Egyptian Veterinary Medical Society of Parasitology Journal

Original Article

The prevalence of the helminth parasites of stray dogs in Ismailia City

Parasitic fauna of the marine greater lizard fish *Saurida undosquamis* (Richardson, 1848)

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Abstract:

Through examination of 125 specimens of the marine greater lizard fish *Saurida undosquamis* (Richardson, 1848) obtained from Zagazig fish market and its source from Gulf of Suez, the overall prevalence was 44.8%. The parasitic fauna was composed of Acanthocephala; *Serrasentis sagittifer* (prevalence: 12.8%), Cestoda; *Oncodiscus sauridae* (prevalence: 5.6%), Nematoda; *Echinocephalus* species larvae (prevalence: 4%), female of *Philometra* species (prevalence: 13.6%) and Trematoda; *Lecithochirium grandiporum* (prevalence: 16%) and juvenile didymozoid; *Neotorticaecum* (prevalence: 2.4%). The most prevalent parasitic fauna was nematodes followed by trematodes then acanthocephala and cestodes. The detected parasitic fauna was morphologically described by light microscope.

Key words: *Saurida undosquamis*- parasitic fauna- *Serrasentis sagittifer- Oncodiscus sauridae- Lecithochirium grandiporum*.

INTRODUCTION

The Red Sea is one of the major centers of global marine biodiversity which has a very rich and varied fish fauna (***Galli et al., 2007***). The lizard fish is a widely distributed fish in the Red Sea. One of the most important commercial and economic fish species of family Synodontidae from Gulf of Suez, Egypt is the brushtooth lizardfish *Saurida undosquamis*. It is a marine carnivorous fish that feeds on crustacean and planktonic invertebrates (***Kadharsha et al. 2013*; *Manojkumar and Pavithran, 2016* and *Ozyurt et al. 2017***). Therefore, occurrence of parasitic infection becomes higher in nature. Diet and feeding habits of host species are the main factors affecting the parasitic community structure. Fish parasites have various negative contributions on the commercial fisheries industry. Although studies on parasitic worms from Egyptian fish are important in controlling the impact of such parasites on fish health and fish production, relatively little is known on the parasitic fauna of fish in Egypt (***Morsy et al. 2012* and *Abdel-Ghaffar et al. 2013***). So, the aim of this study was to determine the parasitic infections of marine greater lizard fish *Saurida*

undosquamis specimens collected from Zagazig fish market, Zagazig, Egypt.

MATERIAL AND METHODS

Totally 125 specimens of *Saurida undosquamis* fish were examined for different classes of parasites. Fish were purchased from Zagazig fish market and its source from Gulf of Suez, Egypt, during the period from October 2016 to May 2016. Demographic features were expressed in terms of prevalence and mean intensity according to ***Bush et al. (1997)*.**

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 (***Beaver et al. 1984***). Meanwhile, Nematodes and acanthocephalan parasites were cleared in lacto phenol and mounted in polyvol **(*Kruse and Pritchard, 1982*)**. The morphological characters were described. The parasites were identified according to ***Yamaguti (1963& 1971), Khalil and Abu-Hakima (1985), Kuchta et al. (2008), Santos et al. (2008), Kuchta et al. (2009), Felizardo et al. (2011), Morsy et al. (2012)*** **and *Abdel-Ghaffar et al. (2013 & 2014*).**

RESULTS

A total of 125 marine greater lizard fish (*S. undosquamis*) specimens were investigated for parasitic infection. Out of the examined fish, 56 fish (44.8%) were naturally infected by at least one parasite. The most prevalent parasitic fauna was nematodes (17.6%) followed by trematodes (16.8%) then acanthocephala (12.8%) and cestodes (5.6%), Table (1). Six species of parasites were recovered from the fish host, Table (2). One Acanthocephala (*Serrasentis sagittifer*), one Cestoda (*Oncodiscus sauridae*), two Nematoda (*Echinocephalus* species larvae, and female of *Philometra* species) and two Trematoda (*Lecithochirium grandiporum* and Juvenile didymozoid; *Neotorticaecum*) were identified as follows:

***Serrasentis sagittifer* (Linton, 1889) (Figure 1)**

Description: the body was elongated and narrow posteriorly, measured 2.94-5.46 mm (Fig. 1A). The proboscis was long (0.56-0.90 mm), club-shaped and supported with longitudinal rows of hooks. The spineless neck followed by the trunk which is supported anteriorly with collar rows of spines then multiple incomplete rows of spines like combs (18-24 rows) on its ventral surface (Fig. 1B). In male specimens, testes were ovoid in shape, nearly equal in size (measured 0.086-0.089 mm) and tandem in position (Fig. 1C). Primordial of four pyriform cement glands were located at the posterior end of the body (Fig. 1E). Female body (Fig. 1A) was usually larger than that of the male. Vagina was surrounded by two pairs of vaginal muscles with the uterus having a conical shape (Fig. 1D).

