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Some Monogenetic Trematodes of Marine Fishes from Fiji*

H. W. MANTER AND DONALD F. PRINCE

This paper describes three new species of monogenetic trematodes collected by the senior author from fishes at Suva, Fiji, in 1951. A new genus is named for one of these species. A fourth species, previously known from India, is identified. Parasites of the numerous fishes of the South Pacific have been studied very little and, so far as we can learn, no Monogenea has been reported from this region. One difficulty met in collecting there was lack of adequate identification of the hosts. In these particular cases, only the common or native names of the fishes were obtained. Often, however, the general type of family of the fish was evident.

The specimens were killed in formol-alcohol-acetic solution under slight pressure with a cover glass, and preserved in 70% alcohol. They were stained in Delafield's hematoxylin and mounted in Permount.

I. Suborder POLYOPISTHOCOTYLEA Odhner, 1912

A. Family Discotylidae Price, 1936

a. Subfamily Vallisiinae Price, 1943

1. *Lethacotyle fijiensis* n. gen., n.s.p. (Figs. 1-6).

DESCRIPTION (based on two specimens): Body elongate, pointed anteriorly, widest about $\frac{2}{3}$ body length from anterior end. Total length 3.156 to 3.759 mm., greatest width 0.663 to 0.770 mm. The small haptor, at the posterior end, is a transversely extended lobe bearing three pairs of hooks. Another lobe with ventrally curved anterior and posterior ends lies on the right side of the body adjacent to the haptor. There is no trace of clamps. Largest hooks (Fig. 2) are most lateral. Anterior root of this hook thick and apparently double with fused halves; posterior root short, the blade sharply recurved; length from base of anterior root to curvature of blade, 0.024 mm. Just median to these hooks is a pair of very slender, needle-like hooks with long anterior root and short blade (Fig. 4). These are 0.014 mm. long. Third pair of hooks median, 0.016 mm. long, with single roots (Fig. 3). Dorsal surface of haptor with fine transverse striations. Left side of the body from base of haptor for a distance of about 0.710 mm. provided with small scales pointed anteriorly. MacCallum (1918) described similar spines for *Protomicrocotyle mirabilis* (MacCallum, 1918) Johnston and Tiegs, 1922.

Oral suckers 0.049 to 0.052 mm. in diameter; pharynx 0.064 by 0.050 mm.; esophagus 0.670 mm. long, bifurcating 0.871 mm. from anterior end of body; ceca with both median and lateral branches; each cecum ends blindly at base of haptor.

Ovary posttesticular, near posterior end of body, consisting of a longitudinally coiled tube with lobed proximal end and both ends posterior. Vitellaria beginning a short distance posterior to intestinal bifurcation and extending not quite to posterior end of body. No eggs present. Atrial pore median and ventral about $\frac{1}{5}$ body length from anterior end. The thick-walled atrium is armed with a circle of 24 or 25 conspicuous, sickle-shaped spines 0.024 mm. long, all of approximately equal length (Fig. 5). Vagina a conspicuous, muscular and glandular organ lying near but to the left and rear of

*Studies from the Department of Zoology, University of Nebraska, No. 260.

