# Helminthiasis and histopathological effect on yellowtail scad fish (*Atule mate*) from Red Sea with referring to its public health hazards

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**Abstract**
Yellowtail scad fish (*Atule mate*) is considered one of the most important fish species in the Red Sea, also as seafood at fish markets and restaurants. During the period of April 2013 till March 2014 a total of 50 fish specimens were collected from Hurghada, Red Sea and examined for their internal parasites. The total infestation rate of isolated parasites from gastrointestinal tract was 64%. The isolated parasites were identified morphologically as trematodes from family: Hemiuridae *Lecithocladium excisum* (20%); *lecithochirium* spp. (14%); Family: Bucephalidae *Prosorhynchus epinepheli* (12%) and *Prosorhynchus* spp. (8%). The rate of infestation of acanthocephalan parasite was 10% from family Rhadinorhynchidae: *Radinorhynchus pristis*. The histopathological lesions of these parasitic infestation were manifested as severe hyperplastic changes of intestinal mucosa accompanied by severe hyperplasia and hypertrophy of glandular goblet cells as well as chronic gastroenteritis with granulation tissue formation in the submucosa which extended to tunica muscularis and in severe cases had a fibrous tunnel around parasite extended to the peritoneal cavity which accompanied by peritonitis. Cross sections of the parasites were observed in the lesions of intestine. Heavy parasitic infestations capable of causing irreversible damage to the intestinal tissues can seriously affect the health and quality of the affected fish and thereby making the fish unfit for hatchery production. In this study, the probability of zoonotic significance of the isolated parasites was referred.

***Key words:***
*histopathological lesions ,Yellowtail scad fish, f. Hemiuridae, f. Bucephalidae, f. Rhadinorhynchidae*

## Introduction

Parasites are accepted among the most detrimental effects on fish stocks all over the world. They cause retardation in growth, lead to diseases and may even cause the deaths of whole school of host fish. Only a small number of parasites do not cause noticeable defects on fish, however, when they increased in numbers, an increase in ratio of the harm also occur. The digenea are one of the major taxa of parasitic platyhelminths and they are invariably endoparasites. Digeneans are heteroxenous and require more than one host to complete their life cycle. The most important limiting factor for digenean dispersal is the intermediate host such as gastropoda and bivalves **(Paperna and Dzikowski 2006).**

**Shaukat and Bilqees (2011)** mentioned that member of family Hemiuridae Looss, 1899 are among the most frequently encountered digeneans in deep sea benthic teleosts. Several Hemiurid species were recorded from freshwater fish as well as marine fish. Some of these species revealed from fish stomach and others from intestinal lumen of fish **(El-Serafy *et al.,* 2002)**.

**Nahhas *et al.,* (2006)** isolated and identified six trematode species belong to family Bucephalidae from the intestine of some marine fish collected from the Arabian Gulf of the coast of Kuwait. Moreover, they mentioned that all recorded species, except *Prosorhynchus epinepheli* represented new records from Arabian Gulf.

The digenean *Lecithochirium* genus now contains at least more than 100 species These worms are generally morphologically complex, the ecological, physiological, and environmental factors of the hosts and the adaptations of parasites might have lead to morphological variations of flukes **(Surekha and Lakshmi, 2005)**.

**Alves and Luque (2001)** mentioned that the digenean *Lecithochirium* was exception, with the highest values of prevalence in the intermediate length class, when the fish inhabit the littoral zone at 25-30 meters deep.

Acanthocephalans, known as thorny-headed worms or spiny-headed worms, characterized by the presence of an evertable proboscis, armed with spines, which they use to pierce and hold the gut wall in the definitive host. Acanthocephalans are obligate endoparasites which infect hosts intestines **(Taraschewski, 1989a and b).**

*Radinorhynchus pristis* acanthocephalan parasites collected from the intestine of Scombrid fish *Scomber scombrus* and *S. japonicus* from Portugues coast of Atlantic Ocean **(Rego, 1987 and Alves *et al.,* 2003).**

**El-Mansy *et al.,* (2011)** stated that the direct effect of helminth parasites mainly depend on their attachment organs. The acanthocephalan parasite *Acanthosentis tilapiae* caused severe rupture of the infected tissue by its proboscis hooks at the attachment site. Moreover, it may lead to complete decompose to intestinal tissue of the host.

The host immune system reacts in different ways to the parasite stages and the cellular responses invariably attempts to isolate and destroy the parasites. The most severe pathology is often a combination of efficient parasite replication and excessive host response **(Feist and Longshaw, 2008).**

**Oktener *et al.,* (2010)** stated the public health hazards of fish parasites. They also recorded that people handling and consuming meat from fishes, such as fishermen and sellers, or people who come into contact with fish for research or during daily and monthly care of aquarium and cage fishes are also at risk of contracting these zoonotic diseases.

This study was designed to determine the parasitic fauna infested Yellowtail scad (*Atule mate*) marine fish from Hurghada, Red Sea. It also aimed to describe the pathological lesions accompanied with the parasitic manifestation of infected yellowtail scad fish. The public health hazards of the isolated parasites were referred in this study.