Taxonomic summary

Type species: *Serrasentis sagittifer* (Linton, 1889).

Family: Rhadinorhynchidae Travassos 1923.

Type host: greater lizard fish (*S. undosquamis*) (Synodontidae, Richardson, 1848).

Type locality: Gulf of Suez (Red Sea), Egypt.

Type habitat and infection site: the intestine, pyloric caeca and peritoneal cavity of infected fish host.

Prevalence: 16 out of 125 specimens were found to be naturally infected (12.8%).

***Oncodiscus sauridae* Yamaguti, 1934 (Figure 2)**

Description: scolex was fan-shaped with conspicuous apical disc. Apical disc had two semi-circular lobes (fig. 2A&B). Segments were broader than long, measured 0.27-0.31 mm long and 1.00-1.09 mm wide in mature segments and 0.41-0.43 mm long and 1.01-1.16 mm wide in gravid ones). Posterior border of segments at the middle of strobila has prominent indentation in middle, giving sides of segment appearance of wing-like expansions which overlap succeeding segment. Immature segment had tiny groups of deeply stained cells in a transverse line and measured 0.17-0.18 mm in length and 0.91-0.94 mm in width). Testes were numerous in number, confined to two lateral fields (fig. 2C). Large thin-walled cirrus sac, round or slightly oval, lied directly anterior to ovary. Ovary was transversely elongate, lobulate, immediately anterior to posterior margin of the segment. Vitellaria were numerous follicles occupied cortical parenchyma except in median fields. uterine sacs of the gravid segments was distended by massive numbers of eggs bulge into globular masses opening medially by large round or oval uterine pores on ventral surface of segments (fig. 2D, E & F).

Taxonomic summary

Type species: *Oncodiscus sauridae* Yamaguti, 1934.

Family: Bothriocephalidae Blanchard, 1849.

Type host: greater lizard fish (*S. undosquamis*) (Synodontidae, Richardson, 1848).

Type locality: Gulf of Suez (Red Sea), Egypt.

Type habitat and infection site: the intestine of infected fish host.

Prevalence: 7 out of 125 specimens were found to be naturally infected (5.6%).

***Echinocephalus* species larvae (Figure 3)**

Description: the body of the larvae was coiled and measured 8.54-12.87 mm long and 0.29-0.38 mm wide. The anterior end of the body had a characteristic head bulb measured 0.23-0.30 x 0.34-0.40 mm in average size, armed with 6 concentric rows of hooklets. The hooklets were sharp single-pointed tips and curved posteriorly. It had a pair of lips surrounding an elongated mouth in the center of cephalic region protruded at the anterior end (Fig. 3A), followed by a club-shape esophagus and a brownish intestine. The anal opening was subterminal and opened at the ventral surface of the posterior end (Fig. 3B).

Taxonomic summary

Type species: *Echinocephalus* species larvae Deardorff and Ko 1983.

Family: Gnathostomatidae Railliet, 1895.

Type host: greater lizard fish (*S. undosquamis*) (Synodontidae, Richardson, 1848).

Type locality: Gulf of Suez (Red Sea), Egypt.

Type habitat and infection site: larvae were found in the stomach wall, gonads, and peritoneal cavity of infected fish host.

Prevalence: 5 out of 125 specimens were found to be naturally infected (4%).

***Philometra* species (Figure 3)**

Description: body was elongated, slender, dark brown to brownish in color. The anterior end was rounded. Body length was 11.00–55.96 mm, width 0.11-0.21 mm. Oesophagus was narrow, swollen near mouth prior to nerve ring forming a distinct muscular bulb. Ventriculus was small. Uterus occupied most space of body and filled with numerous larvae (fig. 3D). Posterior end rounded (fig. 3E).

Taxonomic summary

Type species: *Philometra* Costa, 1845.

