Morphological studies on prevailing parasitic infections in the lizard fish *Saurida undosquamis* from the Gulf of Suez, Red Sea, Egypt

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ABSTRACT

Two hundred and seventy specimens of the marine lizard fish *Saurida undosquamis* were collected during the period from October 2018 to April 2019 from Gulf of Suez, Red Sea, Egypt. Fish were subjected to clinical, postmortem and parasitic examinations. The total parasitic infestation rate was 87.4%. The isolated parasites were one species of Microsporidia (*Glugea sp.*) with infestation rate 23%; one species of digenetic trematode (*Lecithochirium grandiporum*) with infestation rate 34.4%; one species of adult cestode (*Oncodiscus sauridae*) with prevalence rate 9.6%. The total prevalence rate of cestode larvae was 67.7%; three species of larval cestodes (Tetraphyllidean larvae; *Pseudogrillotia sp.* and *Floriceps sp.*). Tetraphyllidea plerocercoid and Trypanorhyncha Plerocercoid larvae infection rate were 59.6% and 40.4 % respectively. The total prevalence rate of larval nematodes infection was 39%. Two species of larval nematodes (*Anisakis simplex* larvae and *Echinocephalus overstreeti*) with prevalence rate 89.5% and 12.4% respectively. The histopathological alterations due to different parasitic agents were studied.

Key words: *Saurida undosquamis*, Parasitic infections, Histopathology.

INTRODUCTION

Fish is one of the most important sources among the food products of animal origin because of their content of high-quality biological animal protein, lipids, vitamins, essential fatty acids and several kinds of minerals Metin *et al.*, (2000).
The Lizard fish *Saurida undosquamis* Richardson, 1848 (Synodontidae) is a very commercially important fish species in marine aquatic water especially in Gulf of Suez, Egypt with a very good prospect for aquaculture Taha and Ramadan (2017).

The study of fish parasitology has importance for many reasons. Fish parasites cause commercial losses in both the aquaculture and fisheries industries and some are also causing for human diseases in many areas of the world Shamsi (2019).

It is well-known that marine fish may play roles as intermediate or definitive hosts for a number of helminthic parasites. The helminthes cause decreasing in the aqua resource production, reduction in fish growth and increase susceptibility of fish to other pathogens and raising mortality rates Shih *et al.*, (2010).

Microsporidiosis is a serious parasitic and potentially lethal disease in wild, cultured, marine, and freshwater fishes. They are a major cause of disease in fish and may have an economically important impact on fish stocks Lom and Nilsen (2003).

Digenetic trematodes are parasites of all classes of vertebrates, especially marine fish, and nearly every organ of the vertebrate body can be parasitized by some kinds of trematodes, as adult or juvenile stages Roberts and Janovy (1996).

Larval and adult tapeworms are common in fish. Adults usually are found in the intestinal tract, while larval forms (metacestode) encysted in visceral organs and musculature. Its migration throughout visceral organs is typically associated with spleen damage, hepatic necrosis and gonadal damage that might has the potential to reduce the reproductive capability and survival of affected fish Ehab and Faisal (2008).

Nematodes comprise one of the largest and most diverse groups of helminthes. The larval stages of these parasites sometimes found on the flesh and viscera, causing massive diseases of fish, economical losses, can cause very dangerous diseases in human and they have the greatest impact on the consumer acceptance of fish Moravec (1994).

Therefore, the present work was planned to focus more spotlight on the common parasitic infections of marine Lizard fish *Saurida undosquamis* through clinical picture, isolation and identification of the causative parasites, total prevalence as well as histopathological alterations caused by such parasites.
MATERIALS AND METHODS

Fish samples:

Two hundred and seventy specimens of the lizard fish (*Saurida undosquamis*) were collected during the period from October 2018 to April 2019 from Gulf of Suez, Red Sea, Egypt. The collected fish were transported alive after catching in plastic bags partially filled with its natural water within a short time according to Langdon and Jones, (2002) to the laboratory of Central Laboratory for Aquaculture Research, Abbassa, Abou Hammad Sharkia, Egypt, (CLAR) for dissection and examined.

