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DIGENETIC TREMATODES OF MARINE FISHES FROM THE KUWAITI
COAST OF THE ARABIAN GULF

A Thesis
Presented to
The Faculty of the
Department of Biological Sciences
University of the Pacific

In Partial Fulfillment
of the Requirements for the Degree
Master of Science

by
Faiza Yousef Al-Yamani

May 1979

This thesis, written and submitted by

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TABLE OF CONTENTS

	Page
I. ACKNOWLEDGEMENTS.	iii
II. INTRODUCTION.	1
III. MATERIALS AND METHODS	2
IV. DESCRIPTION AND DISCUSSION OF SPECIES	4
FAMILY HEMIURIDAE Luhe, 1901.	4
<u>Opisthadena kuwaiti</u> n. sp.	4
<u>Lecithocladium bulbolabrum</u> Reid, Coil and Kuntz, 1966.	8
<u>Clupenuroides sheemi</u> n.g., n. sp.	15
FAMILY ANGIODICTYIDAE Looss, 1902	17
<u>Hexangium sigani</u> Goto and Ozaki, 1929	17
FAMILY PLEORCHIIDAE Poche, 1926	19
<u>Pleorchis arabicus</u> n. sp.	19
FAMILY OPECOELIDAE Ozaki, 1925	25
<u>Helicometrina nimia</u> Linton, 1910.	25
<u>Plagioporus</u> sp.	29
FAMILY ACANTHOCOLPIDAE Luhe, 1910	31
<u>Stephanostomum</u> sp.	31
V. HOST-PARASITE LIST.	33
VI. LIST OF FISHES NEGATIVE FOR TREMATODES.	35
VII. LITERATURE CITED.	38
VIII. ABSTRACT.	40
IX. PLATES.	41

ACKNOWLEDGMENTS

The writer wishes to express appreciation for the assistance of several persons who have contributed to the progress of this investigation: Dr. Fuad M. Nahhas under whose guidance and constant encouragement this study has been made; Mr. Nizar Hussain, Director, and Dr. Inaam-Ullah Tareen, Head of the Pathology Unit, of the Kuwait Institute for Scientific Research for making the facilities of the Marine Station available; and to the several ichthyologists at the Kuwait Marine Station for their assistance in the identification of some of the fishes. Lastly, I am indebted to my family, for their encouragement, cooperation and endless patience.

INTRODUCTION

This study concerns adult digenetic trematodes which parasitize marine fishes of the Kuwaiti coast of the Arabian Gulf. As far as it can be determined, this is the first and only research on helminth parasites in the Arabian Gulf. Dr. Inaam-Ullah Tareen, Head of Pathology, at the Marine Division of the Kuwait Institute for Scientific Research, has done extensive studies on parasitic isopods and copepods of Kuwaiti fishes. Under his supervision several other research activities are being conducted that involve fungal, bacterial, viral and protozoan diseases affecting fishes of the area including those raised in hatcheries and fish cultures.

During the months of July and August 1978, 165 fishes belonging to 35 species in 19 different families were collected from the Kuwaiti coast of the Gulf and examined for parasites.

Many cestode larvae, several nematodes, mature and larval, a few acanthocephala and several digenea were recovered. This paper includes a description of nine digenetic trematodes. A few trematodes are not included in this study because of their poor condition. The nematodes and acanthocephala will be the subject of a separate study.

Although the Arabian Gulf is a part of the Arabian Sea and the Indian Ocean, it is partially separated from them

by its location between the Arabian Peninsula and Iran. Because of this specific geographic location it may provide a different habitat from that of the Arabian Sea or the Indian Ocean for both the free living and the parasitic fauna.

The first systematic study in this region was a marine biological survey of animals in Kuwaiti coastal water and the Arabian Gulf conducted by the Umitaka-Marui, Training-Research Vessel, Tokyo University of Fisheries, in collaboration with Kuwait Institute for Scientific Research, between October 1968 and October 1969. This study has culminated, so far, in the publication of "Fishes of Kuwait" by K. Kuronuma and Y. Abe, and a monograph with limited data on zoo- and phytoplankton in The Transaction of the Tokyo University of Fisheries, October 1974.

Although no previous work on the helminth fauna of marine fishes of the Arabian Gulf has been done, some research has been conducted by Indian, and to a lesser extent, Pakistani parasitologists in the Indian-Pakistani side of the Arabian Sea. The small collection in the present study does not allow a meaningful comparison. It is hoped, however, that a foundation has been established for more extensive work in the future.

MATERIALS AND METHODS

The fish were obtained from local fishermen. The fishing gear used included hook and line, gill-net, cast-net, set-net, long-net, seine, trawling, and traps. The fish

were identified with the aid of "Fishes of Kuwait" by Kuro-
numa and Abe (1972) and the assistance of the ichthyologists
of the Kuwait Marine Station.

Fish obtained from the fishermen were taken to the
laboratory of the Marine Station and examined for parasites.
The parasites were removed from their hosts, washed in 0.7%
saline and kept in this solution in the refrigerator over-
night. The trematodes, live and well-extended, were then
transferred to slides and fixed with alcohol-formalin-acetic
acid (AFA) and transported in this solution to the University
of the Pacific, Stockton, California. The specimens were
then washed in 50% isopropyl alcohol, stained with aceto-
carmine, destained with 0.5% acid alcohol, dehydrated in a
graded series of isopropyl alcohol (70%, 80%, 90%, 100%),
cleared in methyl salicylate, rinsed in xylol and mounted in
Piccolite. Drawings were made by microprojection; measure-
ments are in mm except for ova which are in microns. Sucker
ratios were calculated from the average of the length plus
the width and are expressed with the oral sucker taken as 1.

Holotypes and representatives of some previously de-
scribed species are deposited in the Helminthological Collec-
tion of the United States National Museum; all others in
the University of the Pacific Parasitology Collection (U.O.P.
Parasitol. Col.). An asterisk indicates a new host record.
The number of fish infected compared with total examined is
indicated by the numerator and the denominator, respectively,
next to the host name.

DESCRIPTION AND DISCUSSION OF SPECIES

Opisthadena kuwaiti n. sp.

Plate I Fig. 1

Host: Valamugil seheli (Forsk.) 1/6

Site: Stomach

Locality: Al-Fahaheel

Holotype: U.S.N.M.

