

First record of *Merlucciotrema praeclarum* from *Caesio lunaris* (Perciformes: Caesionidae) and *Cyatholecithochirium* sp. from *Epinephelus tauvina* (Perciformes: Serranidae) from the Red Sea in Egypt

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Abstract

This study examined Red Sea fishes at Hurghada and Safaga, Egypt, for the presence of trematodes of the superfamily Hemiuridae Looss, 1899. *Merlucciotrema praeclarum* Manter, 1934 was detected from *Caesio lunaris* (Perciformes: Caesionidae) and *Cyatholecithochirium* sp. from *Epinephelus tauvina* (Perciformes: Serranidae). Standard methods for collecting and examining marine fishes, for processing and illustrating specimens, and for studying the morphometric characteristics of the parasites by light microscopy and taxonomic identification were employed. For fine structure illustrating of *Cyatholecithochirium* sp. scanning electron microscopy (SEM) was used. The main characteristics of the first species were similar to those of *M. praeclarum*, as the body being small and oval, and the ventral sucker being very large. In the middle of the body, the vitellarium consists of seven small lobed masses close to the ovary, and the excretory vesicle is Y-shaped and divided posterior to the ventral sucker, with the arms being united in the fore-body. The *Cyatholecithochirium* sp. matched the genus *Cyatholecithochirium* Yamaguti, 1970 in overall appearance; however, it differed from the previously described forms in the ventral sucker being located in the middle of the body, the seminal vesicle being globular and lying posterior to the ventral sucker near to the middle of the body, and the ovary lying close to the ecsoma. This paper is the first report of the trematode parasites *Merlucciotrema praeclarum* in *Caesio lunaris* and *Cyatholecithochirium* sp. in *Epinephelus tauvina* from the Red Sea in Egypt.

Keywords:

Merlucciotrema praeclarum, *Cyatholecithochirium* sp., Trematode, SEM, Red Sea Fishes

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Introduction

Trematodes are parasites of zoonotic importance. Humans can be infected with some trematodes by consumption of raw, improperly cooked, or processed fish. Such infection has been reported from various geographical regions (Park et al., 2009). The World Health Organization (WHO) has estimated that the number of people was infected with fish-borne trematodes exceeds 18 million, and many more are at risk (WHO, 1995). Due to humans increasing exploitation of the marine environment, the parasites are increasing in fishes. Sushi, natural seafood fish and other flesh fish dishes have been suspected of causing fish-borne parasitic zoonoses (Deardorff, 1991). Trematodes of the superfamily Hemiuroidea Looss, 1899 were first recognized under the name Hemiurida (Dollfus, 1923) and consisted of the families Hemiuridae, Accacoeliidae and Syncoeliidae. However, the family-group name is attributed to Looss (1899), who introduced it at the subfamily level. The typical life cycle of hemiurids has marine gastropods as the first intermediate hosts, crustaceans or some other invertebrates as the second intermediate hosts, and fish as the final hosts (Køie, 1979). Manter (1934) first described *Sterrhurus praeclarus* based on a single flattened specimen detected in the stomach of *Merluccius* sp. off the Dry Tortugas, Florida. Skrjabin and Guschanskaja (1955) transferred the species to *Musculovesicula* Yamaguti, 1940, but Manter and Pritchard (1960) “preferred to retain it in *Sterrhurus*” Yamaguti (1971) redrew the worm and the details of its terminal genitalia from the host *Merluccius bilinearis*. The terminal genitalia were considered to be distinct enough to justify the recognition of the new genus *Merluciotrema* in the tribe Merluciotrematini and the hemiurid subfamily Lecithophyllinae. Gibson and Bray (1979) placed *Merluciotrema* in synonymy with *Plerurus* Looss, 1907. The

trematode family Hemiuridae Looss, 1899 is a large group that includes numerous subfamilies featuring an ecsoma, which is a protrusible at the posterior region of the body that appears to form a feeding organ and enables the parasite to attach itself to the host’s organs (Gibson and Bray, 1979). The most common genus of this family is *Lecithochirium* Lühe, 1901 which includes approximately 100 nominal species (Shih et al., 2004; Surekha and Lakshmi 2005; Morsy et al., 2012). Yamaguti (1970) described *Cyatholecithochirium gymnothoracis* from *Gymnothorax flavimarginatus* and *Gymnothorax undulates* (Perciformes: Muraenidae) and *Conger marginatus* (Perciformes: Congridae). Because the rare previously information on trematodes from the family Hemiuridae Looss, 1899 that infecting marine fishes, the present study aims to examine some marine fishes for *Merluciotrema* and *Cyatholecithochirium* trematodes.

Material and Methods

1- Sample collection:

A total of 179 fish samples were collected from the coast of Hurgada and Safaga in the Red Sea of Egypt from February 2016 to January 2017. Fish were collected by help of fishermen for several times, with a sample size not more than 12 fish per time, and were transported immediately, using special tanks to Parasitology Laboratory, Zoology Department, Faculty of Science, South Valley University, at the Qena Governorate, Egypt for examination in the same day. The samples belonged to three orders: Beloniformes, Beryciformes, and Perciformes. Fishes were identified according to the criteria (Randall, 1983; Lieske and Myers, 2004; Lieske et al., 2004) and confirmed based on the information on the FishBase website (<http://www.fishbase.org>).