Clinical signs and Post-mortem examination of fish:

The collected fish were examined using the methods adopted by Stoskopf (1993) for any pathognomic abnormalities on the external and internal organs.

Parasitological examination:

Skin surface, fins, and gills of fish were examined by the naked eye and dissecting microscope to detect any visible microsporidian cyst or helminth parasites, lesions or external changes according to Inoue *et al.*, (2000).

Microsporidian cysts found embedded in the body cavity and in heavy infections, the parasites spread in many organs of the body and vital internal organs (stomach, liver, ovaries and testis). Cysts were examined by making compression between two clean slides to release milky fluid from these nodules to make smears. The smears were air dried, fixed with absolute methyl alcohol and stained with Giemsa's stain according to Woo (1995). The identification of the recovered sporozoan parasites was based on morphological characters according to Paperna (1996). After dissection, the alimentary canal and the internal organs of the fish were transferred to Petri dishes with 0.7 % NaCl (a saline solution) and were examined under the stereomicroscope. The collected parasites were placed into large Petri-dish containing normal saline. For Trematode and cestode; Parasites were washed with water and fixed in formalin 4%, stained with acetic acid alum carmine stain, dehydrated in ascending grades of ethyl alcohol series, cleared in clove oil and mounted in Canada balsam Lucky, (1977). Meanwhile, Nematodes were cleared in lacto phenol and mounted in polyvol Kruse and Pritchard (1982). The morphological characters were described. The parasites were identified.

**Histopathological examination:**

Small pieces of suspected lesions with cyst were fixed immediately in 10% neutral buffered formalin for 24-48 hours, then dehydrated, embedded in paraffin wax, sectioned at five micron thickness and stained with haematoxlin and eosin (H&E), according to Bancroft and Stevens, (1982).

**RESULTS AND DISCUSSION**

**Clinical and Postmortem findings:**

In the present study, the naturally infected marine lizard fish (*Saurida undosquamis*) apparently normal and showed no pathognomonic clinical signs. The postmortem findings in some cases were enlarged pale liver, enlarged swim bladder, excessive mucus secretion and swelling intestine with hemorrhagic area in internal organs. The infected fishes with microsporidia showed macroscopic creamy whitish nodules embedded in the musculature, body cavity and on vital internal organs (stomach, liver, ovaries and testis). These nodules are oval in shape and its number varied from 2-7 cysts per fish and filled with milky white fluid containing mature spores Fig. (1, A, B, C and D). These results are similar to that introduced by Eissa (2002), Peyghan et al., (2009) and Marzouk et al., (2010) that no characteristic signs were associated with microsporidiosis in infected fishes. This may be attributed to nature of the disease and species of the infected fish and the parasite in which a localized disease was only demonstrated. Naturally infected fishes with larval tapworms Fig (1, E and F) and larval nematodes Fig (1, G) which showed a thin wall with swelling intestine and presence of some encapsulated or free larvae especially in liver, musculature and other internal organs, Excessive mucus secretion is the first line of defense against parasitic infection and the signs of diseases due to parasites attachment, physiological activity and feeding habitat of parasites. These results are nearly similar with those recorded by El-Ashram and Shager (2008), Ahmed et al., (2010), El-Lamie and Abdel-Mawla (2012) and Abo-Esa and Abdel-Mawla (2013).
Parasitological finding:
Phylum: Microsporidia                Balbiani, 1882
Class: Marinosporidia
Order: Microsporidia
Family: Glugeidae                      Thélohan, 1892
Genus: Glugea                            Thélohan, 1891
Species: Glugea sp.
Habitat: The body cavity, musculature and internal organs.

Cyst-like nodules or xenomas, whitish and mostly ovoid in shaped. The cyst was approximately from 3–5 mm in diameter. In wet mounts fresh spores were thick walled, uni-nucleated, pear-oval shaped with a large vacuole measuring 2.8-3.2 x 1.9-2.2 µm and composed of sporoplasm, single nucleus, anchoring disc, polar tube with polaroplast and a large posterior vacuole. In addition, Giemsa stained spores were oval with crescent polar cap as a dark blue dot Fig. (2). These met the description recorded by Eissa (2002), Dykova (2006), Peyghan et al., (2009) and Abdel-Ghaffar et al., (2011).

