

DESCRIPTION OF TWO DIGENEAN PARASITES *LECITHOCHIRIUM PRIACANTHI* YAMAGUTI, 1953 (HEMIURIDAE) AND *PSEUDOPECOELOIDES ARTERINOMORI* AKEN'OVA ET AL, 2009 (OPECOELIDAE) INFECTING ANGUILLIDAE AND SERRANIDAE MARINE HOSTS IN EGYPT

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Abstract

The study described of two parasitic digenean species isolated from pyloric portion of stomach and middle part of their host intestines. *Lecithochirium priacanthi* Yamaguti, 1953 (Hemiuridae) & *Pseudopecoeloides artherinomori* Aken'Ova et al, 2009 (Opecoelidae) respectively infecting two marine fish, the European sea eel *Anguilla anguilla* (Anguillidae) captured from Alexandria City coast, Mediterranean Sea and the spotted coral grouper *Plectropomus maculatus* (Serranidae) from coasts of Suez Gulf and Hurghada of the Red Sea, both species captured during the year 2015. The morphology and morphometric characterization were carried out by light microscopy. *L. priacanthi* characterized by elongated body measured 2.11 ± 0.20 mm (1.93-2.54) in length with tapered conical anterior and cylindrical wide posterior ends, supplied with a very short retracted tail with blunt end and two large oval testes. This species is unique by two compact, lobed masses of vitellaria just posterior to ovary. *P. artherinomori* characterized by elongated slender body measured 1.8 ± 0.02 mm (1.4-2.20) in length with a ventral sucker larger than oral sucker situated on a very short peduncle formed wrinkles around sucker. Both species were recorded for the first time from these host species in Egypt.

Key words: *Lecithochirium priacanthi*, Hemiuridae, *Anguilla Anguilla*, *Pseudopecoeloides artherinomori*, Opecoelidae, *Plectropomus maculatus*, light microscopy.

Introduction

It is known that marine fish play important roles as intermediate or definitive hosts for a number of helminthes (Manter, 1940; Dogiel et al, 1964; Williams and Jones, 1994; Abdou et al, 2001). The digeneans of family Hemiuridae is commonest digeneans found inside digestive tract of marine fish, and the present isolated *Lecithochirium* is the most common genus of this family (Shih et al, 2004). Yamaguti (1971) gave diagnostic generic features of *Lecithochirium* are male gonads, fish host and harboring site in host (stomach and pyloric part of intestines) with testes being symmetrical, and immediately posterior to acetabulum. Surekha and Lakshmi (2005) reported that genus *Lecithochirium* has exclusive taxonomic characters like a well or poorly developed ecsoma and a presomatic pit, seminal vesicle bipartite or tripartite and occasionally coiled, vitellarium

condensed and usually divided into 6-7 oval to digitiform lobes and with massive uterine coils. Genus *Lecithochirium* contains several species parasitic in marine fish such as: *L. gravidum* (Looss, 1907); *L. physcon* (Luhé, 1901); *L. musculus* (Looss, 1907); *L. synodi* Manter, 1931; *L. furcolabiatum*, (Luhé, 1901), *L. conviva* (Luhé, 1901); *L. australis* Manter, 1954; *L. magnaporum* Manter, 1940; *L. genypteri* (Manter, 1954); *L. flexum* (Manter, 1954) and *L. trichiuri* (Gu and shen, 1981). The genus *Lecithochirium* now contains at least more than 100 species (Surekha and Lakshmi, 2005). This species was recorded in Coast of Yemen, the Red Sea. *Lecithochirium* sp. (Digenea: Hemiuridae) in the marine Fish *Carangoides bajad* by Al-Zubaidy (2010).

Opecoelidae (Ozaki, 1925) constitutes a large and cosmopolitan family of digeneans, which includes about 51 genera & 465

species (Yamaguti, 1971). Genus *Pseudopecoeloides* (Yamaguti, 1940) is a well established, contains elongate and slender worms with a pedunculated, non-papillate ventral sucker and an uroproct. All the nominal species confirmed to that concept, except *Pseudopecoeloides equesi* (Manter, 1947). *P. equesi* has five distinct papillae on ventral sucker and Manter (1947) suggested a new genus. Yamaguti (1971) gave ten *Pseudopecoeloides*, species but Bartoli *et al.* (2003) devised a key to 18 species. Seven species of *Pseudopecoeloides* including the present one were recorded from Australian temperate marine fishes (Aken'Ova *et al.*, 2009) of five new species; *P. hickmani*, *P. lesteri*, *P. arripi*, *P. atherinomori*, *P. hafeezullahi*, *P. scomberi* (Hafeezullah, 1971) and *P. tenuis* (Yamaguti, 1940).