## Materials and Methods

The present investigation was carried out using 50 marine fish yellowtail scad (*Atule mate*) collected from Hurghada, Red Sea during the period of April 2013 till March 2014. The collected fishes were transported to the lab in thick plastic bags partially filled with its natural water within a short time according to **Langdon and Jones (2002).**

### I. Clinical and postmortem examination.

Fishes were examined clinically for any pathognomic abnormalities due to presence of parasitic helminthes according to **Aloo *et al.,* (2004).**

### II. Parasitological examination.

Fish were dissected carefully for observing internal organs and then placed in separate Petri dishes containing physiological saline water.

The isolated intestinal endoparasites were examined microscopically for morphometric identification according to **Aloo *et al.*, (2004).** The freshly recovered acanthocephalan parasites were refrigerated overnight to extend the proboscis. Both acanthocephala and trematodes were fixed in alcohol-formalin-acetic acid (AFA). The specimens stained with Semichon's aceto-carmine, dehydrated through an ethanol series, cleared in clove oil, then got rid of oil by xylene and mounted in Canada balsam **(Pritcharid and Kruse, 1982).**

**III. Histopathology techniques.**

After dissection of the fish, different organs were removed to search for helminthes. Some infected intestinal specimens were processed for histopathological investigations. The specimens were fixed in 10% neutral formalin and embedded in paraffin. Appropriate sections were cut at about 5-6 microns and stained with hematoxylin and eosin. They were later examined under the microscope and their photomicrographs taken **(Bancroft and Gamble, 2002).**

## Results and Discussion

Identification of isolated trematodes and acanthcephalan parasites was carried out according to its morphometric features recorded by **Yamaguti (1958)** and **Margolis and Kabata (1989)** respectively.

**1- Trematode parasites.**

**Family:** Hemiuridae

**Genus:** Lecithocladium

**Species:** *Lecithocladium excisum* **(Rud, 1819 and Luhe, 1901).**

**Location:** Intestines

In this study, tramatode *Lecithocladium* excisum was isolated from the intestine of *Atule mate* marine water fish. The entire worm is elongate with tail like structure, measuring 1.87 – 1.97mm in length and 0.34-0.37mm in width. The oral sucker is funnel-shaped and measures 0.063- 0.064 x 0.098-0.099 mm. Pharynx is well developed and measures 0.12-0.16 long and 0.18- 0.19 mm wide. The esophagus is short. The intestinal caecum is tubular in shape and measures 0.34-0.35 mm in length. The ventral sucker measures 0.088-0.085 x 0.062- 0.084 mm. The testes are small, located at the middle of the body, each measures 0.033- 0.034 x 0.030-0.032 mm. The ovary is nearly spherical, larger than testes and posterior to testes, it measures 0.055-0.058 x 0.057-0.059 mm. The vitelline glands tubular and consists of 7 lobes convoluted posterior to ovary (Fig.1, A). The uterus filled with eggs and extends to ecsoma. The eggs are small and measures 0.024-0.025 x 0.012-0.013 mm. The excretory vesicle is elongate, tubular in shape and opens at the posterior end with a terminal excretory pore (Fig. 1, B).

This species was originally described by **Rud (1819) and Luhe (1901)** from *Scombrus scombrus* fish from the Mediterranean Sea. This species is a very common parasite of *Scomber* spp. and widely distributed in the Atlantic coasts, Mediterranean and Black Sea **(Dimitrov, 1991; Cisse and Belghgti, 2005 and Keser *et al.,* 2007)** .The present work fully agrees with the original description of *Lecithocladium excisum* by **Rud (1819) and Luhe (1901)**, but represents different host and locality .

**Family:** Hemiuridae **(Luhe, 1901)**

**Subfamily:** Hemiuroidea **(Faust, 1929)**

**Genus:** Lecithochirium **(Luhe, 1901)**

**Species:** *Lecithochirium* spp**.**

**Location:** Stomach

The body is elongated, with cuticular denticulations. It is characterized by the hump-like thickenings projecting into the lumen of the oral sucker rather than a “prostatic vesicle” in the sinus sac. The wall of the sinus sac is more or less open posteriorly and seems partially to enclose one end of the prostatic vesicle. The genital pore situated adjacent to the right posterior margin of the pharynx (Fig. 2, A&B). Body length measures 3.25-3.28 mm, while the maximum width attained at acetabular level was 0.55-0.65 mm. The oral sucker is subterminal, nearly rounded and measures 0.13-0.16 mm long and 0.13-0.15 mm wide. Acetabulum is larger than oral sucker near anterior extremity and measures 0.38-0.40 mm long and 0.42-0.44 mm wide. The ratio between oral sucker/

acetabulum 0.33-0.40:1. Prepharynx absent, pharynx well developed and measures 0.08-0.09 mm long and 0.09- 0.10 mm wide, caeca extending into tail. The testes are nearly rounded, diagonal, some distance posterior to acetabulum. Anterior testis measures 0.16-0.17 mm long and 0.21-0.23 mm wide, while the posterior one measures 0.18-0.19mm long and 0.17-0.18 mm wide. The ovary is located posterior to testes from which it measures 0.12 -0.13 mm long and 0.17-0.18 mm wide. Receptaculum seminis is contiguous with the ovary measuring 0.06- 0.07 mm long and 0.07-0.11mm wide. The vitellaria lie immediately behind ovary and consist of several oval lobes (covered with the coiled uterus). The uterus very coiled and filled with eggs, extends into tail and passes anteriorly to form a metraterm, which opens into the hermaphroditic duct. Eggs are small, numerous. The excretory opening is terminal (Fig. 2, A).

