

# Metazoan Ectoparasites of Some Cultured Fishes from Laguna Lake and Vicinities

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## ABSTRACT

*Chanos chanos* and *Oreochromis mossambicus* were collected from fishponds in Obando, Bulacan and Malabon, Rizal, respectively, in 1982 and 1983. *Transversotrema laruei* (Trematoda) was recovered from the skin of both fishes. *Argulus indicus* (Crustacea) was also found on the skin of *O. mossambicus*.

Laguna Lake fishes studied in 1982 and 1983 were *Clarias batrachus*, *Ophicephalus striatus* and *Oreochromis niloticus*. *Actinocleidus* sp. (Trematoda) was recovered from the gills of *Clarias batrachus* while *Argulus indicus* was recovered from the skin of *O. striatus*. *T. laruei* infested the skin of *O. niloticus* while *Cichlidogyrus sclerosus* (Trematoda) was recovered from the gills.

Fishes collected from La Mesa Reservoir in 1989 and 1990 were *Arius thalassinus*, *Glossogobius giurus*, *Oreochromis niloticus*, *Tilapia zillii* and *Therapon plumbeus*. *Cleidodiscus* sp. (Trematoda) was recovered from the gills of *A. thalassinus*. *Ergasilus philippinensis* (Crustacea) was found on the gills of *G. giurus*. *Cichlidogyrus sclerosus* and *E. philippinensis* were recovered from the gills of *O. niloticus* and *Tilapia zillii*. *Cichlidogyrus tiberianus*, *C. tilapiae*, *C. longicornis gravivaginus* were also found on the gills of *T. zillii*. The gills of *Therapon plumbeus* were infested with *E. philippinensis* and *Diplectanum* sp. (Trematoda).

## INTRODUCTION

The decline of fish catches from natural waters has increased the importance of aquaculture in providing food for the world's rapidly growing population. Fish production by aquaculture often involves increasing the density of the fish population under cultivation. The unnaturally high population density favors the spread of diseases and parasites. Every parasite harms its host. If few parasites are present, the effect on the host may be minimal; if large numbers are present, the fish may be killed. A knowledge of the occurrence of parasites on fishes is important for effective aquacultural management.

This paper presents the prevalence and intensity of metazoan parasite infestation on the skin and gills of some fishes from Bulacan and Malabon fishponds, Laguna Lake and La Mesa Reservoir.

## MATERIALS AND METHODS

Specimens of *Chanos chanos* (milkfish) were collected from fishponds in Obando, Bulacan in December 1982 and September 1983. *Oreochromis mossambicus* (Java tilapia) specimens were collected from fishponds in Malabon, Rizal in August and September 1982 and December 1983. *Clarias batrachus* (freshwater catfish) from Laguna Lake were bought from Nepa-Q-Mart, Quezon City from February to August 1983 while the mudfish *Ophicephalus striatus* specimens from the same lake were obtained from Farmers Market, Quezon City, from September to November 1983. Collection of *Oreochromis niloticus* (Nile tilapia) was from a fishpen in Laguna Lake in Angono, Rizal. Fishes collected from La Mesa Reservoir were: *Oreochromis niloticus* in August 1990; *Tilapia zillii* in September 1989 and from March to August 1990; *Therapon plumbeus* (freshwater perch) from April to August 1990; *Arius thalassinus* (green sea catfish) from May to August 1990; and *Glossogobius giurus* (goby) from March to October 1990.

Fresh fish specimens from Bulacan, Malabon and Laguna Lake were examined for skin and gill parasites. Fishes from La Mesa Reservoir were frozen after collection and examined for parasites at a later date. Fish length in centimeters and weight in grams were recorded.

Fins, mucus scrapings, scales, skin and gills were first examined by ocular inspection and then under the stereomicroscope. Gills of small fish were compressed between two slides and examined. Gills of large fish were teased then placed in jars for washing and decanting. To dislodge monogenea from the gills of fresh specimens, magnesium sulfate crystals were added to the water used for washing and decanting. The species and number of parasites recovered from each host were recorded.

Trematodes recovered were fixed in AFA (alcohol-formalin-acetic acid), stained in borax carmine or acetocarmine and mounted in balsam. Temporary mounts in glycerine were also prepared.

Crustacean parasites were fixed in 70% ethyl alcohol and mounted in glycerine. Some specimens were stained with carbol fuchsin and mounted in balsam.

Microphotographs and camera lucida drawings of the parasites were made from mounted specimens.

