Vet.Med.J.,Giza. Vol.46, No.4A. (1998): 493-506.

ON SOME ECTOPARASITES CAUSING DELETERIOUS PATHOLOGICAL EFFECT AMONG RED SEA FISHES WITH THE DESCRIPTION OF POLYLABROIDES EGYPTIACUS N. SP.

BY

NISREEN EZZ EL-DIEN, M. AND IMAN, B. SHAHEED*

Dept. Parasitol. Fac. Vet. Med. Cairo Univ.
* Dept. Pathol. Fac. Vet. Med. Cairo Univ.

SUMMARY

Examination of two fish species from Gulf of Suez (Red sea) revealed 27.3% infestation rate with ectoparasites. Five monogenea and two crustacea were identified. From *Saurus tumbil*, the Monogeneae; *Osphyobothrus paraperces, Diclidophora macruri* and *Calydiscoides nemipteris* and the crustacea; *Caligus lunatus* as well as *Hatschekia conifera* were collected, in which all were considered as new host record from a new locality. On the other side, from *Serranus fasciatus*, two monogeneae were collected, the new species *Polylabroides egyptiacus* as well as *Encotyllobe spari*. Histopathological study included increase of mucous, epithelial hyperplasia, loss of lamellar structure and others which might lead to death of the affected fish as a reaction of total cessation of gas exchange. Those changes of the tissues of fishes infected with the recovered new species of monogenea as well as those infected with the crustacean *Hatschekia conifera* were nearly similar and depends on severity of infection.

INTRODUCTION

Red sea fishes attracted only few authors to look for their ectoparasites as Ramadan, 1983 and Badaway, 1994. The monogenea as well as crustacea are the most dangerous ecto-parasites causing outbreaks among fish population all over the world (Hogans and Trudeau, 1989).

The present study was conducted in order to establish the ectoparasitic fauna infesting two fish hosts that are considered of a relative commercial importance in Gulf of Suez (Red sea). Moreover, the pathological changes are also included that would lead to a broad understanding of the deleterious effect caused by some of the detected ectoparasites.

MATERIALS AND METHODS

Monogenea and crustacea parasites were collected from 175 *Saurus tumbil* and 140 *Serranus fasciatus* from Gulf of Suez, Red sea during the

period from July 1996 to May 1997. Fish were individually transfered in plastic bags to the laboratory. Gills, skin, fins, scales and eyes were examined under dissecting microscope. The specimens were immediately fixed and stored in formaline 10% (for monogenea) and in 70% ethyl alcohol (for crustacea) until staining with carmine and mounted in canada balsam (Pritchard and Kruse, 1982). The parasites were drown and illustrated by camera lucida and microphotographs.

For histological examination, gill samples from affected fish were fixed in 10% neutral buffered formaline, processed by standard paraffin method and sectioned at 7 microns thickness then routinely stained with Haematoxylin and Eosin (Bancroft and Cook, 1984). Also periodic acid shif stain (PAS) was used for staining mucus secreting cells and parasitic elements (Culling, 1974).

RESULTS

1. Incidence:

Examination of *Saurus tumbil* and *Serranus fasciatus* collected from Gulf of Suez (Red sea) from July, 1996 till May 1997 revealed that 86 out of 315 Red sea fish comprising two species were infected with monogenean and crustacean ectoparasites with 27.3% infestation rate (Table 1). It was clear that, winter, (38.6%) predominate the other season while the lowest rate was observed during summer one (16.9%). *Saurus tumbil* fish species was also highly infested during winter and in higher rate than *Serranus fasciatus*.. Table (1).

Table (1): Seasonal incidence of ectoparasites among the examined fish.

Season	Saurus tumbil			Serranus fasciatus			Total		
	Examined	Infested	%	Examined	Infested	%	Examined	Infested	%
Winter	38	17	44.7	32	10	31.3	70	27	38.6
Spring	41	11	26.8	35	5	14.3	76	16	21.1
Summer	50	8	16	33	6	18.2	83	14	16.9
Autumn	46	19	41.3	40	10	25	86	29	33.7
Total	175	55	31.4	140	31	22.1	315	86	27.3

2. Morphometric description of the detected parasites:

2.1. Monogenea:

2.1.1. Family: Diclidophoridae (Furmann, 1928).

2.1.1.A. Osphyobothrus parapercis (Yamaguti, 1958) (Fig.1): From gills of *Saurus tumbil* with 16% incidence (28 infested fish out of 175) and 4-8 (6) intensity / fish.

The worm is tapered anteriorly and wined posteriorly measuring 1.90-2.75 mm. in length (L.) and 0.42-0.77 mm. as maximum width (W.) with anterior buccal suckers measuring 0.05-0.06 by 0.08-0.09 mm. and a well developed salivary glands. The cervical glands are well developed. Pharynx is oval and measures 0.03-0.05 by 0.03-0.04 mm. The oesophagus is short. The two intestinal caeca run posteriorly along the inside of the vitellaria with many inner and outer branches reaching to the base of the opisthaptoral peduncles. Testicular follicles (96-110) fill up the posterior intercecal field till the ovary. The genital atrium is 0.053-0.069 in diameter provided with a coronet of 8 inwardly directed spines. At the center of the coronet, the common genital pore opens just behind the intestinal bifurcation. The W-shaped ovary lies near the mid-region of the body. The vagina is absent. The opisthaptor is of 4 pairs of symmetrical, pedunculated clamps with characteristic structure in addition to the median contractile muscle bulb at the lower part of the back.

