A Review of some Ecto-and Endo Protozoan Parasites Infecting *Sarotherodon Galilaeus* and *Tilapia Zillii* from Damietta Branch of River Nile, Egypt

Enayat Salem Ahmed Reda

Department of Zoology, Faculty of Science, Mansoura University, Mansoura, Egypt
enayatsalem40@yahoo.com

Abstract: The present study was carried out as a general survey searching for the possible protozoan parasites that can infect the Nile fishes *S. galilaeus* and *T. zillii*. A total of 125 live fish specimens were obtained from Damietta branch of River Nile and El-Sahel canal, Nile tributary. Examination of the investigated fish species revealed that, fishes were infected with eleven parasitic protozoan species belonging to eight genera. These species were: *Apiosoma piscicolum*, *A. conica*, *Scopulata epibranchialis*, *Vorticella* sp., *Ambiphrya ameiuri*, *Amphileptus* sp., *Chilodonella hexasticha*, *Tetrahymena corlissi*, *Trypanosoma mansouri*, *T. syanophilum* and *Trypanosoma* sp. Among the obtained parasites, the following were recovered for the first time in Egypt. *Apiosoma conica*, *Vorticella* sp., *Ambiphrya ameiuri*, *Amphileptus* sp., *Tetrahymena corlissi* and *Trypanosoma* sp. While *S. galilaeus* represent a new host for *Chilodonella hexasticha*. The recorded numerous parasites have pathological effects on the host fish with subsequent economic losses were discussed.
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Keywords: Endo; Protozoan; Parasites; *Sarotherodon Galilaeus*; *Tilapia Zillii*; Damietta; Nile; Egypt

1. Introduction:

In general protozoa are one of the major sectors of fish parasites that have been long neglected because of its inherent difficulty in studying compared to other larger parasites. Among protozoa, ecto and endo-parasitic protozoa occupy a very important sector as one of the hazardous threats to fish health. These parasites attack the fish causing massive destruction of skin and gill epithelium. Even moderate infection of these organisms on small fish may prove a fatal disease, since the infection may cause the fish to stop feeding (Meyer, 1968; Hoffman, 1970). Parasitic ciliates, particularly sessilines protozoa genera as *Apiosoma*, *Scopulata*, *Ambiphrya* and *Epistylis*, which infect skin and gills of fish. They are obligate parasites, which utilize gills and skin merely as a substrate for attachment. Thus, their pathogenicity is attributed to the mechanical interference with gas exchange activity (Paperna, 1980; Lom and Dykova 1992).

On the other hand endoparastic, trypanosomes are the most dangerous group that probably cause more diseases to fish than any other group of parasites, anemia and edema (Lom and Dykova 1992). In Egypt, fish parasitc protozoa gain a lot of attention (Ali, 1992; Ali et al., 2003-2007; Abdel-Meguid, 1995; Abdel-Ghaffar et al., 1998, 2008).

The present study aims to report on the occurrence of eleven protozoans found infecting two different host fish species. In addition, it will offer a review of some new species to egyptian protozoic fauna as well as add more detailed description of morphological characteristics of these parasites and its pathological effects.

2. Material and Methods

A total of 125 fresh water fish were collected from the River Nile at two locations, which are Demiatta branch near El-Mansoura and El-Sahel canal near Sherbeen city. The collected fish were transported to the laboratory in tank with good aeration. They were kept alive until required in aerated glass aquaria. The collected fish represent two species namely *Sarotherodon galilaeus* and *Tilapia zilliie*.

Fish skin, fins and gills were firstly examined by the naked eye for detection of any macroscopically visible lesions. Samples of mucus were scraped gently from the skin, fins and gills, then spread on a clean slide and freshly examined under phase-contrast microscope for the presence of ectoparasitic protozoans. Some of the positive slides were air-dried and stained according to Klein's dry silver impregnation method. Other positive slides were also air-dried, fixed with absolute methanol and stained with 10% Giemsa stain.

Blood samples were collected from the arteria caudalis using heparinized syringes. Thin blood films were made, air-dried, fixed with absolute methanol and then stained with 10% Giemsa stain for (20-30) minutes (Ali, 1992)

Detected protozoa were examined freshly, stained and identified according to (Shulman, 1984; Kazubski and Migala ,1974; Viljoen and Van As ,1985; Lom and Dykova ,1992). All measurements were taken in micrometers (µm) mean ± SD (range). Figures were drawn with aid of camera lucida.

3. Results

Among 125 examined fishes, 118 fishes were infected with different protozoan parasites. The detected protozoan parasites were classified into two main phyla; Ciliophora (Ciliates) and Mastigophora (Flagellates) that are summarized in (Table 1).