For each fish species, the prevalence and intensity of infestation by each parasite species were determined. The prevalence of infestation is the percentage of fish infested of the total fish examined. The intensity of the infestation or average parasite burden was determined as follows:

$$\text{average parasite burden} = \frac{n}{n_1}$$

where  $n$  = number of parasites

$n_1$  = number of fish infested

## OBSERVATIONS AND RESULTS

*Chanos chanos* specimens had fork lengths ranging from 6.0 to 13.5 cm and weights from 2.2. to 30.4 g. *Oreochromis mossambicus* were 6.1 to 13.1 cm in standard lengths and weighed from 7.6 to 70.4 g. Ranges in standard lengths and weights of fishes from Laguna Lake were: *Clarias batrachus*, 12.4 to 19.0 cm, 14.5 to 79.0 g; *Ophicephalus striatus*, 16.0 to 28.8 cm, 54.2 to 325.0 g; and *Oreochromis niloticus*, 6.2 to 15.1 cm, 8.1 to 104.8 g. The total lengths and weights of the fishes collected from La Mesa Reservoir were: *Arius thalassinus*,

15.1 to 24.6 cm, 29.1 to 117.9 g; *Glossogobius giurus*, 12.1 to 24.1 cm, 9.5 to 19.0 g; *Tilapia zillii*, 7.9 to 24.1 cm, 8.1 to 218.0 g; *Oreochromis niloticus*, 9.7 to 11.1 cm, 22.5 to 24.8 g; and *Therapon plumbeus*, 6.5 to 12.3 cm, 4.0 to 29.4 g.

The ectoparasites recovered from the different fish hosts are shown in Table 1. Six of the 32 *Chanos chanos* examined were infested with the digenetic trematode, *Transversotrema laruei*. The trematodes were recovered from the skin of fish with fork lengths of more than 10.0 cm. The smaller fish were not infested. The average worm burden was 1.8.

*Transversotrema laruei* was also recovered from the skin of 72 of the 78 *Oreochromis mossambicus* collected from Malabon. The average parasite burden was 42.8.

Of the 114 *Clarias batrachus* examined, 5 were infested with the gill fluke, *Actinocleidus* sp. The intensity of infestation was 4.2.

Three of the 47 *Ophicephalus striatus* examined harbored *Argulus indicus* with an average burden of 2.0.

*Oreochromis niloticus* collected from a Laguna Lake fishpen harbored *T. laruei* and *Cichlidogyrus sclerosus*. Of the two *O. niloticus* specimens collected from La Mesa Reservoir, one was infested with *Cichlidogyrus sclerosus* while the other harbored the copepod, *Ergasilus philippinensis*.

*Tilapia zillii* collected from La Mesa Reservoir has 17.0% infestation with *Cichlidogyrus* spp. with an average burden of 8.1. The species recovered were *C. tiberianus*, *C. tilapiae*, *C. longicornis gravivaginus* and *C. sclerosus*. *Ergasilus philippinensis* was also found on 154 of the 182 fish specimens examined. The average burden was 23.2.

All of the 15 *Therapon plumbeus* collected were infested with *Ergasilus philippinensis* with average burden of 30.1. Seven fish specimens or 46.7% harbored *Diplectanum* sp. with an average burden of 13.9.

Of the 20 *Arius thalassinus* examined, 3 or 15.0% were infested with *Cleidodiscus* sp. with an average burden of 1.0.

Four of the 15 *Glossogobius giurus* examined were infested with *Ergasilus philippinensis*. One to six parasites were recovered from infested fish with an average burden of 2.2.

Descriptions of the 10 species of ectoparasites recovered from the eight fish species studied (with measurements in micra unless otherwise stated) are as follows:

*Cichlidogyrus tiberianus* Paperna, 1960  
(Trematoda: Dactylogyridae)  
Figs. 2 D-G; 4 A-B

Diagnosis (based on three specimens): Body 360.8-564.2 long, maximum width 77.7-129.5. Prohaptor with four lobes, containing two groups of head organs. Two pairs of eyes. Copulatory organ of two parts, ejaculator and accessory piece. Ejaculator 53.6- 55.5 long, consisting of an oval-mouthed funnel which continues as a long sickle-shaped tube with a sharp tip. Adjacent to funnel is accessory piece 38.8-40.7 long, with irregular complicated structure. Vagina opens on left side of body near its center; vaginal prop represented by plate and curled ducts both consisting of sclerotized substance. Opisthaptor with two pairs of anchors of unequal size; first pair longer (31.4-37.0 long), second pair (29.6-31.4 long). Anchors with curved wing attached to shaft. Basal piece of compound bar tapers gradually with tips bent slightly inwards, 37.0-46.2 long, appendages 11.1-13.0 long; V-shaped bar 42.6-55.5 long. Fourteen marginal hooklets, each with well-developed base growing thicker toward its proximal extremity; spike sickle-shaped, outer side with attached needle-like appendage directed parallel to shaft.