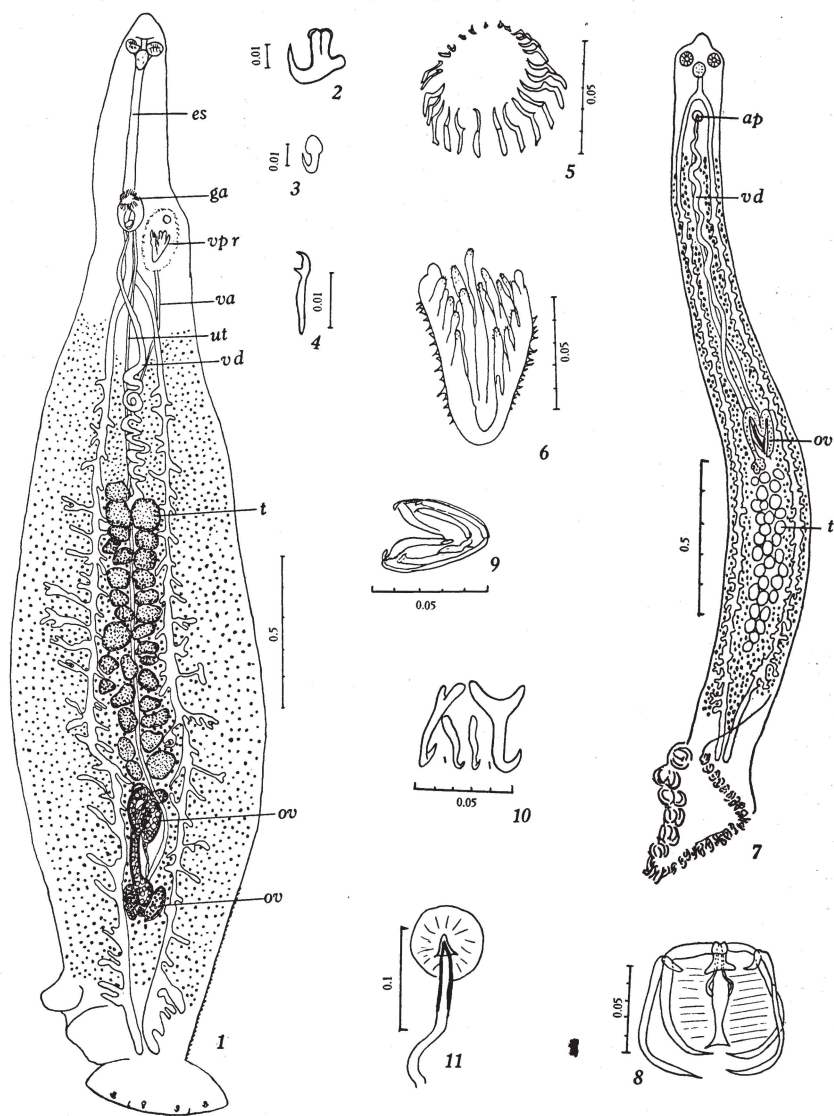


PLATE I

Fig. 1. *Lethacotyle fijiensis*. Entire worm, ventral view.

Figs. 2-4. Haptoral hooks of *L. fijiensis*.

Fig. 5. Hooks of genital atrium of *L. fijiensis*.

Fig. 6. Vaginal processes of *L. fijiensis*.

Fig. 7. *Cemocotyle saquae*. Ventral view.

Fig. 8. Large clamp of *C. saquae*. Ventral view.

Fig. 9. "Muzzle" type clamp of *C. saquae*. Lateral view.

Fig. 10. Haptoral hooks of *C. saquae*.

Fig. 11. Genital atrium and cirrus of *C. saquae*.

genital atrium. It contains a basal cluster of thinly chitinized processes of varying length most of which are long and slender rather than cone-shaped as in *P. pacifica*. An odd feature is the presence of minute spines on the tips and in some cases along the sides of these vaginal processes (Fig. 6). These fine spines can be seen only by high magnification but they do not occur in *P. pacifica*.

Testes 30, in two rows filling midbody region between ceca anterior to ovary. Vas deferens sinuous between ceca, then straightening near bifurcation of ceca.

HOST: yellow jack (Family Carangidae)

LOCATION: Gills

LOCALITY: Suva, Fiji Islands

TYPE SPECIMENS U. S. Nat. Mus. Helminth. Collection No. 48718.

GENERIC DIAGNOSIS OF LETHACOTYLE. Characters of the subfamily Vallisiinae Price, 1943 as emended by Sproston, 1946. Clamps lacking. Three pairs of hooks on the small, lobe-like haptor. Atrial hooks of one type. Vagina muscular and glandular, with chitinized processes. Type species: *L. fijiensis*.

The name *Lethacotyle* is from *letha* = forgetting, and *cotyle* = cup, and refers to the absence of clamps.

DISCUSSION: This trematode is most closely related to *Protomicrocotyle* Johnston & Tiegs, 1922, differing chiefly in the entire absence of all clamps. While there is a possibility that these could have been lost, both specimens were in excellent condition and had retained even the minute hooks of the haptor. Two species of *Protomicrocotyle* have been named, *P. mirabilis* (MacCallum, 1918) Johnston & Tiegs, 1922 and *P. pacifica* Meserve, 1938.

