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Helminth Parasites of Cyclopterid Fish, *Aptocyclus ventricosus*, Caught off Northern Japan

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Abstract Eight species of helminth parasites were recorded from a cyclopterid fish, *Aptocyclus ventricosus* (PALLAS), caught off northern Japan. They are: *Paraccacladium jamiesoni* BRAY et GIBSON, *Opechona alaskensis* WARD et FILLINGHAM, *Derogenes varicus* (MÜLLER), *Hemiurus levinseni* ODHNER, *Lecithophyllum botryophorum* (OLSSON) (Trematoda); *Phyllobothrium* sp. (larval form) (Cestoda); *Contracaecum osculatum* (RUDOLPHI) (larval form) (Nematoda); and *Echinorhynchus gadi* MÜLLER (Acanthocephala). *Paraccacladium jamiesoni* was first found from fish in the Pacific Ocean.

Eight species of helminth parasites were collected from a cyclopterid fish, *Aptocyclus ventricosus* (PALLAS), caught off Usujiri, on the Pacific coast of Hokkaido, northern Japan, in March 1976, February 1977 and March 1978. As far as I know, this is the first record on the helminth parasites of *A. ventricosus*. The helminths obtained are shown in Table 1, of these the present report deals with three species of trematodes, *Paraccacladium jamiesoni*, *Opechona alaskensis* and *Lecithophyllum botryophorum*.

Trematodes were washed in saline, fixed in acetic sublimate under slight pressure, stained with Heidenhain's hematoxylin and mounted in balsam. Specimens are deposited in the collection of the National Science Museum, Tokyo (NSMT).

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Accacoeliidae

Paraccacladium jamiesoni BRAY et GIBSON, 1977

(Figs. 1–2)

Based on 10 specimens (NSMT-Pl 3043 and 3044). Body plump, with blunt-pointed extremities, 3.03–4.50 mm long and 1.05–1.40 mm wide at acetabular level. Cuticle aspinose, sometimes with scattered scale-like spines. Oral sucker subterminal, rounded quadrangular, 0.27–0.38×0.30–0.41 mm. Prepharynx absent. Pharynx pyriform, 0.14–0.22×0.11–0.17 mm, protruding into base of oral sucker. Esophagus oval, 67–116×103–111 μm, with thick wall consisting of cuticular lining and muscular covering. Caeca forming stomach portion at commencement, swollen, sinuous,

Table 1. Helminths of *Aptocyclus ventricosus* caught off northern Japan.

Species	Site of infection
Trematoda	
Accacoeliidae	
Paraccacladium jamiesoni BRAY et GIBSON, 1977	Intestine & rectum
Lepocreadiidae	
Opechona alaskensis WARD et FILLINGHAM, 1934	Pyloric caeca & intestine
Hemiuridae	
Derogenes varicus (MÜLLER, 1784)	Stomach
Hemiurus levinseni ODHNER, 1905	〃
Lecithophyllum botryophorum (OLSSON, 1868)	〃
Cestoda	
Phyllobothriidae	
Phyllobothrium sp. (larval form)	Pyloric caeca & intestine
Nematoda	
Anisakidae	
Contracaecum osculatum (RUDOLPHI, 1802) (larval form)	Body cavity
Acanthocephala	
Echinorhynchidae	
Echinorhynchus gadi MÜLLER, 1776	Intestine

terminating blindly at posterior extremity. Acetabulum spherical, 0.53–0.73×0.53–0.75 mm, short stalked, at junction between anterior and middle third of body. Sucker ratio 1: 1.4–2.1.

Testes ovoid, obliquely tandem, occasionally tandem or symmetrical, the anterior 0.18–0.36×0.15–0.19 mm and the posterior 0.23–0.38×0.13–0.28 mm, in anterior half of hindbody. Seminal vesicle convoluted tubular, 25–107 μm wide, just anterior to acetabulum or overlapping acetabulum in part. Pars prostatica tubular, curved, surrounded by prostatic cells. Genital cone conical, 0.10–0.13×0.12–0.15 mm, containing hermaphroditic duct in its axis, and projecting into genital atrium which is also conical in shape. Genital pore median or submedian, immediately postbifurcal or a little more anteriorly.

