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INVESTIGATION ON THE INTERNAL PROTOZOA INFECTING NILE TILAPIA FISH

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ABSTRACT

Parasitological examination of 119 alive *Tilapia* fish collected from River Nile at Giza province for internal protozoa indicated that, it harbored eighteen species of protozoa representing 5 genera of coccidia and 2 genera of myxosporea. Seven species are not recorded before in Egypt (*Eimeria sp.; Octosporella sp.; Thelohanellus sp.; Myxobolus sp.*1; *Myxobolus sarigi; Myxobolus sp.*2 & *Myxobolus equatorialis)*. Both morphometeric features and seasonal incidence are illustrated.

INTRODUCTION

To date, there is a huge number of parasitic protozoa recorded in fish, some of which are serious pathogens since every organ and site on or in the fish can be utilized by various types of protozoa (**Heckmann, 1996**). In spite of the high resistance of Tilapias to diseases, it is vulnerable to large number of parasites even in subclinical but potentially dangerous (**Roberts & Sommerville, 1982**). Records of endoparasitic protozoa in *Tilapia* fish in Egypt are either from natural resources by: **Fahmy *et al.*, 1975** (Assiut province); **Abu El-Wafa, (1988 & 1990)** (Behera province); **Imam *et al.*, 1987; Abdel Ghaffar *et al.*, 1995** and **El-Deep 1995** (Giza district) or from fish cultures by: **Ali, (1992** & **1996)** and **Eid, (1997)**.

Fish *Eimeria* as a group of endoparasitic protozoa have many features different from emeriids infecting warm blooded vertebrates such as thin walled oocysts, mainly endogenous sporulation, frequent extra-intestinal sites and possibly lower host specificity (**Lom & Dykova, 1995**). It is supposed that most of fish *Eimeria* belong to one of two genera; *Eimeria* or *Goussia*, the sporocysts of the former genus have a stieda body or a stieda-body like opening at one of the two poles. Whereas those of the latter genus have smooth wall, without stieda body and with suture uniting the two shells of the sporocyst wall, this suture is hard to see in light microscopy (**Lom & Dykova, 1992 and Molnar, 1996**).

Myxosporea are essentially fish parasites forming an abundant and diversified group of parasites, their systematics are based fundamentally on morphometeric characteristics of spores which are the infective and only stages of life cycle with a well defined structure (**Fomena & Bouix, 1997**), they presented a key with illustrations to the known species in Africa. **Lom & Arthur, (1989)** proposed guidelines for species description and identification, they also indicated that myxosporeans show little tissue or host specificity and readily introduced into new geographic areas. Myxosporea are either histozoic species in the intercellular space of solid tissue or coelozoic in lumina of the gastrointestinal and urinary tracts (**Lom, 1987**). In wild fish, mixed infection with several myxosporeans is common while single infection is unusual (**Athanassopoulou & Sommerville, 1993**).

The present study is an assessment of the incidence, seasonal fluctuation and taxonomy of the endoparasitic protozoa inhabiting wild *Tilapia* fish species.

MATERIAL AND METHODES

During the course of this study that extended for a year, 119 *Tilapia* fish specimens were collected from the fishermen by the Pharaonic village at Giza. Fish were transported alive with an amount of their habitat water to the laboratory where they kept in well-aerated glass aquaria. After dispatching and evisceration of each fish, internal organs (intestine, liver, spleen and kidney) were grossly inspected for any lesions or cysts, then direct wet smears from each organ were microscopically examined. At least two squash preparations from each tissue fixed in absolute methanol together with intestinal scrapings fixed in schaudin solution were stained with Giemsa. Modified Ziehl Neelsen (MZN) stain was used for detection of Cryptosporidia (**Henriksen & Pohlenz, 1981**). The intestinal content of the samples positive for coccidia were kept in 2.5% potassium dichromate at 22 °C for further identification (**Soulsby, 1986**). Morphometeric data and seasonal incidence of the detected protozoa are presented.