2- Macroscopic examination:

The gastrointestinal tract was untangled using fingers (Justine et al., 2012) and opened the entire digestive system and other viscera longitudinally. Macroscopic and microscopic examinations of different fish organs were conducted to detect the presence of any visible parasites. The collected trematodes were cleaned by washing them several times with an isotonic saline solution. The flattening and fixation were done following Manter (1934), with the trematodes being compressed either between a slide and a cover or between two covers held gently together by a thread and then being fixed in 5% Formalin.

3- Light microscope examination:

For microscopic study, trematodes were stained using an acetic acid–alum carmine staining solution following Gurr (1969), the stained specimens were then dehydrated, cleared in clove oil, mounted in DPX, and left to dry in an oven at 370 °C (Lawrence and Thomas, 1987). Keys for identify the trematodes were used (Yamaguti, 1958; Gibson et al., 2002; Jones et al., 2005).

4- Scanning electron microscope (SEM) examination:

For SEM examination, specimens were fixed for six hours at 4 °C in 3% buffered glutaraldehyde, washed several times in 0.1 M sodium cacodylate buffer, dehydrated in ascending concentrations of ethanol, and transferred to pure acetone. Samples were then processed in a Bomer-900 critical point drier with Freon 13. The samples were sputter-coated with gold in a Technics Hummer V (Lee, 1993) and studied using a JEOL JSM-5400LV SEM operated at 15 kV in the electron microscopy unit of Assiut University.

Results and discussion

From 179 examined fish samples, out of two examined *Caesio lunaris* Cuvier, 1830 (17&20.5 cm in length, 150&175 gm in weight) specimens, one was infected with *Merlucciotrema praeclarum* Manter, 1934 (worm burden= 3), in its intestine, and a single specimen of *Epinephelus tazuvina* Forsskål, 1775 (21 cm in length, 200 gm), was infected with *Cyatholecithochirium* sp. (worm burden= 4), in its intestine.

Merlucciotrema praeclarum (Manter, 1934) (Fig. 1 – Fig. 3 based on two adults)

The collected specimens of trematodes *Merlucciotrema praeclarum* (Manter, 1934) in present study are first record from the Red Sea fish *Caesio lunaris*, and they were identified as belonging to the superfamily Hemiuroidea Looss, 1899, according to the criteria used by Gibson (2002a): The body was small, oval measured 1.259–1.793 mm in length, 0.473–0.793 mm in width, with the maximum width being at the level of the post-ventral sucker, and lacked a pre-somatic pit with ecsoma. The soma measured 0.134–0.293 mm in length, 0.134–0.478 mm in width (Fig. 1A & Fig. 2).

The length of the evaginated ecsoma was 0–0.134 mm (Fig. 1B & Fig. 3A), and well-developed oral sucker was sub-terminal and sub-globular and measured 170–261 µm in length, 179–326 µm in width. The ventral sucker was situated in the middle of the body, very large and measuring 357–609 µm in length, 295–587 µm in width. The sucker ratio was 1:2.1–2.3. The prepharynx was absent, oval, well-developed and measuring 125–163 µm in length, 116–141 µm in width. The esophagus was short and bifurcated into two simple and narrow intestinal caeca before the ventral sucker, which ended blindly within the ecsoma. The testes, two in number, were tandem to symmetrical and post-ovarian, and adjacent to the posterior edge of the ventral sucker. The right testis measured 54–207 µm in length, 36–163 µm

in width, and the left testis measured 54–288 μm in length, 45–185 μm in width. The seminal vesicle was thin-walled and located in the fore-body, and measured 161–207 μm in length, 36–76 μm in width. The pars prostatica was vesicular, oval, and large and surrounded by prostate cells in the fore-body. Male and female terminal ducts fused to form a hermaphroditic duct which was surrounded by muscle bundles that formed the sinus sac. A sinus organ extended through the genital pore, which lay posterior to the pharynx. The genital pore was situated in the fore-body. The ovary was oval, entire, and pretesticular in the hind-body and measured 80–228 μm in length, 63–87 μm in width. A Mehli's gland and a Juel's organ were present close to the ovary. Uterus coils filled much of the hind-body, extending into the fore-body. The intrauterine eggs (Fig. 3B) were thin-shelled, oval, small, numerous, and embryonated and they measured 19–25 μm in length, 8–15 μm in width, the vitellarium consisted of seven small lobed masses close to the ovary, and the vitellarium field measured 161–163 μm in length, 89–120 μm in width (Table 1). The excretory vesicle was Y-shaped and parasitic in the gut, particularly in the stomach and tissues in marine teleosts.

