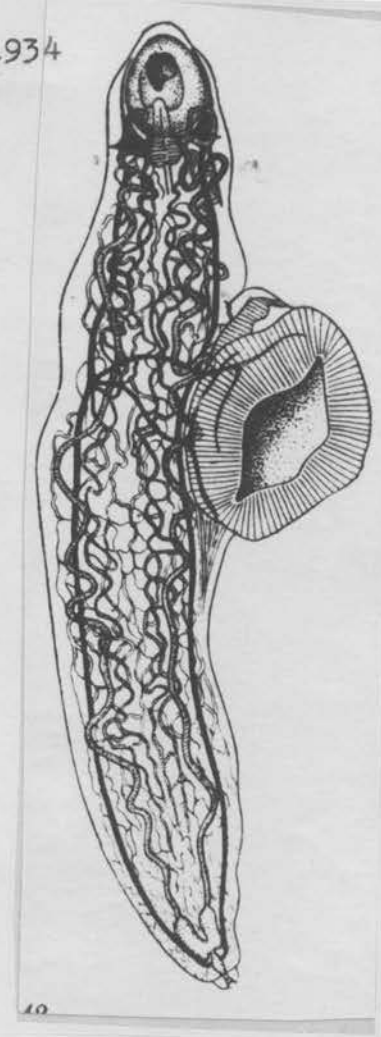
а — срез переднего конца; *б* — выводные половые протоки; *в* — фаринкс; *г* — схема женских половых органов; *д* — срез в области полового отверстия; *е* — экскреторная система; *ж* — деталь строения экскреторных протоков

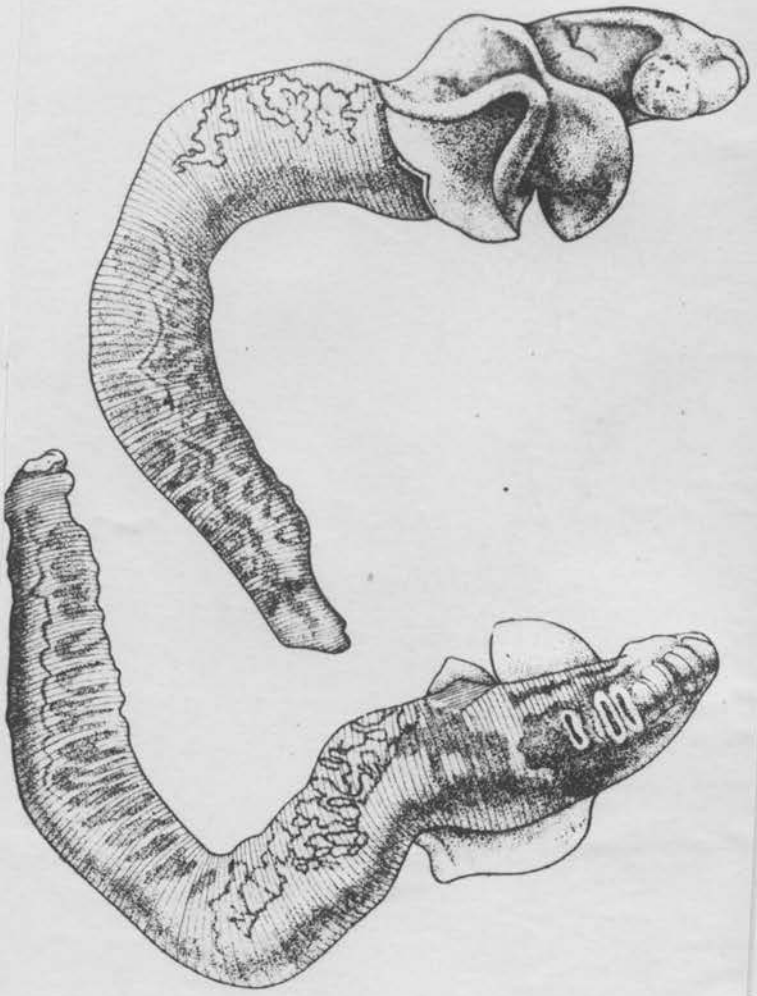
Odhnerium calyptocotyle (Monticelli,1893) Yam.,1934

Syn.: Mneidodhneria calyptocotyle

Host: Mola mola; Japan; Woods Hole; N.Z.

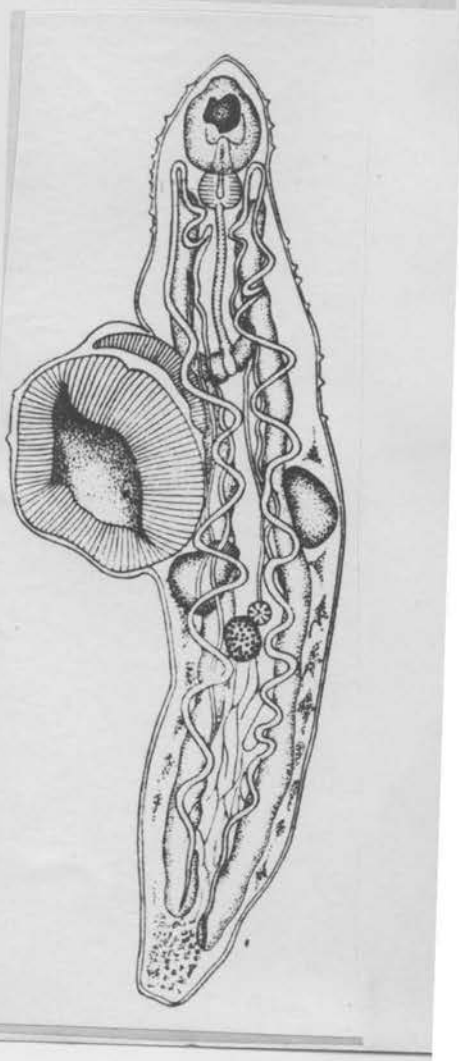
Syn. Distomum foliatum Linton,1898
in Beroe ovata





41

Рис. 41. *Mneidodhneria calyptrocotyle* (Monticelli, 1893)
(по Дольфю, 1935)



Family ACCACOELIIDAE

44. **Odhnerium calyptrocotyle** (Monticelli, 1893) Yamaguti, 1934

HOST: *Mola mola* (Linn.), ocean sunfish; intestine.

LOCALITY: Wellington.

DISCUSSION: Several specimens of this trematode were recovered from a jar of cestodes collected from a sunfish by C. A. McCann of the Dominion Museum at Wellington who kindly placed them at my disposal. All specimens were considerably macerated but the dorsal " nuchal crest " of muscular nodules and the cap-like muscular plate on the dorsal side of the acetabulum clearly place the species in the genus *Odhnerium* Yamaguti, 1934. They agree with Yamaguti's (1934, pp. 509-510) description of *O. calyptrocotyle* and are probably that species.

Dollfus (1935, pp. 208-209) takes the position that the generic name *Odhneria* Travassos, 1921 makes *Odhnerium* a homonym, and renames the genus *Mneiodhneria* Dollfus, 1935. This same situation has arisen a number of times (e.g. *Haematoloechus* Looss, 1899 and *Haematoloecha* Stal, 1874), and most parasitologists interpret the Rules of Nomenclature as permitting both such names. Therefore, I consider *Mneiodhneria* a synonym of *Odhnerium*.

It seems probable that *Distomum foliatum* Linton, 1898 is a synonym of *O. calyptrocotyle* as Yamaguti (1934) believed, but restudy of material from Woods Hole is needed. Dollfus tentatively considered it a second species in the genus.

Family ACCAOELIIDAE

ODHNERIUM CALYPTROCOTYLE (Mont., 1893) Yamaguti, 1934

This species was found in two specimens of *Mola mola* Linn. Lloyd (*l.c.*) reported it from *Mola mola* in Puget Sound. Monticelli first reported it from *Beroe ovata* (Chamis. & Eysenh.) at Naples. Linton described *Distomum foliatum* Linton, 1898 (=*Odhnerium calyptrocotyle*) from *Mola mola* at Woods Hole.

Host: *Mola mola* Linn. Sunfish, (Molidae).
Location: Intestine.

Montgomery 1957

136. ***Odhnerium calyptrocotyle*** **(Montic., 1893) n. g.**

Syn. *Distomum calyptrocotyle* Montic., 1893 Yamaguti, 1934

In 1893 Monticelli found a young distome in the gastro-vascular canal of *Beroe ovata* from the Gulf of Naples. Five years later Linton described a new species, *D. foliatum*, from the intestine of *Mola mola*. In 1928 Odhner stated that *D. foliatum* Linton represents a fourth genus of Accacoeliidae and that Monticelli's species is undoubtedly the larval form of Linton's species, so that the name given by Monticelli should be retained.

see Bray & Gibson, 1977 (reprint)

On the basis of my material from *Mola mola*, I agree with Odhner in his procedure and propose a new generic name *Odhnerium* in his honor.

The material at my disposal was fixed in alcohol, stained with hematoxylin-eosin and mounted in balsam. Transverse sections were also prepared. The following description is based on a whole mount measuring 8.95 × 0.89 mm. The body is cylindrical and tapers only slightly toward the posterior extremity. The forebody is curved ventrally and bears on the dorsal surface eleven median sucker-like nodules, of which the largest anteriormost one is 0.36 mm long and projects over the oral sucker; they

become gradually smaller backwards and the last one measures 0.11 mm long by 0.4 mm thick. The pediculate acetabulum, directed posteroventrally, consists of lip-like muscular flaps having a length of 1.5 mm. On the dorsal side of the sucker there is a cap-like muscle plate, "cappuccio della ventosa" of Monticelli. It appears to be fused with the acetabulum in the median plane, as illustrated by Monticelli in his plate-figure 5.

The pedicle of the acetabulum, 0.63×0.52 mm, is directed anteroventrally. The subterminal oral sucker is 0.84 mm long by 0.6 mm thick. There is a muscular prepharynx. The pharynx is longitudinally elongated. The intestine is H-shaped, with its anterior diverticula reaching to the pharynx and its posterior crura opening into the excretory vesicle from the sides.

The ovoid testes lie one behind the other in the middle third of the body, separated from each other by the uterus and vitelline gland; the anterior is oval, 0.8 mm long and 0.52 mm wide, and lies near the dorsal cuticle, while the posterior is roundish, 0.6×0.57 mm and lies ventrally. The long strongly convoluted vesicula seminalis extends from the anterior testis to beyond the base of the acetabular pedicle. The pars prostatica is relatively short. There is no true cirrus pouch. The genital sinus opens on the ventral side some distance behind the oral sucker.

The transversely elongate ovary, 0.47×0.69 mm, lies at the hind end of the middle third of the body. The shell gland is situated anteroventral to the ovary. The receptaculum seminis uterinum is a convoluted tube lying in front of the shell gland. The Laurer's canal opens on the dorsal median line in front of the ovary. The vitelline gland consists of slender tubules beginning at about the level of the genital pore and extending posteriorly to the ovary along the inner wall of the ceca. The descending uterine coils terminate about 0.8 mm from the posterior tip of the body; in front of the ovary the uterus is confined to the intercecal field. The eggs are elongate oval and measure 0.034–0.039×0.021–0.023 mm.

The dorsal and ventral excretory stems unite with each other at the posterior extremity of the body and form a spacious cloaca 0.075 mm long and 0.11 mm wide at the base and with a wide aperture at the extreme posterior end of the body.