Description and measurements based on one mature specimen: Body elongate, 2.710 long, 0.400 wide at level of ventral sucker. Cuticle smooth: eye-spot pigments absent. Oral sucker subterminal, without oral papillae, 0.172 long, 0.197 wide; ventral sucker in anterior fourth of body, 0.324 long, 0.355 wide; sucker ratio 1:1.85. Prepharynx absent; pharynx ovoid, 0.100 long, 0.079 wide; esophagus short; ceca inflated, extending to near posterior end of body. Testes slightly irregular, tandem, in midbody third; anterior testis 0.179 long, 0.157 wide; posterior testis 0.117 long, 0.179 wide. Seminal vesicle, thick-walled ovoid, 0.305 long, 0.203 wide, extending to midlevel of anterior testis; prostatic duct surrounded by conspicuous cells in its posterior half only, and extending anteriorly to base of hermaphroditic sac. Ovary somewhat triangular, 0.130 in diameter, at junction of middle and posterior thirds of body, separated from

posterior testis by uterine coils; seminal receptacle posterodorsal to ovary, 0.088 long, 0.112 wide; uterus coiled, occupying most of postovarian space between ovary and testes, extending anteriorly to join prostatic duct just posterior to base of hermaphroditic sac. Vitelline glands two, compact, immediately postovarian, side by side, one 0.230 long by 0.207 wide, the other 0.195 long by 0.156 wide. Hermaphroditic sac elongate, 0.165 long, 0.060 wide, containing conspicuous and thick-walled hermaphroditic duct, and occupying most of the length between the suckers; no "prostatic vesicle" evident; genital atrium wide; genital pore median, at anterior margin of pharynx. Eggs numerous, 13-18 by 8-10 microns. Excretory bladder tubular; its anterior extent not evident; excretory arms united dorsal to oral sucker; pore terminal.

Discussion

Six species of Opisthadena have been described to date: O. dimidia Linton, 1910 from Kyphosus sectatrix and K. incisor from Florida, N. Bimini, and the Panama Pacific; O. karachi (Srivastava, 1941) Skrjabin and Guschanskaja, 1955 from Clupea longiceps from the Arabian Sea; O. bodegensis Johnson and Copsey 1953 from Cebidichthys violaceus from Dillon Beach, California; O. cortesi Bravo-Hollis, 1965 from Kyphosus elegans from Baja California, and O. kyphosi Yamaguti, 1970 from Kyphosus cinerascens from Hawaii; O. cheni Martin, 1978 from Girella nigricans from San Pedro, California. Overstreet (1969) considered O. cortesi a synonym of O. dimidia. His

eighteen specimens showed intergradations of characteristics listed by Bravo-Hollis (1965) as distinguishing the two species.

Opisthadena karachii was described from two specimens as a species of Sterrhurus. The only reference to an ecsoma was made in connection with the description of the intestinal ceca which were described as "never extend into the tail." The drawing, however, does not show a tail, and, apparently, on this basis, Skrjabin and Guschanskaja (1955) transferred the species to the genus Opisthadena.

Only O. karachii has eggs comparable in size to those of O. kuwaiti (15-19 x 8 compared with 13-18 x 8-10); other similarities include general topography of the gonads, sucker ratio and position of the genital pore. O. karachii is, however, smaller (1.400 x 0.200); its testes are "situated symmetrically just behind the first half of the body," and the seminal vesicle is thin-walled and extends two-thirds the distance from the acetabulum to testes. In O. kuwaiti, the testes are tandem and the seminal vesicle is thick-walled and in contact with anterior testis. The other species of Opisthadena have larger eggs; O. dimidia 27-42 x 11-17, O. bodegensis 43-50 x 18-21, O. kyphosi 32-46 x 14-18 and O. cheni 28-44 by 13-18. The following key may be used as an aid in distinguishing the species:

- | | |
|-------------------------|---|
| 1. A. Eggs 13-19 x 8-10 | 2 |
| B. Eggs 27-50 x 11-21 | 3 |

2. A. Seminal vesicle thin-walled and extends two-thirds distance from acetabulum to testes; testes symmetrical O. karachii
- B. Seminal vesicle thick-walled and extends to anterior testis; testes tandem O. kuwaiti
3. A. Pharynx as large as oral sucker; testes in midbody third 4
- B. Pharynx smaller than oral sucker; testes in posterior third of body 5
4. A. Acetabulum with circular muscle, and papillae O. cheni
- B. Acetabulum without circular muscle or papillae O. bodegensis
5. A. Oral papillae present; seminal vesicle round O. dimidia
- B. Oral papillae absent; seminal vesicle ovoid and curved O. kyphosi

Lecithocladium bulbolabrum Reid, Coil and Kuntz, 1966

Plate I Fig. 2

Host: *Johnius aneus Bloch and Schneider, 1/2

Site: Intestine

Locality: Al-Fahaheel

Deposited specimens: U.S.N.M.
U.O.P. Parasitol. Col.: K-8-9-4-78

Description and measurements based on five specimens:

Body elongate, appendiculate, total length 2.020-2.646; soma 1.089-1.386 long, 0.346-0.416 wide at level of ovary; ecsoma completely extended, 0.931-1.260 long. Cuticular plications extend dorsally from midlevel of oral sucker and ventrally from level of the acetabulum to near posterior end of soma. Oral sucker terminal, funnel-shaped, with a wide base, 0.216-0.247 long including oral bulbs, 0.224-0.267 wide; dorsal lip of oral sucker slightly longer than ventral lip; oral bulbs two, about 0.038 long; ventral sucker in anterior third of soma, 0.114-0.158 long, 0.134-0.148 wide; sucker ratio about 1:0.6. Prepharynx absent; pharynx cylindrical, 0.176-0.187 long, 0.079-0.092 wide; esophagus about half length of pharynx, bifurcating about midway between pharynx and acetabulum; ceca extending to near posterior end of ecsoma. Testes two, ovoid, diagonal to tandem, contiguous, 0.080-0.110 long, 0.130-0.140 wide, located midway between acetabulum and posterior end of soma. Seminal vesicle ovoid, 0.187-0.292 long, 0.117-0.141 wide, with a muscular wall,

28-33 u in thickness, overlapping anterior testis; prostatic duct long, sinuous, surrounded by conspicuous prostatic cells, except for its terminal portion near posterior level of acetabulum. Ovary posttesticular, separated from posterior testis by uterine coils, 0.044-0.066 long, 0.112-0.150 wide; uterus extending into ecsoma, then proceeding anteriorly to join prostatic duct dorsal to midlevel of acetabulum. Hermaphroditic duct long, straight to slightly curved, and enclosed within a weakly developed sinus sac. Genital pore ventral to midlevel of oral sucker. Vitellaria postovarian, consisting of seven tubules, each about 0.200 long by 0.024 wide and extending a short distance into ecsoma. Eggs small, numerous, 13-18 by 6-11 u. Excretory vesicle not evident, pore terminal.

Discussion

Lecithocladium bulbolabrum was described from Rastralliger kanagurta from Formosa. Its most distinctive characteristics are the two bulbs at the posterior end of the funnel-shaped oral sucker. These bulbs, however, were seen clearly in only two of the five specimens. The present material is in close agreement with the original description. Minor differences are seen in our specimens: The pharynx is somewhat larger, the seminal vesicle has a thicker wall (28-33 compared with 14-20 u), and the eggs are slightly smaller (13-18 by 6-11 compared with 18-22 by 8-10 u).