RESULTS

Examination of 119 *Tilapia* fish from River Nile at Giza revealed 18 species of endoparasitic protozoa. The protozoa were determined in two major categories; 6 coccidia in 5 genera and 12 myxosporea in two genera (7 species are not recorded before in Egypt). Table (1) elucidates that the highest total rate of infection among coccidia was 28.6% *(Goussia sp.)* and the rest came next to it. In winter, spring and autumn *Goussia sp.* prevailed the other coccidia (28.1%, 21.1%, 47.6%) while *Isospora spp.* infection was

highest in summer (28.6%) and disappeared in winter and spring. *Cryptosporidium nasorum* vanished in summer and autumn. Infection with myxosporea dispersed all over the year and the total rate was 63% with the highest rate in summer; 82.1% and the lowest rate in winter 31.3%. Twelve species of myxosporea are identified; one in genus *Thelohanellus* and eleven species in genus *Myxobolus*.

Morphometry of the revealed protozoa:

I- Coccidia: All the revealed species were detected in the intestine.

(1) *Eimeria sp.:* (pl. 1. a)

It is detected in all seasons with a total infection rate of 16% and maximized in autumn (28.6%), it has subspherical oocysts averaged 34.1 (30-40) μm with thin single layered wall and has very small micropyle. It lacks residium and contains 4 sporocysts filling the whole oocyst and closely arranged. The sporocysts (pl. 1.b) are lemon shaped, tapering at both ends and have double layered wall and a cap-like stieda body at one pole. Each measured 12-16 x 8-10 (13 x 8.9) μm, has two sporozoites and a granular residium

(2) *Goussia sp.:* (pl. 1.c)

The oocyst is somewhat circular with thick and single layered wall, it averaged 21.7 x 20.6 (18-26 x 18-24) μm and has no micropyle or residium containing 4 sporocysts, which arranged loosely with ample space around them. The sporocyst is ovoid in shape, blunt edged with double layered wall. It measured 6-12 x 4-10 (9.2 x 6.1) μm

(3) *Octosporella sp.:* (pl. 1.d)

It was found in all seasons with a total rate of infection 8.4% and peaked in autumn 14.3%. The oocyst is large and subspherical measuring 20-40 x 20- 30(25.8 x 24) μm with thin, smooth and single layered membrane. It has a rounded granular micropyle of 3.5 μm in diameter and contains eight sporocysts. The latter are scattered freely in random distribution, ovoid in shape with blunt edges and have double layered membrane. Each sporocyst measured 6-12 x 4-6 (9 x 5.7) μm. and contains two sporozoites and a granular residium.

(4) *Isospora sp. (1):* (pl. 1.e)

This first species is large, oval and measuring 20-28 x 18-22 (25.3 x 20.3) μm. It has thin, transparent wall of one layer and no oocyst residium. The two centrally located sporocysts have thick and dark colored wall, each ranged 12-20 x 6-12 (14.5 x 9) μm in size and has 4 semi circular sporozoites and a small residual body.

(5) *Isospora sp. (2):* (pl. 1.f)

It is smaller in size than the former one, oval in shape and 17-20 x 11-17 (18 x 13.6) µm in size and has a very thin single layered wall mainly stretched over the two sporocysts. The latter measured 10- 15 X 5 – 10 (11.8 X 6.8) µm.

(6) *Cryptosporidium nasorum:* (pl. 1.g)

It is appeared in the intestinal mucosal smears as red, spherical oocysts of 4-4.5 µm in diameter with green background in MZN. The infection rate varied from 10.5-18.8% in spring and winter while disappeared in summer and autumn.

II- Myxosporea: Spores were dispersed in melanomacrophage centers of the spleen and kidney and diffused in the liver and intestinal tissue.

(1) Genus *Thelohanellus: (Th .sp.)* (Pl. 2.a)

The spores were histozoic in the spleen, pyriform in shape with single and well-developedpolar capsule (PC) that discharged apically and eccentrically. The length of spores 9-12 (11) µm and the width 6-8 (7.2) µm and PC measured 6-8 µm in length and 3-4 µm in width averaging (7.3 x 3.3) µm.

(2) Genus *MyxobolusL:* 1- *(M. sarigi)* (pl. 2.b)

It was detected in spleen, liver, intestine and kidney. The anterior end of this spore is wider than the posterior one. It measures 7-12 x 5-9 (9.6 x 6.6) µm. The two PCs are oval shaped and occupy almost half the spore length from 3-5 x 2-3 (4.2 x 2.7) µm. A prominent intercapsular space of 2 µm and an intercapsular process are observed.