Family: Philometridae Baylis & Daubney, 1926.

Type host: greater lizard fish (*S. undosquamis*) (Synodontidae Richardson, 1848).

Type locality: Gulf of Suez (Red Sea), Egypt.

Type habitat and infection site: gonads and peritoneal cavity of infected fish.

Prevalence: 17 out of 125 specimens were found to be naturally infected with female of this species (13.6%).

***Lecithochirium grandiporum* (Rudolphi 1819) (Figure 4)**

Description: body length measured 2.35-2.60 mm with an invaginated ecsoma, and reached 2.52-2.69 mm with evaginated ecsoma. Width was 0.42– 0.75 mm at ovarian level. The oral sucker was subterminal (0.09-0.12 mm in diameter) and large circular ventral sucker projected from the body and measured 0.17-0.25 mm in diameter. Ecsoma located at the hind body was well developed. Pharynx was large, and the esophagus was short. Intestinal caeca were often inflated with anterior region and end blindly close to the base of ecsoma. The two testes (0.13-0.16 mm in diameter) were ovoid in shape located in ventral field of the body and well separated from each other. Ovary (0.14-0.22 mm in diameter) was subspherical, post-testicular and widely separated from testes by uterine loops. Uterus was long, coiled, filled with eggs. Vitellaria were two compact masses located posterior to ovary (fig. 4 A, B & C).

Taxonomic summary

Type species: *Lecithochirium grandiporum* (Rudolphi 1819)

Family: Hemiuridae, Looss 1899.

Type host: greater lizard fish (*S. undosquamis*) (Synodontidae, Richardson, 1848).

Type locality: Gulf of Suez (Red Sea), Egypt.

Type habitat and infection site: stomach of infected fish host.

Prevalence: 20 out of 125 specimens were found to be naturally infected (16%).

Neotorticaecum Kurochkin & Nikolaeva (1978) (Figure 4 D & E)

Description: body was elongated with smooth cuticle. The body length was 2.27-2.35 mm and width was 0.27-0.28 mm). The oral sucker was subterminal, followed by a muscular pharynx and a large ventral sucker, measured 0.11-0.12 mm in diameter. Oesophagus was narrow and bifurcated anterior to the ventral sucker and encircled by glandular cells (fig. 4E). Caeca chambers posterior to ventral sucker increasing in size as they reach the end of body. Excretory vesicle was saccular located posterior to caeca (fig. 4D).

Taxonomic summary

Type species: *Neotorticaecum* Kurochkin & Nikolaeva (1978)

Family: *Didymozoid*ae Monticelli, 1888

Type host: greater lizard fish (*S. undosquamis*) (Synodontidae Richardson, 1848).

Type locality: Gulf of Suez (Red Sea), Egypt.

Type habitat and infection site: muscle, intestine and peritoneal cavity of infected fish host.

Prevalence of infection: three out of 125 specimens were found to be naturally infected (2.4%).

Table 1: prevalence of parasitic infection of greater lizard fish (*Saurida undosquamis*)

Parasite Taxon	No. infected	Prevalence
Acanthocephala	16	12.8%
Cestoda	7	5.6%
Nematoda	22	17.6%
Trematoda	21	16.8%

Table 2: Parasitic fauna of the greater lizard fish (*Saurida undosquamis*).

Parasites	No. infected	Prevalence (%)	Number of parasite	Mean intensity	Site of infection
Serrasentis sagittifer	**16**	**12.8%**	**22**	**1.34**	intestine, pyloric caeca and peritoneal cavity
Oncodiscus sauridae	**7**	**5.6%**	**9**	**1.29**	intestine
***Echinocephalus* species larvae.**	**5**	**4%**	**8**	**1.6**	Stomach wall, gonads, and peritoneal cavity**.**
***Philometra* species**	**17**	**13.6%**	**25**	**1.47**	Ovary and peritoneal cavity
Lecithochirium grandiporum	**20**	**16%**	**42**	**2.1**	Stomach
Juvenile didymozoid (*Neotorticaecum*)	**3**	**2.4%**	**4**	**1.33**	muscle, intestine and peritoneal cavity

