A CONTRIBUTION ON INTERNAL PROTOZOAL INFECTIONS OF SOME CULTURED FRESHWATER FISHES AT ABBASSA, SHARKIA GOVERNORATE

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Abstract

A total number of 1088 cultured fishes including *Tilapia spp.* (*Oreochromis niloticus, Oreochromis aureus* and *Tilapia zillii*), African catfish (*Clarias gariepinus*) and common carp (*Cyprinus carpio*) were collected from El-Abbassa fish ponds and subjected to clinical, postmortem, parasitological and histopathological examinations. Out of 1088 examined fish, 728 fish (66.9%) were infected with different intero-protozoan parasites. The infection rates were 62.3% in *O. niloticus*, 56.5% in *O. aureus*, 80.1% in *T. zillii*, 58.1% in *C. gariepinus* and 50% in *C. carpio*. The infection rates with *Eimeria sp., Cryptosporidium nasorum, Myxobolus sp., Ceratomyxa drepanosettae, Myxidium lieberkuehni, Entamoeba molae, Hexamita sp.* and *Trypanosoma tilapiae* were 48.5%, 47.2%, 12.1%, 1.8%, 1.1%, 7%, 7% and 0.7%, respectively. The highest rate of infection was recorded in spring (80.9%). The general clinical signs and postmortem changes were anorexia, emaciation, dark colouration, lethargy, ascites, enteritis and may lead to death. The morphological character of each collected protozoan was described in details and the site of each protozoan parasite was also recorded. An experimental infection with *Eimeria rutili* was performed on 15 fish of *O. aureus*. Different development stages of *E. rutili* were detected on 41 days post-infection. On the other hand, an experimental infection with *Goussia sp.* I. in *O. aureus* showed no developmental stages in the experimentally infected fish. Histopathological examinations showed leucocytic infiltration, congestion and desquamation of epithelium in the infected organs.

INTRODUCTION

Fish is the most valuable food allover the world. Fresh or marine water fishes are important source for easily digest, high nutritional value, less fat and cholesterol, rich with some important vital elements and cheap animal protein.

The intensively cultured fishes are subjected to a wide variety of parasites and high intensity of infection than wild fishes (Woo 1995, Paperna, 1996, Roberts, 2001 and Renaud *et al.,* 2004). The internal protozoal infections are increasingly being considered as an economic problem and first actual threat and health problems facing aquaculture (Abu El-Wafa 1988).

However, little literatures are available on internal protozoa which are causative agents of serious diseases and subsequently more dangerous than other parasitic category in fish (Koura *et al.*, 1997 and Negm El-Din, 1991).

This study aimed to survey the internal protozoa inhabiting gut, kidneys, liver, spleen and gas bladder of five species of cultured fish collected from Abbassa fish ponds at Sharkia Governorate. Also studying the life cycle and pathological effect of two protozoal parasites, *Eimeria rutili* and *Goussia* sp. I were planned .

MATERIALS AND METHODS

I. Fishes:

A total number of 1088 cultured fishes including tilapias (*Oreochromis niloticus, Oreochromis aureus* and *Tilapia zillii*), African catfish (*Clarias gariepinus*) and common carp (*Cyprinus carpio*) were collected from fish ponds of El-Abbassa, Abu-Hammad, Sharkia Governorate, Egypt.

II. Clinical and Postmortem Examination:

The collected fish species were subjected to clinical and postmortem examinations as described by Lucky (1977) and Woo (1995).

III. Parasitological Examination:

Fish specimens were transported alive to the laboratory, fresh blood smear were prepared from all examined fish for rapid diagnosis of blood protozoa (Lucky, 1977). Fresh squash smears of internal organs (liver, spleen, kidney and gasbladder) were prepared and examined under microscope using (x 40, x 100 and oil immersion).

IV. Identification of parasites:

Identification of the protozoan parasites was done according to Hoffman (1970), Molnar (1978 and 1979), Lom and Dykova (1992) and Molnar and Ogawa (2000).

V. Experimental infection of fish by *Eimeria rutili* and *Goussia sp.* I

V.1. Parasite:

Eimeria rutili sporulated oocysts were isolated from kidneys and Goussia sp. I sporulated oocysts were isolated from gasbladder of tilapias and studied under light microscope at a magnification of x 400. The sporulated oocysts were collected in a small Petri dish containing small quantity of tap water according to Molnar (1978 and 1979) and Molnar and Ogawa (2000).

V. 2. Experimental Design:

Oreochromis aureus were obtained from Central Laboratory of Aquaculture Research at Abbassa farm and maintained in clean glass aquaria supplied with decholorinated tap water and continuous oxygen. Fish were subjected to

parasitological examination in order to prove to be free from natural infection during the whole of experimental period.

A total number of 15 *Oreochromis aureus* fish fingerlings (12-15 g) were allotted into 3 equal groups (A, B &C) and kept in 3 clean glass aquaria as previously mentioned.