Phylum: Platyhelminthes
Class: Trematoda                        Rudolphi, 1808.
Order: Digenea                          Van Benden, 1858.
Family: Hemiurida                       Looss 1899
Order: Azygiida                         Schell, 1982
Genus: Lecithochirium                   Luhe, 1901
Species: Lecithochirium grandiporum    Rudolphi 1819.
Habitat: Stomach

The body was elongated and rounded anteriorly, but truncated posteriorly. The total body length was measured 3.6–4.1 mm long and 0.31–3.9 mm wide. The ventral sucker projected from the body measured 0.15–0.28 mm in diameter. The fore body consists of an oral sucker which was subterminal measured 0.12–0.18 mm in diameter, smaller than the ventral sucker which was circular and large with a wide aperture. Pharynx was elongated, muscular and measured 0.02–0.07 mm in length. The esophagus was transversely oval and short. Intestinal caeca were often inflated with anterior region transversely striated, pass posteriorly
in dorsolateral fields, and blindly close to the base of ecsoma. Testis were ovoid in shape located in ventral field of the body. The anterior testis measured 0.29 -0.31 mm in length and 0.33 – 0.41 mm in width, while the posterior testis measures 0.31 - 0.37 mm in length and 0.4 -0.48 mm in width. Ovary was sub-spherical, equatorial, and post-testicular and widely separated from testis by uterine loops which measured 0.13–0.19 mm in diameter. Uterine seminal receptacle was well developed, and post-ovarian uterine has numerous coils and fills much of somatic hind body, reaching back to the level of caecal extremities. Vitellarium was equatorially located in ventral field; it was multilobated and arranged in groups. Eggs were very numerous, small, regularly oval, operculate, and without polar filament. Excretory pore was located at the posterior extremity of the ecsoma. Excretory vesicle was Y-shaped, constricted at the junction of soma and ecsoma, and passed forward in dorsal field, and bifurcates close to posterior margin of ventral sucker; arms run dorsolaterally to ventral sucker and laterally to caeca, uniting dorsally to pharynx Fig. (3). This description in agreement with that described by Morsy et al., (2012) and Abd El-Ghany (2017) from the same fish species.

**Adult cestodes:**

Phylum: Platyhelminthes  
Class: Cestoda  
Subclass: Eucestoda  
Order: Pseudophyllidea  
Family: Bothriocephalidae  
Genus: Oncodiscus  
Species: *Oncodiscus sauridae*  
Habitat: The intestinal wall

Worms long, scolex flattended, irregularly-shaped or fan-shaped 1.7-3.1mm long by 1.25–2.17 wide. Bothria well developed, with conspicuously crenulated margins turned laterally. Apical small disc centrally placed with minute hooks, disc measured 0.27- 0.36 wide by 0.69-0.76 high, Neck absent, first segments starting immediately posterior to scolex. All segments are usually broader than long. Mature segments measures 0.29 mm long and 0.53 mm wide. Gravid 0.39 mm long and 0.71 mm wide. Testis oval, 50–100 in number per segment, in
two lateral fields, usually separated medially, continuous between segments. Cirrus-sac submedian, irregularly alternating, thick-walled, round or slightly oval, just anterodorsal to ovary. Genital pore dorsal, median, slightly postequatorial. Ovary transverse elongate, bilobed, lobulate, median, near posterior margin of segment, Uterine duct well developed, sinuous, ending in muscular, thick-walled uterine sac situated medially. Uterine pore medioventral, at distance from anterior margin of segment or almost equatorial. In some segments, pore extremely large due to collapse of wall of uterus Fig. (4). The morphological description of this cestode was similar to the original description of Yamaguti (1934), Khalil and Abu-Hakima (1985), Kuchta et al., (2009) and Abd El-Ghany (2017).