Host : *Tilapia zillii*  
Location : gills  
Host locality : La Mesa Reservoir

*Cichlidogyrus tilapiae* Paperna, 1960  
(Trematoda: Dactylogyridae)  
Figs. 1 A-D; 3 A-B

Diagnosis (based on eight specimens): Body 351.5-434.8 long, maximum width 53.6-66.6. Body slender, elongated, tapering gradually at the posterior extremity, where it is much narrower than the transversely oval opisthaptor. Prohaptor with four lobes containing head organs. Eyespots two pairs. Copulatory organ consisting of ejaculator and accessory piece. Ejaculator 18.5- 24.1 long, its funnel-shaped base continues in a narrow tube slightly bent at the tip. Accessory piece shaped as a thin plate 27.8-31.4 long, with folded rims; it originates near the funnel and terminates in a bent bifur-

cated tip. Opisthaptor with two pairs large anchors, two supporting bars and 14 marginal hooklets. Anchors of both pairs about equal in size, 27.8-37.0 long. A small thin wing on shaft of each anchor. Compound bar with basal piece 25.9-31.4 long divided into three segments of equal length by constrictions at two points. Two appendages 11.1-14.8 long join margin of basal piece at points of constrictions. V-shaped bar 42.6-48.1 long with symmetrical tooth-like projections on internal surface. Hooklets with thickened base, a tapering shaft and a sickle-shaped spike. Each hooklet with a needle-like appendage originating at base of spike and running parallel to shaft on side opposite to spike.

Host : *Tilapia zillii*  
 Location : gills  
 Host locality : La Mesa Reservoir

*Cichlidogyrus longicornis gravivaginus* Paperna  
 and Thurston, 1969  
 (Trematoda:Dactylogyridae)  
 Figs. 2 A-C; 4 E-F

Diagnosis (based on three specimens): Body 392.2-573.5 long, maximum width 61.1-107.3. Eyes two pairs, only one pair compound with lenses. Copulatory organ of two parts, ejaculator and accessory piece. Ejaculator 22.2-27.8 long, its funnel-shaped base continues in a narrow tube slightly bent at the tip. Accessory piece 20.4-27.8 long, stouter than ejaculator. Basal piece of compound bar 59.2-61.1 long, its distal ends in the form of wide triangular plates; appendages very long 38.9-46.2. V-shaped bar supported by heavily sclerotized plate which follows the proximal margins of the opisthaptor. Fourteen marginal hooklets.

Host : *Tilapia zillii*  
 Location : gills  
 Host locality : La Mesa Reservoir  
*Cichlidogyrus sclerosus* Paperna and Thurston, 1969  
 (Trematoda: Dactylogyridae)  
 Figs. 2 D-F; 4 A-C

Diagnosis (based on seven specimens): Body 662.5-841.7 long, maximum width 80.0-170.2. Prohaptor with four lobes containing head organs. Eyespots two pairs. Copulatory organ of two parts, ejaculator and accessory piece. Ejaculator begins with an oval mouthed funnel on one side of which is attached a flat basal plate, continues as a sickle-shaped tube gradually narrowing to a sharp tip; ejaculator measured on a straight line from basal plate to tip 32.5-42.5 long; accessory piece robust, sausage-shaped, 35.2-57.5 long. Opisthaptor poorly demarcated from most of body. Anchor two pairs with wings on shafts. Anchors of both pairs equal in size 31.4-33.3 long. Compound bar consists of shallow V-shaped piece with two loop-shaped appendages dividing piece into three nearly equal parts; basal piece 35.2-50.0 long, appendages 15.0-17.5 long. The second bar V-shaped, heavy, a thin shelf or ledge along inner edge, length taken as shortest distance between tips 35.2-52.5; 14 marginal hooklets, hooklets small with poorly developed base.

Host : *Oreochromis niloticus*  
*Tilapia zillii*

Location : gills

Host Locality : Laguna Lake, La Mesa Reservoir

*Diplectanum* sp. Diesing, 1858  
(Trematoda: Dactylogyridae)

Fig. 4 C-D

Diagnosis (based on three specimens): Body elongated, 281.2-310.8 long, maximum width 46.2-61.1. Opisthaptor well delineated from body, transversely oval, with 14 marginal hooks, 2 pairs anchors and 3 transverse connecting bars. Opisthaptor 74.0-98.1 wide. First pair of anchors 29.6-35.2 long, second pair 25.9-31.4 long. One dorsal and one ventral squamodisc present. Eyes two pairs. Intestinal caeca end blindly without posterior fusion.

Host : *Therapon plumbeus*

Location : gills

Host locality : La Mesa Reservoir

*Cleidodiscus* sp. Mueller, 1934  
(Trematoda: Dactylogyridae)  
Figs. 4 E; 5 A

Diagnosis (based on three specimens): Body 693.8-869.5 long, 74.0-99.9 wide. Eyes four, posterior pair larger. Gut bifurcate. Cirrus a simple cuticularized tube. Vitellaria of numerous small and discrete follicles in lateral bands extending from pharyngeal region into peduncle; bands confluent anteriorly and posteriorly. Haptor distinct, discoidal; with two pairs anchors and seven pairs hooklets. Anchors with superficial roots of each pair connected by transverse bar. Bars separate, non-articulate with each other.

Host : *Arius thalassinus*  
Location : gills  
Host locality : La Mesa Reservoir

*Actinocleidus* sp. Mueller, 1937  
(Trematoda: Dactylogyridae)  
Fig. 5 B

Diagnosis (based on four specimens): Body elongated, 325.0-437.5 by 97.5-112.5. Opisthaptor disc-shaped with two pairs of anchors and 14 marginal hooks. Two dissimilar connecting bars between anchors more or less V-shaped, articulating with each other. One bar consisting of two pieces. Eyespots present.