Lecithocladium unibulbolabrum Fischthal and Thomas, 1971

Plate I Figs. 3 and 4

Host: *Rastralliger kanagurta (Cuvier), 2/22

Site: Stomach

Locality: Al-Fahaheel

Deposited specimens: U.S.N.M.
U.O.P. Parasitol. Col. K-8-9-13-78

Description and measurements based on two specimens, one cut in two parts: Body elongate, appendiculate, total length 2.746; soma 1.386 long, 0.376 wide at level of ovary; ecsoma 0.880-1.150 long. Cuticular plications of one specimen extend from anterior level of oral sucker dorsally and ventrally almost to posterior end of soma. Oral sucker funnel-shaped with wide base, 0.297 long, 0.218-0.307 wide; dorsal lip of oral sucker slightly longer than ventral lip; one oral bulb at base of dorsal lip; ventral lip constricted near base but no true bulb seen. Ventral sucker in anterior third of body, 0.150-0.200 in diameter; sucker ratio about 1:0.6. Prepharynx absent; pharynx cylindrical, 0.216-0.287 long, 0.108-0.130 wide; esophagus about half length of pharynx; ceca extending to near posterior end of ecsoma. Testes two, globular to ovoid, tandem, overlapping, 0.060-0.077 long, 0.077-0.108 wide, posterior to middle of soma. Seminal vesicle saccular, 0.330-0.340 long, 0.120-0.130 wide, with muscular wall, 22-33 μ in thickness, overlapping anterior testis; prostatic duct long, sinuous, surrounded by conspicuous

prostatic cells along its posterior half, cells becoming less conspicuous anteriorly, joining metraterm at postero-dorsal level of acetabulum. Ovary posttesticular, separated from posterior testis by uterine coils, 0.103-0.110 long, 0.100-0.163 wide; uterus extending midway into ecsoma, then proceeding anteriorly to join prostatic duct. Hermaphroditic duct long, straight or slightly sinuous, enclosed within a weakly developed sinus sac. Genital pore ventral to midlevel of oral sucker. Vitellaria postovarian, consisting of seven tubules, each about 0.350 in length and 0.033 in width, and partly extending into ecsoma. Eggs small, 15-18 by 6-9 μ . Excretory vesicle and crura not evident, pore terminal.

Discussion

Lecithocladium unibulbolabrum was described from 29 adult specimens obtained from the stomach of the flying gurnard, Cephalacanthus volitans from Tema, Ghana. In comparing their species with other species of Lecithocladium, Fischthal and Thomas (1971) pointed to its close resemblance to L. bulbolabrum Reid, Coil and Kuntz, 1966 from the intestine of the rake-gilled mackerel, Rastralliger kanagurta of Formosan waters. The chief difference between the two species is the presence of two bulbs at the posterior end of the oral sucker of L. bulbolabrum compared with only one in L. unibulbolabrum. In L. unibulbolabrum, the bulb is located at the posterior end of the dorsal lip of the oral sucker, the ventral lip having only a groove. Another difference is

the thickness of the wall of the seminal vesicle, 14-20 u in L. bulbolabrum compared with 30-53 in L. unibulbolabrum: The material in this study from the gray-finned croaker, Johnius aneus and that from Rastralliger kanagurta were identified as L. bulbolabrum and L. unibulbolabrum, respectively, on the basis of the presence and number of bulbs. The seminal vesicle wall in our specimens had a thickness of 28-33 and 22-33 u, intermediate between those reported by Reid et al (1966) and Fischthal and Thomas (1971). Fischthal and Thomas (1971) emphasized the fact that this characteristic was not evident in every specimen. The specimens must be mounted in a particular manner or the material observed from the proper angle to see the structures clearly.

The next species is a dinurid with close relationship to Ectenurus Looss, 1907, Erilepturus Woolcock, 1935, Clu-penurus Srivastava, 1935 and Uterovesiculurus Skrjabin and Guschanskaja, 1954. This is evident in the ecsomate bodies, topography of the gonads, and the basic structure of the prostatic duct, which, in this group, is a long tube not surrounded by prostate cells except for a short portion at the distal end just before it joins the metraterm. Various characteristics have been used to distinguish the four genera, including presence or absence of cuticular plications, nature of the seminal vesicle (tubular, saccular, bipartite, tripartite, etc.), presence or absence of a swelling at the terminal end of the uterus, presence or absence of a seminal receptacle, and union (or lack thereof) of excretory crura

in the anterior region of the body. Over 25 species have been named; often the same species placed in different genera by different authors. Manter (1947) separated Ectenurus from Erilepturus on the basis of presence of cuticular plications and lack of union of excretory crura in the anterior region of the body. Yamaguti (1971) did not give any generic significance to the presence of cuticular plications but recognized the generic importance of the excretory crura. The latter unite anteriorly in Erilepturus, Uterovesiculurus, and Clupenurus. These three genera, according to Yamaguti (1971), are also characterized by the presence of a seminal receptacle, although such a structure is not indicated as present in the original description of a number of species assigned to these genera. On the assumption that all species in the genera Erilepturus, Uterovesiculurus and Clupenurus have seminal receptacles as implied by Yamaguti (1971), then the four specimens encountered in this study should be assigned to a new genus, for which the name Clupenuroides is suggested and it is characterized as follows:

Clupenuroides: Hemiuridae, Dinurinae. Body elongate, appendiculate. Cuticle smooth or finely ringed. Eye-spot pigments absent. Oral sucker subterminal; pharynx present; esophagus short; ceca extending to at least posterior end of soma. Ventral sucker in midthird of soma, larger than oral sucker. Testes two, side by side or slightly diagonal; seminal vesicle thick-walled, ovoid, posterodorsal to acetabulum.

Prostatic duct long, devoid of prostate cells except for terminal portion which forms swelling or small prostatic vesicle surrounded by prostate cells just before joining the metraterm at base of sinus aac. Hermaphroditic duct surrounded by hermaphroditic sac (sinus sac); genital atrium tubular, pore near pharynx. Ovary globular, posttesticular; uterus extends posterior to ovary, but occupies chiefly space between ovary and hermaphroditic sac; metraterm not swollen at its terminal end; seminal receptacle and Laurer's canal absent. Vitellaria seven digitiform tubules, chiefly post-ovarian. Eggs numerous, small. Excretory arms unite anteriorly. Stomach parasites of marine fishes. Type species: C. sheemi.

The five genera may be distinguished by the following key:

1. A. Main excretory crura do not unite anteriorly; seminal receptacle absent Ectenurus
- B. Main excretory crura unite anteriorly; seminal receptacle present or absent 2
2. A. Seminal receptacle absent Clupenuroides
- B. Seminal receptacle present 3
3. A. Metraterm swollen at its distal end Uterovesiculurus
- B. Metraterm not swollen at its distal end 4
4. A. Seminal vesicle muscular, ovoid; Laurer's canal present Clupenurus
- B. Seminal vesicle not muscular, usually tubular, bipartite or tripartite Erilepturus

Clupenuroides sheemi n.g., n.sp.

Plate I Fig. 5

Host: Eleutheronema tetradactylum (Shaw), 2/2

Site: Stomach

Locality: Al-Fahaheel

Holotype: U.S.N.M.