The present study described two parasites from two marine water different species.

Materials and Methods

A total of 83 marine fish samples of two different species, the European Sea eel *Anguilla anguilla* (Anguillidae) and *Plectropomus maculatus* (Serranidae) along Alexandria Governorate Mediterranean Sea coast, the Suez Gulf and Hurghada coasts of the Red Sea, respectively, over the year 2015. Samples were immediately transported in water tanks to the experimental laboratory and identified (Randall, 1983; Froese and Pauly, 2004). Fish were carefully dissected and examined for parasites, alimentary canal and internal organs were transferred to sterile normal saline in Petri dishes and stereomicroscopic examined. Digenetic trematodes were fixed and preserved (Cribb and Bray, 2010). Worms were stained with Carmine acetic acid, dehydrated in ascending series of ethanol and mounted on Canada balsam. Identification was done using standard keys (Yamaguti, 1971; Surekha and Lakshmi, 2005). Illustrations were done by a drawing tube, measurements in mm (M±SE) with range in parentheses.

Results

Lecithochirium priacanthi Yamaguti, 1953

(Figs. 1, 2, 3, 10a): 16/40 fishes (40%) were naturally infected with digenetic trematode *Lecithochirium priacanthi* (Family: Hemiuridae). Infection was recorded in stomach and mid intestinal wall of the European Sea eel *Anguilla anguilla*. Adult flattened, elongated with tapered conical anterior end and cylindrical posterior end at widest point measured 2.11 ± 0.20 mm (1.93-2.54) x 0.67 ± 0.02 mm (0.61-0.72). Body with short retracted esoma with blunt end measured 0.20 ± 0.02 mm (0.18-0.25) x 0.32 ± 0.02 mm (0.28-0.35). Oral sucker: subterminal with a diameter of 0.10 ± 0.03 mm (0.08-0.13) about 1/3; ventral sucker 0.29 ± 0.02 mm (0.25-0.32) in diameter, at body posterior part of anterior third. Pharynx: 0.05 ± 0.01 mm (0.03-0.07) in length. Caeca wide, with a bifurcated tube terminated blindly posterior in front of tail base. Two large oval testes located laterally at body left median third part 0.16 ± 0.03 (0.13-0.21) mm in diameter. Ovary: oval 0.22 ± 0.03 (0.19-0.26) mm x 0.15 ± 0.02 (0.13-0.21) mm, located at body posterior third end left of median line. Uterus was long, coiled, filled with eggs, not extended into posterior end with its main bulk between ovary and testes from acetabulum to end of intestinal caeca. Vitellaria: 2 compact masses located posterior to ovary.

Taxonomic summary:

Family: Hemiuridae Looss (1899).

Type species: *Lecithochirium priacanthi* Yamaguti (1953)

Type host: Europe eel *Anguilla anguilla* (F: Anguillidae Linnaeus, 1758)

Type locality: Mediterranean Sea Coasts of Alexandria Governorate, Egypt.

Type habitat and infection site: Adult worms attached to host's intestinal wall.

Prevalence: 16/40 fish species (40%) naturally infected.

Etymology: Specific name derived from *Priacanthus* a genus host (Yamaguti, 1953).

Pseudopecoeloides atherinomori Aken'Ova *et al.* (2009) (Figs. 3-9, 10b,c): 27/43 fishes (62.7%) were naturally infected with digenetic trematode *Pseudopecoeloides ath-*