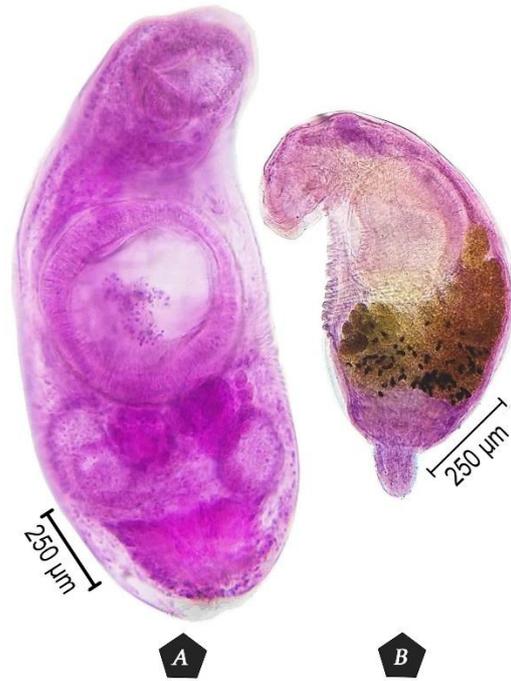


Fig. 1. Photomicrographs of *Merlucciotrema praeclarum* infecting *Caesio lunaris*. **A.** Ventral view of whole mount preparation of the trematode with soma, X10. **B.** Ventral view of whole mount preparation of the trematode with ecsoma extended, X10.

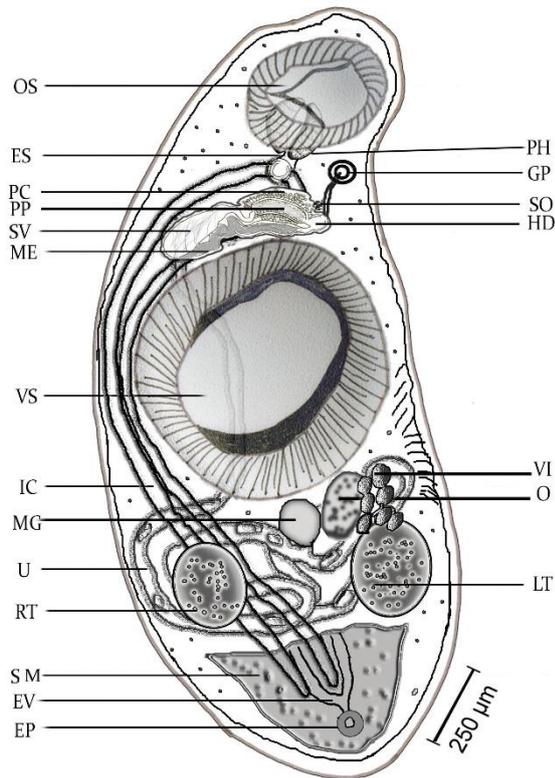


Fig. 2. Camera lucida drawing of *Merlucciotrema praeclarum* infecting *Caesio lunaris*, showing the ventral view of the whole mount preparation of the trematode.

The collected specimens were identified as belonging to the family Hemiuridae Looss, 1899, according to the criteria used by Gibson (2002b): The gut caeca terminated blindly within the ecsoma, and there was a saccular seminal vesicle and a well-developed sinus sac. Laurer's canal and a canalicular seminal receptacle were absent.

The collected specimens were identified as belonging to the subfamily Plerurinae Gibson and Bray, 1979, following the criteria used by Gibson (2002c): The hermaphroditic duct was vesicular proximally and tubular distally. The genital pore was situated mid-ventrally in the fore-body. The uterus was convoluted, passing back from the ovary

into the ecsoma and then forward into the fore-body.

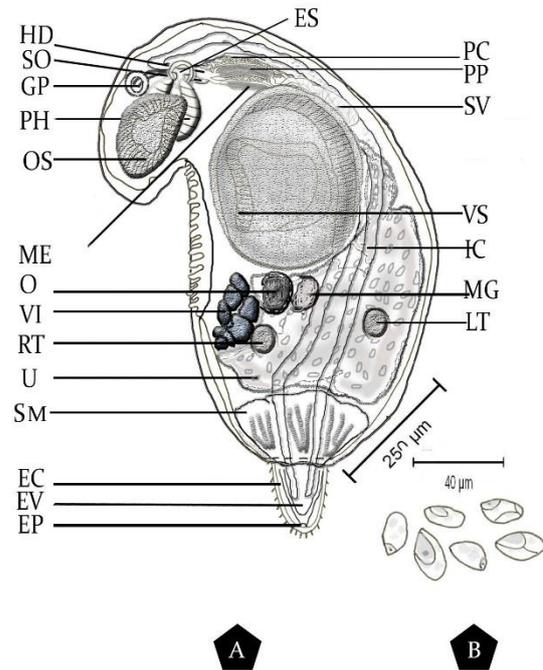


Fig. 3. Camera lucida drawing of *Merlucciotrema praeclarum* infecting *Caesio lunaris*. **A.** Ventral view of whole mount preparation of the trematode with evaginated ecsoma. **B.** View of oval eggs. *Abbreviations:* OS, oral sucker; PH, pharynx; ES, esophagus; IC, intestinal cecum; VS, ventral sucker; EV, excretory vesicle; EP, excretory pore; RT, right testis; LT, left testis; SV, seminal vesicle; PP, pars prostatica; PC, prostate cells; GP, genital pore; O, ovary; U, uterus; MG, "Mehlis" gland; HD, hermaphroditic duct; ME, metraterm; SO, sinus organ; VI, vitellarium; SM, soma; EC, evaginated ecsoma.