FROM YAMAGUTI, 1934

Orophocotylinae ~~n. subfam.~~ YAMAGUTI, 1958

Subfamily diagnosis. — Accacoliidae: Body cylindrical, or somewhat tapered toward extremities, with or without a median row of sucker-like nodules on dorsal side of forebody. Esophagus with or without posterior glandular outgrowths. Anterior and posterior ceca simple. Acetabulum pedunculate, in anterior or middle third of body with wide two-valved opening, and a muscular cap-like accessory lobe on each side of median line near its anterior free margin. Testes in middle third of body. No genital papilla. Genital pore ventral or posterior to oral sucker. Ovary postequatorial. Vitellaria extending from pharynx to ovary or more posteriorly, or confined to pretesticular lateral fields of hindbody. Uterus reaching as far as or to near posterior extremity.

Key to genera of Orophocotylinae

A longitudinal row of sucker-like structures on dorsal side of forebody; esophagus without posterior glandular outgrowths; vitellaria confined to pretesticular lateral fields of hindbody *Orophocotyle*

No sucker-like structures on dorsal side of forebody; esophagus with posterior glandular outgrowths; vitellaria much more extensive anteriorly and posteriorly ..... *Odhnerium*

Orophocotyle Looss, 1902

Generic diagnosis. — Accacoeliidae, Orophocotylinae: Body cylindrical, smooth, without sucker-like structures on dorsal side of forebody. Oral sucker subterminal, large, with wide lumen, followed by pyriform pharynx. Esophagus, anterior and posterior ceca simple. Acetabulum pedunculate, with a muscular accessory lobe on each side of median line near its anterior free margin. Testes diagonal, in middle third of body. Vesicula seminalis winding. No genital papilla. Genital pore ventral to oral sucker or pharynx. Ovary postequatorial. Vitellaria acinous, confined to pretesticular lateral fields of hindbody. Uterus reaching as far as or nearly to posterior extremity. Intestinal parasites of marine fishes.

Genotype: *O. planci* (Stoss., 1899) Looss, 1902 (Pl. 25, Fig. 330), in *Ranzania truncata;* Triest.

Other species: *O. divergens* Looss, 1902, in *Ranzania truncata;* Triest.

OROPHOCOTYLE

Body cylindrical, ventral sucker protuberant, cuticula smooth, without spines or papillae. Esophagus forks opposite base of ventral sucker. Anterior ceca unbranched, extending to the ~~level of the~~ level of the posterior edge of the oral sucker. Excretory system of short stem and two branches. Genital pore median at level of oral sucker. Short, simple genital sinus, no copulatory organs. ~~Anterior testRepre~~ Gonads near the middle of the hind body. Anterior testis more dorsal, posterior testis more ventral. Vitelline gland single with a few globular follicles. Uterus runs foward to ventral sucker then coils backward ventrally to near the posterior end, then it coils foward dorsally becoming straight at about the level of the seminal vesicle. Eggs numerous, of dark brown color, about 30 by 20 μ.

Type species: Orophocotyle planci (Stoss.) Looss

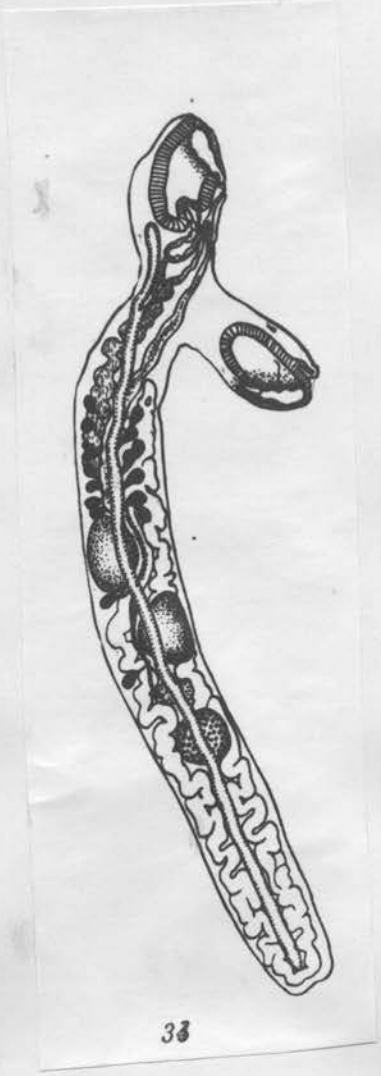
Other species: Orophocotyle divergens Looss 1902

Orophocotyle coryphaenae Manter

Orophocotyle planci (Stossich,1899)

Length 3 to 3.4 mm. Thickness about 0.3. Hindend broad, usually a little rounded. Suckers about equal in size; diameter 0.15 to 0.18, length to 0.27, that of the oral sucker always somewhat less than that of the acetabulum. Genital pore at about ½ the height og oral sucker. Gonads almost exactly in the middle of ~~body~~ hindbody. Seminal vesicle extending considerably beyond the stalk of the acetabulum. Some vitellaria always occur in the space between testes and ovary. Uterine coils reach close to body end. Eggs 25-30 by 16-19 u.

Host: Ranzania truncata

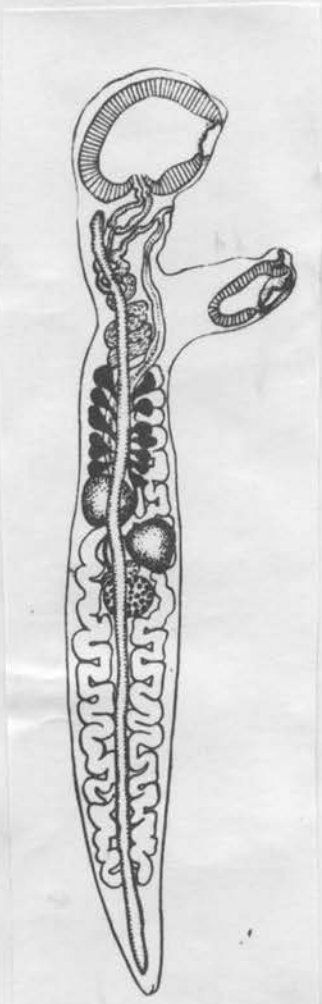


38

Orophocotyle divergens Looss,1902

Body size similar to O.planci but a little smaller. Hind end pointed sicne the uterus bends a short distance in front of the posterior end. Oral sucker clearly larger than acetabulum, averaging 0.45 long by 0.33 wide, therefore thicker than rest of body/ Acetabulum as large as in O.planci, average 0.27 long by 0.17 thick Genital pore near posterior end of oral sucker. Seminal vesicle overreaches the stalk of acetabulum by only a short distance. Vitelline follicles not found between ovary and testes. Gonads lie somewhat in front of middle of hindbody. Eggs as in O.planci.

Host: Ranzania truncata



PARACCACLADIUM ~~gen. nov.~~ BRAY AND GIBSON 1977

DEFINITION. As subfamily.

TYPE SPECIES. *Paraccacladium jamiesoni* sp. nov.

DISCUSSION. The above detailed definition of the subfamily will serve, for the present time, to define the genus, although both will, no doubt, need to be redefined if further new genera are discovered. *Paraccacladium* appears to be essentially an accacoeliid, but differs in the structure of its alimentary system, the structure of the vitellarium and the position of Mehlis' gland, from all of the genera included in the Accacoeliinae. The accacoeliines have a long, narrow, oesophagus, an H-shaped gut, a uroproct, a one-sided vitellarium (i.e. with one main collecting duct plus one which is usually rudimentary), and Mehlis' gland lying anteriorly, antero-laterally or antero-dorsally to the ovary. *Paraccacladium* has a short, wide oesophagus, only small caecal 'shoulders', no uroproct, a symmetrical vitellarium with two main collecting ducts, and Mehlis' gland posterior to the ovary (Fig. 1). Its pharynx, however, is typically accacoeliid, as it protrudes into the base of the oral sucker, and the presence of immature forms in teleosts which feed on coelenterates suggests that the metacercariae occur in the same invertebrate groups as the accacoeliines.

Subfamily **PARACCACLADIINAE** ~~subfam. nov.~~ BRAY AND GIBSON, 1977

DEFINITION. Accacoeliidae. Body slender. Ventral sucker borne on small peduncle. Body-surface without spines or plications ; papillae on outer surface of ventral sucker. Oral sucker with internal ridge. Prepharynx absent. Pharynx protruding into base of oral sucker ; otherwise unmodified. Oesophagus short, wide. Caeca with small 'shoulders', but without anterior extensions, terminate blindly near posterior extremity. Testes symmetrical to tandem, in anterior half of hindbody. Seminal vesicle tubular, convoluted ; dorsal to ventral sucker and in forebody. Pars prostatica elongate, convoluted. Ejaculatory duct unites with metraterm within sinus-sac. Sinus-sac surrounding base of genital atrium ; with diffuse musculature. Sinus-organ short ; cylindrical. Hermaphroditic duct within sinus-organ. Genital atrium relatively large ; contains sinus-organ. Genital pore mid-ventral in anterior forebody. Ovary globular, post-testicular. Mehlis' gland post-ovarian, linked to posterior region of ovary by oviduct. Laurer's canal with dorsal pore. Uterine seminal receptacle present. Uterus extensive in hindbody. Eggs fairly small ; numerous. Vitellarium with branching tubules ; symmetrical with two main lateral collecting ducts ; in region mainly lateral and posterior to ovary. Excretory vesicle Y-shaped ; with arms situated dorsally and ventrally in hindbody and laterally in forebody, uniting dorsally to pharynx. Immature forms in rectum of teleosts with diet of coelenterates, ctenophores and chaetognaths, adults in rectum of carnivorous teleosts (*Coryphaenoides*).

TYPE AND ONLY GENUS. *Paraccacladium* gen. nov.

Paraccacladium jamiesoni ~~sp. nov.~~ BRAY AND GIBSON, 1977

(Figs 14 and 15a)

TYPE-HOST AND LOCALITY. *Coryphaenoides rupestris*, 55°N, 11°W.

RECORDS.

(i) Material studied.

Coryphaenoides rupestris [rectum] Off west coast of Great Britain :

50°N, 12°W ; depth 965–980 m ; April 1973 (2 specimens).
51°N, 14°W ; depth 920–960 m ; April 1973 (1 specimen).
55°N, 11°W ; depth 800–820 m ; April 1973 (5 specimens).
56°N, 09°W ; depth 780–790 m ; April 1973 (1 specimen).
57°N, 09°W ; depth 560–572 m ; April 1973 (4 specimens).
58°N, 10°W ; depth 780–800 m ; April 1973 (4 specimens).
59°N, 09°W ; depth 720–860 m ; April 1973 (3 specimens).
59°N, 08°W ; depth 570–700 m ; June 1974 (1 specimen).
59°N, 08°W ; depth 880–900 m ; June 1974 (3 specimens).
54°N, 14°W ; depth 1050 m ; June 1974 (7 specimens).
56°N, 17°W ; depth 640 m ; June 1974 (3 specimens).
59°N, 10°W ; depth 1000 m ; June 1974 (2 specimens).

Holotype : BM(NH) Reg. No. 1975.10.31.1.
Paratypes : BM(NH) Reg. No. 1975.10.31.2–18.

(ii) From the literature.

None.