erinomori (F.: Opecoelidae). Infection in pyloric portion and mid-intestine of the spotted coral grouper *Plectropomus maculatus* (F: Serranidae). Body: elongate, slender, measured 1.8 ± 0.02 mm (1.4-2.20) in length, maximum width 0.2 ± 0.02 mm (0.17-0.23) at gonads region. Oral sucker: subspherical, subterminal measured 0.15 ± 0.02 mm (0.13-0.20) in diameter. Ventral sucker: spherical 0.25 ± 0.02 mm (0.22-0.28) in diameter, larger than oral sucker and situated on a very short peduncle forming wrinkles around sucker. Fore body: short, 0.57 ± 0.02 mm (0.53-0.64) in length. Pharynx: large, sub-spherical measured 0.08 ± 0.02 mm (0.06-0.11) in length with numerous gland cells along posterior margin. Oesophagus: moderately long. Caeca: long, bifurcated opened into an excretory vesicle close to posterior extremity forming uroproct. Testes: two circular, usually separate, occasionally contiguous (intandem), at posterior body 0.15 ± 0.02 mm (0.094-0.16) in diameter, without cirrus-sac. Seminal vesicle: naked, long tubular, convoluted anteriorly, saccular posteriorly, extent from intestinal bifurcation to ventral sucker posteriorly. Genital atrium: doliiform with thick walled. Genital pore: submedian, anterior to intestinal bifurcation or slightly at pharynx posterior margin. Ovary: pre-testicular, sub-

spherical measured 0.081 ± 0.02 mm (0.052-0.12). Uterus coiled between anterior margin of ovary and posterior margin of ventral sucker; runs without coiling along anterior portion of seminal vesicle to unite with ejaculatory duct close to genital pore. Eggs: large, oval, operculated measured 0.07 ± 0.02 mm (0.04-0.79). Vitelline follicles confined to third body extent posteriorly from about level of posterior margin of ventral sucker, excretory pore terminal.

Taxonomic summary:

Family: Opecoelidae Ozaki, (1925).

Type species: *Pseudopecoeloides atherinomori* (Aken'Ova et al, 2009).

Type host: Spotted coral grouper *Plectropomus maculatus* (F: Serranidae Bloch, 1708)

Type locality: Gulf of Suez and Hurghada City of the Red Sea, Egypt.

Type habitat and infection site: Adult worms attached to pyloric portion wall and intestine middle part.

Prevalence: 27/43 fish species with a percent of 62.7% naturally infected.

Etymology: Parasite specific name derived from genus name *atherinomori* (Fowler, 1903) of host fish.

Details in tables (1 & 2) and figures

Table 1: Comparative measurements (mm) of present *L. priacanthi* isolated and those previously recorded (Yamaguti, 1953):

Parasite	<i>L. priacanthi</i> (Yamaguti,1953)	Present <i>L. priacanthi</i>
Host	<i>Priacanthus hamrur</i>	<i>Anguilla anguilla</i>
Total body length	2.3	2.11 ± 0.20 (1.93-2.54)
Total body width	0.68	0.67 ± 0.02 (0.61-0.72)
Tail length	0.525	0.20 ± 0.02 (0.18-0.25)
Tail width	0.35	0.32 ± 0.02 (0.28-0.35)
Oral sucker diameter	0.132	0.10 ± 0.03 (0.08-0.13)
Ventral sucker diameter	0.4	0.29 ± 0.02 (0.25-0.32)
Pharynx length	0.075	0.05 ± 0.01 (0.03-0.07)
Testes length	0.18 - 0.2	0.16 ± 0.03 (0.13-0.21)
Ovary length	0.15	0.22 ± 0.03 (0.19-0.26)
Ovary width	0.24	0.15 ± 0.02 (0.12-0.19)
Vitellaria	seven elliptical masses	Two lobed masses

Table 2: Comparative measurements (mm) of present *P. atherinomori* and two morphologically similar ones

Variant	<i>P. lesteri</i>	<i>P. atherinomori</i> (Ova et al, 2009)	Present <i>P. atherinomori</i>
Host	<i>Pseudocaranx wrighti</i>	<i>Atherinomorus ogilbyi</i>	<i>Plectropomus maculatus</i>
Total body length	1.373-1.58	1.312-2.155	1.8 ± 0.02 (1.4-2.20)
Total body width	0.158-0.17	0.146-0.194	0.2 ± 0.02 (0.17-0.23)
Oral sucker diameter	0.085-0.095	0.084-0.130	0.15 ± 0.02 (0.13-0.20)
Ventral sucker diameter	0.105-0.107	0.117-0.175	0.25 ± 0.02 (0.22-.28)
Pharynx length	0.067-0.077	0.062-0.084	0.08 ± 0.02 (0.06-0.11)
Testes	0.136-0.147	0.091-0.188	0.15 ± 0.02 (0.094-0.16)
Ovary length	0.071-0.077	0.075-0.143	0.10 ± 0.02 (0.07-0.12)