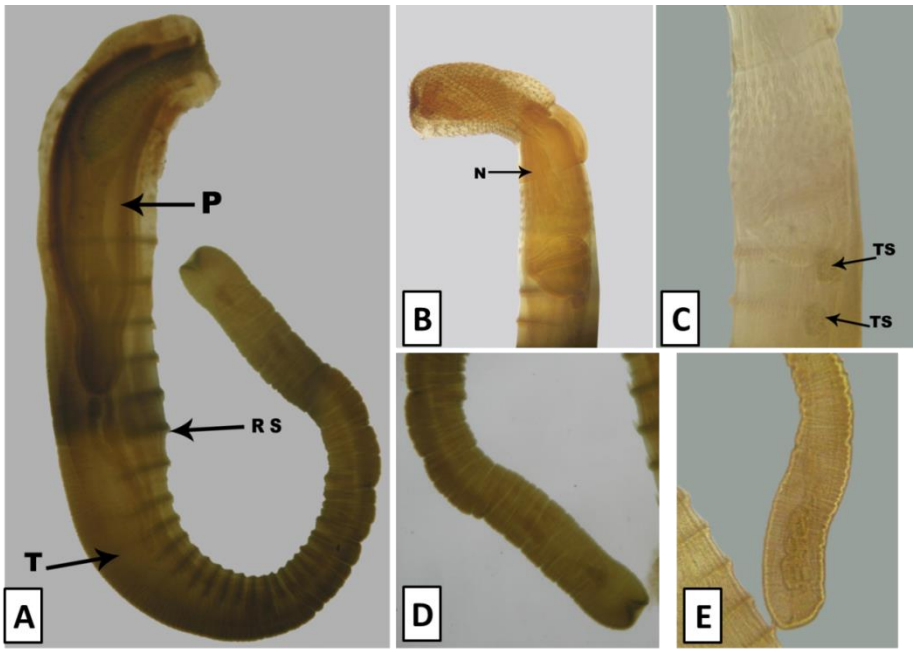

Fig. 1 Photomicrographs of the adult *S. sagittifer*. **A.** Female showing proboscis (P) and followed by trunk region (T) supplied with multiple rows of incomplete spines from its ventral surface (R S). **B.** Anterior end showing proboscis (P) and spineless neck (N) **C.** Two testes (TS). **D.** Posterior end of female. E. Posterior end of male.

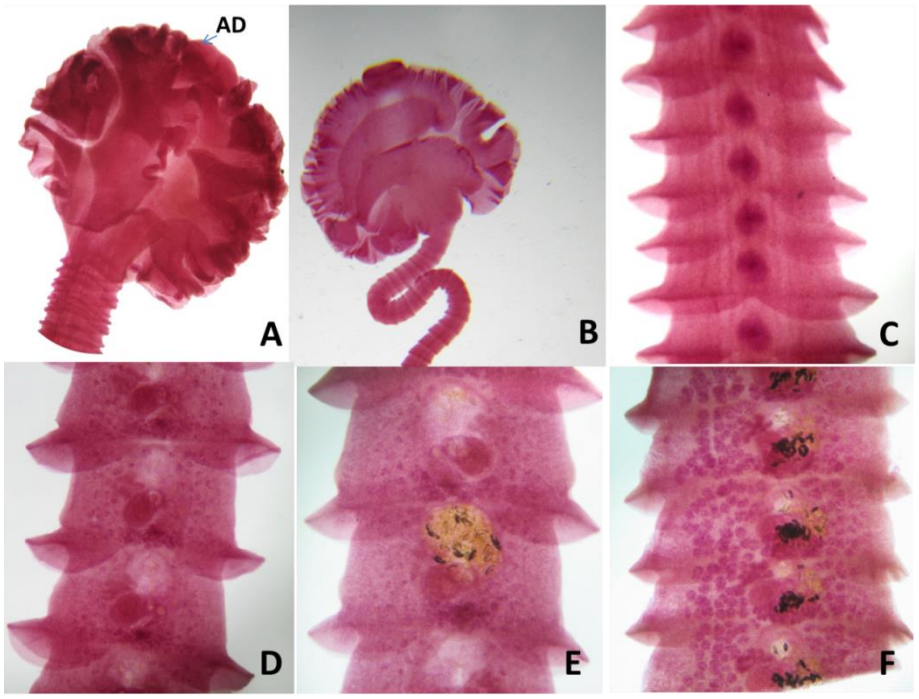

Fig. 2 Photomicrographs of *Oncodiscus sauridae*. **A & B.** Scolex which is fan shaped with apical discs (AD) **C.** immature segments. **D.** mature segments. **E and F.** gravid segments.