**Larval cestodes:**

Order: Tetraphyllidea 
Family: Tetraphyllidae 
Species: Tetraphyllidean larvae 
Habitat: The intestine

The free larvae were collected from the intestine. They were white, ovoid in shape. The body length was 1.6 -1.69 mm and 0.4 -0.42 mm width. Scolex bearing four suckers unarmed with hooks each measured 0.13 -0.15 mm long and the terminal sucker unarmed with hooks Fig. (5). This morphological description was agreed with that given by Amer et al., (2007), El-Ashram and Shager (2008), El-Ekiaby (2009) and Abo-Esa and Abdel-Mawla(2013).

Order: Trypanorhyncha         Diesing, 1863  
Superfamily: Otopothriodea   Dollfus, 1942 
Family: Grillotiidae         Dollfus, 1969 
Genera: Pseudogrillotia      Dollfus, 1969 
Species: *Pseudogrillotia sp.* Dollfus, 1969 
Habitat: The body cavity and mesentries.

White Trypanorhyncha plerocercoids. The scolex was long, slender and strongly craspsodate with velum. Two bothria were notched on posterior margin. Pars vaginalis was long. Tentacle sheath was spirally coiled. Basal armature swelling was present with special hooks. Prebulbar organs present. Bulbs were much shorter than pars vaginalis.
Pars postbulbosa was absent. Strobila were craspedate and long Fig. (6). Similar results were recorded by Abo-Esa and Abdel-Mawla (2013) whom recorded *Pseudogrillotia sp.* from same fish species. Whilst; Al-Zubaidy (2006) and Al-Zubaidy and Mhaisen (2011) isolated it from *Lethrinus lentjan* fish from the Red Sea which was the same locality of this study.

Order: Trypanorhyncha        Diesing, 1863
Superfamily: Poecilacanthoidea
Family: Lacistrorhynchidae    Guiart, 1927
Genus: Floriceps              Cuvier. 1817
Species: *Floriceps sp.*      Cuvier. 1817

Habitat: The body cavity and mesentries.

The body length was 5.2-6.1 mm and 0.9-1.2 mm width. Scolex was large, elongate, slightly craspedate and has two indented bothridia in the posterior margin measuring 0.2 mm long and 0.07 mm wide. The pars vaginalis is long. There are 4 heteromorphic hooked tentacles at the anterior extremity of the parasite’s body that can be either extended or retracted through 4 apertures which is the area occupied by the tentacles when they are entirely retracted within the parasite body. Each tentacle has a spiral sheath connected to retractor muscles. The post-bulbous region is absent Fig. (7). The morphological critica of this worm was in agreement with Abdou (2005), Palm *et al.*, (2009) and Abo-Esa and Abdel-Mawla (2013).

**Larval nematodes:**

Phylum: Nemathelminthes        Carus, 1863.
Class: Nematoda                Rudolphi, 1808.
Order: Ascaridida              Skrjabin et Schulz, 1940.
Family: Anisakidae             Raillet et Henry, 1912.
Genus: Anisakis
Species: *Anisakis simplex* larvae Rudolphi, 1809
Habitat: The body cavity
This third stage larva was slender in shape and whitish in colour. The body measured was 20 – 24 mm in length and 0.37 - 0.51 mm in width. The cuticle had fine transverse striations. The mouth opening surrounding with three lips which were two ventro-lateral and one dorsal and having a characteristic antero-laterally boring tooth at its anterior end. The excretory pore was situated between the ventro-lateral lips. The mouth leaded to oesophagus which measured 1.9 – 2.6 mm long and provided with an elongated ventriculus. The intestinal caecum was absent. The tail was broadly rounded and measured 0.19- 0.24 mm long and provided with mucron Fig (8). The same morphological characteristics were described previously by Moravec (1994), Ahmed et al., (2010) and Dadar et al., (2016).