(3) *Myxobolus sp.(1):* (pl. 2.c)

Histozoic spores in the spleen, ellipsoid in shape with rounded anterior and posterior ends. It measured 10-12 x 8 –9.5 (11 x 9) µm. One of the oval shaped PCs is directed apically as usual while the other discharged posteriorly and transversely, each was 3.8-4.5 x 3-3.2 (4.2 x 3.1) µm. The sporoplasm surrounds the posterior PC.

(4) *Myxobolus beninensis:* (pl. 2. d & e)

The spores were histozoic in spleen, liver and intestine, pyriform in shape with rounded posterior end and slightly narrow anterior end. It measures 10- 14 x 7-10 (11.8 x 8.2) µm. Two pyriform PCs are pointed anteriorly and occupying more than half of the spore length measuring 6-8 x 2-3 (6.9 x 2.8) µm. There is a small intercapsular process and 7-9 coils of polar filament.

(5) *Myxobolus sp. (2):* (pl. 2. f & g, left one)

Histozoic in the spleen, the spores are oval with rounded ends measuring 9-11 x 6-9 (10 x 7.5) µm. The two PCs are ovoid, unequal and

convergent, the large one was 5-7 x 2-3 (5.8 x 2.8) µm and the small one was 3-5 x 2-3 (4 x 2.4) µm. One iodinophilus vacuole is clearly observed.

(6) *Myxobolus imami:* (pl. 2. g, right one & h)

It was found in spleen, intestine and liver. The spores are subspherical measuring 9-11 x 8-10 (10.1 x 9.1) µm. The PCs are ovoid and occupy almost half of the spore length from 4-6 x 2-4 (5.5 x 2.8) µm. The anterior ends of the PCs are convergent and pointed.

(7) *Myxobolus equatorialis:* (pl. 2. i & j)

It was detected in the spleen, pear shaped spores with long narrow anterior half sometimes tapered. The spores measured 12-15 x 6-8 (14.1 x 7) µm. The PCs are located equatorially (almost in the middle of the spore) and pear shaped. One PC is slightly larger than the other measuring 3-4 x 2-4 (3.3 x 2.6) µm while the other was 2-3 x 2-2.5 (2.3 x 2.2) µm. In some specimens the PCs are equal. Two polar filaments extend from the PCs to the tip of the spore. An intercapsular process and space from 1.5-2 µm are seen.

(8) *Myxobolus zilli:* (pl. 2.k)

The spores were diffused in the spleen, liver and intestine, it has ovoid shape with a blunt anterior tip and wide posterior end and measuring 9.5-14 x 7.2- 10.6 (11.6 x 8.8) µm. The oval PCs occupy more than half of the spore length, parallel and non convergent anteriorly. Each PC measures 5-8 x 2.5 - 3.9 (6.2 x 3.1) µm. A prominent intercapsular space is detected. The sporoplasm is binucleated.

(9) *Myxobolus brachysporus:* (pl. 2. L & m)

It was frequently found in the spleen, kidney, liver and intestine. The spores have a characteristic style distinguishing them form the rest of myxosporea species, where it is broadly ellipsoidal measuring 7.2-8.8 (7.9) µm in length and 12-12.8 (12.1) µm in width. The PCs are equal and ovoid to round in form, averaging 2.5 x 2.9 (2-4 x 2-3) µm in size. The PCs anterior ends are not convergent

(10) *Myxobolus homeosporus;* (pl. 2.n)

The spores were observed in the spleen and liver, they are ovoid or ellipsoidal and of big size; 12-16 x 9-11 (14.5 x 10.1) µm. The two PCs are ovoid, parallel, non-convergent and small in size almost equal one third of the spore length; 4-5 x 2-3 (4.4 x 2.6) µm. No intercapsular space or process is seen.

(11) *Myxobolus tilapae:* (pl. 2.o)

This species was found in the spleen and liver. The spores are ovoid and the anterior end as wide as the posterior one. The measurements of the spores are 12-15 x 9.2-11 (13.6 x 9.7) µm. The PCs are ovoid, non-convergent and occupy about one- fourth of the spore length 3-3.5 x 2-2.5 (3.3 x 2.2) µm. No intercapsular space while intercapsular process is present.