The present specimens were identified as members of the genus *Merlucciotrema* Yamaguti, 1971, based on the following criteria: There was an unarmed tegument, lacking plications, a sub-terminal and a sub-globular oral sucker, and an oval pharynx. The caeca terminated blindly, reaching into the ecsoma, there was a large ventral sucker

in the anterior half of the soma, two symmetrical testes in the anterior hindbody, a saccular seminal vesicle in the fore-body, vesicular, a large and oval pars prostatica, and dense external gland-cells. The hermaphroditic duct was surrounded by muscle bundles, not forming a complete sinus sac, there was a muscular sinus organ, a median genital pore in the anterior fore-body, an oval ovary, and a long, convoluted, and muscular metraterm. The vitellarium consisted of seven, terminal excretory pores, and the excretory vesicle was Y-shaped and divided in the anterior hind-body, with the arms united in the fore-body (Yamaguti, 1971).

Comparison of the collected specimens and the previously described forms indicated that the main characteristics of the present specimens are similar to those of *Merlucciotrema praeclarum*. Moreover, the allometric measurements were similar to those of the northern Atlantic Ocean specimens; these measurements included pharynx size in *Bathysaurus mollis* and *Merluccius bilinearis* specimens and ventral sucker size in *Bathysaurus ferox*, *B. mollis*, and *M. bilinearis* specimens. The current specimens exhibited allometric variations compared to the northern Atlantic Ocean specimens, as follows: smaller values of soma size, extruded ecsoma length, oral sucker size, pharynx size in *B. ferox* and *Cataetyx laticeps*

specimens and ventral sucker size in *C. laticeps* specimens, fore-body length, testes size, ovary size, seminal vesicle size, vitelline field, and egg size. Conversely, the current specimens were similar to the Indian specimens in respect of body size, ventral sucker size, sucker ratio, testes' size, ovary size, and egg width. The current specimens exhibited the following allometric variations: higher values of oral sucker size, seminal vesicle, and egg length compared to those observed in the Indian specimens. *M. praeclarum* parasitizes the families Merlucciidae and Bythitidae and myctophiforms of the family Bathysauridae. The current specimens were collected from *Caesio lunaris*: family Caesionidae. However, previously described specimens collected from the deep-sea of both the western and the eastern north Atlantic, whereas the current specimens were collected from the Red Sea. Furthermore, all records of infection have been confined to the stomach, apart from Ha et al. (2012), who found infection in both the intestines and the stomach, whereas the infection by the specimens in the present study was in the intestines. There have been no reports of *M. praeclarum* from the host and the Red Sea region off Egypt. Therefore, the specimens in this study considered to be the first record of this species from the Red Sea off Egypt and *C. lunaris* to be a record of a new fish host.

Table 1. Comparative measurements of the collected *Merlucciotrema praeclarum* specimens with the previously described forms.

Reference	Bray (1996)				Ha et al. (2012)	Present study
Fish host (s)	<i>Bathysaurus ferox</i>	<i>Bathysaurus mollis</i>	<i>Cataetyx laticeps</i>	<i>Merluccius bilinearis</i>	<i>Platycephalus indicus</i> and <i>Eleutheronema tetradactylum</i>	<i>Caesio lunaris</i>
Locality	Bahama Islands; northern Atlantic Ocean	northern Atlantic Ocean	northern Atlantic Ocean	Tortugas, Florida	India; Malaysia in Vietnam	Safaga, Egypt.
Site of infection	Stomach	Stomach	Stomach	Stomach	Stomach,intestine	Intestine
Parameters						
Body length (mm)	Not mentioned	N. M.	N. M.	N. M.	1.344–1.600	1.259–1.793
Body width (mm)	N. M.	N. M.	N. M.	N. M.	0.576–0.584	0.473–0.793

Soma length(mm)	2.671–3.100	2.671	4.118–5.724	3.434	Soma extension	0.134–0.293
Soma width (mm)	1.161–1.407	1.402	1.558–2.464	1.189	Soma extension	0.134–0.478
Extruded ecsoma length (mm)	1.010–1.399	0	0–5.072	0.129	N. M.	0–0.134
Oral sucker (µm)	322–332 × 406–444	290 × 327	470–747 × 541–811	289 × 336	0.124–0.168 × 0.112–0.152	170–261 × 179–326
Pharynx (µm)	167–187 × 174–187	161 × 187	206–290 × 193–277	122 × 141	N. M.	125–163 × 116–141
Ventral sucker (µm)	580–728 × 741–784	444 × 573	1.192–1,733 × 1.307–1,685	670 × 671	352–360 × 328–352	357–609 × 295–587
Sucker ratio	1:1.77–1.83	1:1.17	1:1.08–2.42	1:2.00	1:2.1–2.65	1:2.1–2.3
Forebody (µm)	678–696	588	826–1,622	906	N. M.	205–469
Forebody as % of soma length	22–25%	22%	20–28%	26%	N. M.	62–65%
Testes (µm)	354–419 × 225–361	Obscured	Obscured	303–348 × 316–348	62–96 × 62–108	54–207 × 36–163 54–288 × 45–185
Seminal vesicle (µm)	N. M.	N. M.	528 × 367	292 × 108	64–80 × 80	161–207 × 36–76
Ovary (µm)	Obscured	Obscured	309 × 451	238 × 213	70–152 × 70–120	80–228 × 63–87
Vitelline field (µm)	Obscured	Obscured	1.399 × 636	689 × 766	N. M.	161–163 × 89–120
Eggs (µm)	40–41 × 22–28	44 × 31	38 × 23	32–33 × 16–18	13–18 × 7–12	19–25 × 8–15

N. M. not mentioned

Cyatholecithochirium sp. (Fig. 4 – Fig. 6 based on three adults).