2.1.1.B. Diclidophora macruri (Brinkmann, 1942), (Fig.2), from gills of *Saurus tumbil* with 9.14% incidence (16 out of 175) and 2-5 / fish intensity.

The body is markedly tapering anteriorly and merging into 4 pairs of haptoral, symmetrical pedunculated clamps and measuring 1.32-1.66 mm. L. The posterior two third of the body is almost of the same breadth being 0.53-0.68 mm. The anterior suckers are 0.05-0.07 by 0.03-0.04 mm. Pharynx is 0.07-0.08 by 0.06-0.07 mm. The intestinal caeca are not confluent posteriorly and the branches extend into the peduncles. Testes are postovarian and 7-24 in number. The muscular genital atrium measures 0.04-0.05 mm. in diameter and provided with a coronet of 10 hooks of about 0.01-0.02 mm. L. Ovary is convoluted. The vitellaria is co-extensive with the intestinal caeca extending to the haptoral region. Vagina is absent.

2.1.2. Family Diplectanidae (Bychowsky, 1957)

2.1.2.A. Calydiscoides nemipteris (Thoney, 1989), (Fig.3), from gills of *Saurus tumbil* with 18.28% incidence (32 out of 175) and 13-25 / fish intensity.

The body is smooth, elongated and fusiform in shape measuring 1.1-1.7 mm. L. and 0.13-0.17 mm. W. at the level of testis. Four pairs of cephalic glands present anteriorly. The mouth opening is subterminal. Pharynx is rounded 0.03-0.04 mm. in diameter and located just posterior to two pairs of eye spots. Pharyngeal glands are well developed. The caeca bifurcate, extending posteriorly and end blind. Testis is oval, lobulated in few specimens, large (0.22-0.24 mm. L. and 0.06-0.08 mm. W.) and lies post-ovarian. The male copulatory sclerites consist of 2 elements positioned medially about 0.19-0.21 mm. from the anterior body end.

Table (2) Comparison between Polylabroides species.

	P. australis (Murray, 1931)	P. mylionis (Dillon et al., 1985)	P. multispinosus (Roubal, 1981)	P. quadrusppinosus (Byrnes, 1985)	P. longispinosus (Byrnes 1985)	P. biungulatus (Mamaev & Parukhin, 1976)	P. zini (Mamaev, 1988)	P. egyptiacus n.sp. (the present material)
Copulative organ:	4	2	2	4	40-70	2	2	One
1. Number of large spines	ordinary, clow like form, 0.02-0.04mm.	0.023-0.033 mm.	0.018-0.26mm.			large clow like	rose-deer antlers 0.037mm.	sharp, stylet shape 0.046-0.052mm
2. Number of small spines	8-10 of different size and form	8 four near the base of each large spine	30-36	30-36	25-35	6-7 of triangular shape	2 small 0.006mm.	2 small equal size 0.008-0.013 mm.
3. Number of testes	Not more than 13	6-9	Not more than 13	Not more than 13	Not more than 13	13-17	9-11	9-13
Host:	Mylio butcheri	Mylio butcheri	Acanthopagrus australis	Acanthopagrus berda	Acanthopagrus latus	Acanthopagrus bifasciatus	Sparus latus	Serranus fasciatus
Locality:	Australian Pacific	Australian Pacific	Tasman sea	Australian region	Australian Pacific	Arabian sea	China sea	Red sea, Egypt.