Host : *Clarias batrachus*  
Location : gills  
Host locality : Laguna Lake

*Transversotrema laruei* Velasquez, 1958  
(Trematoda: Transversotrematidae)  
Fig. 5 C

Diagnosis (based on 10 specimens): Body leaf-like, wider than long, length 324.0-402.6, width 628.5-864.0. Eyespots present. Acetabulum 78.6-88.4 in diameter. Oral sucker absent. Mouth opening directly into pharynx, 39.3-58.9 in diameter.



Esophagus narrow, bifurcating just anterior to midbody; branches uniting posteriorly forming cycloid intestine. Testes branched one on each side of acetabulum. Ovary with uneven margins, anterior to, and smaller than left testis. Uterus in testicular region. Vitellaria follicular, heavily developed, in semicircle outside intestinal loop. Egg large 49.0-117.8 long by 78.4-88.2 wide.

Host : *Oreochromis mossambicus*  
Location : skin (under scales)  
Host locality : Malabon, Rizal

*Ergasilus philippinensis* Velasquez, 1951  
(Crustacea : Ergasilidae)  
Fig. 5 D

Diagnosis (based on 10 specimens): Female - Total length 556.9- 885.4. Cephalothorax 285.6-357.0 long, 207.1-285.6 wide, violin- shaped including first leg-bearing segment, rounded anterior end slightly wider than truncated posterior end; eyespot near anterior margin; second to fifth leg-bearing segments well- defined, their widths decreasing posteriorly; free-thoracic segments combined length 71.4-142.8, width anterior 142.8-192.8, posterior width 64.3-142.8; genital complex subcircular, length 50.0-64.3, width 57.1-78.5; abdomen three-segmented, segments nearly equal in size, abdomen length excluding uropods 42.8-78.5, width 35.7-42.8. Egg sac length 178.5-285.6, width 71.4-92.8. First antenna six-segmented, with numerous setae. Second antenna slender as long as total body length. First four pairs of legs biramous, all rami with three segments. Fifth leg uniramous, one segmented, bearing two apical setae. Uropods rectangular about 3/4 length of abdomen. Male unknown.

Host : *Glossogobius giurus*  
*Tilapia zillii*  
*Oreochromis niloticus*  
*Therapon plumbeus*  
Location : gills  
Host locality : La Mesa Reservoir  
*Argulus indicus* Weber, 1892  
Fig. 5 E

Diagnosis (based on five specimens): Carapace ovate, considerably narrowed anteriorly with broad lateral lobes which fall slightly short of the abdomen, just reaching it or slightly overlapping it. Body of males, 3.68-5.36 mm by 2.76-4.35 mm; females 4.44-5.54 mm by 3.77-4.15 mm. Cephalic area broadly triangular, distinctly separated from the rest of the carapace and projecting a little anteriorly. Anterior respiratory area minute, posterior one very large and oblong. Knob or hook lacking on anterior surface of first antennae. Basal plate of second maxillae not lobed, tips of maxillary teeth blunt, ribs of suction cup composed of three rods. Swimming lobe of fourth appendage boot-shaped, heel pressed against end of thorax, toe extending to or beyond edge of abdomen. Whole animal golden yellow flecked with black.

Host : *Ophicephalus striatus*  
*Oreochromis mossambicus*

Location : skin

Host locality : Laguna Lake; Malabon, Rizal

## DISCUSSION

*Transversotrema laruei* has been previously reported on *Lates calcarifer* and as progenetic cercaria on *Mollienesia latipinna*, *Scatophagus argus*, *Mugil* sp., *Megalops cyprinoides*, *Tilapia mossambica*, *Anodontostoma chacunda*, *Hemiramphus georgii* and *Therapon argenteus* (9). The recovery of this trematode from the skin of *Oreochromis mossambicus* and *Chanos chanos* in Malabon and Obando fishponds, respectively, and from *Oreochromis niloticus* from Laguna Lake in the present study, indicates not only wide host specificity of the parasite but also its adaptation to a freshwater habitat. Cercaria of *T. laruei* develops in the snail, *Thiara riquetti* Grateloup (9). The introduction of *T. laruei*-infested tilapia to water bodies inhabited by its snail host, provided opportunities for the establishment of the parasite in this water body.

Several species of *Cichlidogyrus* have been reported in several tilapia species in Israel and Africa (6, 7). Duncan (1973) recovered *C. sclerosus* from the gills of cultured *Tilapia mossambica* in Sampaloc Lake and Alligator Lake, Laguna. His report is the first record of *Cichlidogyrus* outside Africa and the Middle East. The spread of the parasite to the Philippines may have been due to the introduction of infested tilapia originating from Middle East or African stocks. The present study is the first report of *Cichlidogyrus* infestation of tilapia from La Mesa Reservoir.

*Diplectanum* has been described as parasites of marine fish (4). The only *Diplectanum* reported from South East Asia is *Diplectanum* sp. on *Epinephelus tauvina* cultured in net cages in Singapore (4). *Diplectanum* sp. has now been recorded on a Philippine fish from a freshwater habitat. Further studies are required for specific identification of the specimens recovered.