Order: Spirurida  
Superfamily: Gnathostomoidea  
Family: Gnathostomatidae  
Genus: Echinocephalus  
Species: Echinocephalus overstreeti  
Habitat: The body cavity

The fourth larval stage was characterized by an unarmed body measuring 10± 2 mm (8–12) in length, and its greatest width at the posterior one third of the body was 0.3±0.02 mm (0.28–0.32). The terminal mouth was guarded by two smooth, bulbous lips; each was 0.05±0.02 mm (0.03–0.07) long. A cephalic bulb measuring 0.25±0.02 mm (0.23–0.27) long was armed by six circular rows of spines which became compacted near the anterior end of the bulb. The spines of the first and second rows were inconspicuous; they were uncinate, larger at the posterior part of the bulb. The body was covered by a transversely striated cuticle. The esophagus was 2.71± 0.2 mm (2.51–2.91) long; the ventricular appendix was narrow, usually somewhat shorter than the intestinal cecum. The intestinal cecum was 7.38±0.2 mm (7.18–7.58) long and 0.12± 0.02 mm (0.1–0.14) wide, opening at a midventral anus located approximately 0.04 mm from the posterior tip of the body which terminated at a pointed mucron. No papillae were observed in the pre- or postanal regions. Since the described worm was immature, the bursae, spicules, and fully reproductive organs were not observed Fig (9). The morphology of specimens of the present material is mainly in accordance with the descriptions of E. overstreeti Deardorff and Ko

Prevalence of the isolated parasites:

Two hundred and thirty six out of 270 lizard fish Saurida undosquamis were naturally infected with total prevalence rate (87.4%). The high prevalence of parasitic infection in Saurida undosquamis may be due to the accumulation of parasitic infection during the life span of the fish. Moreover diet and feeding habits of host species are the main factors affecting the parasitic community structure. This proposition is in accordance with Ramadan et al., (1990) who found the infection rate in Saurida undosquamis was 90% and higher than Abd El-Ghany (2017) who recorded the infection rate in the same species was 44.8%.

In the current study, the total infection rate with Glugea sp. was 23%. Different prevalence rates were recorded for microsporidiosis which was higher than the result obtained in our study by Eissa (1995), who gave 40-60% in naturally infected Hake fish collected from Red Sea at Suez Governorate, Egypt, Peyghan et al., (2009) with rate 44% from Saurida undosquamis and Marzouk et al., (2010) who reported infection rate of 63.23% in the same fish species. These variations could be explained by the different environment and the site of sample collection.

Results of this study have revealed that out of the collected parasites, only one digenetic trematode Lecithochirium grandiporum with a prevalence rate of 34.4% which was nearly similar to the results obtained by Morsy (2012) 37.86% who reported the same species as a first record from the lizard fish and higher than Abd El-Ghany (2017) with 16 % infection rate from S. undosquamis from Red Sea in Egypt.

Regarding prevalence of Oncodiscus sauridae it was recorded with prevalence rate 9.6%. Nearly similar prevalence rate (9%) was obtained by Khalil and Abu-Hakima (1985) from the same species. However, it was higher than that recorded by Abd El-Ghany (2017) 5.6% from S.undosquamis.

The total prevalence of cestode larvae was 67.7%. This result was nearly similar to that reported by Abo-Esa and Badawy (2006) 66.6% in Epinephelus spp. Meanwhile, it was lower than that obtained by, Amer et al., (2007) and Felizardo et al., (2010) who recorded that a prevalence
of infested marine fish was, 100% (*Atherina sp.* ) and 93.3% (*Paralichthys isosceles*) from Brazil. whereas, it was higher than Abo-Esa (2007), El-Ashram and Shager (2008), El-Ekiaby (2009) and Abo-Esa and Abdel-Mawla (2013) who recovered larval cestodes with prevalence 11, 1.2, 23.4 and 43.3% respectively in marine fish. These differences may be attributed to the locality from which fish specimens were obtained and the species of examined fish as well as the revealed parasites. The prevalence of Tetraphyllidea plerocercoid was 59.6% which nearly similar to that recorded by Abo-Esa and Abdel-Mawla (2013) 60% from *S. undosquamis*. whereas it was higher than the results of El-Ashram and Shager (2008) from *Scomberomorous maculates* 1.2%, and lower than El-Ekiaby (2009) 86% from *Atherina sp.*. This difference may be due to fish species, feeding habit and geographic distribution.