(12) *Myxobolus galilaeus:* (pl. 2.p)

It was observed in the spleen. The spores are ovoid in shape measuring 11-14 x 9-12 (12.5 x 10.3) μm and the PCs are ovoid, non convergent occupying little more than one-fourth of the spore length; 2.7-3.8 x 2.2- 2.8 (3.3 x 2.5) μm. An iodinophilous vacuole is detected

DISCUSSION

Eighteen protozoa species were detected as endoparasites from wild *Tilapia spp.*, 6 coccidia and 12 myxosporea species. Regarding *Eimeria*, it has been recorded in Egypt three times starting by **Imam *et al.*, 1987** (*E. sp.*) followed by **Abu El-Wafa, (1988)** (*E. anguillae*) and **El-Deep, (1995)** (*E. sp.*1 & *E. sp.* 2), Table (2) summarizes their measurements comparing with the present species. The revealed *E. sp.* is distinguished from the others by its oocyst diameter, presence of micropyle and having sporocyst with a cap or stieda-like body which verifying its new identity.

Goussia sp. resembles *E. sp.* 2 (**El-Deep, 1995**) but smaller in the oocyst diameter. *G. sp.* is similar to *G. clupearum* (**Thelohan, 1894**) in the oocyst diameter; 18-25 μm and the form and size of sporocyst (8-12 x 4-10) μm. The only other species that close to the present *G. sp.* is *G. degiustii* (**Molnar & Fernando, 1974**) from the spleen, swimbladder, kidney and intestine of a fresh water fish in Canada. Its oocyst measured 15.3-23.1 x 15-22.8 μm but the sporocystes are larger comparing with the handled species measuring 12.7- 16.6 x 5.5-7.8 μm. From what mentioned above, the present *G. sp.* could be regarded as new species.

The genus *Octosporella* has been erected in **(I942)** by **Ray & Raghavachari** who described a coccidian with eight sporocysts each with two sporozoites from the intestine of an Indian Lizard. Then in **(1985), Li and Desser** found three species for the first time in cyprind fish, namely *O. notropis*; *O. opeongoensis* and *O. sasajewunensis*. These species are different from the present one in having: (1) smaller oocyst size; 20, 17.5 and 16.5 μm (2) No micropyle (3) Granular oocyst residium (4) Large slender sporocysts averaging 16.5 x 4; 14 x 3 and 13 x 1.5 μm in size and arranged parallelly and closely. The present *O. sp.* is detected in all seasons with a total incidence of 8.4% but reached its peak in autumn (14.3 %). Such coccidian is recorded herein for the first time in Egypt and the above mentioned variations make it valid to be new species of *Octosporella*.

Concerning *Isospora spp.* four undescribed spp. have been recorded in fish. The sole and named species of them is *I.sinensis* (**Chen, 1984**) from the kidney of fresh water Chinese fish, its size and shape (oval & 31 X 22 μm) similar to the present *I.sp.*1 but it had an oocyst residual body and its

sporocysts were subspherical. Another species is recorded in Egypt by **Abu-El-Wafa, (1990)** from *Clarias lazera*, it had thick oocyst wall and its sporocyst had a conspicuous stieda body differentiating the present *I sp.*1 and *I. sp.* 2 from it. One of the three *Isospora spp (I sp.*1*)* which is recorded from *Oreohromis niloticus* **(El-Deep, 1995)** is close to the present *I. sp.*1 but smaller in size; (19.9- 23.7 x 15.4- 16.5) µm. and had double layered wall. The other two species were small and spherical, *I. sp.* 2 with eccentric sporocysts and the third one with rounded sporocysts. The last two species *I. sp.* 2 & *I. sp.*3 are aidentical. Repeated incidence of *Isospora* infection in *Tilapia* in certain seasons (summer & autumn) with a rate of 28.6% (present) and 7-12% **(El-Deep, 1995)** may not be accidental demanding further clarification.