Ovary ovoid, 0.18–0.30×0.26–0.42 mm, near middle of hindbody. Mehlis' gland just postovarian, occasionally obliquely posterior to or lateral to ovary. Laurer's canal opening dorsally just posterior or obliquely posterior to ovary. Uterus first descending to near posterior extremity and then ascending sinuously. Vitellaria branching tubular, extending laterally from testicular level to midway between ovary and posterior extremity. Uterine eggs relatively small, elliptical, 44–59×24–29 μm. Excretory vesicle Y-shaped; stem very short, arms uniting dorsal to pharynx; pore terminal.

The immature forms of this species (Body 1.72–2.50 mm long and 0.90–1.10 mm wide) were obtained from the intestine of *Antimora microlepis* BEAN (Moridae) and *Coryphaenoides acrolepis* (BEAN) (Macrouridae) caught around the Emperor Sea Mounts to the northwest of Midway Island, central North Pacific (NSMT-Pl 2051

and 2055).

Remarks. BRAY and GIBSON (1977) described *Paraccacladium jamiesoni* as a new genus and species from a macrourid *Coryphaenoides rupestris* caught off west coast of Great Britain, and created the new subfamily Paraccacladiinae for it. The description of my specimens agrees with theirs except for the broader body width of mine. I also obtained the immature forms of this species from a morid and a macrourid fish caught in the central North Pacific, so that this species is distributed not only in the northern Atlantic but also in the northwest-central North Pacific.

BRAY and GIBSON (1977) obtained the mature forms of *P. jamiesoni* only from the carnivorous *Coryphaenoides rupestris*, and the immature forms from *Alepocephalus bairdii*, *Schedophilus medusophagus*, *Centrolophus niger* and *Xenodermichthys copei*, all of which feed on coelenterates and ctenophores, the presumed second intermediate hosts of accacoeliids. The latter four species of fishes, therefore, are considered to be obligatory paratenic hosts for this trematode. On the other hand, I collected the mature forms from *Aptocyclus ventricosus* which feeds on medusae and ctenophores in the pelagic zone of the subarctic Pacific (YOSHIDA, 1984). The definitive hosts will become infected with *P. jamiesoni* on eating either paratenic or second intermediate hosts depending on their food habits.

Lepocreadiidae

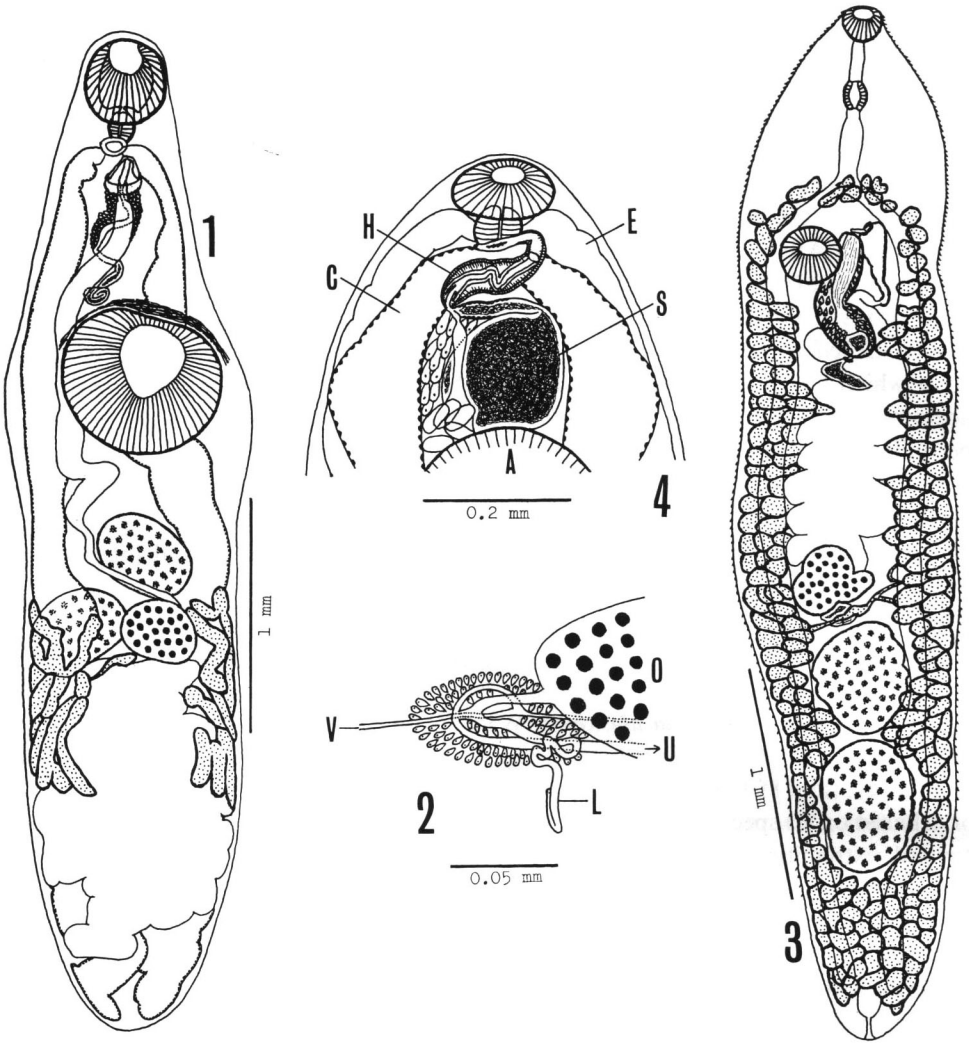
Opechona alaskensis WARD et FILLINGHAM, 1934