The present study revealed the *Lecithochirium* spp. belong to family Hemiuridae from the stomach of *Atule mate* marine fish collected from the Red Sea coast of Egypt from Hurghada city. This finding is similar to that recorded by **Al-Zubaidy (2010)** who isolated the same species from stomach of Carangoides bajad, a commercially important teleost fish species of the Red Sea Coast of Yemen from AL-Khatheib region, in the coast city of Hodeidah.

The digenean family Hemiuridae is the most common digeneans found inside the digestive tract of marine fish, and the present isolated Lecithochirium is the most common genus of this family **(Shih *et al.,* 2004)**. Obviously, the genus Lecithochirium is in a very unsatisfactory state. There are so many variations and combinations of characteristics that make selection of distinguishing characteristics difficult and thus mostly arbitrary **(Manter, 1934)**. The characteristics of all specimens collected during this study, such as: body form is elongated, testes is one pair, Vetellaria are several and oval in shape, Uterus is coiled, site of infection is stomach in a marine fish host, presence of elevations in the wall of the oral cavity; and the characters of the male vesicle within the sinus sac, place this species within the genus Lecithochirium as recorded by **Manter (1954), Yamaguti (1958) Surekha and Lakshmi (2005) and Al-Zubaidy (2010).**

**Family:** Bucephalidae **(Poche, 1907)**
**Subfamily:** Bucephaline **(Poche, 1907)**
**Genus:** Prosorhynchinae **(Nicol, 1914)**
**Species:** *Prosorhynchus epinepheli* **(Yamaguti, 1939)**
*Prosorhynchus* spp.
**Location:** Intestine

This study isolated parasitic trematode *Prosorhynchus epinepheli* from the intestine of *Atule mate* marine fish. Body is plump to elongate (Fig. 3,A) in an average of 1143 x 466 mm. Rhynchus is funnel shaped in an average of 247 x 229 mm, without tentacular appendages. Mouth is opening usually in middle third of body (Fig. 3, B). Intestine is short. Gonads are near mid-body anterior to cirrus sac. Testes are tandem in middle third of body in an average of 124 x109 mm. Cirrus pouch containing tubular vesicular seminalis and well developed prostatic complex. Genital pore is in posterior part. Ovary is in front of anterior testis occasionally intertesticular in an average of 110 x 93 mm. Vitellarium is in two lateral groups of 20 -28 mm follicles extending from level of testicular junction forming an arch in region between caecum and rhynchus. Uterus is extending anteriorly to middle level of caecum filled with eggs. Excretory vesicle is tubular extending to the level of gonads (Fig. 3, A, B&C).

Concerning *Prosorhynchus* spp. (Fig. 4, A , B & C), body is plump to elongate in an average of 937 x 297. Rhynchus is irregular funnel shaped where its width is longer than length, in an average of 180 x 204 mm, without tentacular appendages. Mouth is opening usually in middle third of body. Intestine is short. Gonads are near mid-body anterior to cirrus sac. Testes are tandem in middle third of body in an average of 85 x76 mm. Cirrus pouch containing tubular vesicular seminalis and well developed prostatic complex. Genital pore is in posterior part. Ovary is in front of anterior testis occasionally intertesticular in an average of 76 x 68 mm. Vitellarium is in two lateral groups of 24 -27 mm follicles extending from level of testicular junction forming an arch in region between caecum and rhynchus. Uterus is extending anteriorly to the level of caecum filled with eggs. Excretory vesicle is tubular extending to the level of gonads.

The description of *Prosorhynchus epinepheli* was coincided with that recorded by **Yamaguti (1958)** from *Epinephelus akaara* marine fish collected from Iinland Sea. In the Arabian Gulf, it was also reported by **Saoud *et al.,* (1988)** from *E. chlorostigma.* Moreover, it was isolated from *E. areolatus* by **Kardousha (2003)** and **Nahhas *et al.,* (2006)**.

Moreover, the isolated *Prosorhynchus* spp. in this work is a very similar species to *P. longisaccatus* described by **Bray and Justine (2013)** but is probably with wider and shorter rhynchus.

**2- Acanthocephalan parasites.**

**Phylum:** Acanthocephala **(Rudolphi, 1808)**
**Class:** Palaeacanthocephala **(Meyer, 1931)**
**Order:** Echinorhynchida **(Southwell et Macfie, 1923)**
**Family:** Rhadinorhynchidae **(Travsssos, 1923)**
**Subfamily:** Rhadinorhynchinae **(Lüh, 1912)**
**Genus:** Radinorhynchus **(Lüh, 1912)**
**Species:** *Radinorhynchus pristis* **(Rudolphi, 1802).**
**Site of infection:** Intestine.