Discussion

In the present study, *Lecithochirium priacanthi* Yamaguti, 1953 was commonest digeneans infecting the digestive tract of marine fishes, and present *Lecithochirium* sp. was also the commonest genus (Shih *et al*, 2004). Genus *Lecithochirium* is very unsatisfactory, with many variations and combination of characteristics difficult in identification (Manter, 1934). Yamaguti (1971) reported diagnostic generic features of *Lecithochirium*; male gonads, fish host and infected site. Surekha and Lakshmi (2005) stated that genus *Lecithochirium* have exclusive taxonomic characters as a well or poorly developed ecsoma and a presomatic pit or ventrocervical groove, seminal vesicle bipartite or tripartite and occasionally coiled. Vitellarium condensed and divided to 6-7 oval to digitiform lobes with massive uterine coils. The present species differed from *Anguilla anguilla* but shared distinctive characteristics of genus *Lecithochirium* Yamaguti (1953): elongated body, testes (one pair), vitellaria (two lobed masses instead of seven elliptical ones), uterus (coiled), and stomach infection site. The present species agreed with the species *Lecithochirium priacanthi* recovered from *Priacanthus hamrur* (Yamaguti, 1953), but the present species is distinguished from this species in the presence of reduced vitellaria as 2 compact masses and a short eversible tail (ecsoma) instead of 6-7 oval to digitiform vitellaria lobes. Another species *L. grandiporum* reported from *Saurida tumbil* along Egyptian Red Sea coast and differed from the present one in its papillated more larger ventral sucker and reversible longer ecsoma and multilobated digitiform vitellarium (Morsy *et al*, 2012). Measurements of the present *L. priacanthi* were slightly different than the comparable species that might be due to specimen preparation.

In the present study, *Pseudopecoeloides atherinomori* was described (Yamaguti, 1940). Aken'Ova *et al.* (2009) reviewed two

species of *Pseudopecoeloides* and gave five new ones. They divided species into two groups (A & B) on basis of the sucker ratio, Group A were those with the oral sucker larger than the ventral sucker and in Group B oral sucker was equivalent to or distinctly smaller than ventral one. Yamaguti (1970) stated that the relative positions of ovary and testes were consistent and useful in species identification, except in contracted samples. Post-testicular area has useful criteria. Madhavi (1975) and Bray (1987) also suffered in determining the relationship between the caeca and the excretory vesicle in a related species. The present species has an uroproct, based on observations on the single laterally mounted specimen. *P. atherinomori* can be accommodated in Group B, as resembled the species reported by Aken'Ova *et al.* (2009) in most morphometrical features except for shorter forebody and slightly longer post-testicular area relative to the body length. Anterior limit of the vitelline follicles in *P. atherinomori* is at about the level of the posterior margin of ventral sucker peduncle, whereas is about half-way between anterior margin of ovary and posterior margin of ventral sucker peduncle in *P. lesteri*. *P. atherinomori* and also possesses a vitelline distribution and in some metrical features.

Conclusion

Lecithochirium priacanthi and *Pseudopecoeloides atherinomori* are two digenean parasites isolated from two different marine fishes in Egypt, the European sea eel *Anguilla anguilla* and the spotted coral grouper *Plectropomus maculatus*. The two species were compared with the parasites of the same genus isolated previously from different host species worldwide. Both species are recorded as new host and locality records in Egypt and further electron microscopy and molecular studies will be carried out as future studies to evaluate the exact taxonomic position of these species.