The collected specimens trematodes *Cyatholecithochirium* sp. in present study are first record from the Red Sea fish *Epinephelus tauvina*, and they were identified as belonging to the Superfamily Hemiuroidea Looss, 1899, according to the criteria used by (Gibson, 2002a): The body was smooth, cylindrical (Fig. 4 & Fig. 5A) and measuring 2.600–2.886 mm in length, a maximum width of 0.643–0.887 mm at the level of the ventral sucker. The soma was present and measuring 0.343–0.500 mm in length, 0.219–0.710 mm in width. The oral sucker was sub-terminal, ovoid, and measuring 176–258 µm in length, 171–328 µm in width. The pre-oral lobe was prominent and measuring 42–48 µm. Pre-pharynx was absent. The pharynx was oval and measuring 43–97 µm in length, 71–177 µm in width. The esophagus was short, and it bifurcated into two simple and narrow intestinal caeca pre the ventral sucker. The

ventral sucker was situated in the middle of the body, very large and measuring 357–645 µm in length, 223–593 µm in width. The sucker ratio was 1:2–2.5. The testes, two in number, were oval, pre-ovarian, and dorsal to the ventral sucker, asymmetrical, oblique, and separated from each other by uterine coils. The right testis measured 122–194 µm in length, 75–145 µm in width, and the left testis measured 100–194 µm in length, 70–161 µm in width. The seminal vesicle was globular, lay posterior to the ventral sucker near the middle of the body, and measured 200–306 µm in length, 190–323 µm in width. The pars prostatica was cylindrical, long, enlarged at the distal end, and it united with the metraterm to form a hermaphroditic duct inside the sinus sac and was surrounded by large number of prostate cells, its extremity found in the sinus sac. Male and female terminal ducts fused to form a hermaphroditic duct. Sinus-organ and sinus-sac present. The genital pore was mid-ventral in the fore-body. The

ovary was oval, post-testicular in hind-body, central, and measuring 100–194 μm in length, 71–161 μm in width (Table 2). A Mehlis' gland was present. The seminal receptacle was oval and close to the ovary. Uterus coils filled much of middle-body and extended laterally pre-ovary and then anteriorly between the testes and forward along the ventral sucker into the fore-body. The uterus did not extend into the soma. The intrauterine eggs (Fig. 5B) were oval, small, numerous, and they measure 11–38 μm in length, 7–18 μm in width. The excretory pore was terminal.

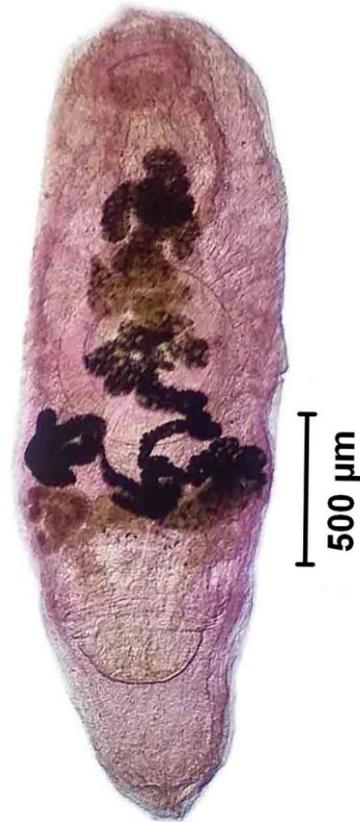


Fig. 4. Photomicrographs of the ventral view of the whole mount preparation of the trematode *Cyatholecithochirium* sp. infecting *Epinephelus tauvina*.

Table 2. Comparative measurements of the collected *Cyatholecithochirium* sp. with the previously described species.

Reference	Yamaguti (1970)	Present study
Related species	<i>Cyatholecithochirium gymnothoracis</i>	<i>Cyatholecithochirium</i> sp.
Fish host(s)	<i>Gymnothorax flavimarginatus</i> and <i>Gymnothorax undulates</i> (Perciformes: Muraenidae) and <i>Conger marginatus</i> (Perciformes: Congridae)	<i>Epinephelus tauvina</i> (Perciformes: Serranidae)
Locality	Hawaii	Red Sea, Hurghada, Egypt
Site of infection	Stomach	Intestine
Body length (mm)	3.73*	2.600–2.886
Body width (mm)	1.12*	0.643–0.887
Soma length (mm)	1.03*	0.343–0.500
Soma width (mm)	0.645*	0.219–0.710
Pre-oral lobe (μm)	17*	42–48
Oral sucker length (μm)	197*	176–258

Oral sucker width (μm)	241*	171–328
Ventral sucker length(μm)	482*	357–645
Ventral sucker width (μm)	498*	223–593
Sucker ratio	1:2.4*	1:2–2.5
Pharynx length (μm)	131*	43–97
Pharynx width (μm)	137*	71–177
Right testis length (μm)	147*	122–194
Right testis width (μm)	224*	75–145
Left testis length (μm)	128*	100–194
Left testis width (μm)	203*	70–161
Ovary length (μm)	214*	100–194
Ovary width (μm)	200*	71–161

Note: The measurements of *Cyatholecithochirium gymnothoracis* were calculated from figures of the original description: Yamaguti*. (1970, Fig. 739).