In group A, 5 fish of *Oreochromis aureus* were inoculated by using a stomach tube introduced into the oesophagus of the fish with enough sporulated oocysts of *Eimeria rutili* from infected kidney of fish. In group B, 5 fish of *Oreochromis aureus* were inoculated with enough sporulated oocyst of *Goussia sp.* I from infected gas bladder of tilapia. Fish in group C were kept without inoculation as a control group.

V.3. Detection of experimental infection:

Microscopic examination of the inoculated fish was done on 10th, 41st and 58th days post-infection (Landsberg and Paperna 1985 and Paperna, 1996).

VI. Histopathological studies:

For histopathological examination, tissue specimens from infected organs were fixed in 10% neutral buffered formalin, dehydrated by ethyl alcohol, cleared in xylene and embedded in paraffin wax. Five microns thickness of paraffin sections were obtained and stained by Haematoxilin and Eosin stains (Roberts, 2001).

RESULTS AND DISCUSSION

In Egypt, few literatures had dealt with interic protozoan infecting freshwater fishes (Abu El-Wafa 1988, Negm El-Din, 1991, Koura *et al.*, 1997 and Aly *et al.* 1998).

With the respect to prevalence of internal protozoa among the cultured fish, the results in Table (1) showed a higher percentage of infection (66.9%) was recorded among the examined fish. The findings of this study were more or less in the range as reported by many authors, Abu El-Wafa (1988) in Rasheed branch among the examined fish. On the other hand, a lower infection rate (21.33%) was recorded by Aly *et al.* (1998) in Suez Canal area in cultured freshwater fish.

With the regard to the incidence of the described in the present investigation, *T. zillii* showed higher infection rates (80.6%), *O. niloticus* (62.3%), *C. gariepinus* (58.1%), *O. aureus* (56.5%) followed by *C. carpio* (50.0%). These findings supported those recorded by Abu El-Wafa (1988) who reported highest percentage of protozoal infection among tilapia species. The variation in the incidence of percentage may be related to the locality and number of examined fishes. On the other hand, Aly *et al.* (1998) found that the total parasitic infection among *C. gariepinus* was higher than that reported in *O. niloticus*.

Table (2) showed that the infection rate with *Eimeria sp* was the highest (79.6%) in *T. zillii* followed by *O. niloticus* (35.8%), *O. aureus* (33.9%), *C. carpio*

(22.2%) and *C. gariepinus* (6.5%). The highest percentage of infection with *Cryptosporidium nasorum* was found in *T. zillii* (77.8%), while moderate percentage was recorded in *O. niloticus* (19.8%). The higher percentage of infection with *Myxobolus sp.* was recorded in *T. zillii* (19.4%), while the lowest one was recorded in *C. gariepinus* (3.2%). The infection with *Myxidium lieberkuehni* was detected in *O. aureus* and *C. gariepinus* at 3.2% and it was not detected in other examined fish species. As the infection by *Ceratomyxa drepanosettae* was increased in *O. aureus* (4.8%), while it was not detected in *T. zillii* and *C. carpio*. The percentage of infection by *Entamoeba molae* was higher in *O. aureus* (16.1%), while it was 0.9% in *T. zillii*, while the infection by *Hexamita sp* was 12.0% in *T. zillii* but it was not detected in *C. carpio*. Infection with extracellular blood parasite (*Trypanosoma tilapiae*) was detected only in *O. aureus* (3.2%). Similar observations were noticed by Woo (1995), Aly *et al.* (1998) who mentioned that protozoal infections differ with species.

It could be observed from Table (3) that the highest percentage of internal protozoal infection was recorded in spring season (80.9%) followed by summer (71.9%), autumn (60.0%) and lastly winter (47.7%). Similar results were recorded by Abu El-Wafa (1988) who reported that the total protozoal infection reached its highest percentage during spring.

Enteric protozoa are common parasites of freshwater fishes, but despite this, they are relatively poorly understood. Most of the infected fish appeared apparently normal. General clinical signs and postmortem changes were anorexia, emaciation, dark colouration, lethargy, ascites, enteritis and may lead to death. Similar observations were in accordance with that recorded by Hoffman, (1970), Woo, (1995), Paperna, (1996), Aly *et al.* (1998), Roberts, (2001) who recorded that the pathological changes associated with protozoal infections were differed according to fish species, intensity of infection, nutritional status, environmental conditions, age of fish, immunity, physiological status and feeding habits .

Family: Eimeriidae **Genus: *Eimeria***

1. *Eimeria aurati* (Figs., 1 & 2).

Host: *O. niloticus, O. aureus, T. zillii* and *C. carpio.* **Habitat**: Intestine.

2. *Eimeria rutili*, (Fig., 3).

Host: *O. aureus, T. zillii* and *C. gariepinus.* **Habitat**: Kidney.

II-3. *Eimeria* sp. (Fig., 4)

Host: *O. niloticus, T. zillii, C. carpio* and *C. gariepinus.* **Habitat**: Intestine.