The present study revealed one female acanthocephalan parasites; identified as *Radinorhynchus pristis* which infected intestine of yellowtail scad (*Atule mate*).

The worm body up to 75 mm long, about 1.12 wide; proboscis up to 2.5 mm long, strongly flexed, subcylindrical, enlarged slightly anteriorly, armed with 14-16 mm longitudinal rows of 26 mm hooks each; ventral hooks of anterior two-thirds of proboscis weaker, slightly shorter than others; basal hooks forming a ring, almost perpendicular to surface of proboscis; surface of body with anterior and posterior fields of spines; anterior field encircling trunk entirely; posterior field restricted to ventral surface, extending further posteriorly in females than in males; uterus very long; uterine bell located near mid-level of trunk; eggs elongate, with middle membrane striated extern (Fig. 5, A,B,C&D).

This description is coincided with the findings recorded by **Rego (1987), Margolis and Kabata (1989) and Samar *et al.,* (2014).**

Table (1) showed that the prevalence of *Lecithochirium* spp. infection was 14%. This result is similar to that recorded by **Al-Zubaidy (2010)** (14.3%). Moreover, in this study, species of the family Hemiuridae were the most-common digeneans found in examined marine fish. This result coincided with that recorded by **Shih *et al.,* (2004)** in marine fish from Taiwanese waters; but with higher prevalence (45.9%) than that recorded in this study (34%) (Table 1).

The present work revealed that the prevalence of *Prosorhynchus epinepheli* was 12% (Table 1) that lower than the finding of **Nahhas *et al.,* (2006)** (43%).

The prevalence of the isolated acanthocephalan *Radinorhynchus pristis* was 10% (Table 1) which nearly agreed with **Alves *et al.,* (2003)** 7% from *Scomber japonicus* fish in Braziland and **Samar *et al.,* (2014)** 7.5% from *Scomber scombrus* (Mackerl),while **Costa *et al.,* (2004)** recorded higher prevalence of 50.6 and 60% in 1999 and 2001 respectively in Chub mackerel, *Scomber japonicus* from Madeira Island.

Histopathological changes of the infested fish intestine indicated different pathological changes which related to the duration of parasitic infestation. The first group showed which related to the earlier duration of parasitic infestation severe hyperplasia of the intestinal villi and lamina propria (Fig.7, A) as well as sever hyperplastic and hypertrophic changes of the goblet cells (Fig. 7,B). . The hyperplastic goblet cells were disperse yet dominated the surface of villi, likely reducing the harmful local effects of the proboscis hooks and serving as an immune response against parasitic infestation. A massive infiltration of lymphocytic inflammatory cells were detected in focal manner between the lining mucosal epithelial cells (Fig.7, C&D) that agree with **Esch and Huffines (1973) and Mehlhorn (2001)** who stated that The small rounded proboscis with large hooks attracting granulocytes in the acute initial phase of infestation in a focal manner. An inflammatory reaction at the submucosa of intestine, edema, mononuclear and eosinophilic focal infiltration were observed. Cell types resembling epitheloids, lymphocytes, macrophages aggregated at the infested area in response to inflammation that which had detected in (Fig.7, E). According to **Lebelo *et al.*, (2001) and Hassen (2002)** the increase in WBCs count occurred as a pathological response since these WBCs play a great role during infestation by stimulating the haemopoietic tissue and immune system by producing antibodies and chemical substances working as defense against infection. gastroenteritis characterized by hyperplasia of the lining mucosal epithelium and goblet cells infilteration in both intestinal and gastric tissues with severe extensive diffuse chronic inflammatory cell infiltration and fibrosis in the lamina propria and submucosa of the intestine of the infested fishes which agreed with **Longshaw (2012)**. **Yildiz *et al.*, (2004)** have also observed a marked thickening of the lamina propria and muscularis mucosa due to parasitic infestation which appear as cross section in muscularis mucosa in our study (Fig.7, F ).

In the second group histopathological changes which related to the moderated duration of parasitic infestation, showed degeneration and and sever necrosis of the mucosal epithelium was evident and in many areas they were showed complete desquamation of the intestinal mucosal epithelium (Fig. 8, G&H). Flattening and fusion of the villi also occurs with sloughing of epithelial covering of the villi. Parasite attachment to the intestinal wall caused destruction of the villi, and degeneration and sever necrosis of the mucosal epithelium (Fig. 8, I&J) that explained by **George and Nadakal (1981).**

Changes in microvasculature including enlargement and proliferation of blood vessels and dilation of lymphatic vessels were observed (Fig. 9, K). In some of the capillaries the numbers of RBCs visible were very low (Fig.9, L). Aggregation of lymphocytes and the presence of large number of esinophiles infilterating the intestinal mucosa and submucosa could be seen.

The payre’s patches showed sever depletion of lymphatic follicles (Fig.9,M). The most severe pathology is often a combination of efficient parasite replication and excessive host response **(Feist and Longshaw, 2008).**

In the Third group which related to the older duration of parasitic infestation, histopathological studies revealed severe pathological changes and the mechanical damage caused by the worms have totally destroyed the architecture of the intestinal tissues. Tunica muscularis showed degenerative changes of muscle fibers accompanied by edema between these muscle fibers as well as mononuclear cell infilteration .