(Fig. 3)

Based on 20 specimens (NSMT-Pl 3045, 3046 and 3047). Body elongate, tapering toward extremities, 2.65–4.27 mm long and 0.60–0.97 mm wide at uterine region. Cuticle spinose. Oral sucker terminal, cup-shaped, 76–133×99–173 μm; prepharynx 46–163 μm long; pharynx nearly elliptical, 87–117×71–125 μm; esophagus 178–474 μm long; caecal bifurcation nearer acetabulum than pharynx; caeca terminating near posterior extremity. Acetabulum spherical, 158–240×178–291 μm, at midlevel of anterior half of body. Sucker ratio 1: 1.4–2.1.

Testes oval, smooth or sometimes irregular in outline, intercaecal, tandem in posterior half of body; anterior testis 0.27–0.48×0.31–0.51 mm and posterior one 0.31–0.56×0.30–0.48 mm. Each vas efferens arising from anterior portion of testes and running forward to enter external seminal vesicle. External seminal vesicle saccular or curved tubular, beginning from midway between posterior end of cirrus pouch and ovary, dorsal to uterus. Cirrus pouch arcuate claviform, 0.46–0.88×0.08–0.17 mm, extending well posterior to acetabulum, occasionally midway between acetabulum and ovary, containing oval seminal vesicle 23–134×36–149 μm, saccular pars prostatica 67–139×52–116 μm and eversible cirrus. Genital pore antero-sinistral to acetabulum.

Ovary trilobate, 0.18–0.32×0.22–0.37 mm, slightly right side, immediately post-equatorial. Seminal receptacle saccular, 38–129×129–284 μm, a little left side just



Figs. 1–2. *Paraccacladium jamiesoni* BRAY et GIBSON, 1977. —— 1. Entire worm, ventral view. 2. Ovarian complex, ventral view. L, Laurer's canal; O, ovary; U, uterus; V, vitelline duct.
Fig. 3. *Opechona alaskensis* WARD et FILLINGHAM, 1934. Entire worm, ventral view.
Fig. 4. *Lecithophyllum botryophorum* (OLSSON, 1868). Anterior end, ventral view. A, acetabulum; C, caecum; E, excretory vessel; H, hermaphroditic pouch; S, seminal vesicle.

posterior to ovary. Laurer's canal opening dorsally near or on left caecum at pretesticular level. Uterus intercaecal, preovarian. Metraterm with thick-walled, 0.26–0.51×0.06–0.14 mm, sinistral to cirrus pouch. Uterine eggs 82–93×48–54 μm. Vitelline follicles relatively large, co-extensive with caeca, from prebifurcal level to posterior extremity, confluent in posttesticular region. Excretory vesicle tubular,

reaching to acetabular level; pore terminal.

Remarks. According to WARD and FILLINGHAM (1934), *Opechona alaskensis* is characteristic in having vitellaria extending anteriorly to the prebifurcal level, a long prepharynx, and relatively large eggs. My specimens have slightly larger acetabulum and testes compared with theirs.