Concerning Trypanorhyncha larvae infection the prevalence rate was 40.4%. This result was higher than recorded by Abo-Esa and Abdel-Mawla (2013) 36% from *S. undosquamis* and Ibrahim (2000) from *Lethrinus sp.* (34.5%) and lower than Abo-Esa and Badawy (2006) 66.6% from *Epinephelus spp.* fish. While it was higher than the finding recorded Al-Zubaidy (2006) from *Lethrinus lentjan* 26.6% , Al-Zubaidy and Mhaisen (2011) from the body cavity of some Red Sea fishes 24.3%, Abo-Esa (2007) 11% from *Mullus barbatus* fish and El-Ekiaby (2009) 5% from *Morone labrax*.

Referring to the larval nematodes infection the total prevalence rate was 39%. This result was nearly El-Ekiaby (2009) 37.65%. while it was higher than Amer *et al.*, (2007) in *Atherina sp.* 20% and lower than Shagar and El-Ashram (2007) in Red Sea fishes 45.9%. This may be due to water temperature fluctuations, pollution, size and feeding habits of fishes which may be an attribution for such differences.

Our results demonstrated that the infection rate of anisakid larvae was 89.5%. This results was higher than El-Ekiaby (2009) and Ahmed *et al.*, (2010) reported that 41.86% and 48.76% of Lizardfish *S. undosquamis* were infected with anisakid larvae, respectively and Nada and Abd El-Ghany (2011) 43.43% from *Saurida undosquamis*. While, Abou-Rahma *et al.*, (2016) recorded anisakidae nematodes with 36.66% as a percentage of infection for the European hake *Merluccius merluccius lessepsianus*. These differences may be attributed to the temperature factor which enhance the life cycle of the parasite and the abundance of natural food specially crustacean which is the main food taken by fishes and play role in Anisakid life cycle Eissa (2002).
Anisakids cause serious human disease by eating insufficiently cooked marine fishes containing larvae of different anisakid species. Infection was associated with abdominal pain, nausea and diarrhea with very high eosinophilia and the formation of granulomata in gastrointestinal tract if the larvae were not removed Morsy et al., (2017). Freezing for few days and prompt cooking of fish is enough to kill the larvae and prevent infection Toyoda and Tanaka (2016).

Dealing with E. overstreeti the prevalence rate was 12.4%. Similar results was recorded by Al-Zubaidy et al., (2012) 12.9% from A. stellatus from the Red Sea whereas; Morsy et al., (2015) recorded it from S. undosquamis with rate 19.16%. Temperature might be a factor in infectivity. Also, host sex can influence parasitism levels due to the behavior and physiological differences between them.

Histopathological findings:

Microsporidiosis is highly destructive to the infected tissue, resulting in high mortality rates in fish Kent et al., (2014). In the current study, the pathological changes showed that the tissue alteration was recorded in different tissues and organs due to Microsporidiosis. Multiple spores of parasites were detected in between the muscle bundles, surrounded with oedema and lines of degenerations Fig. (10, A). This findings agree with Abdel-Mawla and Mohamed (2010) whom recorded oedema, degeneratin, sever necrosis with the presence of monocular cells in between the muscle fiber infested with Glugea cyst. Also, more or less in agreement with Dykova (2006) who found degeneration of the muscle fiber and also within the individual muscle fibers the spores may be surrounded by amorphous dystrophic sarcoplasm or by unaffected peripheral sarcoplasm, as the infection progresses, the whole muscle became destroyed.