Cross section of parasitic infestation appeaed between muscle fibers (Fig.9, N). Damage to the surface epithelium resulting in desquamation of cells leading to progressive shortening and flattening of the villi was obvious throughout the affected areas. Mechanical destruction to the host's intestinal tissue is usually followed by host immune responses like proliferation of fibroblasts and granular cell infiltration around the invader, resulting in the formation of a collagenic capsule around the parasite **(Schelhaas, 1980)**, which is very much evident in the present study. That also come in agree with **McDonough and Gleason (1981) and Kabata (1985)** who stated that deeply embedded forms of parasite can cause serious pathological conditions resulting in extensive granuloma and subsequent fibrosis.which lead to extensive inflammation, peritonitis due to perforation of the gut and systemic clinical changes will occur only in massive infestations, most often in farmed fish **(Bullock, 1963).** Parasite induced fibrosis in the intestinal wall along with the associated biochemical reactions will induce loss of gut motility **(Nickol, 2006).**

In some cases villious structures was not differentiated and appear as strings of tissues.(fig. 10- O)due to the chronic inflammatory reaction which lead to deposition of fibrin and fibrous tissue proliferation in the intestinal mucosa which make deformities of intestinal gland and appear as different size acini embedded in col-

lagenous fibrous tissue(fig.10,O).
The intestinal wall had parasitic structures surrounded by fibrosis (Fig.10, P&Q). Erosion of intestinal wall with loss of villous epithelial lining is usually seen.
The presoma of the parasites were found to pierce the mucosal epithelium, submucosa , muscularis and serosa of the wall of the intestine forming a tunnel surrounded with collagenous fibers. (Fig.10, R&S).
Severe irreversible damage to the intestinal villi will drastically reduce the absorptive area available for the normal digestive and absorptive functions of the animal while the damages associated with the tissue reactions in the wall of the intestine will alter the nature of the tissues, affecting its functional efficiency and the overall health status of the fish.
**Taraschewski (2000)** observed that the pathogenicity of acanthocephalans is mainly caused by two factors, density of worms and depth of parasite penetration into the host tissues. According to this theory of pathogenicity we classified our results into 3 groups.
Heavy infestations with those parasites capable of causing irreversible damage to the intestinal tissues can seriously affect the health and quality of the fish broodstock and thereby making the fish unfit for hatchery production.
Because fish may play roles as either intermediate or definitive hosts of parasites, helminth infections may cause fish diseases which can directly damage the host or can indirectly affect human health if raw or poorly cooked fish which contains parasitic larvae is consumed. All digeneans and acanthocephalan reported here were in the adult stage and were parasitic in the fish gut. As such, they should not cause any problems for public health. On the other hand, evidence suggests some fish parasites that are not currently considered human pathogens may become a human health concern in the future (**USFDA, 2001**). Therefore, control of parasitic fish diseases should be put in concern.

**Table (1).** Prevalence of isolated parasites recovered from yellowtail scad (*Atule mate*):

| No. of examined fish | No. of infected fish % | No. of non infected fish % | Isolated parasites | No. of infected fish / spp. | Prevalence% |
|---|---|---|---|---|---|
| 50 | 32 64 | 18 36 | *Lecithocladium excisum* | 10 | 20 |
| | | | *Lecithochirium* spp. | 7 | 14 |
| | | | *Prosorhynchus epinepheli* | 6 | 12 |
| | | | *Prosorhynchus* spp. | 4 | 8 |
| | | | *Radinorhynchus pristis* | 5 | 10 |

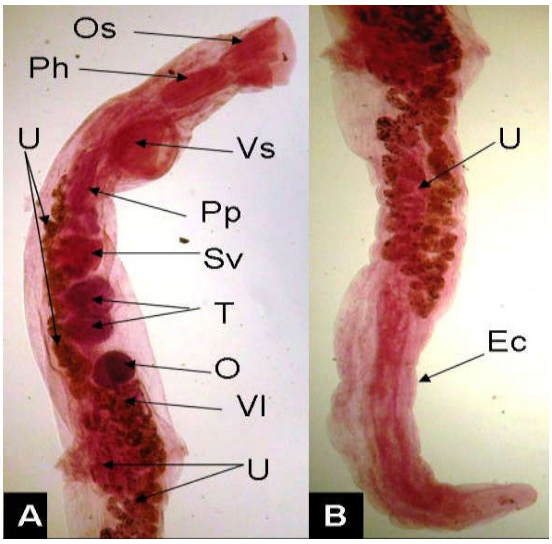


**Fig. 1. *Lecithocladium excicum.*** A) Anterior and middle part of worm (Soma), B) Posterior part of worm (Ecsoma). Os= Oral sucker; Ph= Pharynx; Vs= Ventral sucker; Pp= Pars prostatica; Sv= Seminal vesicle; T= Two testes; O= Ovary; Vl= Vitellariam lobes; U= Uterus filled with eggs; Ec= ecsoma.