Cryptosporidium nasorum has been detected three times from *Tilapia* fish in Egypt; Firstly by **Hefnawy, (1989)** then by **Ezz El- Din *et al.*, (1998)** and finally by **El-Ghaysh and Olfat, (1998)**. In the three records, the rate of infection was 30%; 37.07% and 20 respectively which is higher than the present one (10.5-18.8%). The infection peaked in winter followed by spring and vanished in autumn and summer, this is approved by **Badawy *et al.*, (2001)** who found *C. nasorum* in *Clarias lazera.*

Infection with myxosporea was prevalent all over the year and peaked in summer, which came in accordance with **Bang and kim, (1989)** and **Ali, (1992)**. Mixed infection with more than two species were common and sometimes up to six species were detected in the same organ as indicated formerly by **Athanassopoulou and Sommerville, (1993)**. Spleen was the most infected organ followed by intestine; liver and kidney.

1- *Thelohanellus sp.* is similar to *T. assambai* recorded from *Labeo sp.*, that measured 9-12 x 5-7 µm and its PC; 6-9 x 2-3.5 µm **(Fomena *et al.*, 1994)**, while it is distinguished from the other three species in Africa **(Fomena and Bouix, 1997)** by its measurements. One of these species (*M. unicapsulatus*) was in Egypt **(Gurley, 1893)** and renamed as *T. niloticus*. Such species measured 5 x 3.5 in spore size which is almost half the size of the present one. Consequently the detected species is identified as *T. assambai* and considered new in Egypt.

2- Myxobolus sarigi is defined so, as the only species with broad anterior end and intercapsular space. Its measurements are slightly smaller than that given by **(Landsberg, 1985 and Obiekezie and Okaeme, 1990)** for *M. sarigi* which is recorded from kidney and spleen of various cichlids. Such species was 10-13 x 8-9 µm and its PCs were 4-5 x 3-4 µm. and lacks the intercapsular process which is prominent in the one under this study. This species is not recorded before in Egypt.

3- Myxobolus sp.1. **Fomena *et al.*, (1985)** found *M. africanus*, which has pointed anterior end and PCs not in the same level, where one of the PCs is shifted laterally but parallel to each other. In the contrary of the present species, which has rounded ends and two PCs not parallel and one of them is located laterally and transversely. *M. africanus* has larger spore size than the present one (13.5-17.5 x 5.5-9) µm and PCs are 5.5-9.5 x 1.5-3.5 µm. The variations in the morphometeric features are distinguishing the present species which is regarded as new species in Egypt.

4- Myxobolus beninensis. Similar species recorded twice in Egypt, firstly from *Tilapia sp.* as *M. sp* (**Ali, 1992**) and secondly from *Oreochromis niloticus* and *Barbus byni* as *M. sp.3* (**El-Deep, 1995**). The measurements of the present sp. conceded with the first sp. but smaller than the second one. In the mean time, it is very close to *M. beninensis* (**Sakiti *et al.*, 1991**) as the latter was 10.5-14 x 5.5-9 and its PCs 6-8 x 1.5-3 µm consequently this species is identified as *M. beninensis*.

5- Myxobolus sp. (2) In Egypt, *M. niloticus* with differently sized PCs has been detected from fin rays of *Labeo niloticus* for the first time by **Fahmy *et al.*, (1971)**, then by **Abdel- Ghaffar *et al.*, (1995)** and **Abdel-khalek, (1998)**. In the three cases, the spores were oval shaped and the large PC was almost as twice as the small one. The large PC measured 6 x 2.9 µm and the small one 3 x 1.55 µm. The spore size of *M. niloticus* is close to the present sp; 10.25-11.75 x 6.8-7.8 µm. but the difference between the two PCs is not large. *M. dossoui* **(Sakiti *et al.*, 1991)** is the closest sp. to the present one where its spore measured 8.5-11 x 8-10.5 µm and its PCs 4.5-6.5 x 2.5-5 µm (large PC) and 3-5.5 x 2-3.5 (small PC), also this species is histozoic in *Tilapia*. It is believed to be new in Egypt.

6- Myxobolus Imami is recorded for the first time in **(1996)** by **Ali** from the ovary of *Clarias gariepinus* (Lake Wadi El-Rayan). Its spore size was 11.1 x 8.9 µm and PCs were 5 x 2.9 µm but they were slightly oblique. This is the first record of this species in *Tilapia*.