P. pacifica differs, in addition to having four clamps, in the number, size, and shape of the haptoral hooks; in very different atrial spines; in shape of the vaginal processes. *P. mirabilis* is still inadequately described. It resembles *L. fijiensis* in the shape of the largest haptoral hooks, location of the vagina, and general shape of the ovary. *P. mirabilis*, however, has four clamps; the structure of the vagina is different; and there are two sizes of spines in the genital atrium.

Another related genus is *Bilaterocotyle* Chauhan, 1945 based on a species (*B. chirocentrosus*) from the gills of *Sciaena belengeri* and *Chirocentrus dorab* at Bombay, India. It was distinguished from *Protomicrocotyle* by the presence of six rather than four clamps. It differs from *Lethacotyle* in possessing the six clamps, an unarmed vagina, and the ovary is at midbody.

EXPLANATION OF PLATES

All the drawings were made with the aid of a camera lucida. The value of the projected scale is indicated in millimeters in each figure.

ABBREVIATIONS USED IN FIGURES

<i>ap</i> atrial pore	<i>sr</i> seminal receptacle
<i>c</i> cirrus	<i>t</i> testis
<i>ch</i> cirrus hooks	<i>ut</i> uterus
<i>es</i> esophagus	<i>va</i> vagina
<i>ga</i> genital atrium	<i>vc</i> vaginal cone
<i>lp</i> lateral plate of atrial cavity	<i>vd</i> vas deferens
<i>mp</i> median plate of atrial cavity	<i>vp</i> vaginal pore
<i>ov</i> ovary	<i>vpr</i> vaginal processes

B. Family Microcotylidae Taschenberg, 1879

b. Subfamily Gastrocotylinae Sproston, 1946

2. *Pseudaxine indicana* Chauhan, 1945

HOST: "salala" or mackerel (Family Scombridae)

LOCATION: Gills

LOCALITY: Suva, Fiji Islands

This report constitutes a new host and geographical record. Chauhan records it from *Chrysophrys berda* from the coast of India. A single specimen collected in Fiji is deposited at U. S. Nat. Mus. Helminth. Collection, No. 48721.

C. Subfamily Microcotylinae Monticelli, 1892

3. *Cemocotyle sagae* n.sp. (Figs. 7-11)

DESCRIPTION (Based on three specimens. Measurements are of the holotype): Length 3.095 mm., greatest width 0.272 mm. Anterior end conical, widening abruptly at level of oral suckers. Body width increasing gradually to a maximum near midbody, then remaining about the same. Haptor asymmetrical, V-shaped, bearing three pairs of hooks near its posterior end (Fig. 10). The lateral, largest hooks have bifid roots, strongly curved tips, and measure 0.040 mm. in length. The mesial, medium-sized hooks have unforked roots, slightly curved points and measure 0.027 mm. in length. The smallest hooks are only 0.006 mm. long, with sharp point and root region showing three fine parallel lines. Eighteen to 23 small clamps occur on the longer (left) side of the haptor; six larger clamps are on the shorter (right) side. Larger clamps, of typical microcotylid structure, measure 0.060 mm. long and 0.068 mm. wide (Fig. 8). The smaller clamps measure 0.034 to 0.147 mm. in length by 0.045 to 0.181 mm. in width. Many of these smaller clamps have the typical microcotylid structure but a varying number are of the "muzzle" type (Fig. 9) described by MacCallum (1913). These are seen in side view and have anterior and posterior halves gaping apart like clam shells rather than like a muzzle. In these clamps, the single median sclerite is replaced by a median pair, and each half of the clamp has an anterior and a posterior pair of sclerites. Each of the four latter has a minute, spine-like piece at its tip, and the anterior-median sclerite is also sharply pointed. Of 20 small clamps in the holotype specimen, only two were of the "muzzle" type. The number and location of such clamps can be indicated for each specimen by enumerating the numbers beginning at the anterior end of the haptor and placing the "muzzle" types in parentheses. Holotype: 5 + (2) + 13. Paratypes: (10) + 4 + (2) + 3 + (3); (7) + 2 + (9).