In this study, *E. rutili* was isolated from the kidney parenchyma and renal tubules. Other *Eimeria sp.* was isolated from kidney of fish such as *E. luecisci* (Alvarez-Pellitero and Gonzalez-Lanza, 1986), *E. muraiae* (Molnar, 1978) and *Goussia*

polylepidis (Alvarez-Pellitero and Gonzalez-Lanza, 1986). Molnar (1979) classified the Eimeriae parasitic in the renal tubules of cyprinids as *E. luecisci* and those found in the renal parenchyma or intestinal epithelium as *E. scardinii* and *E. carpelli*, respectively. An *Eimeria* species was detected from intestine of tilapia and carp had polar granules and a micropyl at one extremity (Fig 4). According to our knowledge, this is the first record of this species in tilapias.

Coccidian parasites of Egyptian fishes have been poorly studied. In heavy infected fish with intestinal coccidiosis , lethargy, anorexia, loss of body weight and excessive mucus secretion were recorded. Difficulty in swimming was indicative of gas bladder coccidiosis. Gas bladder with late infection turned opaque white and filled with viscous fluid. Intestine was void of food and filled with viscous mucous. Sometimes pinhead-sized blisters were observed on intestine and liver. The infection of gall bladder was characterized by thickening of its wall. Abu-El-Wafa (1988) described *Eimeria* species from *Synodontis schall* and *Clarias lazera*, respectively. Molnar (1978) mentioned that the *E. nemethi* resembles *E. rutili* and *E. esoci* but differs from them by shape of Stieda body and size of the oocyst and host of fish.

Genus: *Goussia*

II-1. *Goussia* sp. I. (Fig., 5)

Host: *O. niloticus, O. aureus, T. zillii* and *C. carpio.* **Habitat:** Gas bladder.

Sporulated oocyst was completed in the gas bladder of the fish. Oocysts were oval shape. One end was pointed and the other end was rounded. Oocysts measured 12.5 (11.5-13.5) μm long and 8.8 (8.0-9.6) μm wide. Oocysts wall was smooth, colourless and consisted of double layers and the distance between two layers was 0.5μm.

Sporocyst was filled the space of oocyst. Oocyst residium was present, while micropyl and polar granule were absent. Sporocysts were elongated, ellipsoidal and measured 6.8 (6.3-7.3) μm long and 2.6 (2.1-3.1) μm wide. Sporocyst wall was 0.1 μm thick. Steida body was absent. Each sporocyst was with two banana-shaped sporozoites arranged to tail. The sporozoite measured 6.2 (5.5-6.9) μm long and 1.3 (0.9-1.7) μm wide.

2. *Goussia* sp. II (Figs., 6 and 7)

Host: *O. niloticus.* **Habitat:** Intestine.

Only unsporulated oocysts were found. Oocysts ellipsoidal, measuring 18 (17-19) x 11 (10-12) μm. sporont finely granulated, filling entire oocyst. In some oocysts preserved under coverslip for 24 hours early sign of sporulation were found, in these oocysts narrow space appeared between thin oocyst wall and short ellipsoidal sporont. Oocysts pass from gut unsporulated.

The genus *Goussia* was regarded for long time as a synonym of *Eimeria* (Molnar and Ogawa, 2000), some sporulated oocysts found in this study were classified and identified as *Goussia* because the morphological characteristics of them were identical with those described by Molnar and Ogawa (2000) and Abollo *et al.* (2001). There was evidence that any fish coccidian with sporocysts lacking a stieda body may in fact be a species of *Goussia* (Lom and Dykova, 1982).

Family: Cryptosporidiidae Genus: *Cryptosporidium*

1. *Cryptosporidium nasorum* (Fig., 8)

Host: *O. niloticus, O. aureus, T. zillii, C. gariepenus* and *C. carpio.* **Habitat:** Intestine, stomach, liver and kidney.

Balantidia and Cryptosporidia were essential harmless endocommensals of fish intestine but in heavy infected fish, enteritis and emaciation was recorded. Fish infected with ceratomyxosis became sluggish, darkening of the skin and ascites. *Cryptosporidium* has gained better recognition over the last decade as an interopathogen (Hoover *et al.*, 1981). *Cryptosporidium* species infecting freshwater fish was detected in this study and identified as *Cryptosporidium nasorum.* The morphology and identification in this study was similar to Hoover *et al.* (1981).

Family: Myxobolidae Genus: *Myxobolus*

1. *Myxobolus pharyngeus* (Fig., 9)

Host: *O. niloticus, O. aureus, T. zillii* and *C. carpio.* **Habitat:** Intestine, liver and spleen.

2. *Myxobolus carassii* (Fig: 10)

Host: *O. niloticus, O. aureus, T. zillii, C. gariepinus* and *C. carpio.*

Habitat: Intestine and kidney.

3. *Myxobolus nkolyaensis* (Fig., 11)

Host: *O. niloticus* and *O. aureus.* **Habitat:** Intestine, liver and kidney.