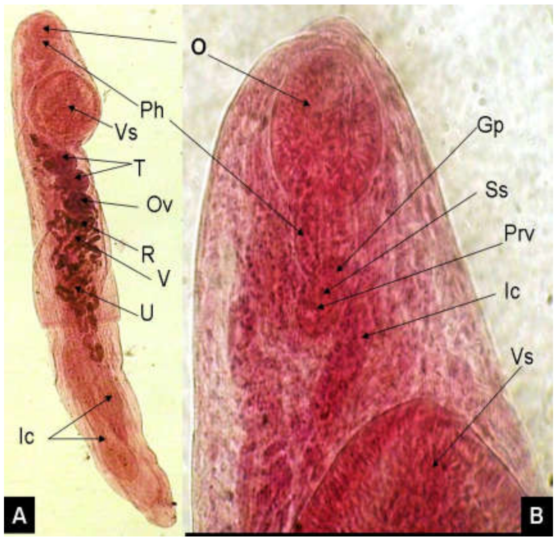


**Fig. 2. *Lecithochirium* spp..** A) Whale worm, B) Anterior part. O = Oral sucker; Ph = Pharynx; Vs = Ventral sucker; T = Testes; Ov = Ovary; R= Receptaculum seminis; V = Vetillarium lobes (under the coiled uterus); U = Uterus; Ic = Intestinal ceacum; Gp = genital pore; Ss = Sinus sac; Prv = Prostatic vesicle.

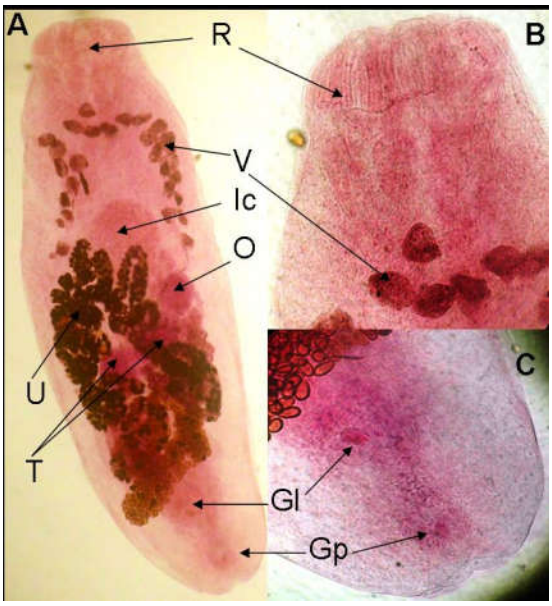


**Fig. 3. *Prosorhynchus epinepheli.*** A) Whole worm; B) Anterior part; C) Posterior part. R= Rhynchus, V= Veteline gland, Ic= Intestinal cecum, O= Ovary, U= Uterus filled with eggs, T= Testes, Gl= Genital lobe, Gp= Genital pore.

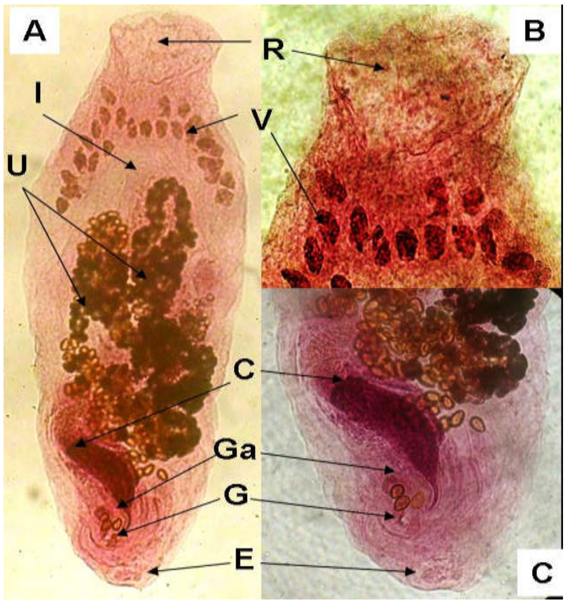


**Fig. 4. *Prosorhynchus spp.*** A) Whole worm, B) Anterior part, C) Posterior part, R= Rhynchus; V= Vitelline follicles; I= Intestinal cecum; U= Uterus filled with eggs; C= Cirrus sac; Ga= Genital atrium has eggs; G= Genital pore. Ovary and testes are not determined because the uterus filled with eggs; E = Execratory pore.

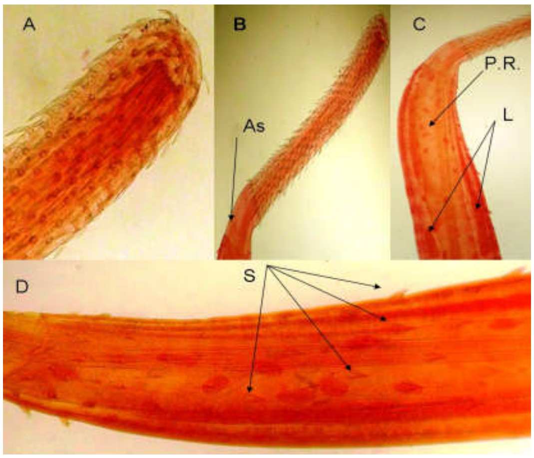


**Fig. 5.** ***Rhadinorhynchus pristis.*** A) Anterior part of proboscis with spins; B) Proboscis , AS= Aspinose area; C) Anterior part of body (Trunk) , P.R. = Proboscis receptacle, L= Lemnisci; D) Trunk part, S= spines