Oral suckers 0.037 mm. in diameter; pharynx 0.040 by 0.037 mm., esophagus 0.188 mm. long, bifurcating about 0.335 mm. from anterior end of body. Ceca with both lateral and median side branches except that the anterior 0.355 mm. and the posterior 0.268 mm. are without branches. Ceca end at anterior edge of the short side of the haptor.

Ovary approximately at midbody; poorly defined; it is tubular and seems to show two longitudinal coils. Neither a seminal receptacle nor a vagina could be seen. Uterus a straight tube leading to the ventral atrial pore just anterior to intestinal bifurcation. A conspicuous atrial or genital bulb present with weak radial striations and a chitinous, triradiate lumen into which the chitinous cirrus opens. Vitellaria lateral along the branched extent of the ceca and median to ceca posterior to testes; not extending posterior to ceca. A

single collapsed egg measured 0.075 by 0.017 mm. It had a short twisted filament at its anterior end but none at its more pointed posterior end. It may have been abnormal. Testes 32 to 35, rounded, postovarian, extending posteriorly from ovary about 0.084 mm., not reaching ends of ceca. Vas deferens almost straight until about halfway to genital pore where it becomes slightly sinuous. Cirrus a straight, unspined, chitinous tube about 0.045 mm. long and 0.008 mm. wide at its base. Its distal end is abruptly pointed.

HOST: "Saq" (*Caranx* sp.)

LOCATION: Gills

LOCALITY: Suva, Fiji

TYPE SPECIMEN: U. S. Nat. Mus. Helminth. Collection, No. 48719

DISCUSSION: The genus *Cemocotyle* was named by Sproston (1946:450) for *Microcotyle carangis* MacCallum, 1913 from *Caranx crysos* from the North American Atlantic. The genus resembles *Microcotyle* except for the haptor which is asymmetrical with typical clamps on the short side but with some peculiar "muzzle" type clamps on the longer side. Two pairs of hooks were described at the posterior tip of the haptor.

The excellent type specimen of *C. carangis*, mounted with a paratype, was kindly loaned by Dr. E. W. Price. It shows the third pair of very small haptoral hooks (about 5 μ long) which resemble those of *C. saque*. The "muzzle" type clamp is very clearly distinct consisting essentially of six sclerites in three rows each of two, end to end sclerites. The conspicuous vagina possesses pointed chitinous processes suggestive of *Protomicrocotyle*. The vaginal pore is ventral. Although the pores are not distinct, it is believed the uterus opens with the cirrus rather than separately.

C. saque is very different from *C. carangis* in its unspined genital atrium, simple chitinous cirrus, distribution of vitellaria, and much smaller size. The chitinous cirrus is somewhat similar to that in *Microcotyloides incisa* (Linton, 1940) Fujii, 1944 which, however, has in addition a prostatic bulb as well as other differences.

4. *Lintaxine microcotyla* n.sp. (Figs. 12-17)

DESCRIPTION (Based on 9 specimens; with measurements of the holotype): Total length 4.134 mm., greatest width 0.302 mm. near midbody; almost equally wide along entire length. Left side of haptor 1.3 mm. long, bearing 33 large, stalked clamps; right side of haptor 0.838 mm. long, bearing about 61 exceedingly minute clamps. Large clamps 50 to 60 μ in greatest diameter; small clamps almost incredibly small, only 8 to 9 μ in diameter. In spite of this minute size, the delicate armature of the small clamps has sclerites similar to those of the large clamps. Large clamps (Fig. 13) with the following sclerites: median sclerite with bifid posterior end; directly at its tip ventrally is a pair of small, curved pieces curving apart medianly but meeting at each end; a pair of outer, lateral sclerites with sharp bifid tips almost meeting at distal end of clamp; an inner, shorter, lateral pair of sclerites, each with a short transverse piece at the distal end. At the proximal junction of the lateral sclerites on each side, a short piece with hook-like point extends diagonally inward. Inconspicuous, transverse striations occur within the wall of the clamp.

Mouth subterminal; oral sucker ovoid, 0.044 to 0.049 by 0.061 to 0.070 mm. Pharynx 0.036 by 0.034 mm.; esophagus 0.275 mm. long; ceca un-

branched for about 0.194 mm., then with lateral branches until shortly anterior to haptor where they become unbranched, extending into haptor about 2/3 its length.