The obtained result showed that *Myxobolus pharyngeus* could be detected from intestine, liver and spleen. However, some differences could be observed in the dimensions of spores, obviously larger as well as new site of infection were recorded by Parker *et al.* (1971) who described *M. pharyngeus* from pharyngeal epithelium of *Gambusia affinis.*

The morphology of *Myxobolus carassii* was found to be similar to the description of the parasite by Lom and Dykova (1992) who isolated the parasite from kidney, body cavity and muscle of gold fish. Review of the literature of the species, which resembles the present spores in the general shape, revealed that it is very close to *Myxobolus sp* described by Lom and Dykova (1992) and Koura *et al.* (1997). Spores

of *M. nkolyaensis* described in the present study were found to be similar to that of Fomena and Bouix (1994).

Family: Myxidiida Genus: *Myxidium*

1. *Myxidium lieberkuehni* (Fig., 12)

Host: *O. aureus* and *C. gariepinus.* **Habitat:** Intestine.

According to the available literature, *Myxidium liberkuehni* is recorded in the first time in Egypt. The only recorded changes associated with *Myxidium lieberkuehni* infection was the enlargement of gall bladder. However, *Myxidium liberkuehni* was recorded in the excretory system of *Escoxlucias* in Europe and North America, other species such as *M. giardi* could be isolated from kidney of eels, *M. rhodei* from European cyprinid fish and *M. minteri* from **salmonids (Lom and Dykova, 1992).**

Family: Ceratomyxidae Genus: *Ceratomyxa*

1. *Ceratomyxa drepanopsettae* (Fig: 13)

Host: *O. niloticus, O. aureus* and *C. gariepinus.* **Habitat:** Intestine.

The same parasite was recorded by Lom and Dykova (1992) from flat fish in North Sea and North Atlantic, where as *C. macrospora* could be detected from gall bladder of fishes (Lom and Dykova, 1992).

Family: Entamoebidae Genus: *Entamoeba*

1. *Entamoeba molae* (Figs., 14 and 15)

Host: *O. niloticus, O. aureus, T. zillii, C. gariepinus and C. carpio.*

Habitat: Intestine.

E. molae was morphologically identical with that described by Noble and Noble (1966) but smaller in dimension. On the other hand, Abu El-Wafa (1988) reported *Entamoeba* in Egypt but from *Tilapia* and *Clarias* species parasitizing the intestine, liver, spleen as well as skin and gills.

Family: Hexamitidae Genus: *Hexamita*

1. *Hexamita* sp. (Fig., 16).

Host: *O. niloticus, O. aureus, T. zillii* and *C. gariepinus.* **Habitat:** Stomach and intestine.

Intensive intestinal infection with *Hexamita* was sometimes accompanied by anorexia, emaciation, lethargy and dark coloration. Internally, catarrhal enteritis and the intestine was filled with mucus followed by hemorrhagic enteritis and ascitis. Also, pale liver was recorded. Cyst was ellipsoidal shape and had four nuclei and remainents flagella. Unfortunately, we could not detect the trophozoit. According to the available literature, indoparasitic flagellate *Hexamita* had not been recorded from fish in Africa (Paperna, 1996).

Family: Trypanosomatina Genus: *Trypanosoma*

1. *Trypanosoma tilapiae* (Fig., 17).

Host: *O. aureus.* **Habitat:** Blood.

Fish heavily infected with blood parasite did not feed properly and showed ascites and anemia. The morphology of *T. tilapiae* was in accordance with the findings previously mentioned by Imam *et al.* (1985), Abu-El-Wafa (1988) and Negm El-Din (1991). According to Imam *et al.* (1985), trypanosoma of African freshwater fishes were only blood parasites that attracted the author's attention where as much as five species had been described including these trypanosoma recorded from Nile fishes in Sudan.

Experimental infection of fish by *Eimeria rutili* and *Goussia* sp. I.:

Table (4) showed that the developmental stages of *Eimeria rutili* (sporocysts, early stage of oocyst, non-sporulated oocyst and sporulated oocyst) were detected in fresh smears of kidney at 41 days post-infection in experimentally infected *O. aureus* of Group A (Fig., 18 (A, B, C & D). The histo-pathological examination of the kidney revealed marked tubular nephrosis mainly vascular degeneration with coagulative necrosis. Endogenous developmental stages of *Eimeria rutili* (schizont, merosoites, macrogametocytes, microgametocytes and early oocyst) were evident in the rental epithelium (Figs 19 and 20) and parenchyma (Figs 21 and 22) associated with activation of melanomacrophage center. No developmental stages of *Goussia* species were recorded in fresh smears and histo-pathological specimens of *O. aureus* experimentally infected (Group B).