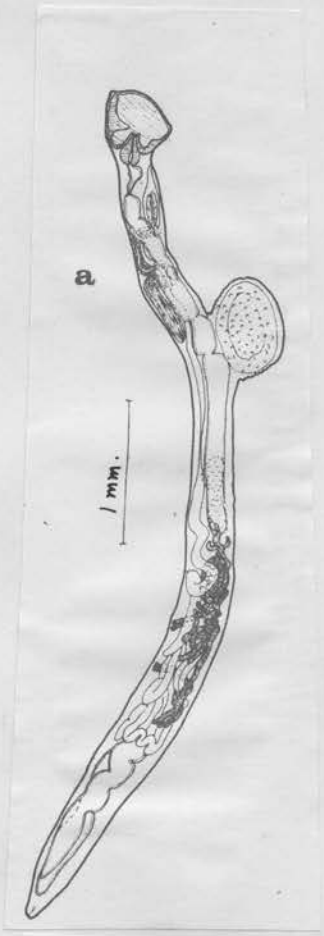
LIFE-HISTORY. Immature forms of this genus have been found in the rectum of *Alepocephalus bairdii*, *Schedophilus medusophagus*, *Centrolophus niger* and *Xenodermichthys copei* (see below), all of which feed upon coelenterates and ctenophores, especially medusae, the presumed second intermediate hosts of accacoeliids. These fishes may act as paratenic hosts, or, more likely, they may be obligatory, particularly as the mature adult has only been found in the carnivorous macrourid *Coryphaenoides rupestris*. It is worth noting that one infested specimen of *Alepocephalus bairdii* was found with its stomach full of the bathypelagic scyphomedusa *Atolla wyvillei*.

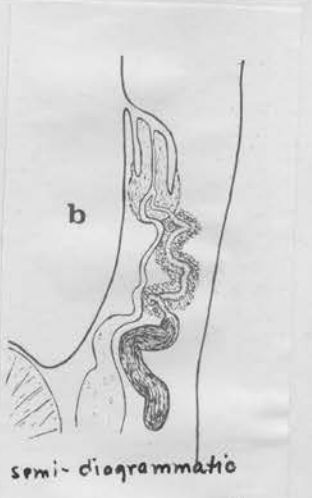
DESCRIPTION. Eleven mature specimens were present and all of the remainder were immature, exhibiting varying degrees of immaturity. The dimensions of the main features, including those for *Paraccacladium* sp. (see below), are given in Table 10.

The worm is long, thin and cylindrical in the case of the mature adults (Fig. 14a), but shorter and stouter in the immature forms (Fig. 15a). The body-surface is smooth, except for numerous dome-shaped papillae, which are present on the outer surface of the ventral sucker, and to a lesser degree on the forebody ; these latter papillae are not always readily visible. The *ventral sucker*, which is larger than the oral sucker, lies on a short peduncle just within the anterior third of the body, but further posteriorly in immature forms. The *oral sucker* opens almost terminally, and bears an internal ridge close to the base of the inside wall. This ridge surrounds the dome produced by the extension of the pharynx into the base of the oral sucker. The pyriform *pharynx* leads into a short wide oesophagus, which has a thick cuticular lining. This extends back to about the level of the sinus-organ, where it bifurcates. The two wide caeca, which are lined with a deeply staining epithelium, form small 'shoulders', but not long anteriorly-directed diverticula, and extend posteriorly, following a sinuous course, almost to the posterior extremity, where they end blindly.

The *exretory pore* is situated at the posterior extremity and leads into a short convoluted vesicle, which divides to form two anteriorly-directed arms, one ventral and one dorsal. At about the level of the gonads the dorsal duct passes over towards the ventral surface, and then both ducts pass forward ventro-laterally to the level of the pharynx, where they unite dorsally.

The gonads lie in the anterior half of the hindbody, apparently moving further from the ventral sucker as the worm develops, presumably as a result of allometric growth. The smooth, oval *testes* are pre-ovarian, and, in mature specimens, usually lie in tandem, often with the anterior testis lying close to the dorsal surface. Im-





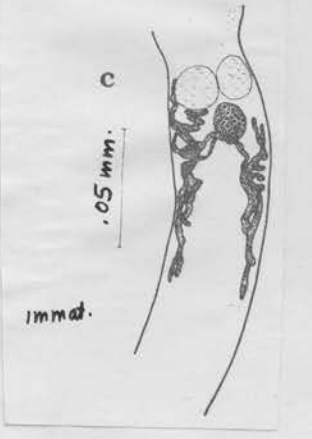


TABLE 10

Dimensions of *Paraccacladium jamiesoni* and *Paraccacladium* sp. immat.

	Paraccacladium jamiesoni		*Paraccacladium* sp. immat.			
Host	*Coryphaenoides rupestris*	*Coryphaenoides rupestris*	*Alepocephalus bairdii*	*Schedophilus medusophagus*	*Xenodermichthys copei*	*Centrolophus niger*
State of maturity	Mature	Immature	Immature	Immature	Immature	Immature
Length, mm	3·08–6·4	1·48 –3·83	1·34 –3·73	1·22	2·9	2·54
Width at ventral sucker, mm	0·64–0·71	0·37 –0·48	0·5 –0·64	0·23	0·39	0·32
Oral sucker, mm	0·38–0·41 × 0·38–0·48	0·22 –0·35 × 0·24 –0·41	0·23 –0·30 × 0·34 –0·36	0·16 × 0·15	0·29 × 0·35	0·21 × 0·26
Ventral sucker, mm	0·35 × 0·64–0·75	0·2 –0·48 × 0·31 –0·55	0·33 –0·38 × 0·36 –0·50	0·27 × 0·25	0·32 × 0·39	0·30 × 0·34
Pharynx, mm	0·14–0·27 × 0·10–0·16	0·09 –0·12 × 0·11 –0·15	0·11 –0·15 × 0·12 –0·13	0·074 × 0·053	0·21 × 0·09	0·12 × 0·069
Oesophagus, mm	0·13–0·24 approx.	0·08 –0·15 approx.	?	?	?	?
Anterior testis, mm	0·18–0·36 × 0·15–0·19	0·062–0·25 × 0·057–0·19	0·093–0·14 × 0·10 –0·17	0·13 × 0·10	symmetrical 0·21 × 0·13	0·16 × 0·08
Posterior testis, mm	0·23–0·38 × 0·13–0·28	0·098–0·21 × 0·062–0·18	0·11 –0·20 × 0·11 –0·15	0·12 × 0·12		0·16 × 0·09
Ovary, mm	0·13–0·33 × 0·13–0·21	0·025–0·18 × 0·025–0·13	0·043–0·13 × 0·043–0·13	0·085 × 0·059	not seen	0·10 × 0·07
Sinus-organ, μm	93–195 × 57–117	88–169 × 57–88	83–170 × 60–85	60 × 49	160 × 80	136 × 56
Pars prostatica overall length, mm	0·27–0·46	0·15 –0·27	0·17 –0·22	?	0·3 approx.	?
Seminal vesicle overall length, mm	0·32–0·54	0·19 –0·35	0·10 –0·30	?	0·11	0·14
Eggs, μm	44–53 × 25–28 (in proximal uterus : 39–41 × 18–22)	–	–	–	–	–

mature specimens show the testes in varying positions from tandem to symmetrical (Fig. 15). The testes are larger than the ovary in immature specimens ; but it appears that this species may be protandrous, as in the largest adults the ovary is distinctly larger than the testes. In some very small specimens, although the testes are well developed, no sign of an ovary could be seen. The seminal vesicle is tubular, stout and sinuous, and it extends from about the mid-region of the ventral sucker to a position just anterior to the ventral sucker (Fig. 14b). It leads into a relatively-long tubular pars prostatica, which is surrounded by gland-cells and gently convoluted. The ejaculatory duct unites with the metraterm at the base of the cylindrical sinus-organ to form an hermaphroditic duct, which passes through the sinus-organ and opens terminally. The base of the sinus-organ is enclosed in a diffusely muscular *sinus-sac*, the walls of which are attached to the walls of the genital atrium a little way from its base. The space within the sinus-sac contains numerous muscle-fibres and gland-cells. The external wall of the sinus-organ appears to be a continuation of the wall of the genital atrium, which in turn is similar to that of the external tegument.

The oval *ovary* lies just posteriorly to the testes, near the ventral surface and close to the middle of the body in the largest worms. Immediately behind the ovary is an oval Mehlis' gland, which is rather smaller than the ovary in mature specimens. The oviduct leads into this organ after leaving the ovary posteriorly and receiving Laurer's canal and the common vitelline duct. Laurer's canal runs across the body and opens to the exterior dorsally at the level of the ovary. A uterine seminal receptacle is present and is the sole seminal storage apparatus in the female system. The *uterus* runs posteriorly from the ovary to a point beyond the hindermost end of the vitellarium, but well anteriorly to the posterior extremity of the worm. It then passes anteriorly and winds in the region of the gonads, but then runs forward in a relatively straight or slightly sinuous manner to join the hermaphroditic duct within the sinus-sac in the form of a short metraterm. The uterus contains numerous relatively small eggs, which are noticeably smaller at the proximal extremity of the uterus. The *vitellarium* consists of a symmetrical branching tubular system, possessing two main collecting ducts which pass medially and unite to form a common duct at the level of Mehlis' gland (Fig. 14c). The tubular branches extend laterally between about the level of the posterior testis and a position about half-way between the ovary and the posterior extremity.

Paraccacladium sp. (immature)

(Fig. 15b–e)

RECORDS.

(i) Material studied.

Alepocephalus bairdii [rectum] Off west coast of Great Britain :
51°N, 14°W ; depth 920–960 m ; April 1973 (3 specimens).
55°N, 17°W ; depth 821–850 m ; June 1974 (5 specimens).
57°N, 13°W ; depth 1000–1060 m ; June 1974 (3 specimens).
BM(NH) Reg. No. 1975.10.31.19–21.

Xenodermichthys copei [rectum] Off north-west coast of Scotland :
59°N, 11°W ; depth 970–1025 m ; June 1974 (1 specimen).
BM(NH) Reg. No. 1975.10.31.22.

Schedophilus medusophagus [rectum] Off north-west coast of Scotland :
58°N, 10°W ; depth 780–800 m ; April 1973 (1 specimen).
BM(NH) Reg. No. 1975.10.31.23.

Centrolophus niger [rectum] Off north-west coast of Scotland :
57°N, 13°W ; depth 800–820 m ; June 1974 (1 specimen).
BM(NH) Reg. No. 1975.10.31.24.

(ii) From the literature.

None.

DESCRIPTION. These specimens are morphologically similar to the immature forms of *P. jamiesoni*. Their measurements are given in Table 10, and specimens from each of the four hosts are illustrated in Fig. 15b–e.

DISCUSSION. These immature specimens probably belong to *P. jamiesoni*, as they do not differ significantly from the immature specimens of this species from *Coryphaenoides rupestris*. A complete series from immature to fully mature was found in the latter fish. The sinus-organ is clearly visible in all of the immature specimens, so that they cannot be confused with *Tetrochetus* Looss, 1912, which also appears to utilize teleosts as intermediate hosts (see Gibson, 1976).

Accacladocoelium leontjevae Korotaeva, 1976, appears to belong to this genus, although some important details are omitted from the original description. Korotaeva found it in the intestine of six diverse species of teleost off the south-east coast of New Zealand. It possesses eggs which are considerably smaller than those of *P. jamiesoni*, and apparently also differs in lacking an oesophagus, but this would be a very unusual feature and needs confirmation. We tentatively consider it, as *Paraccacladium leontjevae* (Korotaeva, 1976) n. comb., to represent the second species of this new genus.

The differences between *Paraccacladium* and the accacoeliines are discussed above. It may, however, be worth drawing attention to the similarity between this species and *Sclerodistomoides pacificus* Kamegai, 1971, from the gall-bladder of *Cypselurus pinnatibarbatus japonicus* from the Pacific coast of Japan. According to Kamegai (1971), however, *Sclerodistomoides* is a much more robust worm and lacks the definite accacoeliid type of pharynx possessed by *Paraccacladium*, and also apparently the presence of dorsal and ventral excretory arms in the hindbody.