Testes with somewhat indistinct outline, probable number 26 to 31; postovarian; intercecal; from level of ovary to slightly less than halfway to posterior end of body. Vas deferens sinuous, leading to an armed, thin-walled sac, the cirrus, just posterior to the genital atrium. Cirrus hooks in right and left sets, each set consisting of a dorso-ventral row of 7 hooks (Fig. 15) with broad bases and recurved tips. In these rows the three middle hooks are largest, the next one on each side somewhat smaller, while the most dorsal and ventral hooks are smallest.

Ovary near midbody, tubular, extending forward about 0.817 mm., then backward a short distance. Uterus a straight tube. Genital atrium large; ventral to intestinal bifurcation; encircled with small gland cells; provided with three spiny plates or pads, one median with a transverse anterior edge measuring 0.070 mm. across and armed with rather long spines, two lateral and more dorsal (Fig. 14). Vagina very short but conspicuous, opening on median dorsal surface opposite distal end of ovary, approximately at midbody; it consists of an ovoid, unarmed sac containing a ventral, cone-shaped papilla. Gland cells surround the vaginal sac (Fig. 17). A small, spherical seminal receptacle lies just posterior to the vagina. Vitellaria begin shortly posterior to genital atrium and extend to a level about opposite hindmost testis. Only one normal egg was seen (Fig. 16); it measured 0.121 by 0.040 mm. and had a filament at each end.

HOST: "ribbon fish"

LOCATION: gills

LOCALITY: Suva, Fiji Islands

TYPE SPECIMEN: U. S. Nat. Mus. Helminth. Collection, No. 48720

DISCUSSION: The only other species in the genus *Lintaxine* Sproston, 1946 is *L. cokeri* (Linton, 1940) Sproston, 1946 (= *Heteraxine cokeri* Linton, 1940) from the gills of the freshwater drum, *Aplodinotus grunniens*, at Fairport, Iowa. This rather surprising relationship prompted an examination of the type material of that species. The slide, containing the holotype and 5 paratypes, was kindly loaned by Dr. E. W. Price. Since Linton's description is rather incomplete a few details are added here. The clamps, all sessile, are of typical *Axine* structure as suspected by Sproston. The "flange of unarmed haptor tissue" noted by Sproston is not very evident and probably represents only the edge of the body. The large clamps have rather strong sclerites (Fig. 18). At the extreme posterior tip of the body is a single clamp about half the size of the large clamps and twice the size of the small clamps. There is a single, median, unarmed, dorsal vaginal pore midway between the anterior edge of the ovary and the atrial pore. The armature of the cirrus (Fig. 19) is complex although consisting of a single ring or spines or hooks, not two rings as described by Linton. Ventrally and laterally there is a partial circle of slightly curved, thorn-shaped hooks, 12 in number, all about equal in size. Dorsally in the ring, these hooks are replaced by very long, needle-like spines, 7 in number. The three middle spines are longest and are very slightly knobbed at the end. To each side of these three, the spines are progressively shorter, pointed, and provided with curious, hair-like processes on the outer side of their distal halves. All these spines project into the atrial cavity from the anterior side.