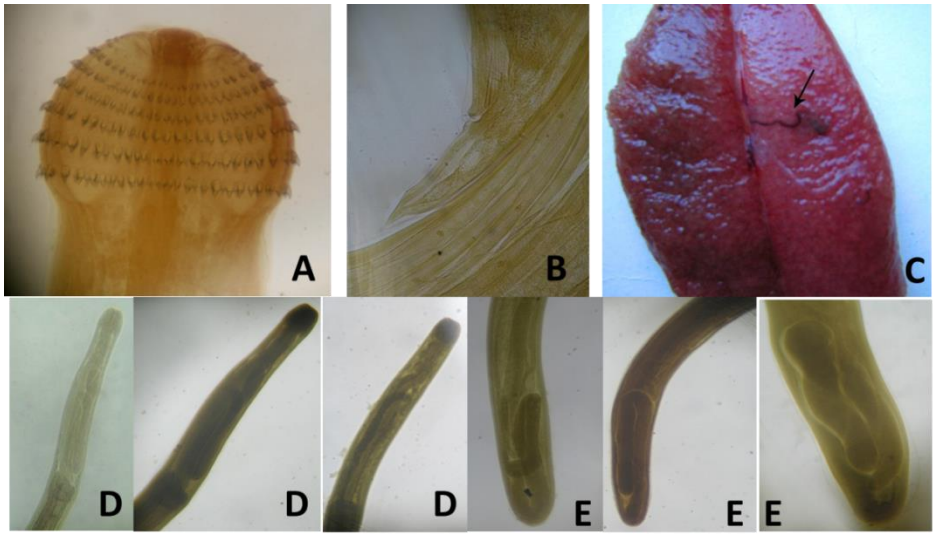

Fig. 3: Photomicrographs of **A.** Anterior end of *Echinocephalus* larva showing the head bulb with 6 concentric rows of hooklets. **B.** Posterior end of *Echinocephalus* larva. **C.** ovary infected with *Philometra* species (arrow) **D.** Anterior end of *Philometra* species **E.** female posterior end of *Philometra* species.

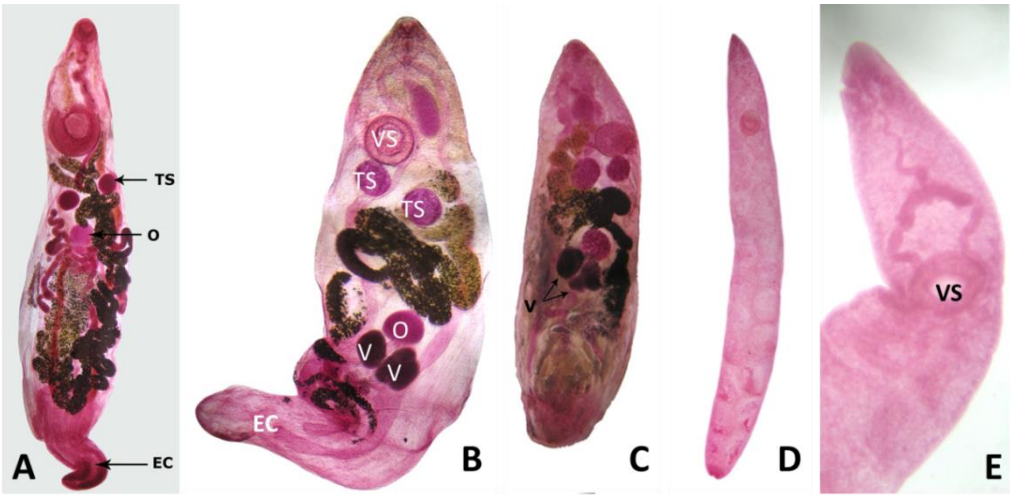

Fig. 4 Photomicrographs of **A., B. & C.** Adult worm of *Lecithochirium grandiporum* showing the different structures of the body, ventral sucker (VS), ovary (O) with its large coiled uterus and vitellaria (V), the two spherical testes (TS), and their vaginated and invaginated ecsoma (EC). **D.** *Neotorticaecum*. **E.** High magnification of the anterior end of body showing large ventral sucker (VS), narrow Oesophagus and intestinal bifurcation anterior to ventral sucker.