Paperna (1996) mentioned that the development of the intestinal coccidium *E. vanasi* was fast lasted 8 days from infection to sporulation at 24-27 °C. In the gas bladder coccidium (*G. cichlidarum*) endogenous development to sporozoite containing sporocysts lasted at least 58 days at 23-26 °C (Soo-Hyun and Paperna, 1993). Landsberg and Paperna (1985) recorded that oocyst and developing stages of *G. cichlidarum* could be detected after 95 days post infection in experimentally infection for hybrid of *O. aureus* and *O. niloticus*. The experimental infection of fish hosts with the coccidian parasites was rarely successful (Molnar, 1979).

Sporognoy in a few *Eimeria sp* may be both endogenous and exogenous (Landsberg and Paperna, 1985). They found that heavy infection of the resulting increased sloughing of host mucosal cells may consequently released young zygotes which were excreted in a non-sporulated state. The obtained results support all the previously mentioned concepts.

Pathological Changes:

1. In case of *Eimeria species*:

Intestine: The intestine showed developmental stages of *Eimeria sp.* and *Goussia* sp. II. Inside the epithelial linning of intestine, which exhibited mucinous degeneration and necrosis. The lamina properia infiltration by mononuclear leukocytes (Figs. 23 and 24).

Kidney: The kidney revealed marked tubular nephrosis mainly vascuolar degeneration with coagulative necrosis. Developmental stages of *Eimeria rutili* were evident in the epithelial linning of renal tubules and associated with activation of melanomacrophage center (Fig 25).

2. In case of *Cryptosporidium nasorum*:

Intestine: It showed marked congestion and leukocytic infiltration of lamina properia and submucosa mainly lymphocytes, plasma cells and eosinophilic granular cells (Fig 26). It was observed that endogenous developmental stages were attached to brush border of the tips of the intestinal villi of the anterior part of the intestine (Fig 26).

3. In case of *Myxobolus species*:

Intestine: It showed mucinous degeneration of the epithelial linning with edema, melanomacrophages and mononuclear leukocytic infiltration in the lamina propria (Fig 27). Some myxosporidius spores were seen in the intestinal lumen together with epithelial desquamation and mononuclear leukocytic infiltration (Fig 28).

4. In case of *Myxidium lieberkuehni*:

Intestine: It showed marked degeneration and necrosis in the epithelial linning. The lamena propria and submucosa were edematous and infiltrated with nononuclear and eosinophilic granular cells. The intestinal lumen contained tissue debris, *Myxidium* and numerous leukocytes (Fig 29).

5. In case of *Ceratomyxa drepanopsettae*:

Intestine: It displayed severe entritis with marked sloughing in the intestinal fold. The intestinal lumen contained numerous number of *Ceratomyxa drepanopsettae* with tissue debris and mononuclear leukocytes (Fig 30).

6. In case of *Entamoeba molae*:

Intestine: It showed mild degeneration in the epithelial linning. The lamina propria and submucosa revield edema, some mononuclear leukocytes and numerous eosinophilic granular cells (Fig 31).

7. In case of *Hexamita species*:

Intestine: It revealed mucinous degeneration and focal necrosis in the epithelial linning. The lamina propria and submucosa were infiltrated with some mononuclear leukocytes (Fig 32).

Similar histopathological pictures were recorded in the involved tissues by Landsberg and Paperna (1985), Abu El-Wafa (1988), Paperna (1996), Aly *et al.* (1998), Roberts (2001) and Renaud *et al.,* 2004.

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Table 1. Prevalence of internal protozoa in examined cultured fish.

Fish species	Examined fish	Infected fish	
	No.	No.	%
Oreochromis niloticus	212	132	62.3
Oreochromis aureus	248	140	56.5
zillii	432	348	80.6
Clarias gariepinus	124	72	58.1
Cyprinus carpio	72	36	50.0
Total	1088	728	66.9

Table 2. Prevalence of different internal protozoal infections in cultured fishes.

Fish species	Total No. of	*Eimeria sp.*		*Cryptosporidium nasorum*		*Myxobolus sp.*		*Myxidium lieberkuehni*		*Ceratomyxa drepanopsettae*		*Entamoeba molae*		*Hexamita sp.*		*Trypanosoma tilapiae*	
	examined fish	No. infected fish	%	No. infected fish	%	No. infected fish	%	No. infected fish	%	No. infected fish	%	No. infected fish	%	No. infected fish	%	No. infected fish	%
O. niloticus	212	76	35.8	42	19.8	20	9.4	-	-	4	1.9	16	7.5	8	3.8	-	-
O. aureus	248	84	33.9	52	21	16	6.5	8	3.2	12	4.8	40	16.1	12	4.8	8	3.2
T. zillii	432	344	79.6	336	77.8	84	19.4	-	-	-	-	4	0.9	52	12	-	-
C. gariepinus	124	8	6.5	68	54.8	4	3.2	4	3.2	4	3.2	8	6.5	4	3.2	-	-
C. carpio	72	16	22.2	16	22.2	8	11.2	-	-	-	-	8	11.1	-	-	-	-
Total	1088	528	48.5	514	47.2	132	12.1	12	1.1	20	1.8	76	7	76	7	8	0.7

Table 3. Seasonal prevalence of internal protozoal in examined cultured fishes.