From BRAY AND GIBSON, 1977

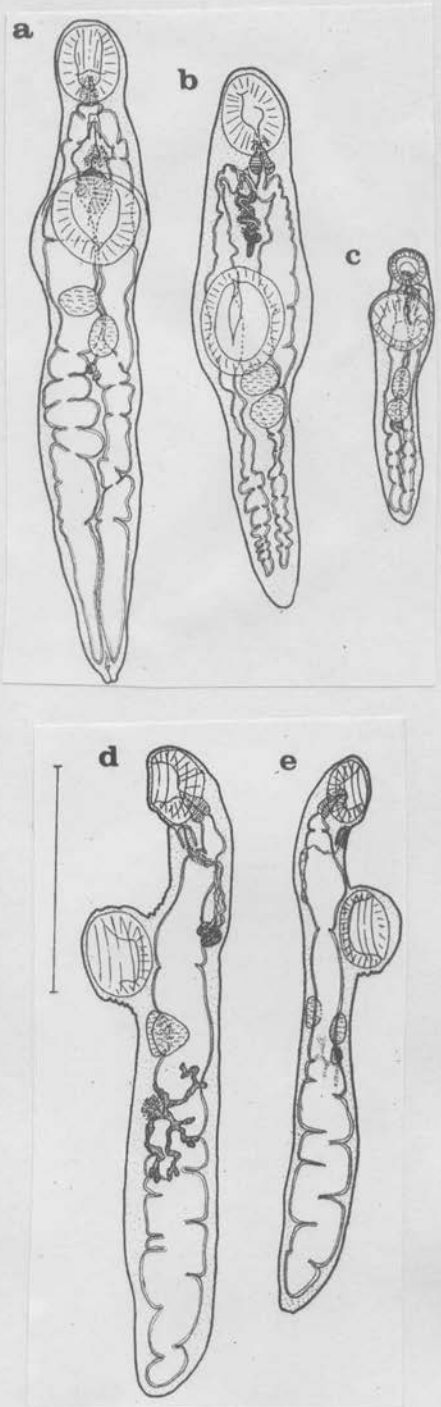


FIG. 15. *Paraccacladium jamiesoni* : (a) immature specimen from *Coryphaenoides rupestris*. *Paraccacladium* sp. immature : (b) from *Alepocephalus bairdii* ; (c) from *Schedophilus medusophagus* ; (d) from *Xenodermichthys copei* ; (e) from *Centrolophus niger*. Scale – 1 mm.

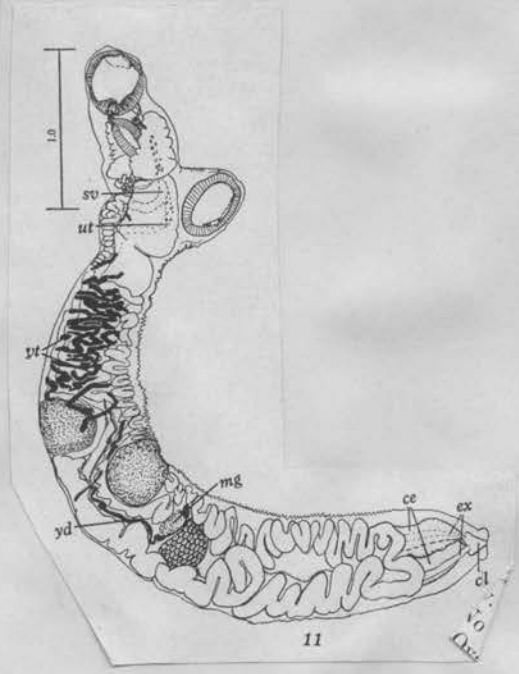
Paratetrochetus aluterae, n. gen., n. sp. (Figs. 11-13) Hanson, 1955

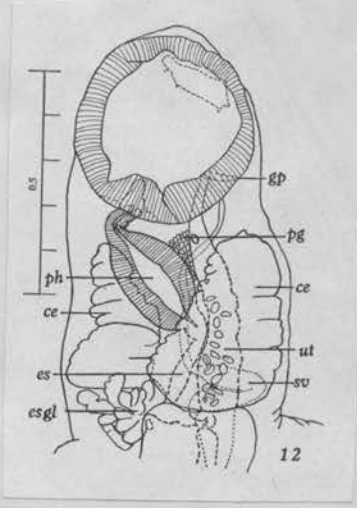
HOST: *Alutera scripta* (Osbeck), file fish, "oililepa" or "ohua"; 1 specimen examined.

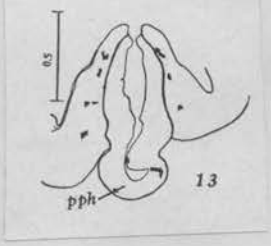
LOCATION: Small intestine

TYPE SPECIMEN: U. S. Nat. Mus. Helm. Coll. No. 37468.

DESCRIPTION (based on a single specimen): Body elongated, cylindrical, 5.227 mm. long by 0.657 mm. wide; forebody more slender than hindbody. Cuticula thick, unspined. Oral sucker very slightly subterminal, subspherical, 0.380 mm. long by 0.394 mm. wide; small cone-shaped elevation, with lumen, rising from base of oral sucker cavity. Acetabulum stalked, about one-fifth body length from anterior end; oval, 0.467 mm. long by 0.343 mm. deep, with longitudinal opening. Sucker ratio based on lengths: 1:1.23. Pharynx large and oval, 0.234 mm. long by 0.139 mm. wide with slender anterior extension 0.073 mm. long by 0.043 mm. wide and short, rounded posterior thickening about 0.050 mm. in diameter; anterior extension entering lumen of elevation at base of oral cavity. Esophagus extending to posterior part of forebody where lobed glandular mass [illegible] bifurcation at level of anterior edge of acetabular stalk. Ceca H-shaped, wide; unbranched but deeply indented anterior extensions terminate near anterior end of pharynx; very wide posterior ceca narrow before joining excretory system to form short cloaca near posterior end of body. Genital pore inconspicuous, ventral to posterior portion of oral sucker. Testes close together near middle of hindbody, separated by ascending limb of uterus and vitelline glands; anterior testis dorsal, 0.38 mm. long by 0.343 mm. thick; posterior testis ventral, 0.38 mm. long by 0.372 mm. thick. Cirrus sac absent. Seminal vesicle originates a little posterior to acetabular stalk and extends forward as tightly coiled tube close to dorsal body wall; dorsal to acetabulum tube bows ventrally; distinct constriction in tube occurs opposite intestinal bifurcation, anterior to which the vesicle is more or less winding (Fig. 12). Union with the uterus not discernible, but probably occurs near genital pore. Pars prostatica extending from level of posterior end of pharynx to near oral sucker, surrounded by prostatic cells. Ovary subspherical, posttesticular, about two-thirds body length from anterior end, 0.241 mm. long by 0.350 mm. deep, separated from ventral and dorsal body walls and from posterior testis by uterine coils. Uterus coils anteriorly to level of posterior end of seminal vesicle, then descends ventrally to near posterior end of body, coils forward dorsally, passing between testes, then returns to dorsal position until opposite acetabulum where it bows ventrally. Mehlis' gland comparatively compact mass of cells anterior to ovary, 0.088 mm. long by 0.183 mm. thick. Laurer's canal present, opening dorsally just anterior to Mehlis' gland; seminal receptacle absent; vitellaria tubular between anterior testis and acetabulum, extending backward between testes; well developed yolk duct dorsal to posterior testis, yolk reservoir at ventral anterior edge of ovary. Eggs very numerous, 25 to 29 μ by 15 to 19 μ. Cloacal pore terminal; cloaca short; excretory system not observed except for rather large collecting tubules in forebody and posterior portion of the pair of tubules which enter cloaca.





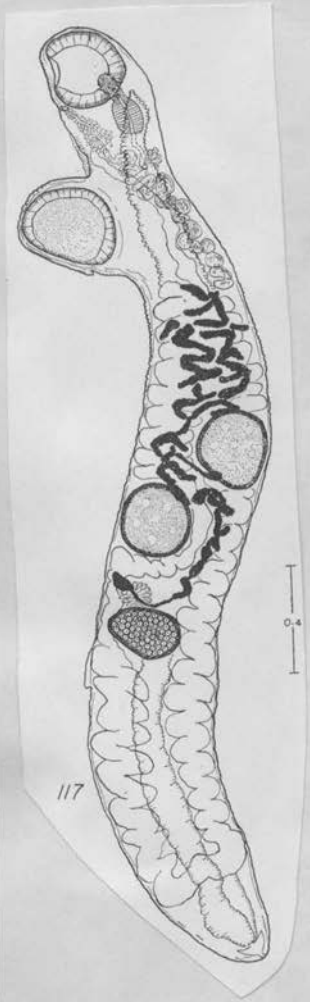


DIAGNOSIS OF THE GENUS *Paratetrochetus*. Accacoelidae: Body elongate. Acetabulum more or less stalked. Esophagus with glandular outgrowths at its bifurcation. Anterior and posterior ceca simple. Pharynx elongate with slender anterior extension projecting into lumen of conical elevation in base of oral cavity; small, bulb-like muscular addition at posterior end of pharynx. Testes tandem (anterior more dorsal, posterior more ventral) in middle third of body. Seminal vesicle coiled. Pars prostatica surrounded by prostatic cells. No genital papilla. Genital pore at level of posterior part of oral sucker. Ovary posttesticular, postequatorial. Vitellaria tubular, tending to be dorsal, extending between acetabular stalk and anterior testis. Uterus reaching to near posterior end of body. Excretory tubules joining ceca to form a short cloaca. Intestinal parasites of marine fishes. Type specimen: *Paratetrochetus aluterae* from *Alutera scripta;* Hawaii.

The name *Paratetrochetus* implies the close relationship with the genus *Tetrochetus*. *Paratetrochetus* has several similarities to *Tetrochetus*, i.e. unbranched anterior extensions of the ceca, the absence of a proboscis and proboscis sheath, the absence of a genital papilla, the absence of a well differentiated metraterm and the postequatorial gonads. Unlike *Tetrochetus* (compare Figs. 12 and 13), and resembling *Rhynchopharynx* to some extent, *Paratetrochetus* has an anterior extension of the pharynx which apparently moves into the lumen of the elevation in the base of the oral cavity.

Hawaii

over



FAMILY ACCACOELIIDAE Looss, 1912

Tetrochetus aluterae (Hanson, 1955) Yamaguti, 1958 (FIGURE 117)

Synonym:

Paratetrochetus aluterae Hanson, 1955.

Hosts: *Coryphaena hippurus*, **Acanthocybium solandri*.

Site: intestine and stomach.

Locality: off Puerto Real, Mona Is., P. R.

Deposited specimen: No. 39387.

The genus *Paratetrochetus* Hanson, 1955, was reduced to synonymy with *Tetrochetus* Looss, 1912, by Yamaguti (1958), and we agree, since the 2 species differ only as to whether the conelike elevation at the base of oral sucker is pharyngeal or prepharyngeal. Our specimens are in more or less complete agreement with Hanson's (1955) account of *Tetrochetus aluterae*. Furthermore, they are so similar to *T. proctocolus* Manter, 1930, and *T. coryphaenae* Yamaguti, 1934, as to suggest that the 3 species are identical. They seem to differ but slightly in egg size.

4

from Siddiqi & Cable, 1960

Accacoeliidae

Paratetrochetus hansoni Parukhin, 1964

Ftom Helminth. Abstracts:

Host: Alutera monoceros

Differs from the only other spe ies known in the genus, P.aluterae, by the smaller body (length 2.4 to 2.9 mm., maximum width 0.32 to 0.50 mm.) and the size of the suckers and sex glands.