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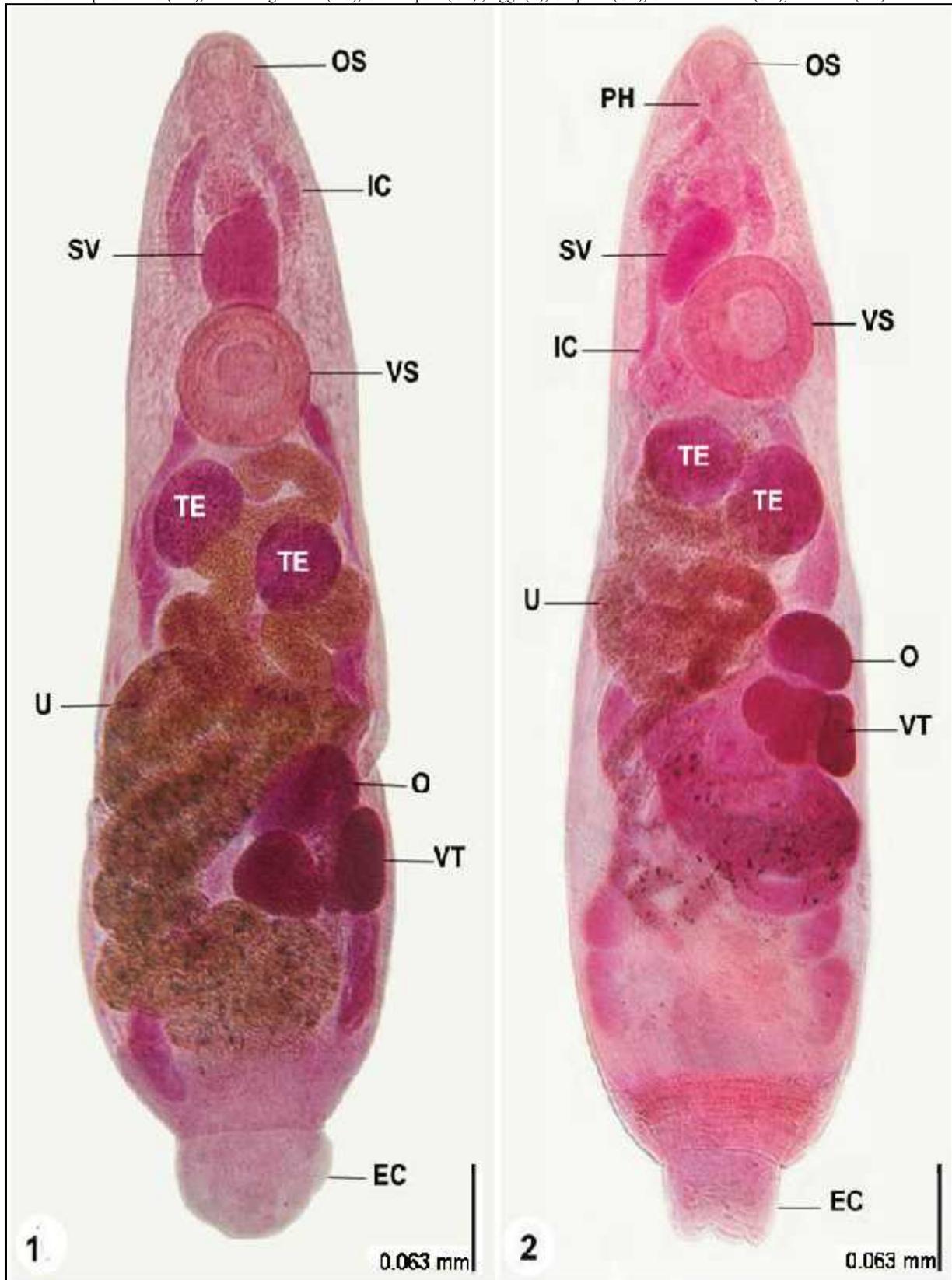
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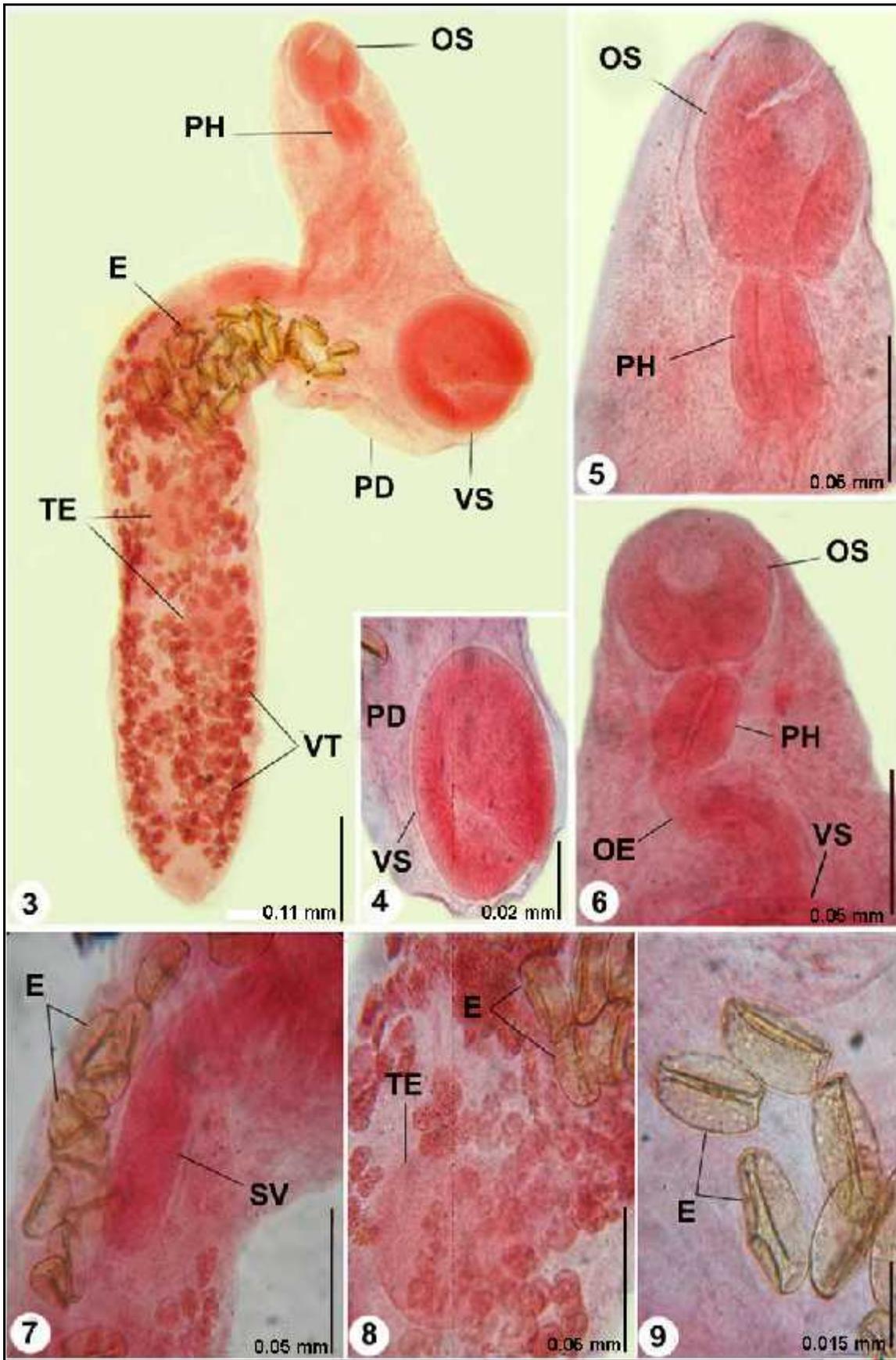
Explanation of figures