Paratype: U.O.P. Parasitol. Col.: K-8-11-5-78

Description and measurements based on four mature specimens: Body elongate, appendiculate; ecsoma completely retracted into the soma in three and partially in one; soma 1.722-2.505 long, 0.400-0.742 wide at level of ventral sucker. Cuticle smooth, finely ringed in one specimen; eye-spot pigments absent. Oral sucker subterminal, 0.110-0.148 in diameter; ventral sucker in midbody third, 0.357-0.505 long, 0.297-0.445 wide; sucker ratio about 1:3. Prepharynx absent; pharynx 0.055-0.114 in diameter; esophagus about as long as pharynx; ceca extending to posterior end of soma. Testes two, symmetrical to slightly diagonal, globular, 0.103-0.176 long, 0.147-0.246 wide; seminal vesicle ovoid, thick-walled, 0.147-0.297 long, 0.066-0.154 wide, posterodorsal to acetabulum; one specimen showing shallow constriction in contents of vesicle but not the vesicle itself. Prostatic duct long, about 4-6 times length of seminal vesicle, devoid of cells throughout most of its length except for terminal part which forms a swelling or a vesicle surrounded by prostate cells, just before it joins metraterm at base of hermaphroditic sac.

Ovary smooth, posterior to and in contact with left testis, 0.108-0.176 long by 0.068-0.167 wide; seminal receptacle absent; uterus reaches posterior end of soma, but is chiefly preovarian; metratermal vesicle or swelling not evident. Vitellaria seven thick digitiform lobes, immediately posterior to ovary. Hermaphroditic sac in anterior fourth of body, smaller than seminal vesicle; genital atrium tubular, pore near base of pharynx or midway between intestinal bifurcation and pharynx. Eggs numerous, uncollapsed eggs 17-20 by 8-12 μ . Excretory crura uniting dorsal to base of pharynx.

The species is named after the local name of the host.

Hexangium sigani Goto and Ozaki, 1929

Plate II Fig. 6

Synonyms: Hexangium affinum Tubangui and Masilungan, 1944

H. secundum Annereaux, 1947

Arthurloossia loossi Nagaty, 1954

H. loossi (Nagaty, 1954) Yamaguti, 1958

Host: Siganus oramin (Bloch and Schneider), 1/6

Site: Intestine

Locality: Al-Fahaheel

Deposited specimens: U.S.N.M.

U.O.P. Parasitol. Col.: K-8-10-6-78

Description and measurements based on eight mature specimens: Body elongate, 3.990-4.767 long, 0.777-0.840 in maximum width near midbody level. Cuticle aspinose; eye-spot pigments absent. Oral sucker subterminal, 0.224-0.263 in diameter; ventral sucker lacking. Prepharynx 0.506-0.561 long; pharynx poorly developed, 0.110-0.140 in diameter; esophagus very short; ceca extending to anterior level of testes. Testes diagonal, in posterior fourth of body; anterior (left) testis 0.396-0.505 long, 0.335-0.470 wide; posterior testis (right) 0.445-0.594 long, 0.337-0.465 wide. Seminal vesicle not evident; cirrus sac, presumably present in this genus but poorly developed, not seen; cirrus also not evident. Ovary ovoid, 0.148-0.257 long, 0.198-0.297 wide, posterior to, and partially overlapping, right testis; Mehlis' gland postovarian; seminal receptacle absent; uterus

occupying practically all intercecal space; genital atrium not evident; genital pore median, about one-fourth distance from oral sucker to pharynx. Vitellaria follicular, chiefly lateral, extending dorsally and ventrally along most of cecal length except for few follicles in intercecal space. Eggs operculated, numerous, 78-90 by 40-62 u. Excretory bladder, V-shaped, thick-walled; excretory arms extending laterally and anteriorly to at least midesophageal level; pore subterminal. Extensive lymphatic ducts are evident, especially lateral and anterior to intestinal bifurcation.

Discussion

The description above is in close agreement with those given for H. sigani from other localities and supports the synonymies above suggested by Razarihelisoa (1959), Velasques (1961) and Fischthal and Kuntz (1964).

H. sigani seems to be a common parasite chiefly of siganid and lutjanid fishes of Japan, The Philippines, Macassar, Madagascar, N. Caledonia, N. Borneo and the Red Sea.

Pleorchis arabicus n. sp.

Plate II Fig. 7

Host: Otolithes argenteus Cuvier and Valenciennes 1/10

Site: Intestine

Locality: Al-Oraifan

Holotype: U.S.N.M.

Description and measurements based on one mature specimen. Body broadly elongate, 5.847 long, 1.441 wide at level of ventral sucker. Cuticle spinose, spines large and conspicuous, extending to near posterior end of body. Eye-spot pigments present. Oral sucker subterminal, 0.392 long, 0.460 wide; ventral sucker near junction of anterior and midbody thirds, 0.277 in diameter; sucker ratio 1:0.65. Prepharynx 0.240 long; pharynx globular, 0.275 in diameter, with inconspicuous muscle ring on its anterior margin; esophagus 0.097 long; ceca with anteriorly directed diverticula, each approximately 0.535 long; posterior branches extending to near posterior end of body, lateral branches not evident. Testes irregular in outline, in four longitudinal rows, two ventral and two dorsal, each row with 11 testes or 44 total. Cirrus sac claviform, 0.792 long by 0.200 wide at its base, to left of ventral sucker, extending approximately two-thirds distance from acetabulum to ovary. Seminal vesicle internal, consisting of posterior ovoid part and long tubular segment which seems to extend anteriorly within cirrus sac, makes one loop and curves posteriorly to near base, then ascends anteriorly

to join short unspined cirrus; prostatic duct short, prostate cells inconspicuous. Ovary multilobed, 0.346 long, 0.723 wide; Mehlis' gland preovarian; seminal receptacle absent; uterus short and chiefly preovarian, extending on both sides of cirrus sac and entering genital atrium sinistral to midline. Vitellaria follicular, small follicles extending laterally from anterior level of ventral sucker to posterior end of body, confluent posterior to testes. Genital pore median, a short distance anterior to acetabulum. Eggs 66-76 by 26-35 microns. Excretory bladder tubular, extending to ovary; pore terminal.

Discussion

Eight species are recognized in the genus Pleorchis: P. polyorchis (Stossich, 1898); P. americanus Luhe, 1906; P. sciaenae Yamaguti, 1938; P. californiensis Manter and Van Cleave, 1951; P. magniporus Arai, 1962; P. ghanensis Fischthal and Thomas, 1968; P. uku Yamaguti, 1970, and P. puriensis Gupta and Ahmad, 1976. P. puriensis lacks anterior cecal diverticula. Since one of the distinctive characteristics of the genus Pleorchis and the family Pleorchiidae Poche, 1926, is the presence of two anterior cecal diverticula, it is evident that P. puriensis either does not belong in the genus and the family, or these taxa should be amended to reflect this difference. The author considers this characteristic of generic but not familial significance. It is suggested that a new genus, Parapleorchis, be erected to accommodate P.

puricensis, and the family Pleorchiidae emended to reflect this characteristic.