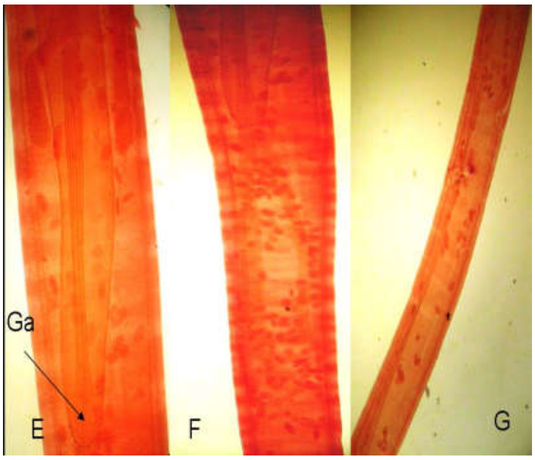


**Fig. 6.** ***Rhadinorhynchus pristis.*** E) Proboscis receptacle, Ga= Ganglion; F) Middle part of female body, G) Posterior part of female body.

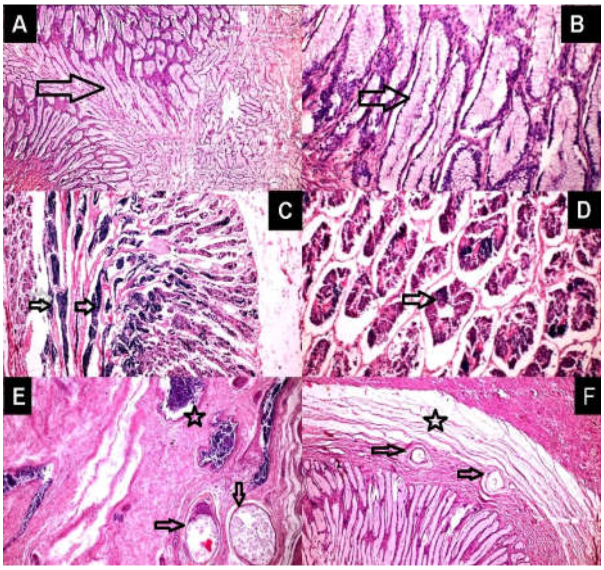


**Fig. 7.** (A) Intestinal mucosa showed severe hyperplasia of the intestinal villi (arrow) and lamina propria H&E X200.

(B) Intestinal mucosa showed severe hyperplastic and hypertrophic changes of the goblet cells. (arrow) H&E X400.

(C&D) showed a massive infiltration of lymphocytic inflammatory cells were detected in focal manner between the lining mucosal epithelial cells (arrow) (C) H&E X200 (D) H&E X400.

(E) Intestinal submucosa showed mononuclear, eosinophilic focal infiltration (star) and edema as well as cross sections of parasitic infestation. (arrow) H&E X400.

(F) showed parasitic infestation appear as cross section of parasite (arrow) at muscularis mucosa accompanied by edema and thickning in lamina propria. (star) H&E X200.

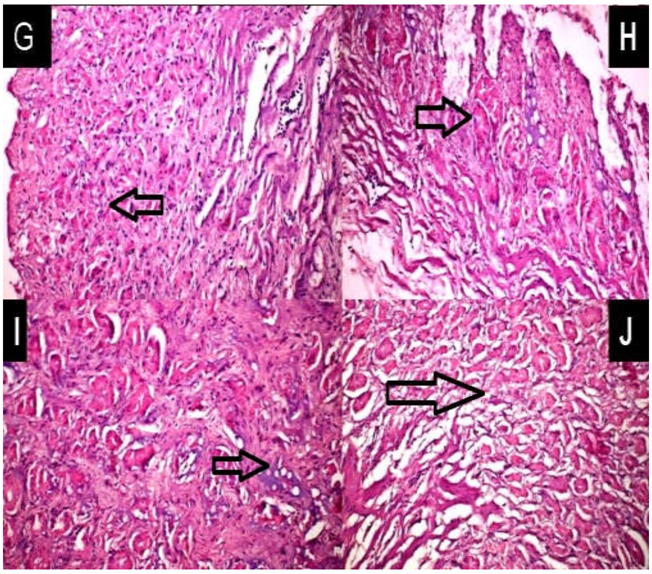


**Fig. 8**. (G&H) showed severe degeneration and necrosis of the mucosal epithelium. (arrow) H&E X400

(I&J) showed destruction of the villi, and degeneration and sever necrosis of the mucosal epithelium (arrow) H&E X400.