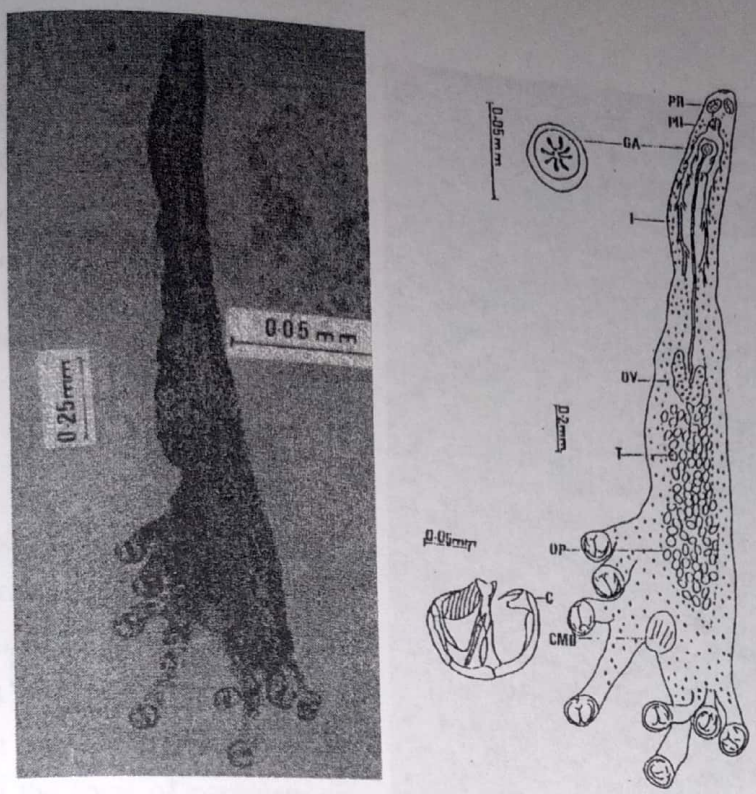

Fig. (1): *Osphyobothrus parapercis*

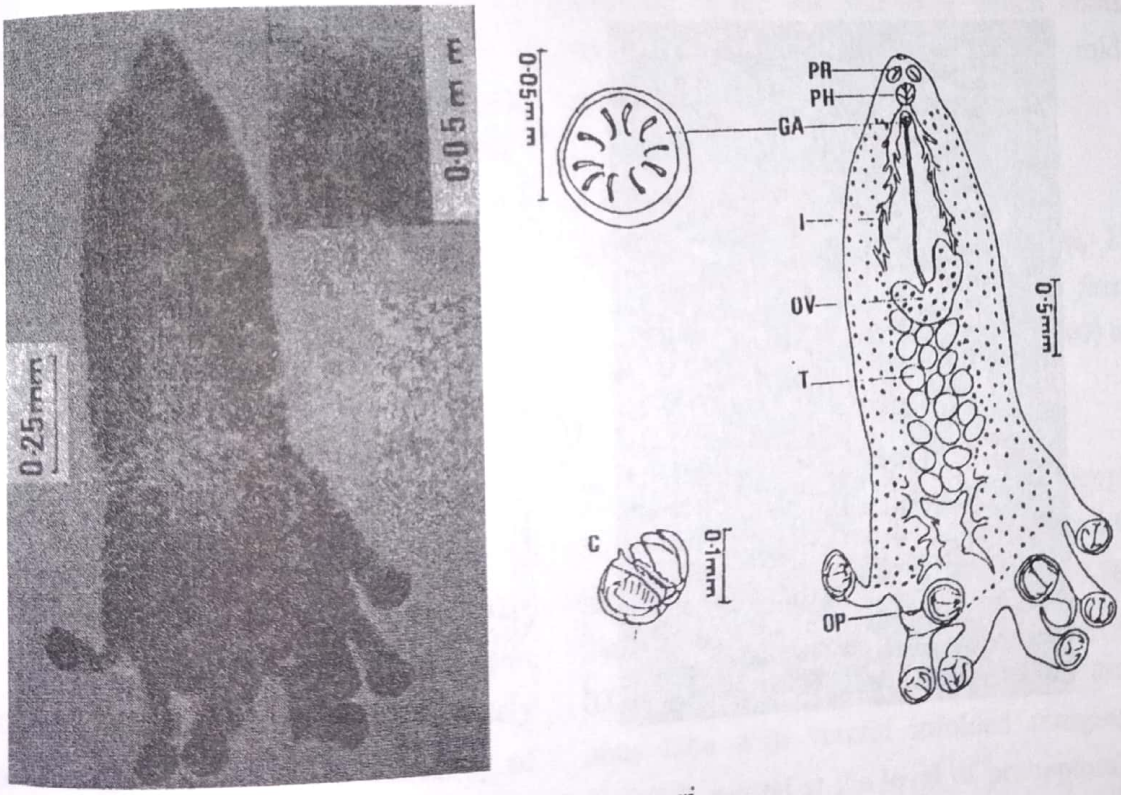

Fig. (2): *Dwiclidophora macruri*

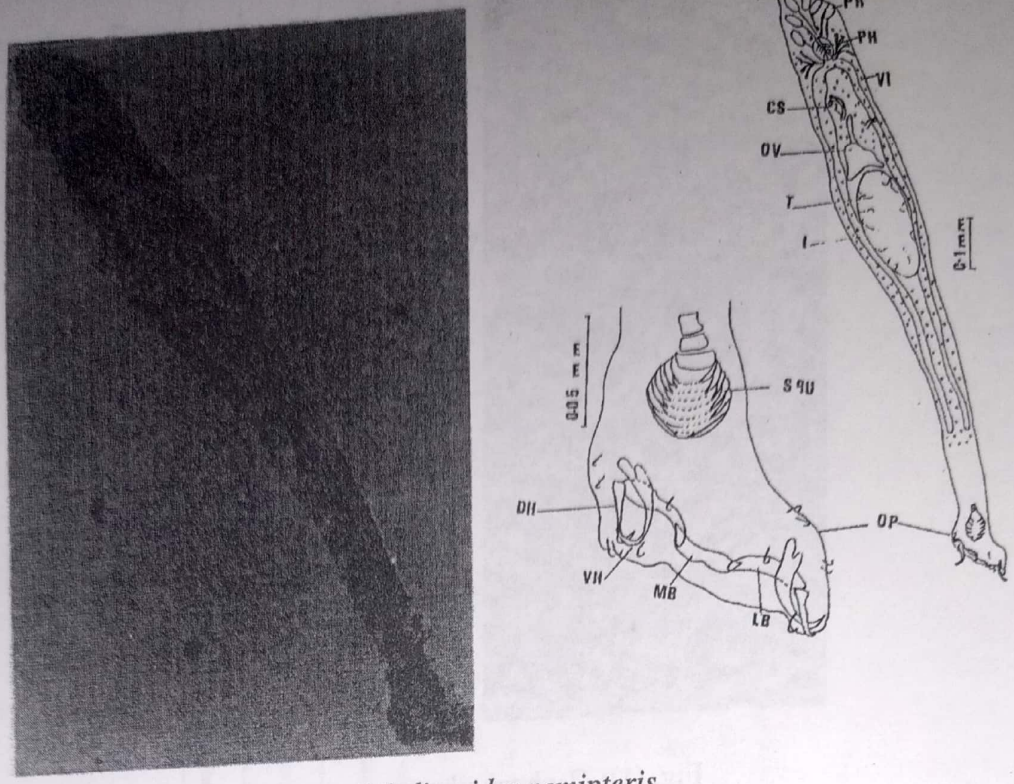

Fig. (3): *Calydiscoides nemipteris*

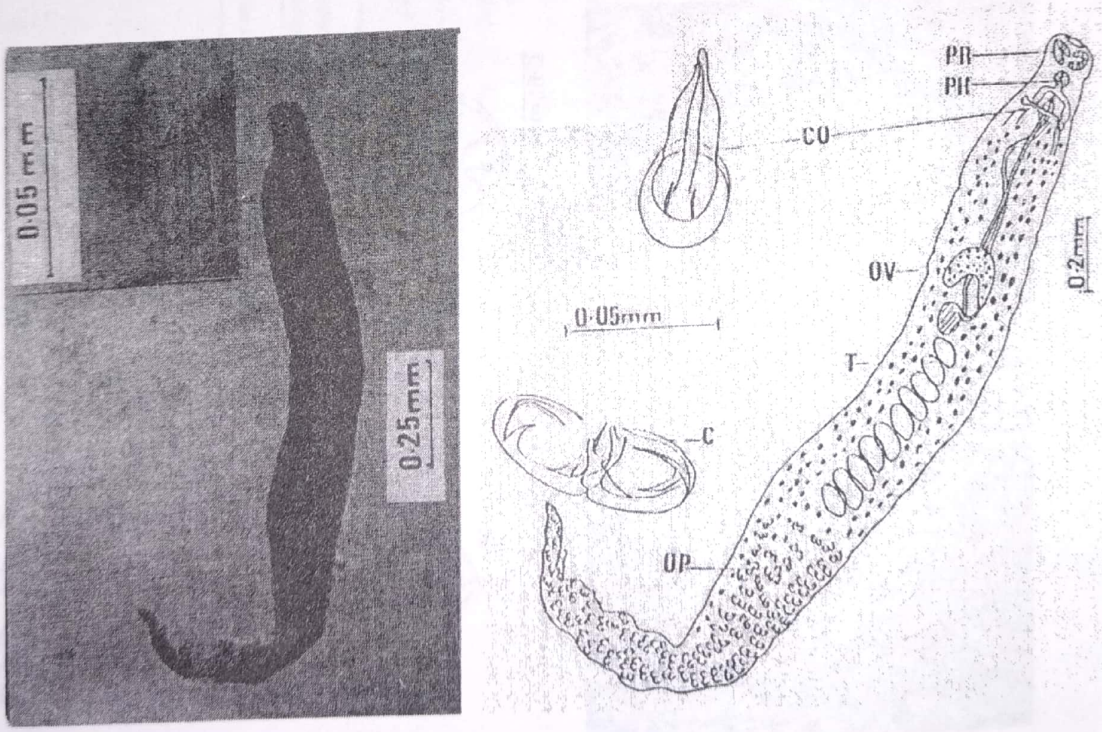

Fig. (4): *Polylabroides egyptiacus n.sp.*

The sclerotized vagina opens on the left side. The opisthaptor is of 0.09-0.12 mm. L. and 0.1-0.13 mm. W. and set off from the body, it consist of single median transverse bar and two lateral bars of 0.03-0.04 mm. long dorsally. The two dorso-lateral hamuli are slightly bifid and 0.04-0.05 mm. L. The two ventro-medial are bifid and of 0.03-0.04 mm. L. The marginal 14 small hooks are present.

Squamoidiscs are paired, sucker like, and consist of 10 lamellae that form the skeleton of the disc. The 7 posterior lamellae are most curved band-shaped overlaping each other, and their open ends forming a cavity within the disc. The three anterior most lamellae are in the form of complete circular bands and telescope anteriorly at an angle into the body.

2.1.3. Family Microcotylidae

2.1.3.A. Polylabroides egyptiacus n. sp. (Fig.4), from gills of *Serranus fasciatus* with 10.71% incidence (17 out of 140) and 5-18 / fish intensity.