The single most important characteristic that distinguishes P. arabicus from the other species, with the possible exception of P. magniporus, is the sinistral position of the cirrus sac. Additional differences include a combination of features: sucker ratio, number of testes, egg size, degree of ovarian lobation, spination of the cuticle, absence of pharyngeal ring, distribution of the vitellaria, and structure of the seminal vesicle. The following key is an aid in distinguishing the eight species of Pleorchis:

- | | |
|--|--------------------------|
| 1. A. testes 24 | <u>P. pleorchis</u> |
| B. testes 92-108 | <u>P. californiensis</u> |
| C. testes 44-60 | 2 |
| 2. A. testes 60; eggs 69-78 x 45;
vitellaria extend to posterior
edge of acetabulum; cirrus unspined | <u>P. americanus</u> |
| B. testes 54; eggs 46-56 x 27-31;
vitellaria extend to intestinal
bifurcation or to level of
esophagus; cirrus spined | <u>P. uku</u> |
| C. testes 44-48 | 3 |
| 3. A. cirrus sac sinistral | 4 |
| B. cirrus sac dextral | 5 |
| 4. A. sucker ratio about 1:1; vitallaria
extend to posterior level of | |

acetabulum; posterior ceca with short outpocketings; ovary with few lobes.

P. magniporus

B. sucker ratio 1:065; vitellaria extend to anterior level of acetabulum; posterior ceca without outpocketings; ovary with many lobes

P. arabicus

5. A. cuticular spines in anterior part of body only; pharyngeal ring absent or poorly developed; ovary with shallow lobation; eggs 69-72 x 33

P. sciaenae

B. cuticular spines throughout body except near preoral lobe; pharyngeal ring well-developed; ovary with deep lobation; eggs 52-66 x 33-47

P. ghanensis

The family Pleorchiidae is emended as follows: Pleorchiidae Poche, 1926. Family diagnosis. Digenea with elongate body covered with spines. Eye-spot pigments present. Oral sucker ventroterminal followed by prepharynx; pharynx well developed, with or without muscular ring on its anterior margin; esophagus short or absent; ceca with or without two anterior diverticula; posterior ceca, with or without short outpocketings, extend to near posterior end of body. Acetabulum in anterior half of body. Testes numerous, forming two or four longitudinal rows in intercecal field of hindbody. No external seminal vesicle. Cirrus pouch extending posterior

to ventral sucker, enclosing bipartite seminal vesicle and prostatic complex. Genital pore median, immediately preacetabular. Ovary lobed, ventral, immediately pretesticular, seminal receptacle absent, Laurer's canal present. Uterus coiled, preovarian. Vitellaria follicular, forming two broad lateral bands extending from posterior end of the body to near cecal bifurcation. Excretory vesicle tubular, extending in median field to ovary. Parasites of marine fishes. Two genera: Pleorchis and Parapleorchis.

Pleorchis: Pleorchiidae. Body elongate, covered with spines. Eye-spot pigments present. Oral sucker ventroterminal followed by prepharynx; pharynx well-developed, with or without muscular ring on its anterior margin; esophagus short or absent; ceca with two anterior diverticula; posterior ceca with or without short outpocketings, extend to posterior end of body. Acetabulum comparatively small, in anterior third or fourth of body. Testes numerous, forming two or four longitudinal rows in intercecal field of hindbody. No external seminal vesicle. Cirrus pouch extending posterior to ventral sucker, dextral or sinistral, enclosing bipartite seminal vesicle and prostatic complex. Genital pore median, immediately preacetabular. Ovary lobed, ventral, immediately pretesticular, seminal receptacle absent. Laurer's canal present. Uterus coiled, preovarian. Vitellaria follicular, forming two broad bands extending laterally from posterior end of the body to level of ventral sucker. Excretory vesicle tubular, extending in median field to ovary. Parasites of

marine fishes. Type species P. Polyorchis (Stossich, 1889) Stiles, 1896.

Parapleorchis: Pleorchiidae. Body elongate covered spines. Eye-spot pigments present. Oral sucker subterminal, followed by prepharynx; pharynx with well-developed anterior circular muscle ring; esophagus short; intestinal ceca simple, without anterior diverticula, extending to posterior end of body. Acetabulum in anterior third of body. Testes numerous in four longitudinal rows, two ventral and two dorsal. No external seminal vesicle. Cirrus pouch partly posterior to acetabulum, enclosing bipartite seminal vesicle and prostatic complex. Genital pore median, immediately preacetabular. Ovary lobed, ventral, immediately pretesticular, seminal receptacle absent. Uterus preovarian. Vitellaria follicular extending from posterior end of body laterally to pharyngeal level and confluent at intercecal junction. Excretory vesicle tubular. Parasites of marine fish. Type and only species: P. puriensis (Gupta and Ahmad, 1976) n. comb.

Helicometrina nimia Linton, 1910

Plate II Fig. 8

Host: *Nemipterus tolu (Cuvier and Valenciennes), 2/15

Site: Intestine

Locality: Auhha and Al-Khiran

Deposited Specimens: U.S.N.M.
U.O.P. Parasitol. Col.: K-7-29-8-78

Description and measurements based on three mature specimens: Body elongate to pyriform, 1.974-3.465 long, 0.462-0.903 wide at level of ventral sucker. Cuticle smooth; eyespot pigments absent. Oral sucker subterminal, 0.132-0.337 long, 0.154-0.307 wide; ventral sucker near junction of anterior and middle thirds of body, 0.268-0.426 long, 0.242-0.445 wide; sucker ratio about 1:1.5. Prepharynx absent; pharynx 0.114-0.238 long, 0.147-0.158 wide; esophagus as long as pharynx; ceca extending to near posterior end of body. Testes nine, 0.117-0.267 long, 0.110-0.292 wide; outline irregular in largest specimen, smooth in the two smaller ones; cirrus sac large, 0.890 long by 0.178 wide in largest specimen; seminal vesicle with large ovoid part that fills most of cirrus sac and tubular segment that coils at least three times inside cirrus sac before it joins cirrus. Ovary 0.165-0.277 long by 0.246-0.584 wide with four primary lobes, each lobe with two to six smaller lobes, overlapping two anterior testes; Mehlis' gland anterior and seminal receptacle dorsal to ovary; uterus preovarian. Vitellaria

follicular, extending from level of intestinal bifurcation to posterior end of body, almost confluent in posttesticular space. Genital pore midway between pharynx and intestinal bifurcation. Eggs 33-55 by 19-27 microns, each with unipolar filament four to six times length of egg. Excretory vesicle tubular, extending to ovary.

Discussion

The three specimens reported in this study are referred to this species with some reservation. In a research note discussing H. nimia Linton, 1910 and H. elongata Noble and Park, 1937, Deelman (1960) stated:

In a study of several hundred specimens recovered from a single species of host from one location, numerous intergrades between the two named species were found. Using a combination of characters, testes shape, position of the genital pore, and vitelline distribution, a continuum between the two species was established. Again using the above characters, a third species, Helicometrina orientalis Srivastava, 1936, appears an intermediate between H. nimia and H. elongata. On this basis, evidence will be submitted to place H. orientalis and H. elongata into synonymy with the type species, H. nimia.