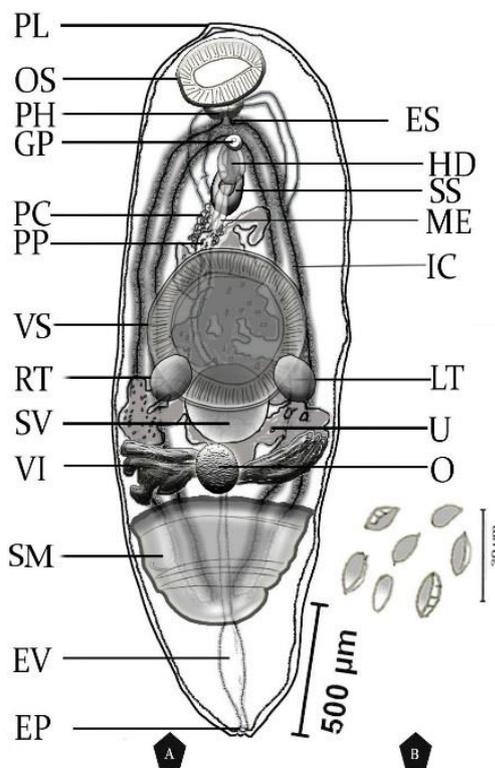


Fig. 5. Camera lucida drawing of *Cyatholecithochirium* sp. infecting *Epinephelus tauvina*. A. Ventral view of the whole mount preparation of the trematode. B. View of oval eggs. Abbreviations: OS, oral sucker; PL, pre-oral lobe; PH, pharynx; ES, esophagus; IC, intestinal cecum; VS, ventral sucker; EV, excretory vesicle; RT, right testis; LT, left

testis; SV, seminal vesicle; PP, pars prostatica; PC, prostate cells; GP, genital pore; O, ovary; U, uterus; HD, hermaphroditic duct; ME, metraterm; SS, sinus sac; VI, vitellarium; EP, excretory pore; SM, soma.

Ultrastructure of *Cyatholecithochirium* sp.: (Fig. 6)

SEM revealed that the body of *Cyatholecithochirium* sp. was not armed; the fore-body was scoop-shaped, with muscular pads in the shoulder region (Fig. 6A & Fig. 6B). The oral sucker was sub-terminal and ovoid, and the pre-oral lobe was prominent and measured 42 μm in length (Fig. 6C). The ventral sucker was in the middle of the body, large and pedunculate, with numerous sensory papillae arranged around it (Fig. 6D). The genital pore was mid-ventral, lying close to the oral sucker. The specimens were characterized by the presence of the somatic pore with invaginated ecsoma (i.e., a tail-appendage, which is both protractible out of and retractable into the body) situated at the posterior extremity of the body (Fig. 6E).