Rhynchopharynginae ~~n. subfam.~~ Yamaguti, 1958

Subfamily diagnosis. — Accacoeliidae: Body cylindrical, papillate anteriorly. Acetabulum pedunculate, without accessory lobes. Immediately in front of the pharynx is a muscular vesicle, whose ventral wall is produced forward into a proboscis projecting into the prepharynx, which forms a sheath for the proboscis. Esophagus with a muscular bulb at anterior end, and a glandular outgrowth at posterior end. Anterior cecum bifurcate, posterior cecum zigzag, opening into excretory vesicle. Testes pre-equatorial. Pars prostatica surrounded by well developed prostate cells. Genital papilla present. Genital pore posteroventral to oral sucker. Ovary equatorial. Vitellaria in lateral fields of anterior half of hindbody. Uterus reaching to posterior extremity.

Rhynchopharynx Odhner, 1928

Generic diagnosis. — Accacoeliidae, Rhynchopharynginae: Body cylindrical, papillate on forebody. Acetabulum large, pedunculate, without accessory lobe. Oral sucker terminal, longer than broad. Immediately in front of the pharynx is a muscular vesicle, whose ventral wall is produced anteriorly into a proboscis projecting into the prepharynx. Latter forming a sheath for the proboscis. Pharynx globular, large. Esophagus with a muscular bulb at its anterior end, provided at its bifurcation with a posterior outgrowth surrounded by glandular cells. Anterior cecum bifurcate, giving off an outgrowth toward acetabulum. Posterior cecum showing zigzag course in lateral view from behind gonad to posterior extremity, where it opens into the excretory vesicle. Testes tandem (anterior dorsal, posterior ventral), pre-equatorial. Vesicula seminalis strongly winding. Pars prostatica long, surrounded by well developed prostate cells. Genital papilla present. Genital atrium opening at level of posterior end of oral sucker. Ovary situated toward middle of body. Vitellaria consisting of dendritic tubular acini, extending along outer side of intestine between level of acetabular peduncle and ovary. Uterus descending as far back as posterior extremity; metraterm well differentiated. Intestinal parasites of marine fishes.

Genotype: *R. paradoxa* Odhner, 1928 (Pl. 25, Fig. 329; Pl. 103, Fig. 1249), in *Orthagoriscus mola;* Atlantic and Pacific.

RHYNCHOPHARYNX Odhner 1928 condensed from Odhner.

Large sized Accacoelidae. Oral sucker longer than wide. Pre-pharynx a sheath-like tube within which lies the proboscis-like terminal portion of the pharynx. Globular pharynx with an anterior muscular vesicle resembling a second small pharynx. From the ventral side of this pharynx vesicle a muscular tube forms first a bow then enters the sheath-like tube to form the proboscis. Bifurcation of H-shaped intestine posterior to ventral sucker. Anterior ceca terminate at level ofpahrynx, each dividing into two short branches. Testes as in Orophocotyle. Vitellaria close to outer sides of ceca, between posterior half of ventral sucker and ovary. Genital sinus deep, with papilla-like structure functioning as copulatory organ.

Type species: Rhynchopharynx paradoxa Odhner 1928
Host: Orthagoriscus mola

Rhynchopharynx paradoxa Odhner 1928

Length 20.-31.5 mm. by 1.5 to 2 . mm.
Oral sucker: length,0.48-57; width 0.34-0.45 mm.
Ventral sucker: 1.25 - 1.4 mm.

There is a two-lobed symmetrical glandular mass just anterior to ventral sucker. Pre-pharynx (proboscis sheath) 1½ times length of oral sucker. Intestine bifurcates 1.-2. mm. behind ventral sucker, has same blind-sac structures described for Tetrochetus(Odhner suspects these things consittute a family character). Ceca zig zag. Anterior testis 2. mm. behind ventral sucker. Vitellaria between posterior half of ventral sucker and ovary. Eggs 27-30 by 19µ. Genital sinus 0.33 mm. long. Pars prostatica to posterior half of ventral sucker. Coiled seminal vesicle reaching to the region of anterior testis

Rhynchapharynx paradoxica Odhner, 1928

Host: Mola mola

Atlantic & Pacific

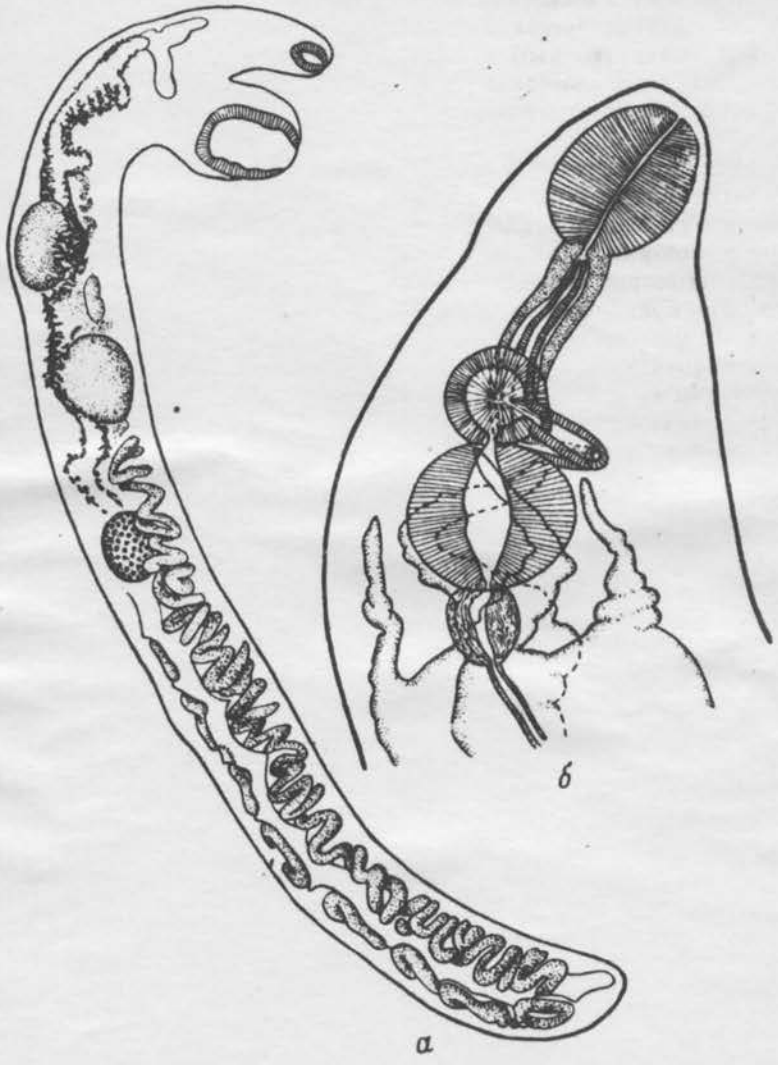


Рис. 35. *Rhynchopharynx paradoxa* Odhner, 1928
(по Одneру, 1928)

а — марита; б — строение ринхофаринкса

see Bray + Gibson, 1977
(reprint)

Tetrochetus Looss, 1912

Syn. *Paratetrochetus* Hanson, 1955

Generic diagnosis. — Accacoeliidae, Accacoeliinae: Body elongate. Acetabulum more or less pedunculate. Esophagus with glandular outgrowths at its bifurcation. Anterior and posterior ceca simple. Testes in middle third of body, anterior dorsal, posterior ventral. Vesicula seminalis more or less winding. Pars prostatica surrounded by prostate cells. No genital papilla. Genital pore posterior to mouth aperture. Ovary postequatorial. Vitellaria tubular, branched, extending between acetabulum and ovary or a little more posteriorly. Uterus reaching to near posterior extremity. Excretory vesicle giving off a dorsal and a ventral vessel at point of connection with cecal ends. Intestinal parasites of marine fishes.

Genotype: *T. raynerianus* (Nardo, 1827) Looss, 1912, in *Luvarus imperialis;* Venice.

Other species:

T. aluterae (Hanson, 1955), syn. *Paratetrochetus a.* H., in *Alutera scripta;* Honolulu.

T. coryphaenae Yamaguti, 1934, in *Coryphaena hippurus;* Toyama Bay and Pacific coast of Japan.

T. hamadai Fukui et Ogata, 1935 (Pl. 25, Fig. 322), in *Spheroides spadiceus* from Toba and also in *Spheroides* sp. from Maisaka, Japan.

T. proctocolus Manter, 1940, in rectum of *Cheilichthys annulatus,* and probably also in *Trachinotus* and *Angelichthys;* Galapagos Island.

Key to species of *Tetrochetus* from Hawaiian fishes

1. Acetabulum larger than oral sucker 2
   Acetabulum nearly as large as oral sucker;
   body 2.27-7.5 mm long . . . . . *T. aluterae*
2. Testes unusually large, bulging out over body surface;
   body 2.4-5.5 mm long . . . . . *T. macrorchis*
   Testes not very large, not bulging out over body surface;
   body 2.65-7.85 mm long . . . . . *T. coryphaenae*

TETROCHETUS Looss 1912

Body elongate, cylindrical. Cuticula smooth. Ventral sucker protuberant, about 1/5 from anterior end. Oral sucker with transverse opening, ventral sucker with longitudinal opening.

Anterior ttip of pharynx protruding into the oral sucker, intestinal bifurcation just anterior to ventral sucker. Cross-bar of the H-shaped intestine with 5 short out-pocketings the middle one of which is tube-like, the four lateral with irregular branches.

Genital pore close behind oral sucker. Copulatory organs lacking. Short genital sinus. Testes oval, just anterior to mid-body, the anterior testis more dorsal, the posterior more ventral. Pars prostatica of large cells extending to base of esophagus. Ovary elliptical, a short distance posterior to testes. Vitellaria tree-like branched tubes with slightly thick ned ends, Between ovary and ventral sucker laterally and ventrally.

Type species: Tetrochetus raynerius (Nardo)Looss 1912

Tetrochetus raynerius (Nardo) Looss

Syn.: Dist. raynerianum autt.
Accacoelium raynerianum (Nardo) Luhe 1901

Length 11-12 mm. by 1.-1.3 mm.
Oral sucker: 1.2-1.3 mm. in diameter
Ventral sucker: 0.9 -1. mm., 2 mm. from anterior end.
Pharynx egg-shaped 0.42 by 0.33 mm.
Esophagus 0.55 mm. long and only 0.03 -0.04 mm. wide.
Genital sinus about 0.12 mm. long.
The seminal vesicle reaches nearly to the anterior testis.
The testes are close together so that they over-lap slightly.
Seminal receptacle lacking. A long L. canal présent.