As far as it can be determined this research note was never followed by a detailed publication, but Deelman's opinion seems to have been accepted by Overstreet (1969). A study of several specimens of H. nimia in the parasitology collection of the University of the Pacific from the Caribbean and Dillon Beach, California, and of H. elongata from Dillon Beach suggests the two species to be distinct. Most of the specimens are well-flattened. In those identified as H. nimia,

the genital pore is posterior to the cecal bifurcation, the ovary deeply lobed, seen as four primary lobes, each with 2-6 smaller lobes, and the vitellaria extending without interruptions from the intestinal bifurcation laterally to the posterior end of the body. There was only one exception that involved a specimen with a slight interruption of vitelline follicles on one side. Those identified as H. elongata have nine testes, genital pore anterior to cecal bifurcation, four-lobed ovary with no secondary lobulations. The vitelline follicles show interruptions on both sides of the ventral sucker in the majority of the specimens. Both species are found on the West Coast, and Deelman might have had both in the same host. The University of the Pacific collection is, however, much smaller than Deelman's. Overstreet (1969) noted similar variations in over 60 specimens of Helicometrina parva from different species of fish; in addition to intergradations seen in position of the genital pore, posterior extent of the cirrus sac, degree of ovarian lobulation, position of the acetabulum, and sucker ratio, he noted variation in the number of testes which led him to the conclusion that Helicometra exacta, a species with two testes, belongs in the genus Helicometrina becoming Helicometrina exacta, and that H. parva is a synonym. Only life history studies may help resolve these problems. H. nimia has been reported from a large number of fishes belonging to different species in different families from the Gulf of Mexico, North American Atlantic, Caribbean, Pacific Coast

of Panama, northern California and Baja California (Yamaguti, 1971).

Plagioporus sp.

Plate II Fig. 9

Host: Nemipterus tolu (Cuvier and Valenciennes), 1/15

Site: Intestine

Locality: Al-Khiran

Deposited specimen: U.O.P. Parasitol. Col. K-7-29-2-78

Description based on two mature specimens, one incomplete, measurements on one. Body broadly elongate, 1.833 long, 0.500 wide at level of ventral sucker. Cuticle smooth; eye-spot pigments absent. Oral sucker 0.140 in diameter; ventral sucker 0.257 long, 0.287 wide; sucker ratio 1:1.87. Prepharynx absent; pharynx 0.100 long, 0.095 wide; esophagus half length of pharynx; ceca extending to near posterior extremity. Testes two, tandem, slightly irregular, in middle of hindbody; anterior testis 0.218 long by 0.307 wide; posterior testis 0.257 long by 0.267 wide; cirrus sac claviform, dextral to acetabulum, about 0.300 long, 0.077 wide at its base, containing coiled tubular seminal vesicle, and prostatic cells; cirrus 0.080 long. Ovary immediately anterior to anterior testis, smooth, 0.100 long by 0.210 wide; Mehlis' gland dorsal and seminal receptacle anterodorsal to ovary; uterus entirely preovarian. Vitellaria follicular, extending from level of cecal bifurcation laterally to posterior end of body and confluent posterior to posterior testis. Genital atrium small; genital pore submedian, dextral to base of pharynx. Eggs 55-60 by 30-40 u. Excretory

vesicle tubular; its anterior extent not determined with certainty, but seems to reach at least posterior edge of posterior testis; excretory pore terminal.

Discussion

This species is not named because of limited material. At least 88 species have been described in the genus Plagioporus. Fifty-four of these are assigned to the subgenus Plagioporus, twenty-seven to the subgenus Caudotestis, one to Paraplagioporus, and the others not referred to any subgenus. Paraplagioporus is characterized by a long excretory vesicle which extends to anterior level of acetabulum or further forward; in the other two subgenera, the excretory vesicle does not extend anterior to the ovariotesticular level. In Caudotestis the testes are closer to the posterior extremity than to the acetabulum, whereas in the subgenus Plagioporus, the testes are near the middle of the hindbody. On this basis, therefore, the present material belongs in the subgenus Plagioporus. It seems best not to name this species until additional material is available for examination.

Stephanostomum sp.

Plate II Fig. 10

Host: Lutjanus coccineus (Cuvier and Valenciennes) 1/5

Site: Intestine

Locality: Al-Fahaheel

Deposited specimen: U.O.P. Parasitol. Col.: K-8-2-3-78

Description and measurements are based on a single mature specimen. Body elongate, 3.150 long, 0.420 wide at level of ventral sucker. Cuticle spinose, spines large in forebody, becoming smaller and sparse posteriorly on ventral side of hindbody, and absent dorsally and laterally from near anterior level of ovary to posterior end of body. Eye-spot pigments present. Oral sucker 0.150 long, 0.250 wide, with 30 perioral spines, 55-66 μ long, 22 μ wide at base, alternating in two rows of 15 each: ventral sucker 0.360 long, 0.300 wide; sucker ratio about 1:1.65. Prepharynx 0.600 long; pharynx 0.220 long, 0.190 in greatest width: esophagus about three-fourths length of pharynx; intestinal bifurcation immediately anterior to acetabulum, ceca extending to near posterior end of body; no connections to excretory vesicle evident. Gonads in posterior third of body; testes two, tandem; anterior testis 0.247 long, 0.267 wide; posterior testis 0.300 long, 0.218 wide separated by few vitelline follicles; cirrus sac thick-walled, extending three-fourths distance from acetabulum to ovary, containing ovoid seminal vesicle, 0.210 by 0.090,

prostatic duct and very long protruding spiny cirrus. Ovary globular, 0.160 long, 0.180 wide, anterior to, and separated from anterior testis, by few vitelline follicles. Uterus preovarian, joining male duct dorsal to midlevel of acetabulum. Genital atrium tubular, pore immediately preacetabular. Eggs collapsed, 55-72 by 22-30 u. Vitellaria extending from near posterior level of ventral sucker to posterior end of body. Excretory vesicle sac-like extending to at least posterior level of ovary; pore terminal.

Discussion

This species is not named because of limited material and difficulty in determining degree of variations when comparing it with the large number of species (at least 70 described to date) in the genus Stephanostomum.

HOST-PARASITE LIST

- Eleutheronema tetradactylum (Shaw), Four-threads threadfin,
Sheem, (Polynemidae) - 2
Clupenuroides sheemi n.g., n.sp.
- Johnius aneus Bloch and Schneider, Gray-finned croaker,
Eshmahy, (Sciaenidae) - 2
Lecithocladium bulbolabrum Reid, Coil and Kuntz, 1966
- Lutjanus coccineus (Cuvier and Valenciennes), Crimson snapper,
Hamrah, (Lutjanidae) - 5
Stephanostomum sp.
- Nemipterus tolu (Cuvier and Valenciennes), Notched thread-fin
bream, Bassi, (Nemipteridae) - 15
Helicometrina nimia Linton, 1910,
Plagioporus sp.
- Otolithus argenteus Cuvier and Valenciennes, Silvery croaker,
Nowaiby, (Sciaenidae) - 10
Pleorchis arabicus n.sp.
- Rastralliger kanagurta (Cuvier), Golden-striped mackerel,
Bangalla, (Scombridae) - 22
Lecithocladium unibulbolabrum Fischthal and
Thomas, 1971
- Siganus oramin (Bloch and Schneider), White-spotted spinefoot,
Safy, (Siganiidae) - 6
Hexangium sigani Goto and Ozaki, 1929

Valamugil sehli (Forsk.) , Blue-spotted mullet, Beyah,

(Mugilidae) - 6

Opisthadena kuwaiti n.sp.