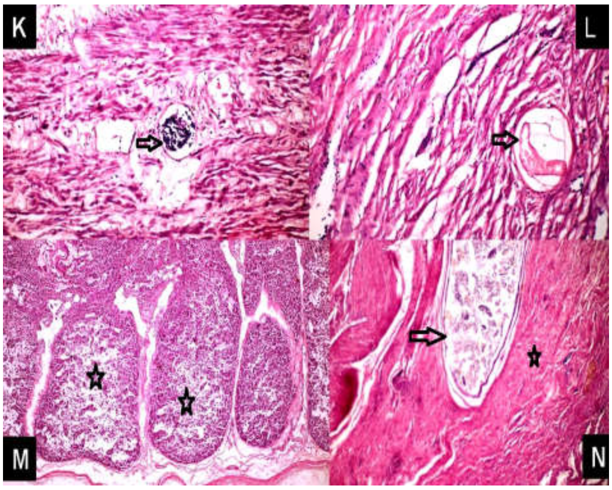


**Fig. 9.** (K) showed changes in microvasculature including enlargement and dilation of lymphatic vessels which filled with mononuclear cell infilteration. (arrow) H&E X400.
(L) showed some of the capillaries which had proliferative changes as well as the numbers of RBCs are very low. (arrow) H&E X400.
(M) The payre's patches showed sever depletion of lymphatic follicles. (star) H&E X200.
(N) Tunica muscularis showed degenerative changes of muscle fibers (star) accompanied by edema between these muscle fibers as well as mononuclear cell infilteration. Cross section of parasitic infestation appeaed between muscle fibers. (arrow) H&E X400.

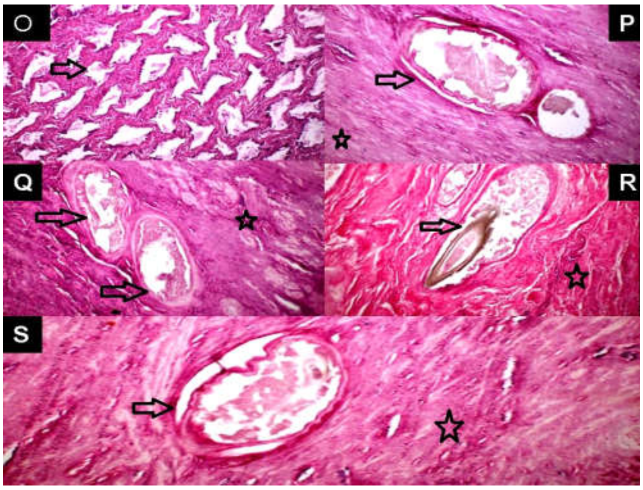


**Fig. 10.** (O) showed destruction to the architecture of the intestinal mucosa which make deformities of intestinal gland and appear as different size acini (arrow) embedded in collagenous fibrous tissue. H&E X400.
(P&Q) The intestinal wall had cross section parasitic structures (arrow) surrounded by fibrosis. (star) H&E X400.
(R&S) The presoma of the parasites (arrow) were found to pierce the muscularis wall of the intestine forming a tunnel surrounded with collagenous fibers (star) H&E X400.

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# الإصابة بالطفيليات وتأثيرها المرضى على الأنسجة فى اسماك الصعبارى من البحرالأحمر مع الإشارة الى خطورتها على الصحة العامة

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**الملخص العربى**

تعتبر اسماك الصعبارى من الأسماك الهامة فى البحر الحمر كطعام بحرى فى أسواق الأسماك و المطاعم. تم تجميع ٥٠ عينه أسماك من البحر الحمر بالغردقة و ذلك فى الفترة من أبريل ٢٠١٣ الى مارس ٢٠١٤ وفحصها للطفيليات الداخلية.

قد وجد ان معدل الإصابة الكلية بالطفيليات المعزولة ٤٠% . و تم التعرف على الطفيليات المعزولة مورفولوجيا على انها من الديدان المفلطحة التى تنتمى الى عائلة الهيميوريدى من نوع ليثيسوكلاديوم إكسيسام (٢٠%) و ليثيسوكيريام (١٤%)، وطفيليات تنتمى الى عائلة باسيفاليدى من نوع بروسورينكاس إبينيفلى (١٢%) و بروسورينكاس (٨%).

وقد كان معدل الإصابة بديدان الأكانثوسيفلا ١٠% التى تنتمى الى عائلة رادينورينكيدى من نوع رادينورينكاس بريستيس.

و تمثلت الأفات الهستوباثولوجية للأصابة الطفيلية في زيادة شديدة في عدد الخلايا الكأسية المبطنة للنسيج المخاطي و كذلك زيادة في حجم و عدد الخلايا الكأسية المبطنة للغدد المعوية. كما شوهد التهاب معدي معوي مزمن مع تكون نسيج ليفي يمتد من المنطقة تحت مخاطية الى الطبقة العضلية و في الحالات الشديدة تكون نفق ليفي حول الطفيل و يصل الى النسيج البريتوني مصحوبا بالتهاب بريتوني. و أظهر القطاع العرضي وجود الطفيل في الأمعاء. و في حالات الأصابة الطفيلية يسبب تغيرات دائمة محدثا تنكرز في النسيج المعوي مما يؤثر سلبا على صحة و جودة الأسماك المصابة و خاصة الأسماك التي تستخدم في التفريخ .

قد تم فى هذه الدراسة الإشارة الى إحتمالية خطورة الطفيليات المعزولة على الصحة العامة.