The body is small, elongated with anterior rounded and posterior pointed haptoral ends measuring 2.01-2.63 mm. L. and 0.23-0.27 mm. W. Two oval anterior suckers with a well defined septum are of 0.06-0.07 by 0.04-0.05 mm. The buccal opening is wide, pharynx is small, rounded 0.02-0.03 mm. in diameter. Oesophagus is very short after which the intestinal bifurcation immediately occur running toward the posterior extremity of the body proper. Testes (9-13 in number) are rather large 0.1-0.16 by 0.07-0.08 mm., arranged post-ovarian in longitudinal row filling up the middle third of the body. The genital atrium is surrounded by muscular rings, and the copulatory organ is a rounded muscular bulb of 0.02-0.04 mm. in diameter armed with sharp, back wardly curved long stylet shape spine of 0.046-0.052 mm. L. and a pair of small sharp spines at its base (0.008-0.013 mm. L.). Uterus appears as straight duct ascending along the mid-line and opens into the genital atrium. No egg is detected.

Ovary appears in the form of question mark. Vagina opens medio-ventrally. Vitelline follicles extend from the level of the genital atrium to the middle of the opisthaptor which is 0.92-1.00 mm. L. bearing 95-128 clamps of microcotylid type. The seminal vesicle is roughly pear shaped, lies immediately anterior to testes and formed by swelling of the vas deference which continues for-wardly and undulates about the mid-line reaching the level of vagina.

2.1.4. Family Capsalidae

2.1.4.A. Encotyllabe spari (Yamaguti, 1934), (Fig.5), from gills of *Serranus fasciatus* with 16.4% incidence (23 out of 140) and 4-6 / fish intensity.