DISCUSSION

Parasitic fauna of One hundred and twenty five specimens of brushtooth lizard fish (*Saurida undosquamis*) fish originally caught from Gulf of Suez, Egypt was described and quantified. 56 fish (44.8%) harbored at least one parasite. Six species of parasites were recovered from the fish host namely; *Serrasentis sagittifer*, *Oncodiscus sauridae, Echinocephalus* species larvae, female of *Philometra* species, *Lecithochirium*

grandiporum, and *Didymozoid* larvae; *Neotorticaecum*. Different parasite species were reported from lizard fish species around the world **(*Khalil and Abu-Hakima, 1985; Kuchta et al., 2008; Santos et al., 2008 and Kuchta et al., 2009*).**In Egypt, there were also many reports of parasitic fauna from lizard fishes (***Morsy et al. 2012; Abdel-Ghaffar et al. 2013 and 2014***).

Parasitism by acanthocephalan is frequently seen in intestines of wild fresh water and marine water fish (***Amin1987; Taraschewski, 2000 and Amin et al., 1987, 2002 & 2013***). In the present study, *S. sagittifer* were collected from the intestine, pyloric caeca and peritoneal cavity of *S. undosquamis* (Richardson, 1848) with frequency distribution of 12.8%. Similarly, prevalence (13.1%) of *S. sagittifer* was previously recorded by ***Al-Zubaidy and Mhaisen (2012)*.** While, ***Abdel-Ghaffaret al. (2014)*** showed a higher percentage (57.14%) of *S. sagittifer* from *Sparus aurata* at the coasts of the Red Sea, Hurghada City, Egypt. Morphologically, the genus *Serrasentis* was erected by Van Cleave, 1923. The present parasite resembled *S. sagittifer* previously recorded in 8% of the examined *S. undosquamis* fish from the Arabian Gulf by ***Kardousha (2005),*** in *Thunnus tonggol* from Yemeni coastal waters, by ***Al-Zubaidy and Mhaisen (2012).***

Results of this study have revealed that out of the collected parasites, only one cestode species; *Oncodiscus sauridae* were detected from intestine of the examined fish host with a prevalence rate of 5.6%. Nearly similar prevalence rate (9%) was recorded in *S. tumbil* from the Indo-Pacific region. The genus *O. sauridae* Yamaguti, 1934 was revised by ***Khalil and Abu-Hakima (1985)*** on the basis of material collected from *Saurida undosquamis* (Richardson) from Kuwait Bay and Australian waters. Morphological examination of the detected cestode showed a high similarity with *O. sauridae* which described by ***Khalil and Abu-Hakima (1985), Kuchta et al. (2008) and Kuchta et al. (2009).***

Most species of adult worms of fish nematodes live in the digestive system of their hosts except species of the family Philometridae which inhabit the body cavities, and gonads. Only two species of *Philometra*; *P. lateolabracis* and *P. tricornuta* were reported from the ovary and the musculature of the caudal peduncle of *S. tumbil* in the Arabian Gulf (***Kardousha, 1999 and Moravec & Ali, 2014***). However, with respect to papers of ***Quiazonet al. (2008)*** and ***Moravec (2008),*** *P. lateolabracis* was misidentified in the paper of ***Kardousha (1999)*** and these nematodes should be designated only as *Philometra* sp. Apparently, they were conspecific with the detected material. Also ***Parukhin (1976)*** reported unidentified juvenile *Philometra* sp. from the gonads and the body cavity of *S. undosquamis*. Observation of this study revealed that only female of *Philometra* sp. was found in the ovaries (fig. 3C) and peritoneal cavity of the infected fish with infection rate of 13.6%. This observation was in agreement with ***Kardousha (1999)*** who

detected *P. lateolabracis* in 15% of examined *S. tumbil.*

Adult stage of *Echinocephalus* species were isolated from *Pastinachus sephen* (Forsskål, 1775), *Myliobatis australis* Macleay, 1881, *Urogymnus asperrimus* (Bloch and Schneider, 1801), *Taeniura meyeni* and *Heterodontus portusjacksoni* (Meyer, 1793) from different geographical regions (***Beveridge, 1987; Brooks and Deardorff, 1988; Moravec and Justine, 2006***).Larval stage of this parasite has been reported in the ray *Taeniura melanospilos* Bleeker, 1853 from Australian waters (***Deardorff and Ko, 1983***) and in *S. undosquamis* at the coasts of Hurghada City along the Red Sea in Egypt (***Morsy et al. 2015***). The detected *Echinocephalus* species larvae in the present investigation were morphologically identical with those described by ***Morsy et al. 2015*** from the same fish host. Our results demonstrated that the infection rate of this larva was 4%. Higher prevalence was recorded by ***Al-Zubaidy, 2011*** (12.9%) and ***Al-Zubaidy et al., 2012*** (17.9%) from the stomach, body cavity, intestine and visceral organs of *Abalistes stellatus* in Yemen Coastal Water**.** In addition to, these larvae were recovered from *S. undosquamis* with infection rate of 19.16 % (***Morsy et al. 2015*****)**.