Various species of *Cleidodiscus* have been found on many species of freshwater fishes in North America (3). There is no record of *Cleidodiscus* on culture fishes in South East Asia. The recovery of *Cleidodiscus* sp. from the gills of *Arius thalassinus* in the present study is the first report of this genus on Philippine fish.

*Actinocleidus* sp. found in the present study on the gills of *Clarias batrachus* was previously reported on a related host, *Clarias macrocephalus* from Lumbang, Laguna (2). In Indonesia, *Actinocleidus* sp. was reported on *C. batrachus* (4). Many species of *Actinocleidus* have been reported from North American freshwater fishes (3). Specific identification of the specimens on *Clarias batrachus* requires further study.

The genus *Ergasilus* comprises more than 80 species widespread in various marine and freshwater habitats of the world. Only four species have been recorded from South East Asia: *Ergasilus thailandensis* on the gills of *Pontius ophroides* from Thailand; *E. borneonensis* from an unidentified fish in Indonesia; *E. mugilis* from *Glossogobius giurus* in Thailand; and *E. philippinensis* from the gills of *G. giurus* in the Philippines (4). Kabata (1985) doubts the identification of the species found on *G. giurus* in Thailand. Prior to this study, the only published record of *E. philippinensis* on fish was from Laguna Lake from the gills of *G. giurus* (4) which led Kabata (1985) to surmise that this parasite is fairly host-specific. Mamaril (1986) reported the presence of a single specimen of *E. philippinensis* in a plankton sample collected from La Mesa Reservoir. The recovery of this copepod from the gills of *G. giurus*, *T. zillii*, *O. niloticus* and *Therapon plumbeus* in the present study is the first record of *E. philippinensis* on host other than *G. giurus* and indicates that the parasite has a wider host specificity than surmised earlier.

There are about 100 species of *Argulus* distributed worldwide in both marine and freshwater habitats. Only three species have been reported on South East Asian cultured fish: *A. foliaceus* (L), *A. indicus* Weber, 1892 and *A. siamensis* Wilson, 1926. In Indonesia, *A. indicus* has been recovered from several fishes including *Ophicephalus striatus* and *Clarias* sp. In Thailand, *Argulus indicus* was found on tilapia and other fishes (4). It appears that *Argulus indicus* has a relatively wide fish host specificity.

**Table 1. Prevalence and intensity of ectoparasitic infestation on the different fish hosts**

Fish species*	Locality and period of fish collection	Parasite species	Prevalence (%)	Intensity
<i>Chanos chanos</i> (32)	Obando, Bulacan Dec. 1982, Sept. 1983	<i>Transversotrema laruei</i>	18.8	1.8
<i>Oreochromis mossambicus</i> (78)	Malabon Aug. - Dec. 1982 Jan. 1983	<i>T. laruei</i>	92.3	42.8
		<i>Argulus indicus</i>	9.0	1.7
<i>Clarias batrachus</i> (114)	Laguna Lake Feb. - Aug. 1983	<i>Actinocleidus</i> sp.	4.4	4.2
<i>Ophicephalus striatus</i> (47)	Laguna Lake Sep. -Nov. 1983	<i>Argulus indicus</i>	6.4	2.0
<i>Oreochromis niloticus</i> (127)	Laguna Lake Aug. 1982 - Jan 1983	<i>T. laruei</i>	5.1	6.2
		<i>Cichlidogyrus sclerosus</i>	1.6	1.0
	(2)	La Mesa Res. Aug. 1990	<i>C. sclerosus</i> <i>Ergasilus philippinensis</i>	50
<i>Tilapia zillii</i> (182)	La Mesa Res. Sept. 1989 - Aug. 1990	<i>Cichlidogyrus</i> spp.	17.0	8.1
		<i>E. philippinensis</i>	84.6	23.2
<i>Therapon plumbeus</i> (15)	La Mesa Res. Apr. - Oct. 1990	<i>E. philippinensis</i>	100.0	30.1
		<i>Diplectanum</i> sp.	46.7	13.9
<i>Arius thalassinus</i> (20)	La Mesa Res. May - Aug. 1990	<i>Cleidodiscus</i> sp.	15.0	1.0
<i>Glossogobius giurus</i> (15)	La Mesa Res. Mar. - Oct. 1990	<i>E. philippinensis</i>	26.7	2.2