The body is subcylindrical in shape, its length excluding the peduncle of the opisthaptor is 1.03-2.1 mm. and the maximum width is 0.23-0.28 mm. Two oval anterior suckers, 0.04-0.06 mm. L. and 0.03-0.04 mm. W. are surrounded by membranous lobe with ventral infolded margins. The mouth is ventral at the level of prohaptoral suckers. Pharynx is of 0.07-0.08 mm. in diameter, at

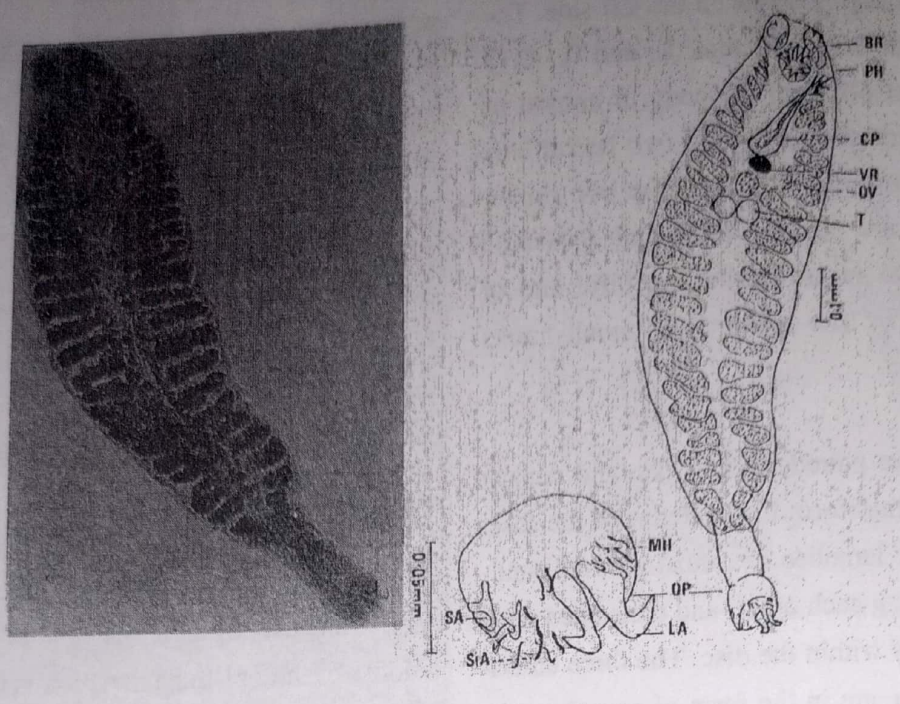

Fig. (5): *Encotyllabe spsti*

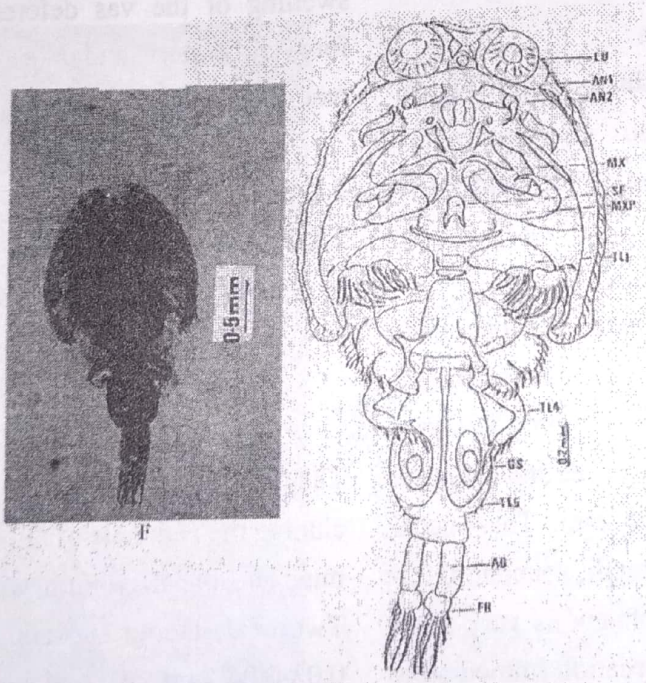

Fig. (6): *Caligus lunatus*

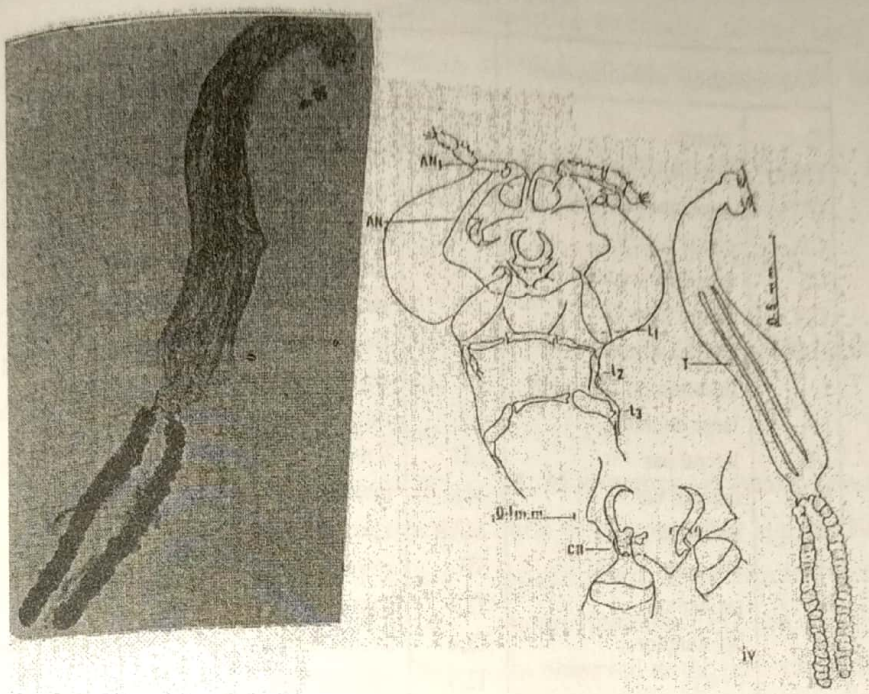

Fig. (7): *Hatschekia conifera*

Fig. (8): Histopathological changes (a-h):