This species was originally described from a "toadfish" (probably *Porichthys notatus*) of Alaska (WARD & FILLINGHAM, 1934) and later recorded from *Sebastes aleutianus*, *S. alutus*, *S. borealis*, *S. flavidus*, *S. maliger*, *S. pinniger*, *S. ruberrimus*, *S. zacentrus* and *Theragra chalcogramma* from northeastern Pacific (MARGOLIS & ARTHUR, 1979; LOVE & MOSER, 1983) and from *Gymnacanthus detrisus*, *Theragra chalcogramma* and *Sebastes trivittatus* from Russian Far East waters (STRELKOV, 1960; ZHUKOV, 1960). Thus, the trematode is distributed in the northern North Pacific.

LEBOUR (1916) and STUNKARD (1932) found the metacercariae of *Opechona bacillaris* (MOLIN, 1859) in medusae and ctenophores. The infection of fishes with *O. alaskensis* also presumably results from the ingestion of metacercariae hidden in medusae and ctenophores.

Hemiuridae

Lecithophyllum botryophorum (OLSSON, 1868)

(Fig. 4)

Based on 9 specimens (NSMT-Pl 3048c). Body small, 1.02–1.45 mm long and 0.34–0.55 mm wide. Oral sucker subterminal, oval, 77–108 × 102–144 μm; prepharynx unrecognizable; pharynx globular 41–85 × 59–77 μm; esophagus very short; caeca terminating near posterior extremity. Acetabulum spherical, 180–232 × 193–264 μm, at junction between anterior and middle third of body. Sucker ratio 1 : 1.6–1.9.

Testes oval, 95–188 × 90–224 μm, arranged diagonally, slightly posterior to acetabulum. Seminal vesicle slender to voluminous saccular, 126–191 × 59–152 μm, just anterior or anterodorsal to acetabulum. Prostatic duct between anterior tip of seminal vesicle and base of hermaphroditic pouch, and surrounded by prostatic cells. Hermaphroditic pouch slender, club-shaped, containing coiled hermaphroditic duct. Genital atrium narrow. Genital pore median, ventral to pharynx.

Ovary oval, 121–175 × 126–219 μm, submedian, just posterior to testes. Seminal receptacle 75–155 × 77–142 μm, antero- to posterodorsal to ovary. Uterus filling most of available space in hindbody and then running forward to enter hermaphroditic pouch. Uterine eggs 43–53 × 23–27 μm. Vitellaria consisting of seven ovoid lobes, each lobe 77–129 × 60–145 μm, immediately lateral and/or behind ovary. Excretory vesicle Y-shaped, dividing at postacetabular level into two arms which unite dorsal to pharynx; pore terminal.

Additional two specimens (NSMT-Pl 2208) from *Laemonema longipes* (SCHMIDT) (Moridae) caught off Onahama, Pacific coast of northern Japan, have slightly larger

body (2.28×0.59 mm and 1.55×0.51 mm) and eggs (51–60×25–31 μm).

Remarks. Since the original description of *Lecithophyllum botryophorum* was incomplete, SCOTT (1969) redescribed this species, based on the material from *Argentina silus* of the east and west Atlantic, and considered *L. anteroporum* MARGOLIS, 1958 to be synonymous with *L. botryophorum*. The description of my specimens agrees well with SCOTT's and MARGOLIS' ones. According to MARGOLIS and ARTHUR (1979), *L. botryophorum* has been recorded from 14 species of fishes of northern Pacific and Atlantic, that is, *Argentina silus*, *Dasycottus setiger*, *Hexagrammos lagocephalus*, *H. stelleri*, *Merluccius productus*, *Oncorhynchus gorbuscha*, *O. nerka*, *Sebastes alentianus*, *S. alutus*, *S. borealis*, *S. crameri*, *S. flavidus*, *S. paucispinis* and *S. reedi*.

CAMPBELL and MUNROE (1977) detected *L. anteroporum* (=*L. botryophorum*) in *Alepocephalus agassizi* in the western North Atlantic and described the seminal vesicle sometimes extended into the testicular zone. Their identification may be incorrect because the seminal vesicle lies just anterior or anterodorsal to the acetabulum, not reaching to the postacetabular level in *L. botryophorum*.

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