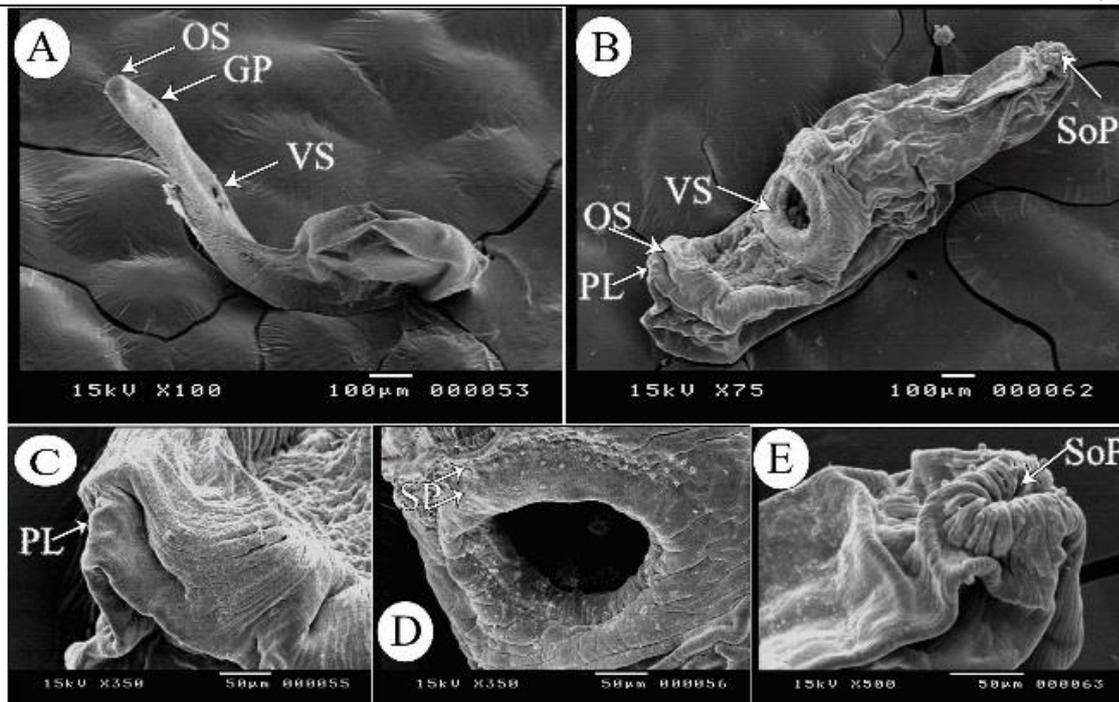


Fig. 6. SEM micrographs of *Cyatholecithochirium* sp. infecting *Epinephelus tauvina*. **A.** Entire body of the adult trematode showing oral sucker (OS), ventral sucker (VS) and genital pore (GP). **B.** High magnification of the ventral view of the entire trematode showing oral sucker (OS), pre-oral lobe (PL), ventral sucker (VS), and somatic pore (SoP) with invaginated ecsoma. **C.** High magnification of the oral sucker showing pre-oral lobe (PL). **D.** High magnification of the ventral sucker showing sensory papillae (SP). **E.** High magnification of the posterior extremity of the trematode showing the somatic pore (SoP) with invaginated ecsoma (soma).

The present specimens were identified as belonging to the family Hemiuridae Looss, 1899, according to the criteria used by (Gibson, 2002b): the gut-caeca terminate blindly within the ecsoma and a well-developed sinus-sac. The vitellarium consisted of seven tubular branches, with three on one side of the body and four on the other (Fig. 4 & Fig. 5). And the excretory vesicle was Y-shaped, with the arms united in the fore-body.

The collected specimens were identified as belonging to the subfamily Lecithochiriinae Lühe, 1901, following the criteria used by Gibson (2002d): muscular “shoulder-pads” were present; there was a globular seminal vesicle in the hind-body

and a pre-ovarian uterus. Occasionally present as adult in the body cavity.

The present specimens were identified as belonging to the genus *Cyatholecithochirium* Yamaguti, 1970, based on the criteria used by Yamaguti (1970). They had an elongate body that was unarmed; a scoop-shaped fore-body, with a median pre-oral lobe and muscular pads in shoulder region; a well-developed pharynx; a short esophagus; and caeca extending into the ecsoma. There was a large ventral sucker. The testes were sub-symmetrical and situated immediately posterior to the ventral sucker. The pars prostatica was surrounded by small prostate cells; the distal portion formed a distinct vesicle, surrounded by larger prostate cells and

enclosed in hermaphroditic pouch (sinus sac), and the hermaphroditic duct was relatively short. The ovary was sub-median. The vitellaria consisted of seven digitiform lobes. The uterus did not extend into the ecsoma. The eggs were elliptical and small. The arms of the excretory vesicle were united dorsal to the pharynx. The specimens were parasites of marine teleosts.

Comparison of the collected specimens with the previously mentioned forms indicated that present specimens matched members of the genus *Cyatholecithochirium* Yamaguti, 1970 in overall appearance and in parasitizing the marine host. However, the species in present study differ from the previously described forms in respect of the ventral sucker being located in the middle of the body, compared with a near anterior extremity; the seminal vesicle being globular and lying posterior to the ventral sucker near to the middle of the body, compared with a bipartite seminal vesicle; the anterior portion being thick-walled and the posterior portion thin-walled and the ovary lying close to the ecsoma, compared with the ovary being situated in the mid-region of the body.

The genus *Cyatholecithochirium* parasitizes the stomachs of marine teleosts. In this study, the collected specimens were collected from the intestines of *E. tauvina* (Family: Serranidae) in Hurghada, Red Sea, Egypt, whereas previous records are from the stomachs of *G. flavimarginatus* and *G. undulates* (Family: Muraenidae) and *C. marginatus* (Family: Congridae) from Hawaii. Hence, this paper presents the first report of *Cyatholecithochirium* sp. from Red Sea fishes at Hurghada, Egypt with details of morphometric features and fine structure illustration by SEM and of *E. tauvina* as a record of a new host for the parasite. Moreover, the parasite has been left at the genetic level for future studies that may relate it to a new species.

Conflicts of interest

The authors report no conflict of interest associated with this manuscript.

References

- Bray RA (1996). *Merlucciotrema praeclarum* (Manter, 1934) (Digenea: Hemiuridae) redescribed from myctophiform and gadiform fishes of the North Atlantic. *Systematic Parasitology*, 33(2):135-141.
- Deardorff T L (1991). Epidemiology of marine fish-borne parasitic zoonoses. *Southeast Asian J. Trop. Med. Public. Health.*, 22(I): 146-149.
- Dollfus RP (1923). Remarques sur la cycle évolutif des hèmeiurides. *Annales de parasitologie humaine et compare*, 1(4): 345-351.
- Gibson DI (2002a). Superfamily Hemiuroidea Looss, 1899 In: Gibson DI, Jones A and Bray RA (Eds), *Keys to the Trematoda. Volume1*. CABI Publishing and the Natural History Museum, Wallingford, pp. 299-304.
- Gibson DI (2002b). Family Hemiuridae Looss, 1899 In: Gibson DI, Jones A and Bray RA (Eds), *Keys to the Trematoda. Volume1*. CABI Publishing and the Natural History Museum, Wallingford, pp. 305-310.
- Gibson DI (2002c). Subfamily Plerurinae Gibson and Bray, 1979 In: Gibson DI, Jones A, Bray RA (Eds), *Keys to the Trematoda. Volume1*. CABI Publishing and the Natural History Museum, Wallingford, pp. 334-336.
- Gibson DI (2002d). Subfamily Lecithochiriinae Lühe, 1901 In: Gibson DI, Jones A, Bray, RA (Eds), *Keys to the Trematoda. Volume1*. CABI Publishing and the Natural History Museum, Wallingford, pp. 325-330.