Season	No. of examined fish	No. of infected fish	%
Autumn	240	144	60.0
Winter	176	84	47.7
Spring	188	152	80.9
Summer	484	348	71.9
Total	1088	728	66.9

Table 4. Time elapsed in *Oreochromis aureus* to find developmental stages of *Eimeria rutili*.

Day	Fish infected with coccidia		Control fish
	Group A	Group B	Group C
10 days	- ve	- ve	- ve
41 days	+ ve	- ve	- ve
58 days	+ ve	- ve	- ve

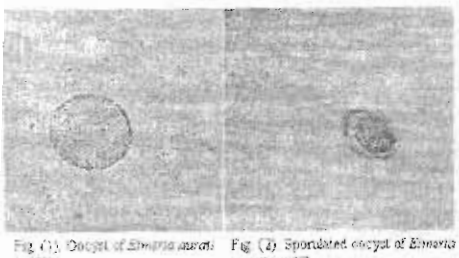

Fig. (1): Oocyst of *Eimeria auruti* (x640).

Fig. (2): Sporulated oocyst of *Eimeria auruti* (x640).

Fig. (3): Sporulated oocyst of *Eimeria ruiti* (x640).

Fig. (4): Sporulated oocyst of *Eimeria sp.* (x640).

Fig. (5): Oocyst of *Goussia sp. I* (x640).

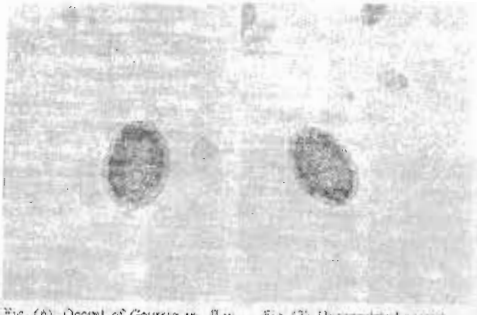

Fig. (6): Oocyst of *Goussia sp. II* in the early stage of sporulation, found space between the sporont and oocyst wall (x640).

Fig. (7): Unsporulated oocyst of *Goussia sp. II* (X640).

Fig. (8): Sporulated oocyst of *Cryptosporidium muris* (x640).

Fig. (9): Spore of *Myxobolus pharyngeus* (x640).

Fig. (10): Spore of *Myxobolus carassii* (x640).

Fig. (11): Spore of *Myxobolus nilotyonesis* (x640).

Fig. (12): Spore of *Myxidium heberlouhni* (x640)

Fig. (13): Spore of *Ceratomyxa drepanopsettae* (x640)

Fig. (14) Trophozoite of *Entamoeba molae* (x640)

Fig. (15) Cyst of *Entamoeba molae* (x640)

Fig. (18)

Fig. (16) Cyst of *Hexamita sp.* (x640)

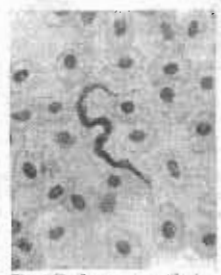

Fig. (17) *Trypanosoma tilapiae* (X1000)

Fig (A) Sporulated oocyst of *Eimeria rutili* (x16x40).

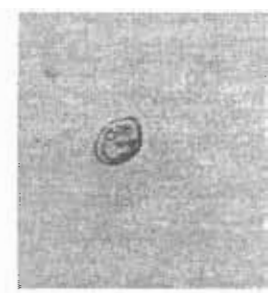

Fig.(B) Sporocyst contains sporozoite(x16x40).

Fig. (19): Showing development stages (merozoites, microgametocytes and early oocyst) of *Eimeria rutili* in the renal epithelium of *C.auratus* (H&E stain, X 250).

Fig.(C): Early stage of oocyst of *Eimeria rutili*(x16x40).

Fig.(D): Non-sporulated oocyst of *Eimeria rutili*(x16x40).

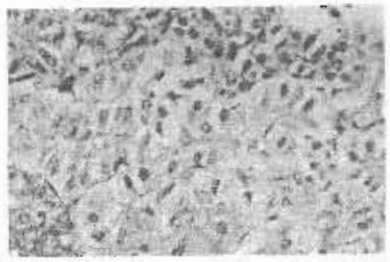

Fig. (20): Showing schizont in the renal epithelium of *O. aureus* (H&E stain, X 400).

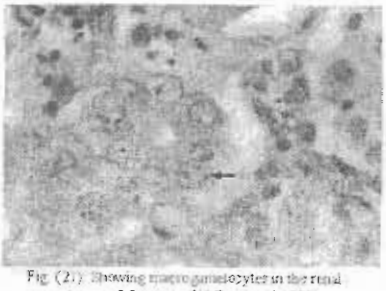

Fig. (21): Showing macro gametocytes in the renal parenchyma of *O. aureus* (H&E stain, X 1000).