\* Sample size in parenthesis

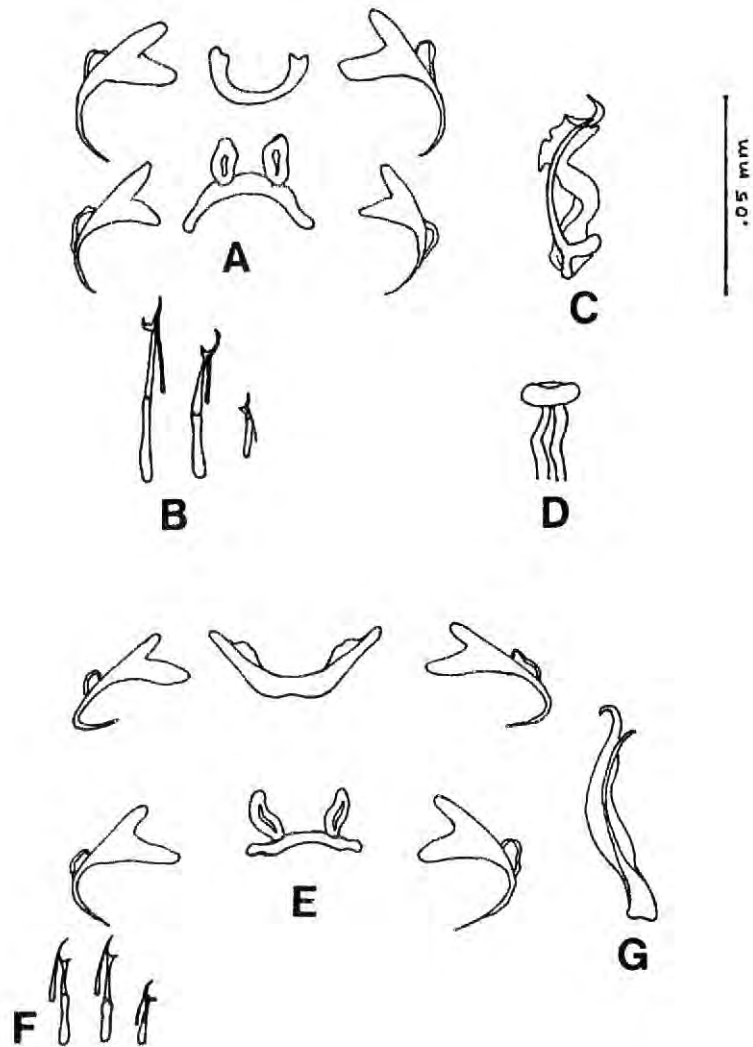


Figure 1. A-D, *Cichlidogyrus tiberianus* A- anchors and bars, B - hooklets, C - copulatory organ, D - vaginal prop; E-G *C. tilapiae* E - anchors and bars, F - hooklets, G - copulatory organ

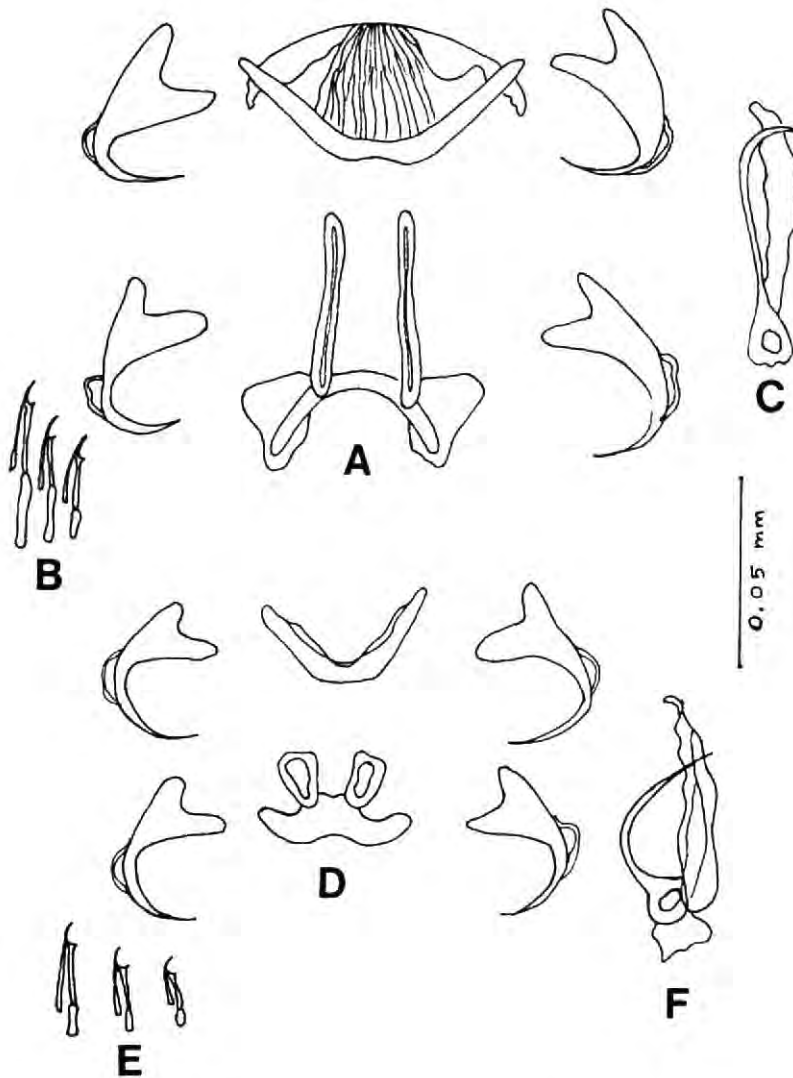


Figure 2. A-C. *C. longicornis gravivagus* A - anchors and bars, B - hooklets, C - copulatory organ; D-G. *C. sclerosus* D - anchors and bars, E - hooklets, F - copulatory organ