a. Gills showing monogenea attached to the secondary gill filaments near the branchial arch, H & E X100.
b. Gills showing hyperplasia and fusion of numbers of secondary lamellae. Notice degeneration and necrosis of chloride cells, H & E X100.
c. Gills showing hypertrophy and oedema in secondary gill filaments, PAS X400.
d. Gills showing crustacea attached to gill filaments. Notice focal erosion in some areas due to sloughing of epithelial lining of secondary lamellae, H &E X100.
e. Gills showing proliferation and hyperplasia of epithelial lining of secondary lamellae forming one mass, H & E X100.
f. Gills showing hyperplasia of mucous secreting cells, PAS X100.
g. Gills showing telangiectasis of blood vessels in gill filaments, H & E X100.
h. Gills showing degeneration and abnormal cartilaginous nests, H & E X400.

Abbreviations

Abbreviations of Monogenea		Abbreviations of Crustacea	
C	clamp	AB	abdomen
CMP	contractile muscle bulb	AN1	first antenna
CO	copulatory organs	AN2	second antenna
CP	cirrus pouch	CR	caudal rami
CS	copulatory sclerite	FR	furcal rami
DH	dorsal hamuli	GS	genital segment
GA	genital atrium	L1	first leg
I	intestine	L2	second leg
LA	large anchor	L3	third leg
LB	lateral bar	LU	lanule
MB	median bar	MX	maxilla
MH	marginal hooks	MXP	maxillipedes
PH	pharynx	SF	sternal furca
PR	prohaptor	TL1	first thoracic leg
OP	opisthaptor	TL4	fourth thoracic leg
OV	ovary	TL5	fifth thoracic leg
SA	small anchor		
SIA	simple anchor		
Squ	squamodisc		
T	testis		
VH	ventral hamuli		
VI	vitelline reservoir		

its level two pairs of eye spots are present. The caeca run to the posterior end of the body with many ramifying branches into the vitellaria. The two testes are oval situated side by side pre-equatorial measuring 0.03-0.11 by 0.05-0.15 mm. Cirrus pouch is elliptical in shape. Ovary is oval, pre-testicular and measures 0.03-0.04 by 0.02-0.03 mm. Vitelline follicles are extensive, fill up the lateral and post-testicular body.

The opisthaptor is in the form of muscular disc of 0.07-0.14 mm. in diameter and connected to the body by a muscular peduncle of 0.08-0.09 mm. long, provided with a thin marginal membrane and armed with one pair of large stout anchors (0.07-0.13 mm. long), one pair of simple anchors (0.01-0.014 mm. long) and 14 marginal hooks (0.01-0.02 mm. long).

2.2. Crustacea

2.2.1. Family Caligidae

2.2.1.A. Caligus lunatus (wilson, 1928), (Fig.6), from gills and skin around anus of *Saurus tumbil* and of 5.14% incidence (9 out of 175) and 2-6 / fish intensity.

The body is elongated (1.46-1.7 mm. L.), carapace is orbicular a little wider than long (0.77-0.83 mm. L. and 0.69-0.76 mm. W.), the posterior lobes are broadly rounded and fully as wide as the

median lobe which emarginate posteriorly leaving a broad rounded corner on either side. The fourth segment is contracted into a narrow neck anteriorly, widened through the bases of the fourth legs and contracted again posteriorly. The long genital segment (0.33-0.4 mm. L. and 0.22-0.25 mm. W.) is with spines at the posterior corners representing the rudimentary fifth and sixth legs. Abdomen is a trifle shorter than the genital segment and two jointed, the basal joint only half as long as the terminal. The anal laminae are large and prominent, each carrying four plumose setae. The lunules are large, prominent and widly separated, the first antennae are narrow and elongate and armed with a few short setae. The second antennae are well developed with a long and powerful claw. The first maxillae are long and slender. The furca is large and lunate, the tips of the two rami being separated by a distance. The fourth legs are long.

2.2.2. Family Hatschekidae.

2.2.2.A. Hatschekia conifera (Yamaguti, 1939), (Fig.7), from gills of *Saurus tumbil* with 14.3% incidence (25 out of 175) and 2-5 / fish intensity.

The body is narrow and elongated of 1.7-2.0 mm. L., the cephalothorax is small (0.16-0.2 mm. by 0.2-0.24 mm.) separated from the trunk by neck-like constriction and extended laterally into two broadly rounded lobes. The trunk region is long and subcylindrical (formed by fusion of the posterior thoracic segment and abdomen). Abdomen is one segmented and not clearly delimited from trunk.

Maxillipeds are absent. The exopods of the two pairs of biramus legs are without spinulation. The posterior extremity of the body provided with pointed conical processes in the lateral corners.

Eggs are large, arranged in one longitudinal row in two ovisacs measure 0.92-1.1 mm. L., each of them contain about 23 eggs.