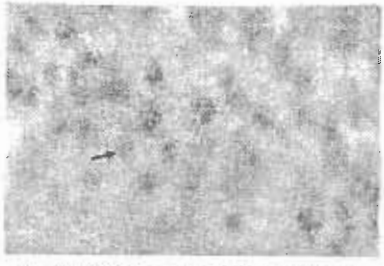

Fig. (22): Showing oocyst in the renal parenchyma of *O. aureus* (H&E stain, X 1000).

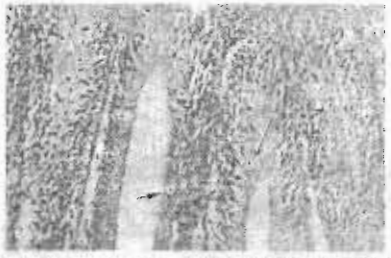

Fig. (23): The intestine of *Tilapia* sp. infected with *Eimeria*, showing intracellular coccidian parasite with marked degeneration on the epithelium and mucosa leukocytes in the lamina propria (H&E stain, X 250).

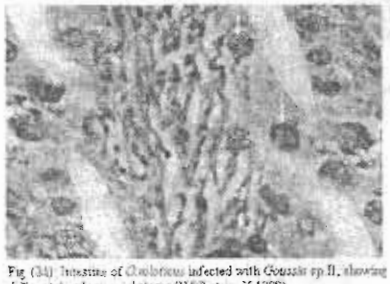

Fig. (24): Intestine of *Oreochromis* infected with *Goussia* sp II, showing different developmental stages (H&E stain, X 1000).

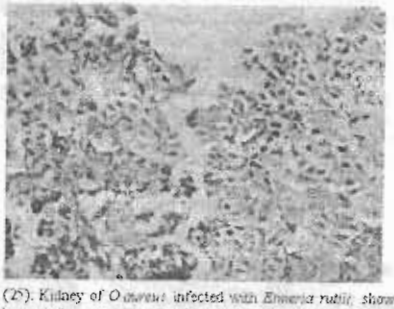

Fig. (25): Kidney of *O. aureus* infected with *Eimeria rutili*, showing developmental stages of the parasite with marked tubular necrosis and activation of melano-macrophage cells (H&E stain, X 250).

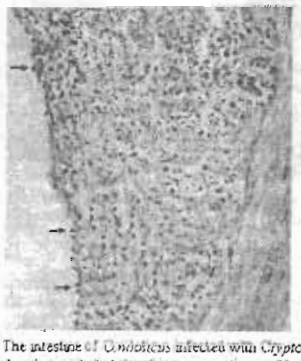

Fig. (26): The intestine of *O. niloticus* infected with *Cryptosporidium molleriani*, showing epithelial sloughing, congestion and leukocytic infiltration of lamina propria and submucosa (H&E stain, X 250).

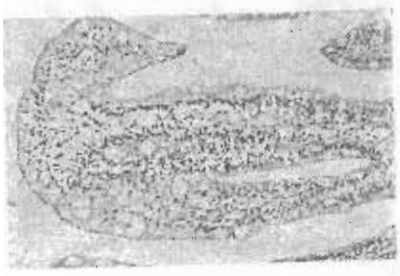

Fig. (27): Intestine of *O.niloticus* infected with *myxobolus* sp., showing mucinous degeneration with edema, melanomacrophages and mononuclear leukocytic infiltration in the lamina propria (H&E stain, X 400)

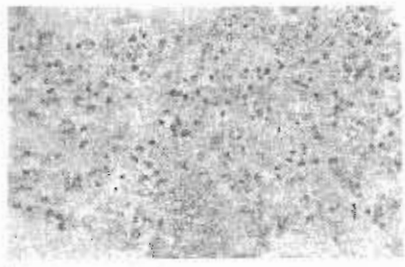

Fig. (28): Intestine of *O.niloticus* infected with *Myxobolus* sp. showing numerous stages of *myxosporidium* in the lamina (H&E stain, X 400)

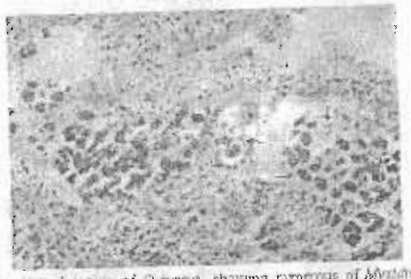

Fig. (29): Intestine of *O.aureus*, showing numerous of *Myxidium lieberkuehni* with necrotic epithelium and numerous mononuclear leukocytes (H&E stain, X 400)

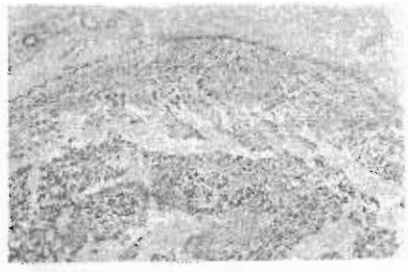

Fig. (30): Intestine of *O.niloticus*, showing marked sloughing of epithelium with focal aggregation of *Ceratomyxa shasta-epithelium* (H&E stain, X 250)