Figs. 1&2: Photomicrographs of *Lecithochirium priacanthi* infecting European sea eel *Anguilla anguilla* stained with Carmine, acetic acid (Schneider) showing elongated body pointed anteriorly and broad posteriorly terminated at a short ecsoma (EC). Subterminal oral sucker (OS), Pharynx (PH), Seminal vesicle (SV), Ventral sucker (VS), Ovary (O), Large coiled uterus (U), Seminal vesicle (SV), Two oval testes (TE), Lobed vitellaria (VT) and Intestinal caeca (IC).

Figs. 3-9: Photomicrographs of *Pseudopecoeloides artherinomori* infecting spotted coral grouper *Plectropomus maculatus* stained with Carmine, acetic acid (Schneider). 3: Flattened adult worm with an anterior oral sucker (OS) followed by pharynx (PH). Body extends outside to wrinkle ventral sucker (VS) by a peduncle (PD). Vitellaria (VT) extends posteriorly from mid part of fore body, two spherical testes (TE) located at the posterior mid part of body. 4-9: High magnifications of: 4: Ventral sucker (VS) and surrounding peduncle (PD). 5-6: Anterior body region with subspherical oral sucker (OS), Pharynx (PH) and Oesophagus (OE). 7- Tubular seminal vesicle (SV), Eggs (E). 8- Mid region of body showing spherical testes (TE) and Operculated eggs (E). 9- Worms' eggs (E).

Fig.10: Line diagrams of (a) *Lecithochirium priacanthi*. Scale bar, 0.063 mm (b) Ventral view, Scale bar, 0.11 mm (c) lateral view (Scale bar, 0.11 mm) of *Pseudopecoeloides artherinomori*. Oral sucker (OS), Ventral sucker (VS), Pharynx (PH), Intestinal caeca (IC), Testes (TE), Ovary (OV), Ductus hermaphroditicus (DH), Terminal genitalia (TG), Genital pore (GP), Eggs (E), Uroproct (UP), Seminal vesicle (SV), Vitellaria (VT).





F. 10