3. Results of histopathological examination (Fig. 8a-h)

3.1. Monogenea (Polylabroides spp.):

Parts of the parasites appeared either in between the gill filaments or attached to the top of the secondary lamellae (Fig. 8a). Proleferative changes are observed at the base of secondary lamellae resulting in their clubbing or fusion (Fig. 8b). Focal areas of severe epithelial necrosis are noticed in some of the examined cases. Dilatation of the branchial blood vesseles, telangiectasis and lamellar oedema (Fig. 8c) are noticed in all examined cases.

3.2. Crustacea (*Hatschekia spp.*):

Gills were severly affected, the parasitic elements were noticed at the root of the secondary lamellae (Fig. 8d), stimulate marked proliferation of the epithelium of the gill filaments. The proliferatrion and hyperplasia resulting in a solid fusion of many or all of the lamellar capillaries with a mass of hyperplastic epithelium (Fig. 8e). Hyperplasia of chloride cells and mucous secreting cells which give positive reaction with PAS are noticed in some cases (Fig. 8f). Inflammatory reaction represented by aggregation of lymphocytes and macrophages at the base of secondry lamellae is ob-

served in some cases showing degeneration and necrosis of the epithelial lining of lamellae resulting in errosions and ulcers. The blood vessels in the branchial arches are dilated and engorged with blood. Lamellar telangiectasis is the most common feature in the examined cases (Fig. 8g) accompanied by oedema in the secondary lamellae. The supporting cartillage of gill filaments suffered from destructive changes and deformity (Fig. 8h).

DISCUSSION

The present study revealed that *Saurus tumbil* and *Serranus fasciatus* were infested with five monogenean and two crustacean ectoparasites. Regarding monogenea, the morphological characters of *Osphyobothrus parapercis* and *Diclidophora macruri* agreed wiht that of Yamaguti, 1958&1963, and Llewellyn and Tully, 1969 respectively. It was worthy to mention that, the incidence and intensity of *D. macruri* were low, an observation which come in accordance wth Pascoe (1987) among *Caryphanoides rupestris* who referred it to the distribution and age of host population. *Calydiscoides nemipteris* description come in accordance with that of Thoney (1989) from *Scalopsis temporalis* except that few of the present specimens had slightly lobulated testes.

Osphyobothrus parapercis, Diclidophora macruri and *Calydiscoides nemipteris* were recorded in the present work from *Saurus tumbil* which considered as a new host as well as first record in Egypt. *Encotyllabe spari* was collected from *Serranus fasciatus* (3.02% incidence) and was identical to the description of Kohn et al. (1984) in regardless to the smaller size of the present specimens. Also, it was previously reported by Badawy (1994) from the Red sea, *Acanthopagrus bifasciatus* (18.86%) and Ergyrops spinifer (8.54%), therefore *Serranus fasciatus* could considered as new host for this monogenea. The morphology of the recorded Polylabroides species was found identical to the generic characters given by Mamaev and Paruchin (1976), the investigated species in the present work was differ in significant features from other species within the genus (Table 2). It is therefore proposed that a new species *Polylabroides egyptiacus* be errected from the new host *Serranus fasciatus* with an incidence of 8.57%.

Concerning the crustacea from *Saurus tumbil*, the detected *Caligus lunatus* was identified according to the description given by Wilson (1928) from the Red sea fish *Seriola auroittata,* the present work could add one new host from the same locality. Moreover, *Hatschekia conifera* was morphologically identical to that given by Yamaguti (1939) as well as Kabata (1988) from *Brama japonica* fish with minor differences in some measurements. *Saurus tumbil* could also considered a new host for this crustacean species.

It was worthy to mention that the histopathology in the present study was done on the new monogenean species as well as the *Hatschekia conifera* as the other crustacean (Caligus spp.) histopathology was previously studied by Eisa and Abu El Wafa (1993).

The histopathological examination of gills in case of the monogenean (*Polylabroides egyptiacus* n. sp.) and the crustacean (Hatschekia conifera) were revealed almost the same changes but differ in severity, the changes include increase mucous production, epithelial hyperplasia , loss of lamellar structure, clubbing and fusion of the gill filaments and finally telangiectasis of the blood vessels. These results agreed with that reported by Paperna (1980), Badawy (1994) and Eid (1997). The epithelial propagation, mucous cells hyperplasia and fusion of secondary lamellae represent a host reaction against stimulation of feeding activity and irritation caused by parasitic attachement with gill filaments especially with the numerous clamps of the monogenean opisthaptor, while telangiectasis caused by the pressure of the parasites against the blood vessels with grasping of the gill cartilage. Death of the affected fish may occur due to reduction or total cessation of gas exchange (Shalaby and Ibrahim, 1988; Shuzo Egusa, 1992 and Harford and Arlene, 1994).

REFERENCES

Badawy, G. A. A. (1994): Some studies on ectoparasites of some marine fish in Egypt. Ph. D. Thesis, Parasitol., Fac. Vet. Med. Zag. Univ.

Bancroft, J. D. and Cook, H. C. (1984): Manual of histological techniques. 1st. Ed. Churchill Livingstone, London and New York.

Brinkmann, A. JR. (1942): On some new and little known Dactylocotyle species, with a discussion on the relations between the genus Dactylocotyle and the family Diclidophoridae. Goteborgs Kungl. Vetenskaps-Och Vitterhetssamhalles handlingar (Sjatte Foljden) (ser.B), 6(1), no 13, 32pp.