7- *Myxobolus equatorialis* is erected originally from the spleen of hybrids of *Oreochromis aureus* x *O. niloticus* in Israel (**Landsberg, 1985**). It is slightly bigger than the present one measuring 13-15x7-8.5 µm and the PCs were located equatorially and 4-5 x 3-4 µm (large PC) and3-4 x 2.5-3 µm (small PC). This species has not previously been reported in Egypt.

8- *Myxobolus zilli* is similar to the *M. zilli* described by **Sakiti *et al.*, (1991)**

and **Ali (1992)** from *Tilapia spp.* The spore size given by the second author averaged 10.1 x 7.3 and PCs of 6.8 x 3 μm which is close enough to the present material. The species detected by **(Sakiti *et al.*, 1991)** and *M. sp.*2 **(Fahmy *et al.*, 1975)** had spores with non convergent PCs as the present species, also the species had intercapsular process and space as the studied one. Same species has been detected in intestine of *Clarias lazera* but with smaller size; 9.4 x 6.3 and PCs 5.7 x 2.7 μm **(Ali, 1996)**.

9- *Myxobolus brachysporus* is recorded repeatedly from spleen and kidney of different *Tilapia* species in Africa beginning with **Baker, (1963); Obiekezie and Okaeme, (1990); Ali, (1992) and Fomena *et al.*, (1993).** The morphology as well as the measurements of such *M. sp.* are in agreement with that given by **Fomena and Bouix, (1997)** (7-7.5 x 12-13.5) μm and PCs (2.5-4 x 2.5) μm.

10- *Myxobolus homeosporus* The general features of such species are coincided with *M. homeosporus* **Baker, (1963)** and **Ali, (1992)** where their measurements were 15 x 9 μm and PCs 4.5 x 2.7 μm also histozoic in *Tilapia* as well.

11- *Myxobolus tilapiae* Morphologically similar species (*M. sp.*1) was recorded from the gills and cornea of two *Oreochromis spp.* **(Abdel-Ghaffar *et al.*, 1995)** but the spore size averaged 17.9 x 11.1 μm and PCs were 5 x 3.5 μm which is bigger than the present species. *M. tilapiae* that recorded from *Tilapia* by **(Abolarin, 1974 and Fomena *et al.*, 1993)** had a wide range of spore size (12-20 x 7.5-11) μm and its PCs occupy almost one-fourth of the spore length (2-3.5 x 2-2.5) μm. The measurements of the studied species are falling in that range of size consequently it is defined as *M. tilapiae.*

12- *Myxobolus galilaeus* is recorded firstly by **Landsberg, (1985)** and then by **Ali, (1992)**. It is measuring 10.5-13 x 8-10 μm and PCs of 3-4 x 2.5-3 μm. The first author detected 11-12 fold on sutural line which lacked in the present species and the species described by the second author.

Obviously, wild *Tilapia* are exposed to an ample variety of internal protozoa where 18 species are detected comparing with 6 *spp.* **(Ali, 1992)** and 7 *spp.* **(El-Deep, 1995)**. This could be an indication to the quality of water habitat and reflects the general status of Nile *Tilapia* as one of the main fish species in the market.

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Table (1): Seasonal incidence of internal Coccidia and Myxosporea recovered from Nile *Tilapia* fish.

Protozoa	Winter			Spring			Summer			Autumn			Total		
	Ex. No.	Inf. No.	%	Ex. No.	Inf. No.	%	Ex. No.	Inf. No.	%	Ex. No.	Inf. No.	%	Ex. No.	Inf. No.	%
I. Coccidia	32			38			28			21			119		
1- Eimeria sp.		3	9.4		5	13.2		5	17.9		6	28.6		19	16
2- Goussia sp.		9	28.1		8	21.1		7	25		10	47.6		34	28.6
3- Octosporella sp.		2	6.3		3	7.9		2	7.1		3	14.3		10	8.4
4- Isospora spp.		-	-		-	-		8	28.6		6	28.6		14	11.8
5- Cryptosporidium nasorum		6	18.8		4	10.5		-	-		-	-		10	8.4
II. Myxosporea *spp.*		10	31.3		30	78.9		23	82.1		12	57.1		75	63

Ex. No.: examined number Inf. No.: infected number

Table (2): Morphometric differences between the present *Eimeria spp.* and the previously ones in Egypt.