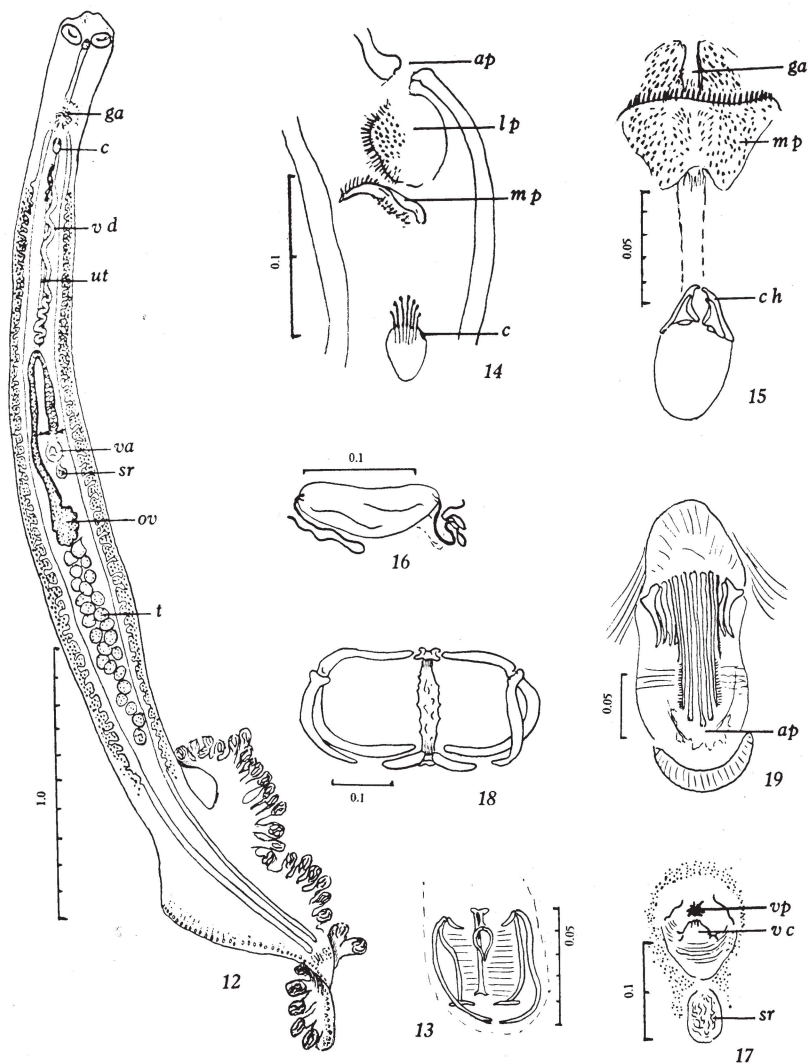


PLATE II

Fig. 12. *Lintaxine microcotyla*. Ventral view.Fig. 13. Large haptor clamp of *L. microcotyla*. Ventral view.Fig. 14. Genital atrium and cirrus of *L. microcotyla*. Lateral view.Fig. 15. Genital atrium and cirrus of *L. microcotyla*. Ventral view.Fig. 16. Egg of *L. microcotyla*.Fig. 17. Dorsal view of vaginal region of *L. microcotyla*.Fig. 18. Large clamp of *Lintaxine cokeri* (Linton, 1940). Ventral view.Fig. 19. Cirrus and cirrus spines of *L. cokeri*. Ventral view.

This study of the type specimens of *Lintaxine cokeri* confirmed relationship to the Fijian material. Generic criteria now used in taxonomy of Monogenea would seem to permit the two species in one genus. There are, however, a number of distinct differences. Perhaps the most conspicuous of these, other than sizes, are the stalked large clamps and the very minute and numerous small clamps of *L. microcotyla*. The armature of the cirrus and atrium is also different, particularly the numerous small atrial spines and the bilateral rows of cirrus hooks in *L. microcotyla*. However, the thorn-like shape of the cirrus hooks is similar in both species. *L. microcotyla* has a more posterior vaginal pore and a smaller egg with a filament at each end rather than at one end only.

In view of the considerable host specificity shown by Monogenea, the resemblance of this species from a marine fish in the Fiji Islands to a species from a freshwater fish in Iowa is surprising. It is unfortunate that the "ribbon fish" was not more exactly identified. It might be noted that the drum, *Aplodinotus grunniens*, is one of the few freshwater species in the family Sciaenidae. Its marine affinities are shown by the fact it is host to two species of *Microcotyle*, a large genus of marine Monogenea. The family Sciaenidae is not known to occur in the islands of the South Pacific.

SUMMARY

The following monogenetic trematodes from marine fishes of Fiji are described: *Lethacotyle fijiensis* n.gen., n.sp. (Family Discotylidae) from a "yellow jack" (Family Carangidae); *Cemocotyle saque* n.sp. (Family Microcotylidae) from a "saqa" (*Caranx* sp.); and *Lintaxine microcotyla* n.sp. (Family Microcotylidae) from a "ribbon fish." *Pseudaxine indicana* Chauhan, 1945 (Family Microcotylidae), formerly known from India, is reported from a "salala" (Family Scombridae) in Fiji.

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