Bychowsky, B. E. (1957): Monogenetic trematodes, their systematics and phylogeny. Akad. Nauk. SSSR, 1-509. Translated from Russian by W. J. Hargis, Jr. AIBS, Washington, D. C.

Byrnes, T. (1985): Four species of Polylabroides (Monogenea: Polyopisthocotylea: Microcotylidae) on an Australian bream, Acanthopagrus spp. Austral. J. Zool., 33: 729-742.

Culling, C. F. (1974): Hand book of histopathological and histochemical techniques. 3rd. Ed. Red Wood Burn LTD. Trow. bridge and Esher.

Dillon, W. A.; Hargis, W. J. Jr. and Harrises, A. E. (1985): Monogenetic trematodes from the southern Pacific Ocean. Polyopisthocotyleids from Australian fishes. Subfamilies polylabrinae (genus Polylabroides) and Microcotylinae (genus Neobivagina) (in Russian). In: Parasitol. sborn., Leningrad, ,,Naukaî, 33: 83-87.

Easa, M. El-S. and Abu El-Wafa, S. A. (1993): Caligus curtus, an ectoparasite affecting marine fish. Egypt J. Comp. Pathol. Clin. Pathol., 6(2): 349-360.

Eid, A. S. (1997): Studies on parasites of the Egyptian cultured fish. M. V. Sc. Thesis, Parasitol., Fac. Vet. Med., Cairo Univ.

Fuhrmann, O. (1928): Zweite Klasse des Cladus Platyhelminthes: Trematoda.- In Kukenthalís Handbuch d. Zool. Berlin & Leipzig, 2, Teil 2 (3 Lief. Bogen 1-8), 1-140.

Harford, W. and Arlene, J. (1994): Parasitic worms of fish. Copyright Tylor and Francis LTD.

Hogans, W. E. and Trudeau, D. J. (1989): Caligus elongatus (Copepoda: Caligoida) from Atlantic salmon (Salmo salar) cultured in marine waters of the lower bay of Fundy. Canad. J. Zool., 67(4): 1080-1082.

Kabata, Z. (1988): In: Guide to the parasites of fishes of Canada. Margolis, L and Kabata, Z. [eds] Part II Crustacea. Can. Special Publ. Fish. Aquat. Sci., 184 pp.

Kohn, A.; Abramson, B. and Macedo, B. (1984): Studies on some monogenean parasites of Haemulon sciurus (Shaw, 1803) (Pomadasyidae). J. Helminthol., 58: 213-218.

Llewellyn, J. and Tully, C. M. (1969): A comparison of speciation in diclidophorinean monogenean gill parasites and their fish hosts. J. Fish. Res. Brd Canada, 26: 1063-1074.

Mamaev, Yu. L. (1988): Polylabroides zini sp. n., a new species of higher monogenean from a marine fish, Acanthopagrus latus. Helminthologia, 25: 195-200.

Mamaev, Yu. L. and Parukhin, A. M. (1976): On the genus Polylabris Euzet et Cauwet, 1967 and some closely allied species of Microcotylids (Monogenoidea: Microcotylidae) (In Russian). Parazitologiya (Leningrad), 10: 245-254.

Murray, F. V. (1931): Gill trematodes from some Australian fishes. Parasitol., 23: 492-906.

Paperna, I. (1980): Parasites in infections and diseases of fish in Africa. CIFA technical paper No. 7, 216pp.

Pascoe, P. L. (1987): Monogenean parasites of deep sea fishes from the Rockall trough (N. E. Atlantic) including a new species. J. Mar. Biol. Ass. U. K., 67: 603-622.

Pritchard, M. H. and Kruse, G. O. W. (1982): The collection and preservation of animal parasites. Univ. Nebraska, Lincoln and London., 141 pp.

Ramadan, M. M. (1983): Dactylogyrus aegyptiacus n. sp. (Monogenetic trematode: Dactylogyridae) a gill parasite of a Atherinid fish from the Red sea. J. Egypt. Soc. Parasitol., 13(2): 407-411.

Roubal, F. (1981): The taxonomy and site specificity of the metazoan ectoparasites on the black bream, Acanthopagrus australis (Gunter), in Northern New South Wales. Austral. J. Zool., 84: 1-100.

Shalaby, S. I. and Ibrahiem, M. M. (1988): The relationship between the monogenetic trematode, Cichlidogyrus tubucirrus magnus (First record in Egypt) and morphological lesions of gill among Oreochromus niloticus. Egypt. J. Comp. Path. Clinic. Path., 1(1): 116-124.

Thoney, D. A. (1989): Morphology of Calydiscoides nemipteris, sp. nov. (Monogenea), with a re-description and revision of the genus. Aust. J. Zool., 37: 37-43.

Wilson, C. B. (1928): Parasitic copepods from the White Nile and the Red sea., Results. Swed. Zool. Exped. Egypt and White Nile, 1901. L. A. Jagerskiold, Expedition (26B): 1-20.

Yamaguti, S. (1934): Studies on the helminth fauna of Japan. Pt. 2. Trematodes of fishes. Jap. J. Zool., 5(3): 249-541.

Yamaguti, S. (1939): Parasitic copepods from fishes of Japan Pt. 5. Caligoida, III Volumen Jubilare Pro Prof. Sadao Yoshida, 2: 443-487.

Yamaguti, S. (1958): Studies on the helminth fauna of Japan. Pt. 53. Trematodes of fishes, XII. Seto Mar. Biol. Lab. 7(1): 53-88.

Yamaguti, S. (1963): Systema Helminthum Vol IV, Monogenea, Aspidocotylea. Interscience Publications. New York, 699 pp.