	Present *E. Sp.*	Present Goussia sp.	E. sp. Imam *et al.*, (1987)	E. anguillae Abu El-Wafa (1988)	E. sp. 1 El-Deep (1995)	E. sp. 2 El-Deep (1995)
Oocyst diameter/µm	30-40 (34.1)	18-26(21.7)x 18-24 (20.6)	21-25 (22)	10.75-11.18 (10.9)	29.3-32 (30.4)	32.3-35 (33.2)
Oocyst wall	Single	Single, thick	thin double layered	single, thin	Single, thin	double layered
Oocyst micropyle	Present	-	-	-	-	-
Oocyst residium	-	-	-	-	-	-
Host	Tilapia sp.	Tilapia sp.	Synodontis schall	Clarias lazera	Tilapia sp.	Tilapia sp.
Locality	Giza	Giza	Giza	Behera province	Giza	Giza
Sporocyst shape	Lemon, tapered at ends	Ovoid, blunt edges	-	Oval	Spherical	Ellipsoidal
Sporocyst size/µm	12-16 x 8-10 (13 x 8.9)	6 -12 x 4 -10 (9.2 x 6.1)	10.8 x 7.2	6.8-7.7x5.2-6 (7.3x5.6)	11.1-12.9 (11.4)	10.1-11.3 (10.5)x6.9-7 (7)
Sporocyst wall	Double, thick	Double		-	2 unit membrane	-
Sporocyst residium	Present	Present	Present 2-3 µm	-		-
Sporocyst cap	Stieda body	-				-

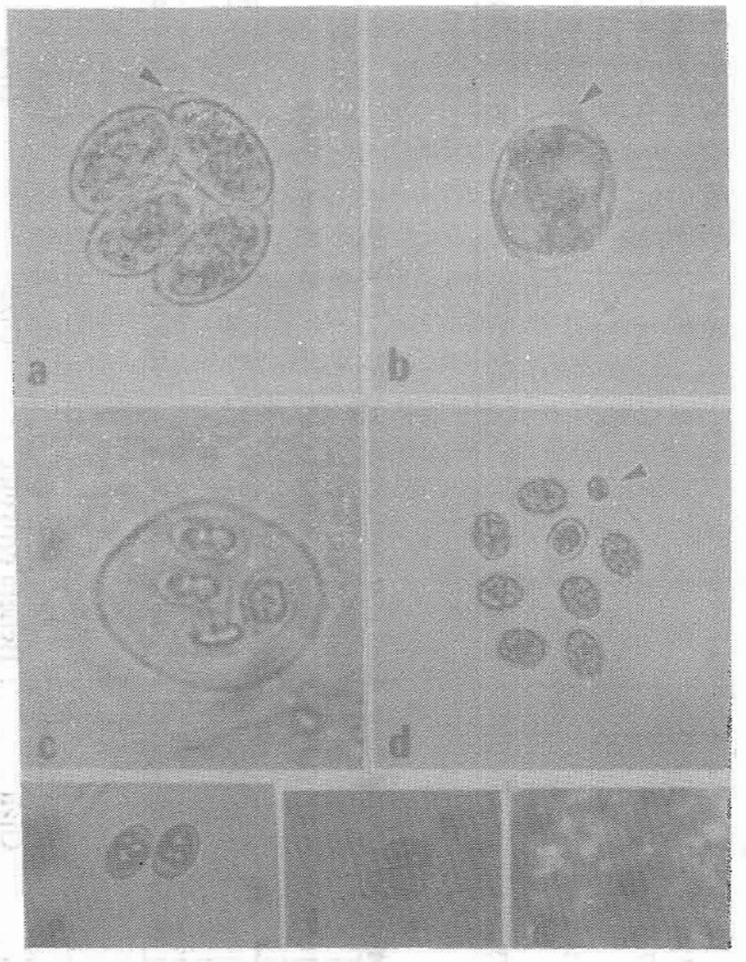

Plate (1): Showing Coccidia spp. (a) *Eimeria sp.*, arrow on micropyle. X 1000. (b) Sporocyst, arrow on stieda-body X 1000 (c) *Goussia sp.* X 1500. (d) *Octosporella sp.* arrow on micropyle. X 1000 (e) *Isospora sp.* 1. X 675 (f) *Isospora sp.* 2. X 1000 (g) *Cryptosporidium nasorum* X 1000.