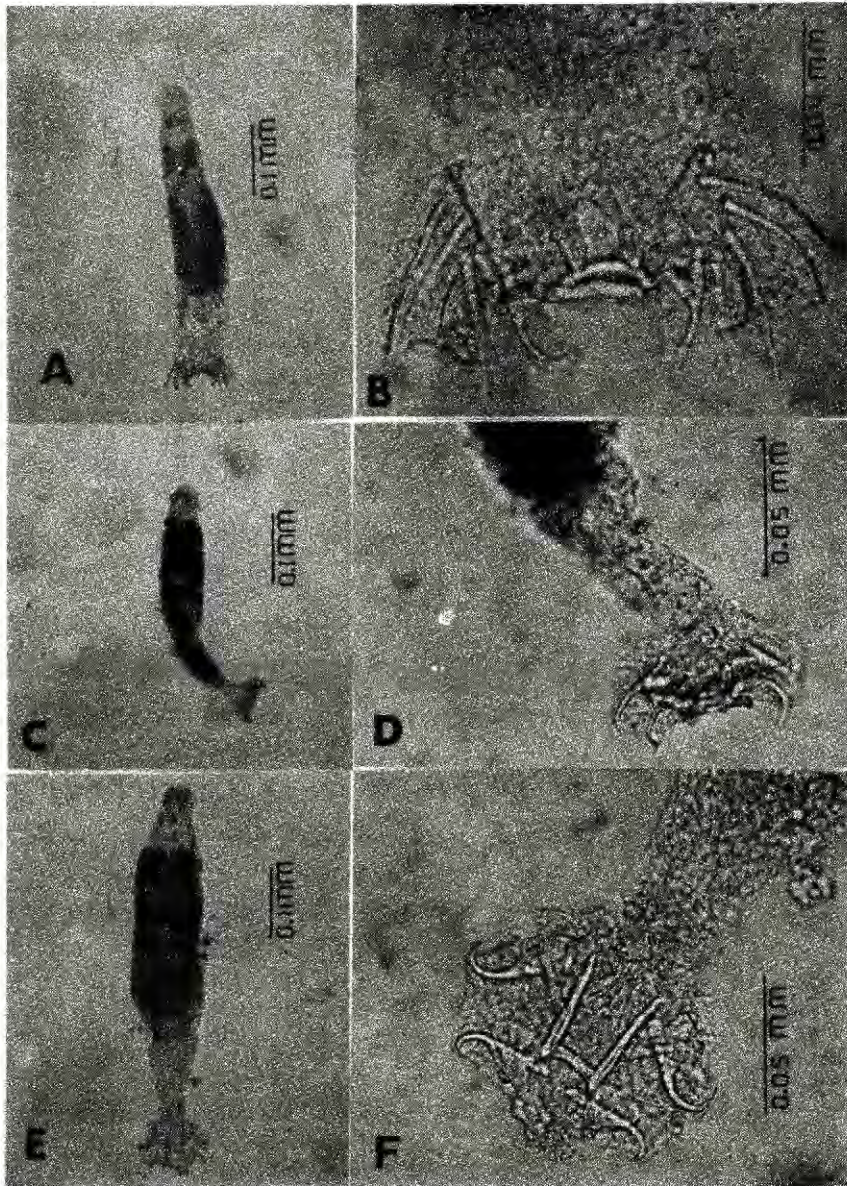


Figure 3. A - *C. tiberianus*, whole worm  
B - *C. tiberianus*, opisthaptor  
C - *C. tilapiae*, whole worm  
D - *C. tilapiae*, opisthaptor  
E - *C. longicornis gravivaginus*, whole worm  
F - *C. longicornis gravivaginus*, opisthaptor