LIST OF FISHES NEGATIVE FOR TREMATODES

The number that follows the name of the family indicates the number of individuals examined.

Acanthopagrus bifasciatus (Forsk.) , two-banded porgy,

Fasker, (Sparidae) - 1

Acanthopagrus latus (Houttuyn), Yellow-finned black porgy,

Sheem, (Sparidae) - 1

Argyrops spinifer (Forsk.) , Long-finned sea bream, Andag,

(Sparidae) - 1

Arius thalassinus (Ruppel), Giant sea catfish, Chihh,

(Ariidae) - 13

Caranx (Atule) kalla Cuvier and Valenciennes, Herring trevally,

Hamam, (Carangidae) - 2

Chorinemus lysan (Forsk.) , Spotted leatherskin, Lihlah or

Thelah, (Carangidae) - 2

Crenidens crenidens (Forsk.) , Crenate-toothed sea bream,

Battanah, (Sparidae) - 5

Cypserulus oligolepsis (Bleeker), Four-winged flying fish,

Yaradah, (Exocoetidae) - 1

Diplodus noct (Cuvier and Valenciennes), One-spot sea bream,

Mochwah, (Lethrinidae) - 10

Epinephelus chlorostigma (Cuvier and Valenciennes), hexagonal-

spots grouper, Gataw, (serranidae) - 2

- Formio niger (Bloch and Schneider), Jack-pomfret, Halway,
(Formionidae) - 1
- Helotes sexlineatus (Quoy and Gaimard), Striped therapon,
Yemyam, (Theraponidae) - 2
- Hilsa ilisha (Hamilton-Buchanan), River shad, Suboor,
(Clupeidae) - 1
- Ilisha indica (Swainson), Indian shad, Sawayah, (Clupeidae) - 4
- Lethrinus nebulosus (Forsk.) , Starry pigface bream, Sheiry,
(Lethrinidae) - 3
- Liza macrolepis (Smith), Large-scaled mullet, Beyah,
(Mugilidae) - 8
- Lutjanus fulviflamma (Forsk.) , One-spot golden snapper,
Naisarah, (Lutjanidae) - 5
- Nematolosa nasus (Bloch), Bloch's gizzard shad, Yawwaf,
(Clupeidae) - 11
- Nemipterus japonicus (Bloch and Schneider), Japanese threadfin
bream, Bassi, (Nemipteridae) - 9
- Pampus argenteus (Euphrasen), Silvery pomfret, Zobaidy,
(Stromateidae) - 2
- Plectorhynchus cinctus (Temminck and Schlegel), Three-banded
grunt, Firsh, (Pomadasyidae) - 2
- Plectorhynchus schotaf (Forsk.) , Grayish grunt, Yanam,
(Pomadasyidae) - 2
- Polydactylus sextarius (Bloch and Schneider), Six-threads
thread fin, Ghazal, (Polynemidae) - 1
- Pomadasy argenteus (Forsk.) , Silvery grunt, Nakroor,
(Pomadasyidae) - 1

Scolopsis ghanam (Forsk.) , Peppered grunt, Ebzaimy,

(Pomadasyidae) - 3

Scolopsis phaeops (Bennet), Blue-checked grunt, Ebzaimy,

(Pomadasyidae) - 2

Therapon puta (Cuvier and Valenciennes), Small-scale banded

therapon, Zamrool, (Theraponidae) - 3

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ABSTRACT

During July and August 1978, 165 fishes belonging to 35 species in 19 families were collected from the Kuwaiti coast of the Arabian Gulf and examined for parasites. Nine digenetic trematodes including three new species and two new genera are described: (Hemiuridae) Opisthadena kuwaiti, n.sp. from Valamugil seheli, Lecithocladium bulbolabrum Reid, Coil and Kuntz, 1966 from Johnius aneus (new host record), L. unibulbolabrum Fischthal and Thomas, 1971 from Rastralliger kanagurta (new host record), Clupenuroides sheemi n.g., n.sp. from Eleutheronema tetradactylum; (Angiodactylidae) Hexangium sigani Goto and Ozaki, 1929 from Siganus oramin; (Pleorchiidae) Pleorchis arabicus n.sp. from Otolithes argenteus; (Opecoelidae) Helicometrina nimia Linton, 1910, from Nemipterus tolu (new host record) and Plagioporus sp. from Nemipterus tolu; (Acanthocolpidae) Stephanostomum sp. from Lutjanus coccineus. Keys to the species of Opisthadena and Pleorchis, and to certain closely related dinurid genera are given. P. puriensis Gupta and Ahmad, 1976 is transferred to the new genus Parapleorchis.