Concerning of Anisakiasis, fish showed a severely infested musculature with enormous number of capsule formation around the parasites and degeneration of the surrounding muscle bundles. The pathological findings revealed encapsulated anisakis larvae embedded in-between muscle fibers, surrounded with fibrous connective tissues associated with edema and inflammatory cells infiltration Fig. (10, B). This encapsulation due to host tissue innate defense to parasite. The results were in agreed with Ebrahem (2011), Roberts (2012) and Hassan et al., (2013). So that, this study can throw more light on parasites affecting marine Lizard fish Saurida undosquamis from the Gulf of Suez, Red Sea, Egypt.
Fig. 1: (A, B, C and D): Photomicrograph of *Saurida undosquamis* fish infected with the microsporidian parasite. The infection occurs in the form of whitish cysts (arrows) appeared embedded in different organs in the peritoneal cavity of infected fish. (E and F) Abdominal cavity of *Saurida undosquamis* showing free larvae of cystode (arrows). (G) Abdominal cavity of *Saurida undosquamis* showing an encapsulated Anisakis (arrow).

Fig. (2): Photomicrograph of thin smear from the contents of the nodules showing multiple spores of microsporidia (Giemsa staining, ×1000).
Fig. (3): Photomicrograph of the adult digenetic trematode *Lecithochirium grandiporum* (x40). O.S.-Oral sucker; V.S.-Ventral sucker; T-Testis; O-Ovary; EC-Ecsoma.

Fig. (4): Photomicrograph of *Oncodiscus sauridae*, (A) Scolex which is fan shaped with apical discs (AD) (x100), (B) Mature segment (x40) and (C, D) Gravid segment (x40).
Fig. (5): Photomicrograph of Tetraphyllidean larvae (x100).

Fig. (6): Photomicrograph of *Pseudogrillotia* sp. (A) Scolex, (B) Bulbs organ, (C) Posterior end and (D) Cyst with encapsulated Trypanorhyncha plerocercoid. B0-Bothridium; T-Tentacles with retracted hooks; B-Bulb.
Fig. (7): Photomicrograph of *Floriceps sp.*, (A) Scolex, (B) Bulbs organ and (C) Posterior end. B0-Bothridium; T-Tentacles with retracted hooks; B-Bulb.

Fig. (8): Photomicrograph of *Anisakis simplex* (A) anterior end (X100), (B) posterior end (X100). BT-Boring tooth; M-Mucron; AO-Anal opening.
Fig. (9): Photomicrograph of *Echinocephalus overstreeti*, (A) anterior end (X100), (B) posterior end (X100) and (C) High magnification of the anterior end. (CB) Cephalic bulb; (S) Spines; (BL) Bulbous lips.

Fig. (10): (A) Photomicrograph of histological section in abdominal musculature showing multiple nodules of microsporidia (H&E stain X 200). (B) Photomicrograph of histological section in abdominal musculature showing an encapsulated *Anisakis simplex* (H&E stain X 100).

REFERENCES


دراسات مورفولوجية على الإصابات الطفيلية السائدة في أسماك المكرونة من خليج السويس البحر الأحمر، مصر

ولاء طلعت الإكيابي
قسم بحوث صحة الأسماك ورعايتها - المعمل المركزى لبحوث الثروة السمكية – مركز البحوث الزراعية – مصر

الملخص العربي
أجريت هذه الدراسة للكشف عن الطفيليات التي تصيب أسماك المكرونة حيث تم تجميع مائتين وسبعين عينة خلال الفترة من أكتوبر 2018 إلى أبريل 2019 من البحر الأحمر في محافظة السويس، مصر. تم فحصها ظاهرياً، داخلياً و طفيلياً. وقد كانت نسبة الإصابة الكلية للأنواع المختلفة من الطفيليات 87.4 %، حيث اظهر الفحص الطيفلي للأسماك عزل نوع واحد من الميكروسبوريديا (الجوليجا) بمعدل اصابة 33.2 %. نوع واحد من الديدان المسلطية ثنائية العائل (ليثيوكيريم جريانيبوريوم) مع معدل الإصابة 34.6%. نوع من ديدان الشريطية (أونكوديكس سواريدي) مع معدل انتشار 9.6 %. كان معدل الإصابة الكلية للديدان الشريطية اليرقية (تيترافيليدين) 17.8%، مع انتشار 89.5% و 12.4% على التوالي.

التغيرات الهيستوباثولوجية الناتجة عن العوامل الطفيلية المختلفة.