Digenetic trematodes represent the largest group of all internal metazoan parasites as they include about 18,000 nominal species (***Cribb et al. 2001***). The members of family Hemiuridae are the most common digeneans infecting the digestive tract of marine fish, and the present isolate, *Lecithochirium*, was the most common genus within this family (***Shih et al. 2004***). The recovered adult digeneans in the present study was identified as *L. grandiporum* according to ***Morsy et al. (2012)*** and ***Abdel-Ghaffar et al. (2013).*** The stomach of *S. undosquamis* specimens were found to be parasitized by the *L. grandiporum* with 16 % infection rate. In contrast, ***Abdel-Ghaffar et al. (2013)*** recorded a higher infection rate (41.66 %) with the same fluke from *Anguilla Anguilla*. In addition, ***Morsy et al. 2012*** reported an infection rate of37.86 % in the pyloric and middle parts of the intestine of the lizard fish (*S. tumbil*).

Trematodes of the family Didymozoidae Monticelli, 1888 are a very peculiar group, parasitizing the tissues and organs of fish either as larvae or adults (***Kohn & Justo, 2008***). ***Kardousha (2005)*** isolated didymozoid larvae from kidney of *S. undosquamis*. Also, ***Felizardo et al. (2011)*** reported that *Paralichthys isosceles* and *P. patagonicus* were considered as a new host for two juvenile didymozoids; *Torticaecum* and *Neotorticaecum* with a high prevalence rate in the Atlantic Ocean. This finding contradicted the present investigation which recorded lower prevalence of *Neotorticaecum* in the examined fish host. This may be attributed to difference in fish host and geographic area. The morphology of recovered *Neotorticaecum* in the present study was identical to those described by ***Pozdnyakov and Gibson, 2008 and Felizardo et al. (2011)*** who stated that the main characteristic features of *Neotorticaecum* were the presence of

gland cells in the oesophageal region and in the caecal bifurcation. Also, (***Abdul-Salam et al., 1990***) described a larval didymozoid from the muscles of the marine fish *Nemipterus peromli* from the Arabian Gulf.

Lastly, the present study increase current knowledge regarding parasitic fauna of marine greater lizard fish *S. undosquamis* from the Gulf of Suez, Egypt.

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الملخص العربى

طفيليات أسماك المكرونة البلدى

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قسم الطفيليات – كلية الطب البيطرى-جامعة الزقازيق.

تم فحص عدد ١٢٥ عينة من أسماك المكرونة البلدى (الواردة من خليج السويس – البحر الأحمر) وقد بلغت نسبة الأصابة الكلية لتواجد الأنواع المختلفة من الطفيليات ٤٤.٨% .واظهرت النتائج ان أكثر الطفيليات تواجدا هى الديدان الأسطوانية تليها المفلطحة ثم الديدان ذات الرأس شوكية والديدان الشريطية. أسفرت هذه الدراسة على عزل وتصنيف ستة أنواع مختلفة من الطفيليات التى تتمثل فى نوع من الديدان ذات الرأس شوكية ونوع من الديدان الشريطية ونوعين من الديدان الأسطوانية بالاضافة إلى نوعين من الديدان المفلطحة. بلغت نسبة الاصابة بطفيل سيراسينتنس ساجيتيفير و اونكوديكتس سواريدى و يرقات الاكينوسيفالس وانثى فيلوميترا وليثيثوكيريم جراندىبورم ونيوتورتيسيكم ١٢.٨% و ٥.٦% و ٤% و ١٣.٦% و ١٦% و ٢.٤% على التوالى . شملت هذه الدراسة وصفا تفصيليا بإستخدام الميكروسكوب الضوئى لإظهار التراكيب الداخلية والخارجية لجميع الطفيليات المعزولة.