Host: Ausonia cuvieri Risso
(Luvarus imperialis Rafinesque)

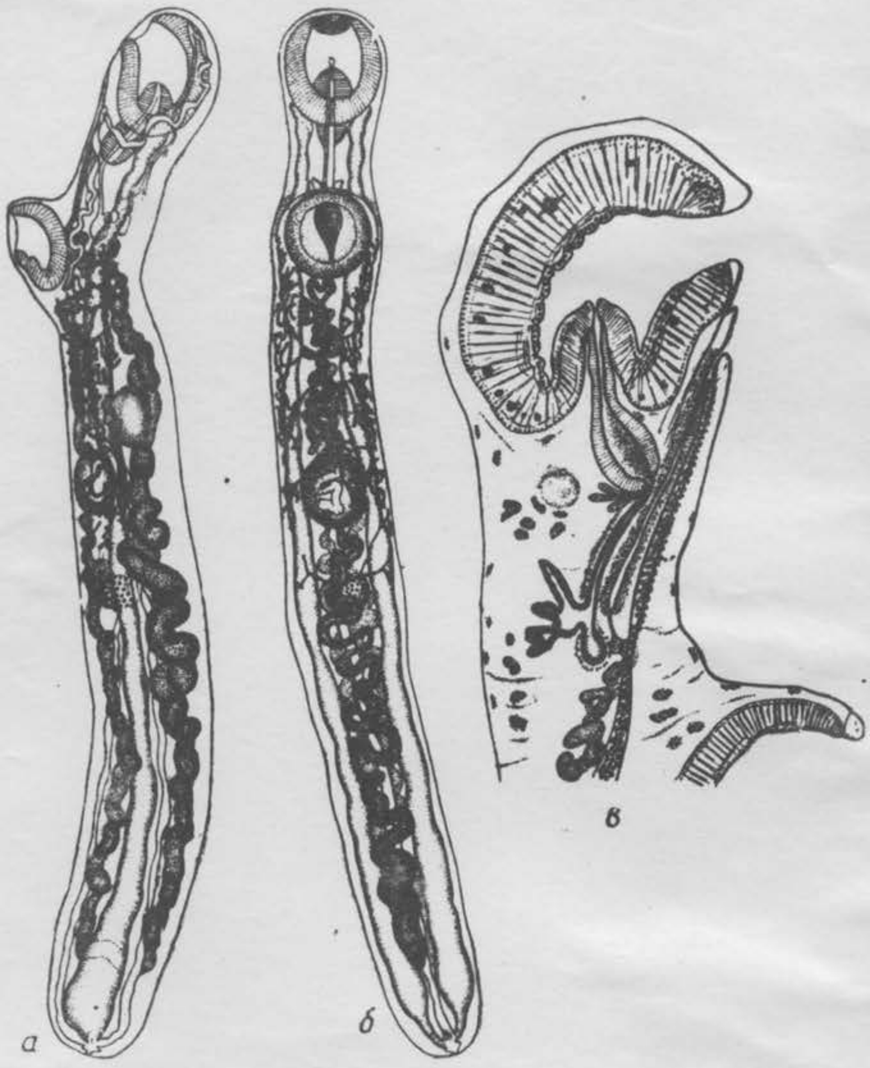
T. coryphaenae Yamaguti, 1934

T. hamadai Fukui & Ogata, 1935

<u>Tetrochetus</u> <u>raynerianus</u> (Nardo,1827) Looss,1912

Host: <u>Luvarus</u> <u>imperialis</u>;
Venice; Italy

Сем. *ACCACOELIIDAE*



37

see Bray + Gibson, 1977 (reprint)

Рис. 37. *Tetrochetus raynerius* (Nardo, 1827)
(по Лоссу, 1912)
[illegible]; в — срез переднего конца тела

124. *Tetrochetus aluterae* (Hanson, 1955) n. comb.
Syn. *Paratetrochetus aluterae* Hanson, 1955
(Fig. 124)

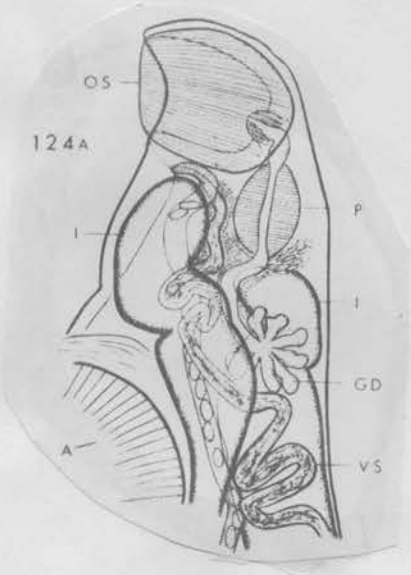
HABITAT: Intestine of *Alutera scripta*; Hawaii.

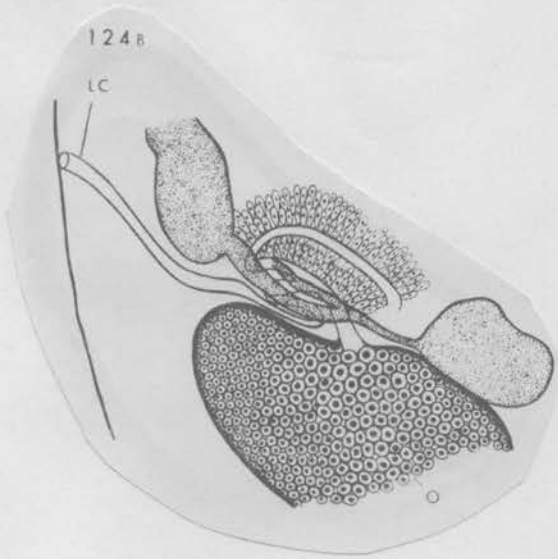
DESCRIPTION (based on ten whole mounts): Body subcylindrical, tapered toward both extremities, 2.27-7.5 X 0.37-0.8 mm. Cuticle smooth. Oral sucker bowl-shaped, subterminal, 0.19-0.35 X 0.2-0.39 mm, surmounted by preoral lobe, with rounded conical elevation, into which the attenuated musculoglandular anterior extension of the pharynx is inserted; pharynx pyriform to fusiform, 0.06-0.16 X 0.07-0.19 mm, with distinct anterior prolongation as mentioned above. Esophagus 0.1-0.15 mm long, surrounded at its bulbous anterior end by postpharyngeal gland cells, whose ducts are converged toward the posterior end of the pharynx to be continued into the lumen of its posterior portion, but provided for greater posterior part with gland cells, probably accompanying cells; lobed esophageal glands or glandular diverticles are massed together, opening into posterior end of esophagus. Anterior cecal diverticle partitioned from posterior cecum, tapered anteriorly, conical in lateral view, 0.15-0.23 X 0.1-0.14 mm; posterior ceca opening into excretory vesicle sideways to form cloaca. Acetabulum stalked, longitudinally elongated, 0.25-0.3 mm dorsoventrally, 0.33-0.5 mm anteroposteriorly.

Testes subglobular to oval, 0.15-0.39 X 0.12-0.3 mm, in middle third of body, anterior testis close to dorsal cuticle, posterior one close to ventral cuticle. Seminal vesicle tubular, convoluted proximally, but more loosely winding anteriorly, up to 20-60 μ wide, extending from base of acetabular stalk to level of esophagus; pars prostatica tubular, not well differentiated, though surrounded by prostate cells. Genital pore ventral to oral sucker.

Ovary transversely elongated oval or reniform, 0.1-0.22 X 0.14-0.23 mm, posttesticular, in posterior part of middle third of body or at its junction with posterior third. No seminal receptacle. Receptaculum seminis uterinum well developed. Laurer's canal opening dorsally a little anterior to ovary. Uterus first ascending, then descending on dorsal side, finally ascending on ventral side; eggs 25-35 X 14-23 μ in life. Vitellaria tubular, extending in lateral fields between base of acetabular stalk and ovary; collecting ducts from two sides uniting in front of ovary. Excretory system as in *Tetrochetus*.

DISCUSSION: Hanson (Mrs. Ptitchard) states that *Paratetrochetus* has an anterior extension of the pharynx but this anterior extension occurs in other typical *Tetrochetus*, such as *T. coryphaenae* Yamaguti, 1934 and *T. macrorchis* n. sp. (*v. i.*). This cannot be regarded as a generic character, inasmuch as there are several important similarities to *Tetrochetus*, as she pointed out. For this reason *Paratetrochetus* Hanson, 1955 is suppressed in favor of *Tetrochetus*.





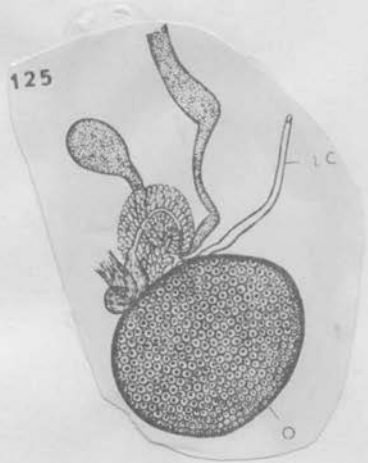
125. *Tetrochetus coryphaenae* Yamaguti, 1934
(Fig. 125)

HABITAT: Intestine of *Coryphaena hippurus* (local name "mahimahi"); Hawaii.

DESCRIPTION (based on eight flattened whole mounts): Body subcylindrical, 2.65-7.85 X 0.4-0.5 mm; oral sucker 0.2-0.28 X 0.2-0.32 mm; pharynx 0.1-0.14 X 0.1-0.14 mm; esophagus 0.2-0.3 mm long; ceca opening into excretory vesicle at posterior extremity. Acetabulum pedunculate, 0.2-0.3 X 0.25-0.35 mm.

Testes subglobular to elongate, 0.25-0.6 X 0.21-0.4 mm; seminal vesicle 20-30 μ wide. Ovary 0.2-0.3 X 0.2-0.38 mm, at beginning of posterior third of body. Laurer's canal opening dorsally only a little anterior to ovary. Uterus first ascending, then descending to near posterior extremity, where it ascends again. Eggs 25-35 X 14-19 μ. Vitellaria extending from posterior part of anterior third of body to near ovary; vitelline reservoir inconspicuous, just pre-ovarian.

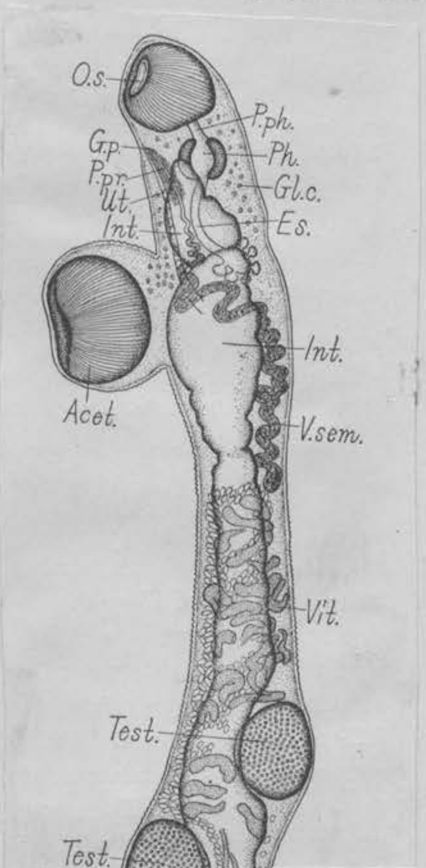
DISCUSSION: The Hawaiian specimens agree well with my original description of this species. The pharynx is attenuated anteriorly and projects into the oral sucker at its base in the form of a blunt-conical projection as in *Tetrochetus aluterae* (Hanson, 1955). In this respect there is not such a great difference to justify the separation of *T. aluterae* as representing a distinct genus.



Tetrochetus coryphaenae Yamaguti,1934

With generic characters. Body 1.92- 6.5 by 0.24 - 0.53 mm. Preoral lip 0.015 to 0.021 mm. long. Oral sucker 0.15 to 0.2 by 0.12 to 0.19 mm. Prepharynx distinct. Pharynx 0.07 to 0.11 mm. in diameter. Esophagus long, slender, dividing at about middle anterior third of body into two chambers with small outpocketings lined with epithelium, Acetabulum pediculate, larger than oral sucker, 0.26 to 0.29 long. Pedicle of acetabulum sometimes as long as forebody. Testes longitudinally elongated oval., 0.18 to 0.25 mm. long, in posterior part of middle third of body. Vesicula seminalis reaching to posterior limit of anterior third of body. Ovary oval, 0.084 to 0.16 by 0.12 to 0.17 mm. at beginning of posterior third of body. Receptaculum seminis uterinum present. Uterus ascending to posterior limit of anterior third of body then descending to near posterior extremity, whence it again ascends. Vitellaria extending from ovary to posterior limit of anterior third of body. Eggs elongate oval,light brown, 26 to 33 by 16 to 19 u.