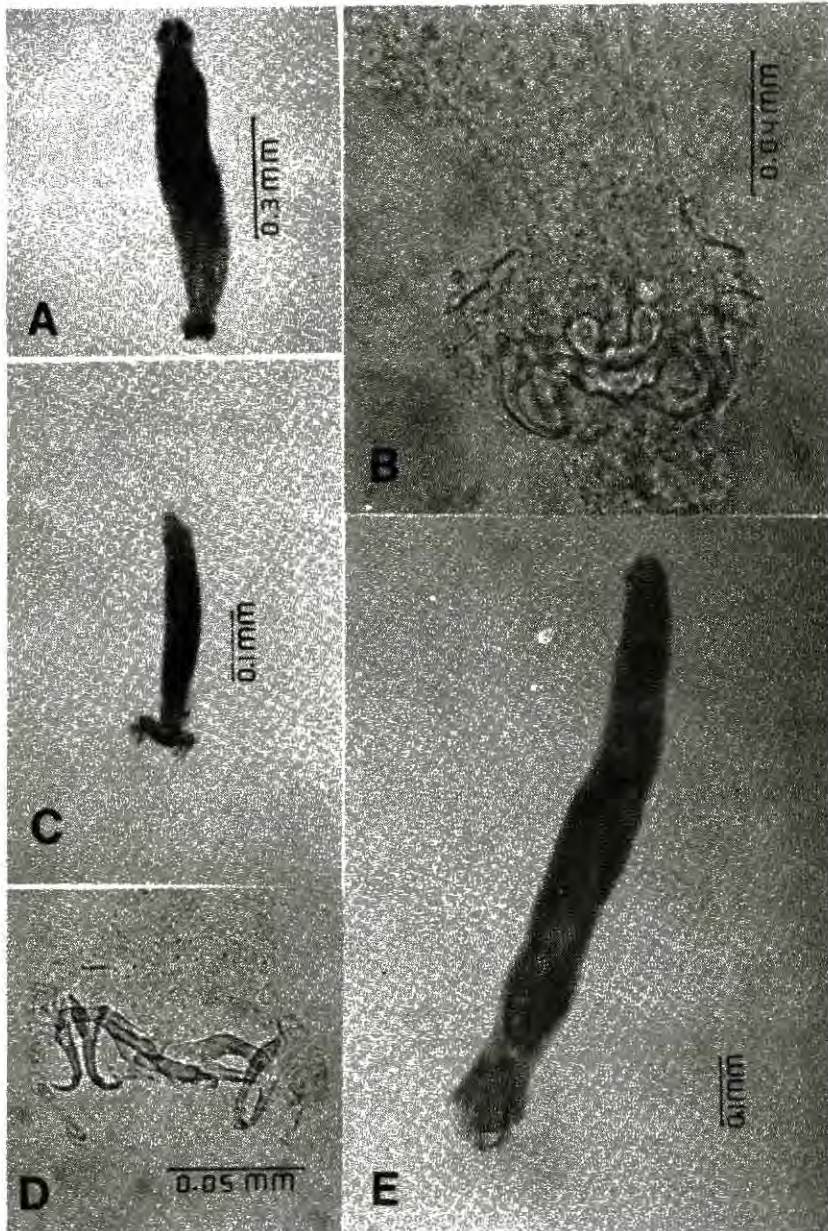


Figure 4. A - *C. sclerosus*, whole worm  
 B - *C. sclerosus*, opisthaptor  
 C - *Diplectanum* sp., whole worm  
 D - *Diplectanum* sp., opisthaptor  
 E - *Cleidodiscus* sp., whole worm



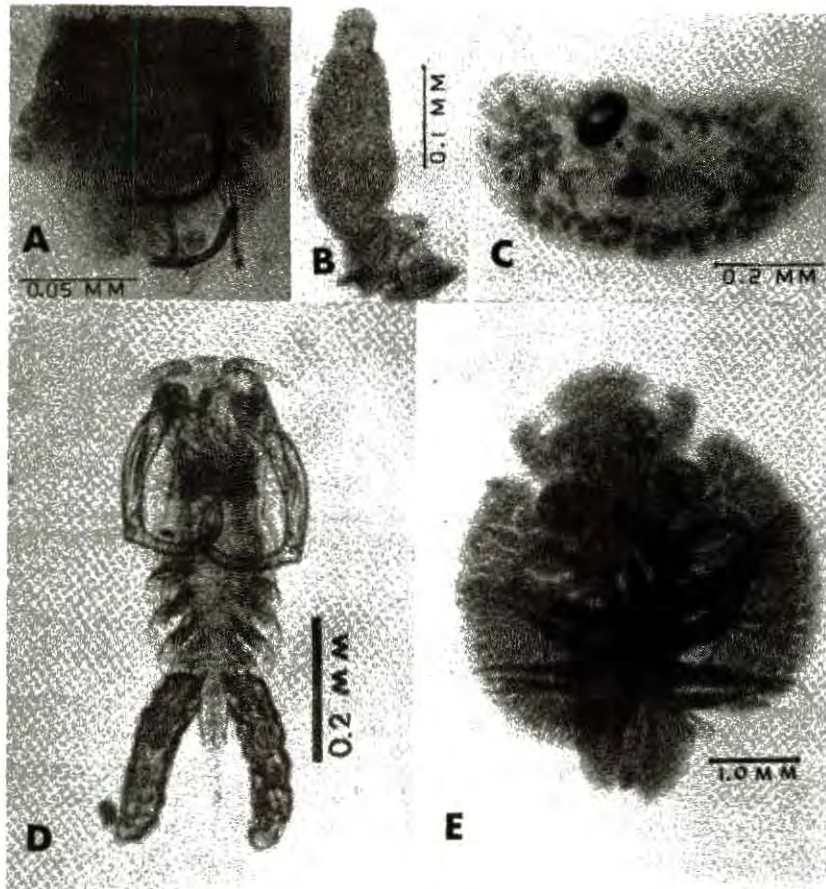


Figure 5. A - *Cleidodiscus* sp., opisthaptor  
B - *Actinocleidus* sp.  
C - *Transversotrema laruei*  
D - *Ergasilus philippinensis*  
E - *Argulus indicus*

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