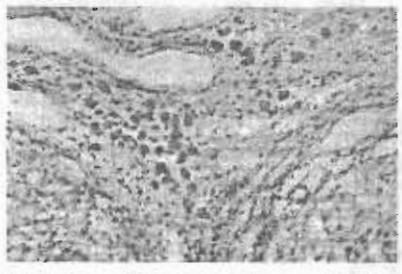

Fig. (31): Intestine of *O.niloticus* infected with *Balamoeba mabis*, showing edema, some leukocytes and numerous eosinophilic granular cells in the lamina propria and submucosa (H&E stain, X 400)

Fig. (32): Intestine of *Tilapia zilli* infected with *Hexamita* sp. showing advanced epithelial mucinous degeneration and leukocytic infiltration in the lamina propria (H&E stain, X 400)

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اسهامة عن العدوى بالأوليات الطفيلية الداخلية في بعض أسماك المياه العذبة المستزرعة بالعباسة بمحافظة الشرقية

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٢. *قسم أمراض الأسماك – المعمل المركزي لبحوث الثروة السمكية بالعباسة – مركز البحوث الزراعية*

أجريت هذه الدراسة لتحديد نوعية الطفيليات الأولية الداخلية التى تصيب خمسة أنواع من أسماك مزارع العباسة بمحافظة الشرقية حيث أنها أحد معاقل الثروة السمكية فى مصر. فى هذه الدراسة تم فحص ١٠٨٨ سمكة (٢١٢ سمكة بلطى نيلى و ٢٤٨ سمكة بلطى أوريا و ٤٣٢ سمكة بلطى زيللى و ١٢٤ سمكة قرموط افريقى و ٧٢ سمكة مبروك عادى) وكانت النتائج كالتالى :

١- كانت نسب الإصابة العامة لهذه الأسماك ٦٦,٩% وكانت نسبة الإصابة لسمكة البلطى النيلى ٦٢,٣% ولأسماك البلطى الأوريا ٥٦,٥% وأسماك البلطى الزيللى ٨٠,٦% وأسماك القرموط ٥٨,١% وأسماك المبروك العادى ٥٠% ، كما تم تسجيل نسبة الإصابة بكل هذه الطفيليات وكانت كالآتى: طفيل الايميريا ٤٨,٥% و طفيل الكريبتوسبوريديم ٤٧,٢% وطفيل الميكزوبولس ١٢,١% و طفيل الميكزيديم ١,١% وطفيل السيراتوميكزيا ١,٨% وطفيل الانتاميبا ٧%.وطفيل الهيكساميتا ٧% وطفيل التريبانوسوما ٠,٧% . كما تم تسجيل مدى وجود هذه الطفيليات على مدار فصول السنة وكانت أعلى نسبة للطفيليات الأولية فى فصل الربيع ٨٠,٩% ثم فصل الصيف ٧١,٩% ثم فصل الخريف ٦٠% ثم فصل الشتاء ٤٧,٧%.

٢- تم عزل وتصنيف عدد وفير من الطفيليات الأولية التى تصيب أسماك المياه العذبة حيث وصفت من خلال المراجع العالمية والمحلية المتخصصة وتضمنت ٩ طفيليات وهم طفيل الايميريا وطفيل الجوسيا و طفيل الكريبتوسبورديم وطفيل الميكزوبولس وطفيل السيراتوميكزيا وطفيل الميكزيديم وطفيل الانتاميبا وطفيل الهيكساميتا وطفيل التريبانوسوما. وأيضا تم وصف جديد لأنواع لم يسبق ذكرها من قبل فى أى نوع من المراجع المتاحة سواء عالميا او محليا وتضمنت نوع من طفيل الايميريا ونوع من طفيل الجوسيا.

٣- كانت الأعراض المرضية والصفة التشريحية المصاحبة للإصابة بالطفيليات المختلفة هى فقدان فى الشهية وضعف عام، هزال، غمقان فى اللون ، استسقاء، التهاب فى الأعضاء المصابة ونفوق .

٤- تم إجراء عدوى لعدد ٥ سمكات بلطى أوريا بطفيل الايميريا روتيلى و الذى تم عزله من كلى أسماك البلطي و ٥ سمكات أخرى بطفيل الجوسيا الذى حصلنا عليه من المثانة الهوائية لأسماك البلطى و تركنا عدد ٥ أسماك أخرى بدون عدوى للمراقبة. أثبتت النتائج أن طفيل الايميريا روتيلى قادر على استكمال دورة حياته فى أسماك البلطى الأوريا بينما لم تقبل أسماك البلطى الأوريا العدوى بطفيل الجوسيا.

تم دراسة بعض التغيرات الهستوباثولوجية التى صاحبت الإصابة بهذه الطفيليات الأولية وأيضا العدوى المعملية ببعض هذه الطفيليات.