Host: small intestine of Coryphaena hippurus
Japan. Pacific coast.



no definite diverticle anywhere.
has a longitudinally elongated a
pedicle of the acetabulum arise
the body.
The approximately oval tes
the other in the middle third o
equatorial level and the posteri

1) Unless otherwise stated, the
dorsoventral dimensions.

Because Yamaguti (1935) refers to a "short cirrus" Dollfus doubts if this form belongs in Tetrochetus. However, Yamaguti's figure shows no such cirrus.

Dollfus shows that only two characters now separate Tetrochetus & Orophocotyle viz: duplication of the anterior wall of the acetabulum - absent in Tetrochetus; different form of vitellaria (small pyriform masses in Orophocotyle and long branching tubes in Tetrochetus.

Tetrochetus coryphaenae Yamaguti, 1934

Host.—*Coryphaena hippurus* Linn., dolphin.

Location.—Rectum.

Locality.—Lerner Fish Pens, Bimini, B.W.I., and from 12 mi. N.W. San Jose Island, Archipielago de las Perlas, Panama Pacific [new locality records].

Discussion.—This species was described from *Coryphaena hippurus* in Japan by Yamaguti (1934) and reported from that host in Tortugas, Florida by Manter (1947). *Coryphaena hippurus* is widely distributed and it is not surprising that its parasites are well established in at least Japan, the tropical American Pacific, the Gulf of Mexico, and neighboring areas.

Sogandares, 1959

— OVER-

Tetrochetus coryphaenae Yamaguti, 1934

Hosts: Coryphaena hippurus (C); **Diodon hystrix* (J).

Site: intestine.

CURAÇAO + JAMAICA; FROM NAHHAS + CABLE, 1964

Tetrochetus yamaguti

Orophocotyle coryphaenae ~~n.sp.~~

T161

Synonym: Dist. furcatum of Diesing e.p.

(according to Odhner 1928:168)

{T947 T946}

2.014 to 7,524.

Host: Coryphaena hippurus

Position: intestine

452T3

Frequency: ~~two from single host examined~~.

The body is elongated, cylindrical, widest at level of ventral sucker, 5.18 and 5.8 mm. by 0.73 at ventral sucker and with diameter of hind body from 0.5 to 0.6 mm. The ventral sucker is protuberant. This character as has been pointed out by Odhner, probably varies with contraction of the body and is especially conspicuous in dead specimens. In related species it has been described as being so conspicuous as to give a forked appearance to the body. The ventral sucker is deep and well embedded in the body wall, so that when a specimen is flattened ~~dorsally~~ dorso-ventrally, the sucker lies beneath a fold of the body wall (fig). The lateral muscular flanges producing what Looss calls the "Duplikatur" of the ventral sucker and described for O. planci and O. divergens are not clearly to be seen in this species. The suckers are nearly equal in size, the ventral sucker being slightly larger (e.g. 0.329 and 0.35 in a 5.18 mm. specimen). The ventral sucker is located about 1/7 from the anterior end. As in other species in the genus, the opening of the oral sucker is transverse, that of the ventral sucker, longitudinal. Anteriorly it protrudes nipple-like into the oral sucker. The pyriform pharynx is of medium size. The narrow esophagus divides behind the ventral sucker to send two voluminous ceca foward and two backward. The anterior ceca ~~are~~

Diverticula of intestinal bifurcation varying lengths. 8 to 10 of 1

are wide and extend slightly beyond the posterior edge of the pharynx. They bear no branches but are rather deeply lobed. The posterior ceca are also wide and lobed. This irregular contour of the ceca apparently does not occur in the other species of the genus. In side view, the posterior ceca show the peculiar zig-zag course typical for other members of the family but not described for O. divergens and O. planci. Near the posterior end of the body the ceca enter the excretory vesicle. Such connection was not described by Looss, but is evidently a family characteristic.

The genital pore is median, ventral, near the mouth, about opposite the middle of the pharynx. There is a short, simple genital sinus. There is no copulatory organ of any kind. The prostate cells extend backward and dorsally not quite to the ventral sucker where the male duct becomes the swollen, coiled seminal vesicle which reaches nearly to the anterior testis. The testes are large, globular or slightly elongate, diagonal, in the anterior half of the hind body. As is characteristic for the genus, the anterior testis (to the left) is dorsal in position, the posterior testis ventral. The ovary is median, behind the testes, just behind the middle of the hind body, thus being more anterior than in O. planci, and only slightly more posterior than in O. divergens. The uterus is typical, running foward to near the base of the ventral sucker, then backward in short broad coils to a short distance from the posterior end, then coiling anteriorly and dorsally, becoming straight at the level of the anterior testis. The post-uterine space is 0.32 and 0.49 mm. in the 5.18 and 5.8 mm. specimens. The vitelline gland is a branched tube with

terminal swellings forming follicles and is disposed rather irregularly from near the posterior border of the ventral sucker to the testes. In one specimen the follicles seemed to stop at the anterior testis, in the other they continued to the posterior border of the posterior testis. Eggs measure 32 to 35 by 16 to 19 u.

Odhner (1928:168) refers to a species of Orophocotyle from Coryphaena hippurus and identified by Diesing as "Dist.furcatum" Among specimens of Dinurus tornatus from this host, Odhner found a single specimen of this form which he calls a third species of Orophocotyle. No name or description is given. Without much doubt, it was the same form here described.

Orophocotyle coryphaenae differs from O.divergens in that the suckers are nearly equal in size (the oral sucker is much larger in O. divergens), and in its voluminous anterior ceca, It differs from O.planci in its pointed posterior end with appreciable post-uterine space; the more anterior position of the gonads; and in its voluminous anterior ceca.

A key to the three species:

Oral sucker larger than ventral sucker.....O.divergens
Suckers nearly the same in size
  Uterus extending to the blunt posterior
    end of the body.....O.planci
  Uterus not reaching by some distance the
    rather pointed posterior end of the body.....O.coryphaenae

126. *Tetrochetus macrorchis* ~~n. sp.~~

(Fig. 126) Yamaguti, 1970

HABITAT: Small intestine of *Xanthichthys ringens* (type host), *Diodon* sp. (*hystrix*?), and *Spheroides cutaneus*; Hawaii.

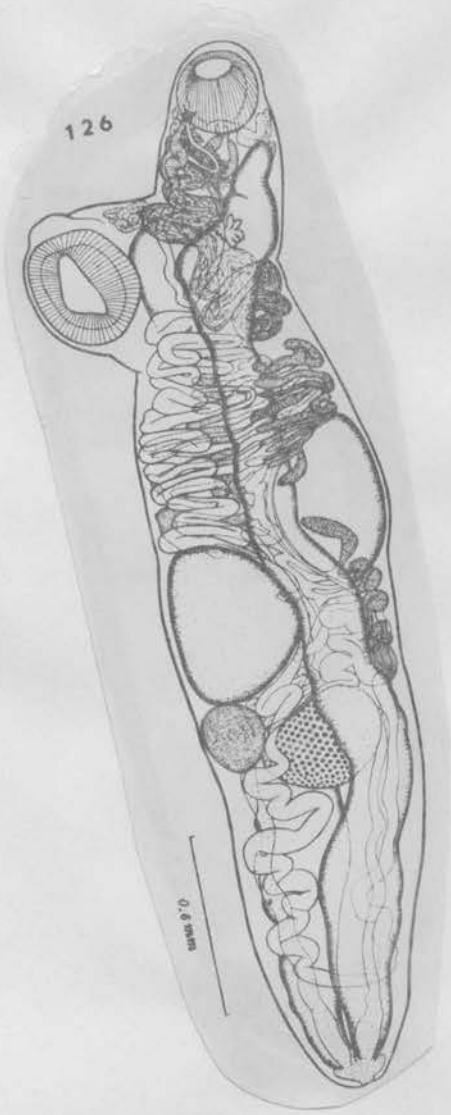
HOLOTYPE: U. S. Nat. Mus. Helm. Coll., No. 63729.

DESCRIPTION (based on 11 whole mounts): Body subcylindrical, 2.4-5.5 mm long, 0.3-0.8 mm wide in testicular region. Oral sucker bowl-shaped, opening anteroventrally in the type, 0.16-0.27 × 0.18-0.3 mm. Prepharynx projecting into oral sucker in form of a cone, well provided with circular muscle fibers. Pharynx globular, 0.08-0.15 mm in diameter; anterior end of esophagus slightly enlarged and surrounded by numerous glandular cells. Intestinal bifurcation with over a dozen diverticles. Anterior ceca reaching to pharynx; posterior ceca opening into cloaca from right and left sides. Acetabulum 0.18-0.28 in smaller diameter, 0.23-0.38 mm in larger diameter; its stalk shorter than forebody.

Testes ovoid, 0.2-0.56 × 0.14-0.43 mm, situated obliquely tandem in middle third of body, anterior testis bulging out dorsally and posterior one ventrally. Seminal vesicle tubular, convoluted proximally on dorsal side of postacetabular region, more loosely coiled anteriorly. Pars prostatica narrow, sigmoid, uniting with uterus just before opening at level of posterior end of oral sucker.

Ovary rounded, 0.1-0.28 × 0.07-0.4 mm, situated at junction of middle with posterior third of body, separated from posterior testis by uterus and compact shell gland. Uterus at first ascending to posterior end of seminal vesicle where it turns backward, descending on dorsal side down to a point 0.3 mm from posterior extremity in the type, and then ascending on ventral side, passing between two testes. Eggs elliptical, 28-40 × 16-23 μ. Vitellaria tubular, branched, extending on each side of body from behind posterior end of seminal vesicle to ovary; vitelline reservoir globular, 0.08-0.22 × 0.05-0.2 mm, ventral to ovary. Dorsal and ventral main excretory vessels opening into cloaca at dorsal and ventral corners of cloaca respectively.

DISCUSSION: This species closely resembles *Tetrochetus aluterae* (Hanson, 1955), only differing from it in the testes being larger; hence the specific name. Moreover, in the present species the testes are more or less bulging outward, even in young adults. In *T. hamadai* Fukui et Ogata, 1935 from *Spheroides spadiceus* of Japan the body is much larger (15.5 mm long by 2.94-3.21 mm wide) and the eggs are smaller (26 × 16 μ).



Tetrochetus proctocolus, ~~new species~~ MANTER, 1940
(Plate 45, figs. 96, 97)

Host: *Cheilichthys annulatus* (Jenyns)
Probably also (rarely) in *Trachinotus rhodopus* (Gill) and Angelichthys sp.

Location: Rectum

Locality: Galapagos Islands

Number: One in each of 2 hosts, 3 in another of a total of 8 examined

The genus Tetrochetus was named by Looss in 1912 with *T. rayneriius* (Nardo) as type. Dollfus (1935, p. 205-206) in a review of the Accacoeliidae points out that only 2 valid differences seem to separate Tetrochetus from Orophocotyle Looss, 1902. These are the lack of the anterior duplication of the acetabulum and the more continuous and branching vitellaria in Tetrochetus. Three species of Tetrochetus are known: *T. raynerius* (Nardo); *T. coryphaenae* Yamaguti, 1934; and *T. hamadai* Fukui and Ogata, 1935.