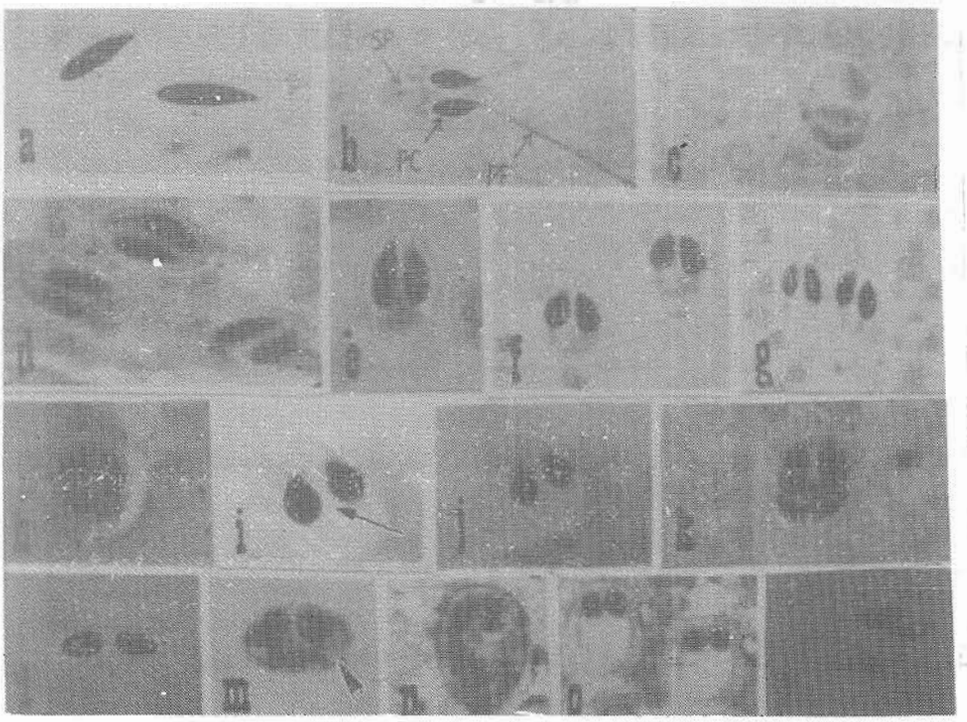

Plate (2): Showing Myxosporea spp. (a) *Th. sp.* (b) *M. sarigi.* with extruded polar filament (infective stage) Pc= polar capsule, Pf = polar filament, Sp= sporoplasm (c) *M. sp.*1 (d & e) *M. beninensis* (f & g left one) *M. sp.*2 (rigth one g & h) *M. imami* (i & j) *M. equatorialis,* arrow on intercapsular process. (k) *M. zilli.* (l & m) *M. brachysporous,* arrow on iodinophillous vacuole (n) *M. homeosporous* (o) *M. tilapae* (p) *M. galilaeus.* (all X 1000 except i X 1500).

الملخص العربي

دراسة عن الأوليات الداخلية التى تصيب أسماك البلطى النيلى

منى حميده محمد خطـاب
قسم الطفيليات معهد بحوث صحة الحيوان. دقى جيزة

بعد فحص عدد ١١٩ سمكة من أسماك البلطي التي تم تجميعـها حية من نهر النيـل عند القرية الفرعونيـة بمحافظـة الجـيزة وجـد أنـها مصابـة بعـدد ١٨ نـوع مـن الأوليـات الطفيلية الداخلية. شمل الفحص كلا من الأمعاء , الكبد, الطحـال و الكلـى. مثلـت الأوليـات سـتة أنـواع فـى خمسـة أجنـاس مـن الكوكسـيديا وكذلـك ١٢ نـوع فـى أثنيـن مـن أجنـاس الميكزوسبورا. وجد منهم سبعة أنواع لم يتم تسجيلها فى مصر من قبل و هم (نـوع مـن الايميريـا, نـوع مـن الأوكتوسـبوريلا و نـوع مـن الثيلوهـانيللس و أربعـة أنـواع مـن الميكسوبولاس). شملت الدراسة وصف وتصنيف كل الأنواع وكذا نسب الإصابة بها فـى فصول السنة الأربعة.