PLATE I

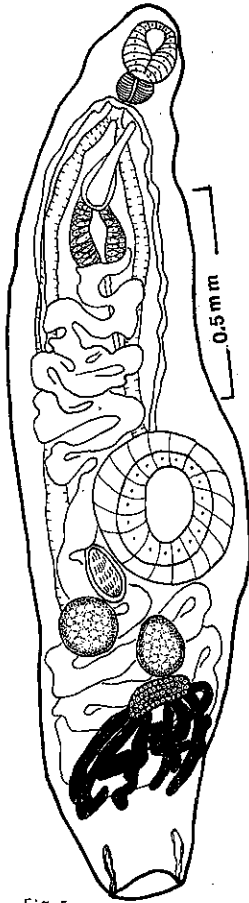


Fig 5

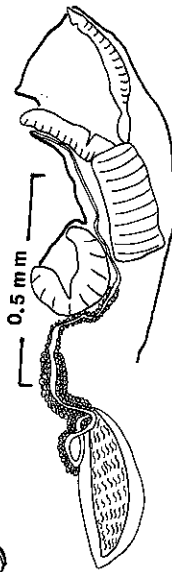


Fig 4

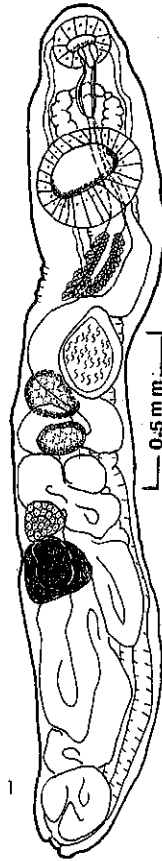


Fig 1

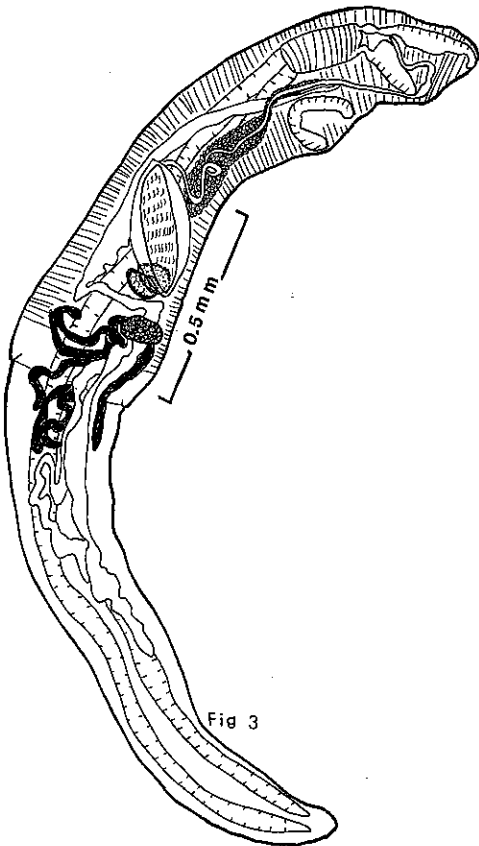


Fig 3

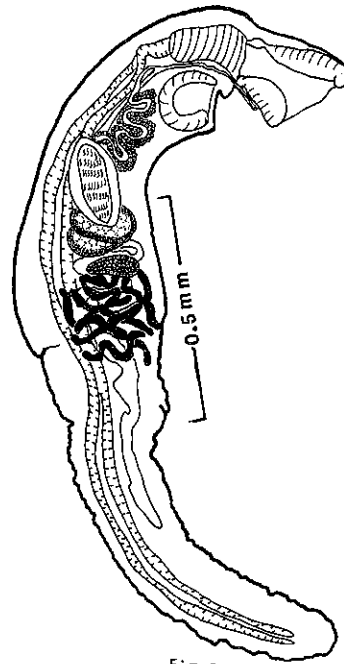


Fig 2

PLATE I

- Fig. 1. Opisthadena kuwaiti n.sp., holotype,
ventral view
- Fig. 2. Lecithocladium bulbolabrum Reid, Coil and
Kuntz, 1966, lateral view
- Fig. 3. Lecithocladium unibulbolabrum Fischthal
and Thomas, 1971, lateral view
- Fig. 4. L. unibulbolabrum, terminal part of male
reproductive organs.
- Fig. 5. Clupenuroides sheemi n.g., n.sp., holotype,
ventral view

PLATE II

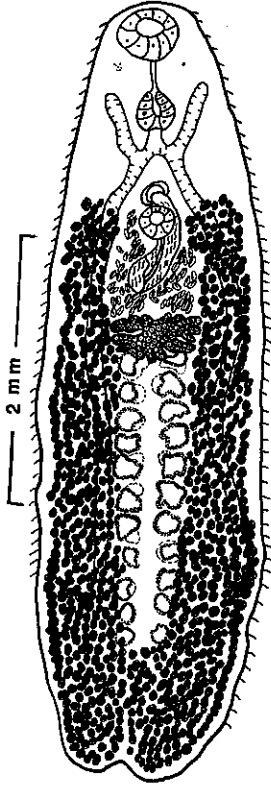


Fig 7

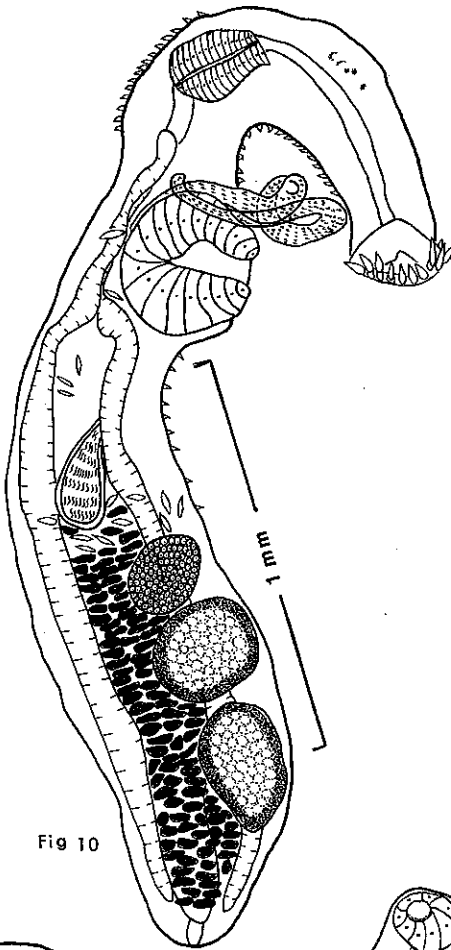


Fig 10

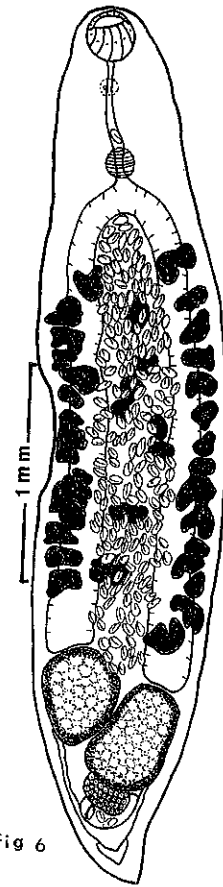


Fig 6

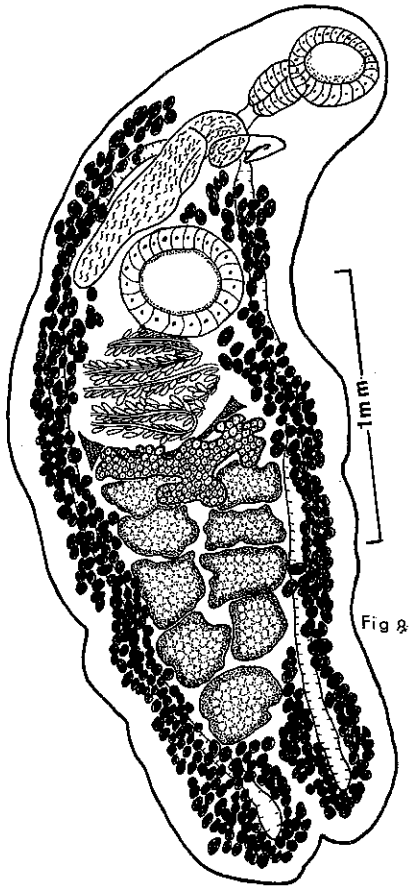


Fig 8

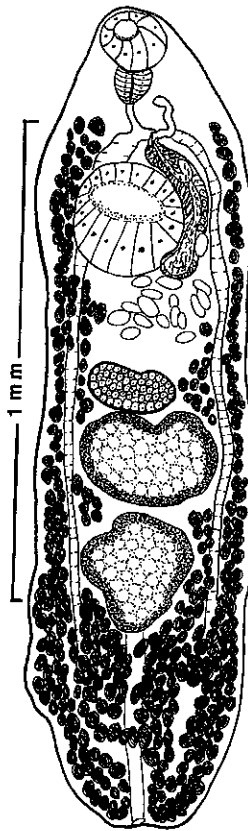


Fig 9

PLATE II

Fig. 6 Hexangium sigani Goto and Ozaki, 1929
dorsal view

Fig. 7 Pleorchis arabicus holotype, ventral
view

Fig. 8 Helicometrina nimia Linton, 1910, ventral
view

Fig. 9 Plagioporus sp. dorsal view

Fig. 10 Stephanostomum sp. side view