- Gibson DI, Bray RA (1979). The Hemiuroidea: terminology, systematic and evolution. *Bulletin of British Museum (Natural History) (Zoology series)*, 36:35-146.
- Gibson DI, Jones A, Bray RA (2002). *Keys to the Trematoda*, Vol. 1. CAB International and The Natural History Museum, London. 521. pp.
- Gurr GT (1969). *Biological staining Methods*. 7th Ed. T. w. Pegg and Son Ltd. (T.U.). Effie Road, Fulham. S. W. G. England, 246 pp.
- Ha NV, Ngo HD, Binh TT, Hung NM, Hien HV (2012). Redescription of hemiurid species parasitic in marine fishes from Ha Long bay, Vietnam. *TAP CHI SINH HOC* 34 (3): 288-293.
- Jones A, Bray RA, Gibson DI (2005). *Keys to the Trematoda*, Vol. 2. CAB International and The Natural History Museum, London. 768 pp.
- Justine JL, Briand MJ, Bray RA (2012). A quick and simple method, usable in the field, for collecting parasites in suitable condition for both morphological and molecular studies. *Parasitology Research*, 111(1): 341-351.
- Køie M (1979). On the morphology and life-history of *Derogenes varicus* (Müller, 1784) Looss, 1901 (Trematoda, Hemiuridae). *Zeitschrift Parasitenkunde*, 59: 67-78.
- Lawrence, Thomas C (1987). A guide to laboratory procedures and identification p164-165.
- Lee MR (1993). The petrography, mineralogy and origins of calcium sulphate within the Cold Bokkeveld CM carbonaceous chondrite. *Meteoritics*, 28:53-62.
- Lieske E, Fiedler KE, Myers RF (2004). *Coral Reef Guide: Red Sea to Gulf of Aden, South Oman; (Definitive Guide to Over 1200 Species of Underwater Life)*. London: Collins. Lieske E, Myers RF (2004). *Coral reef guide of Red Sea*. Fulham Palace Road, London.
- Looss A (1899). Weitere Beiträge zur Kenntniss der Trematoden-Fauna Aegyptens, zugleich Versuch einer natürlichen Gliederung des Genus *Distoomum* Retzius. *Zoologische Jahrbücher (Systematik)*, 12: 521-784.
- Manter HW (1934). Some digenetic trematodes from deepwater fish of Tortugas, Florida. *Carnegie Institution of Washington*, 435: 257-345.
- Manter, HW, Pritchard MH (1960). Some hemiurid trematodes from Hawaiian fishes. *Proceedings of the Helminthological Society of Washington*, 27(1): 87-102.
- Morsy K, Bashtar AR, Abdel-Ghaffar F, Baksh W (2012). First record of *Lecithochirium grandiporum* (Digenea: Hemiuridae) infecting the lizard fish *Saurida tumbil* from the Red Sea. *Parasitol Res*, 111(6): 2339-2344.
- Park CW, Kim JS, Joo HS, Kim J (2009). A human case of *Clinostomum complanatum* infection in Korea. *The Korean journal of parasitology*, 47(4):40-404.
- Randall JE (1983). *Red Sea Reef Fishes*. IMMEL publishing. 20 Berkkeley Street, Berkely squar, London.
- Shih HH, Liu W, Zhao ZQ (2004). Digenean fauna in marine fishes from Taiwanese water with the description of a new species *Lecithochirium*

- tetraorchis* sp. nov. Zoology Studies, 43(4):671-676.
- Skrjabin KI, Guschanskaja Lk (1955). Supplement to subfamily Musculovesiculinae Skrjabin et Guschanskaja, 1954 family Lecithasteridae Skrjabin et Guschanskaja, 1954. Trematody Zhivotnykh i Cheloveka, Osnovy Trematodologii, 10: 645-649.
- Surekha P, Lakshmi, CV (2005). *Lecithochirium testelobatus* n. sp. (Digenea: Hemiuridae) from the lizard fish, *Saurida undosquamis* from Andhrapradesh Coast. Journal of Parasitological Diseases, 29, 2: 14-36.
- World Health Organization-WHO (1995): Control of Foodborne Trematode Infection. Geneva. WHO Technical Report Series, 107: 849.
- Yamaguti S (1958). Systema Helminthum. vol. I The Digenetic Trematodes of Vertebrates Part I, LTD. Interscience publishers, London, 979 pp.
- Yamaguti S (1970). The digenetic trematodes from Hawaiian fishes. I. Pacific Science 19: 458-481.
- Yamaguti S (1971). Synopsis of digenetic trematodes of Svertebrates. Keigaku Publishing Company, Tokyo, Vol. I, 1074 pp.; Vol. II, 349 pp.