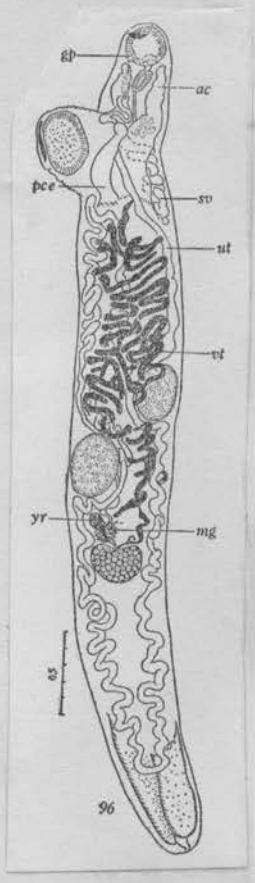
SPECIFIC DIAGNOSIS OF TETROCHETUS PROCTOCOLUS

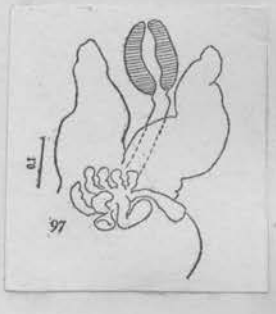
Body smooth, cylindrical, 2. to 5.4 in length by 0.442 to 1. in width; forebody 0.442 to 1.012 or almost exactly the same as greatest body width. Color in life, red. Oral sucker subspherical, 0.187 to 0.277 in transverse diameter, with internal conelike elevation at its base; acetabulum longer than wide, protuberant on a short stalk, with longitudinal aperture, 0.210 to 0.270 in depth (only one specimen in a position for transverse measurement which was 0.345), 0.277 to 0.472 in length. The ratio of transverse diameters about 3:4. Depth of acetabulum only slightly greater than width of oral sucker. Short prepharynx; pharynx cylindrical, 0.102 to 0.178 long by 0.076 to 0.136 wide; esophagus fairly long, joining ceca dorsal to acetabular stalk; intestine H shaped; anterior ceca reaching to midpharynx level or beyond to the base of oral sucker. Nine dorsal diverticula of varying length at the intestinal bifurcation (fig. 97). Posterior ceca wide, extending to posterior end of body, uniting with excretory vesicle.

Genital pore median, opposite base of oral sucker. Testes diagonal, smooth, rounded, slightly longer than wide, in middle of body (midline lies between the testes), anterior testis dorsal, posterior testis ventral, separated by coils of the uterus and by vitellaria. Seminal vesicle a much convoluted tube extending a short distance posterior and a short distance anterior to acetabulum; pars prostatica a straight tube extending almost to the genital pore; prostatic gland free; no copulatory organs. Ovary ovoid or bean shaped, smooth, wider than long, median, about ⅓ from posterior end of body; Mehlis' gland spherical; yolk reservoir ventral to Mehlis' gland; vitellaria consisting of coiled tubes with numerous branches (not of isolated fragments), extending from just posterior to acetabular stalk to ovary (not posterior to ovary); uterus with ascending (ventral) coil to near acetabulum, winding descending posterior coils becoming ventral posterior to testes reaching to near posterior end of body, a dorsal ascending little coiled limb which passes ventral to anterior testis then almost straight to near genital pore where it joins the male duct. Eggs thin shelled, light yellow, ovoid, 22 to 25 by 14 to 17 μ (one specimen with many abnormal eggs had a few up to 32 by 25 μ, but egg size seemed rather constant in normal specimens). Excretory vesicle short; excretory tubes much coiled in anterior region of body, extending to oral sucker. These tubes come close together, but whether or not they unite was not determined.

The name *proctocolus* is from *procto* (= anus) and *-colus* (= inhabiting) and refers to the location of the parasite in the rectum.

Discussion. In the 2 mm specimen the eggs had not reached the portion of the uterus posterior to the ovary; hence, it was but recently sexually mature. The number of dorsal diverticula of the intestinal bifurca-





(OVER)

tion may vary. They could be counted in but 2 specimens in both of which the number was 9.

Although *T. hamadai* is from a related host in Japan, *T. proctocolus* is more similar to *T. coryphaenae*. I have collected what I consider to be *T. coryphaenae* from *Coryphaena hippurus* at Tortugas, Florida. On the basis of this material the questions raised by Dollfus (1935) can be answered by saying that no copulatory organ is present and the vitellaria are tubular and continuous, thus confirming the location of the species in the genus Tetrochetus.

T. proctocolus and *T. coryphaenae* are almost identical. The most pronounced difference is egg size. My material of *T. coryphaenae* has constantly larger eggs (32 to 35 by 16 to 19 μ). Yamaguti records 26 to 33 by 16 to 19 μ for *T. coryphaenae*. Except for a specimen having both abnormally small and abnormally large eggs, *T. proctocolus* eggs were consistently 22 to 25 by 14 to 15 μ. Another difference between the 2 species is a relatively somewhat larger oral sucker in *T. coryphaenae*. Because of the usual lateral view of specimens the most available dimensions to compare are the lengths (anterior-posterior) of these suckers. The following proportions represent in hundredths of millimeters these ratios (oral sucker above acetabulum):

T. proctocolus.....	$\frac{16}{27}$	$\frac{17}{30}$	$\frac{23}{47}$	$\frac{24}{35}$	$\frac{24}{39}$			
T. coryphaenae.....	$\frac{18}{25}$	$\frac{27}{39}$	$\frac{28}{36}$	$\frac{36}{44}$	$\frac{36}{46}$	$\frac{37}{42}$	— $\frac{20}{29}$	(Yamaguti's record)

T. coryphaenae seems to have thicker vitelline tubes with fewer coils between anterior testis and acetabulum. The anterior extent of the uterus and vitellaria is probably too variable to separate the two species. *T. coryphaenae* is from the intestine of its host rather than from the rectum.

T. proctocolus is distinctly different from *T. raynerius* in sucker ratio and location of the gonads. It differs from *T. hamadai* in sucker ratio, in shape of pharynx, and in more posterior extent of vitellaria.

A single specimen of Tetrochetus from the intestine of *Trachinotus rhodopus* at Chatham Island is probably *T. proctocolus*. The sucker ratio would so indicate, as well as most of the eggs, but a very few eggs were abnormally large as compared with others. Another single specimen, probably *T. proctocolus,* was collected from the intestine of an angelfish (Angelichthys sp.) from the Galapagos. In this specimen, a peculiar abnormality was the entire absence of egg shells. The uterus was fully developed and filled with naked embryos. The vitellaria were normal.

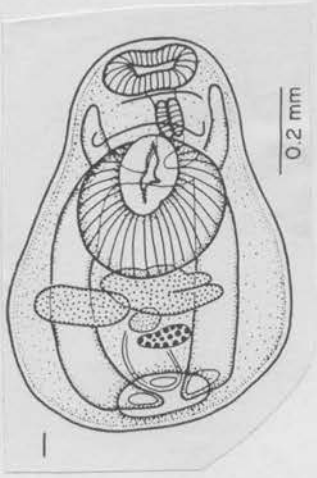
Tetrochetus sp. metacercaria SHIMAZU, 1978

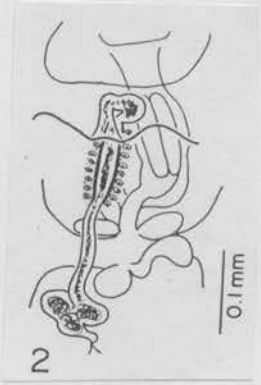
(Figs. 1–2)

A single specimen was found free in the trunk coelom of *Sagitta enflata* GRASSI (1 Nov. 1972).

Specimen No. NSMT–Pl–1803.

Description. Metacercaria, not encysted. Body pyriform, non-spinous, 0.914 mm long, 0.625 mm wide at level of testes in hindbody, with a ventral depression between two suckers. Oral sucker 0.094 mm long by 0.200 mm wide, surmounted with a ventrally folded perioral lip. Ventral sucker spherical, 0.340 mm long by 0.319 mm wide, slightly anterior to mid-level of body; its anterior wall single; its aperture elliptical, located in its anterior half, with a muscular collar. Prepharynx present. Pharynx elongate-ellipsoidal, 0.105 mm long by 0.046 mm wide. Oesophagus moderately long, surrounded by a mass of cells in its anterior portion, with several glandular outgrowths at its posterior end dorsal to anterior half of ventral sucker. Intestines H-shaped; main intestines simple, thick, separately opening into uroproct; anterior caeca not diverticulate. Testes double, diagonally contiguous, posterior to ventral sucker; anterior one somewhat lobed, 0.119 mm long by 0.255 mm wide; posterior one ovoid, 0.085 mm long by 0.213 mm wide. Seminal vesicle (=vas deferens) external, winding, submedian, extending from level slightly posterior to intestinal bifurcation to mid-level of oesophagus. Pars prostatica tubular, lateral to oesophagus and pharynx, encompassed with prostatic cells free in parenchyma in a dense layer. Cirrus pouch and cirrus absent. Ovary transversely ellipsoidal, post-testicular, median, 0.043 mm long by 0.119 mm wide. Mehlis' gland compact, 0.045 mm long by 0.085 mm wide, between testes and ovary. Uterus and metraterm not observed. Genital atrium funnel-shaped, opening with a wide genital pore on top of a gentle protuberance of ventral body surface behind oral sucker. Genital cone absent. Spermatozoa already occurring in seminal vesicle, pars prostatica, and genital atrium. Vitellaria not observed. Excretory vesicle tubular, extending forward as far as genital glands; uroproct present, wide; pore ventro-terminal.





Discussion. The present accacoeliid metacercaria belongs to the genus *Tetrochetus* LOOSS, 1912, in the following features: The genital atrium is devoid of a genital cone; both the main intestines and their anterior caeca are simple; the anterior wall of the ventral sucker is single; and the oesophagus has posterior glandular outgrowths. It closely resembles, except for a little difference in the dimensions, the unidentified metacercariae of the genus described by OKADA (1932) and DOLLFUS (1960 b) from the Portuguese man-of-war, *Physalia utriculus* (LA MARTINIÈRE) (Coelenterata, Siphonophora, Physaliidae) from the Inland Sea of Japan. DOLLFUS (1960 b) provisionally regarded the latter as the metacercarial stage of *T. hamadai* FUKUI et OGATA, 1935, the adult stage of which was found by FUKUI and OGATA (1935) in the puffer, *Spheroides spadiceus* (RICHARDSON), and by YAMAGUTI (1938) in a *Spheroides* sp. fish, respectively, both off the Pacific coast of Central Japan. There is not sufficient evidence to determine the specific identification of the present trematode as *T. hamadai*.

DOLLFUS (1960 a) briefly described an accacoeliid metacercaria, about 0.49 mm long by 0.30 mm wide, from *S. inflata* [sic] GRASSI taken in the Bay of Algiers, the Mediterranean Sea. He assumed that his specimen might be related to the genus *Accacladocoelium* ODHNER, 1928, owing to the "autre ventouse" of the ventral sucker. The autre ventouse seems a muscular collar from his figures 23 and 24. DOLLFUS' trematode is similar in general morphology to the present metacercaria, although the description of its terminal genitalia has not been given.

DOLLFUS *et al.* (1954) obtained accacoeliid metacercariae, probably belonging either to the *Tetrochetus* or to the genus *Accacladium* ODHNER, 1928, from *S. inflata* [sic] collected in the Bay of Bengal near Madras, but failed to establish conclusively the generic determination of them, because the genital atria of them had not yet fully differentiated. An unidentified specimen resembling those of DOLLFUS *et al.* (1954) was reported by DOLLFUS (1960 a) from *S. hexaptera* D'ORBIGNY from Açores. REIMER *et al.* (1975) also recorded similar metacercariae from *S. bipunctata* QUOY et GAIMARD, *S. decipiens* FOWLER, *S. enflata*, *S. friderici* RITTER-ZAHONY, *S. minima* GRASSI, and *S. serratodentata* KROHN, all collected in the Atlantic Ocean, off North-west Africa.