I- Genus: *Apiosoma*

A. piscicolum (Figs. 1A-C &4)

This peritrich is a solitary parasite, its body is goblet- like shaped, tapering towards its scopula by narrow stalk (Figs. 1B &4). The body is divided externally by a groove without cilia, to an oral body part measures 13.2 ±3.3 (9.9-16.5) µm and a basal body part measures 17.1±7.2 (9.9-24.2) µm. This groove is found at nearly one third of the body length from the peristome (Fig. 4). The peristomial lip is narrow and the peristomial disc (adoral spiral) is flat, winding counterclockwise and plunges into the buccal infudibulum. Infundibulum is slightly curved and extends to the non-ciliated groove. Contractile vacuole is large and the food vacuoles are distributed in the oral part only. The compact triangular macronucleus is observed at the level of or just below the groove and measures 13.8±2.8 (11-16.5) µm in length X 12.7±2.8 (9.9-15.4) µm in width (Fig. 1B). The micronucleus is oval and is situated above or alongside the macronucleus and measures 2.2X11 µm. Scopula is broader than stalk, sucker-like disc with undulant margin and measures 4.4(3.3-5.5) µm. Body free of cilia except for peristomial disc (three rows) and measures 33 ±1.1 (31.9-34.1) µm in length X 20.9±1.1 (19.8-22) µm in width. Transverse striations of pellicle are conspicuous and ranged from 33-42 in number (mean 37). Fig. 1C.

2- *A. conica* (Figs. 1D,E & 5)

This is a solitary, stalkless parasite with peculiar, conical body shape, gradually tapering to the scopula. The body measures 32.5±8.9 (21.8-43.2) µm in length X23.6±6.0 (13.8-38.1) µm in width. The non-ciliated groove found more than one third of the body length from the peristome and divided it to an oral body part measures 11.5±4.0 (7-16) µm and a basal part measures 12.1±2.0 (6.8-2.2) µm. The contractile vacuole is large (Fig. 1D). The peristomial lip is narrow and peristomial disc is flat and slanted. The epistomial disc is linguiform and elevated over cilia of peristomial disc (Fig. 5). Infundibulum is short, curved and extends to the non-ciliated groove (Fig .1E). The compact rounded macronucleus is situated below the groove and measures 14.4±3.2 (11.2-17.6) µm in diameter. The micronucleus is rounded, situated below the macronucleus and measures 3.3 µm in diameter. Scopula broad, sucker-like disc with undulant margin and measures 15.6 µm.

II- genus: *Scopulata*

Scopulata epibranchialis (Figs. 1F, G & 6)

This sessile peritrich is solitary and stalkless. The body is barrel-shaped and measures 38.5±4.4 (34.1-42.9) µm in length X 26.4±3.3 (23.1-29.7) µm in width. The body is divided externally by a non-ciliated groove into nearly equal halves, an oral part measures 17.6±1.1(16.5-18.7) µm length and a basal one measures 19.2±7.2(12.1-26.4) µm length. The peristomial disc is broad and flat. The infundibulum is strongly curved and extends to the groove (Fig .1G). Macronucleus is frequently transverse-ellipsoidal, its transverse axis is longer and measures 14.6±3.6(11-17.6) µm in length X 17.1±2.8 (14.3-18.7) µm in width. It situated just below the groove (Fig .1F). Micronucleus is rounded, situated just below the groove and alongside of the macronucleus and measures 3.9±0.6(3.3-5.5) µm in length X 4.0±0.8(3.3-4.7) µm in width. Scopula is broad and flat (Fig.1G) but usually slightly narrower than the body, sometime bilobed (Fig.1F) and measures 4.4 µm in length (Fig. 6).

III- genus: *Vorticella*

***Vorticella* sp.** (Figs. 1H & 7)

This parasite consists of two main parts, solitary zooid and scopula. The zooid is spherical-shaped and measures 72±6.0(66-78)µm in diameter. The peristomial disc is broad. The epistomial disc is vaulted, slightly elevated above the peristomial lips and slanted (Figs. 1H & 7). The peristomial lip is more or less outwardly and encircles the epistomial disc. The infundibulum is curved and lead to narrow cytopharynx. Large number of different sizes of food vacuoles are observed in fresh specimens. The nuclear apparatus consists of ribbon-shaped macronucleus, often sinuous, situated in the zooid center and measures 33 µm. The micronucleus is very small and far away the macronucleus and measures 1.1-2.2 µm. Scopula secretes contractile stalk provided with myonemes used for shortening and coiling the stalk. Stalk measures 20 µm in length and 6 µm in width. Transverse striations of pellicle are conspicuous and ranged from 70-82 (mean 76) (Fig. 1H). Numerous contractile and food vacuoles are present.

IV- Genus: *Ambiphrya*

A. ameiuri (Figs. 2A,B & 8)

Solitary sessil ciliates with large vase-shaped body. It measures 75.1±14.6(60.5-84.7) µm in length X 45.7±3.9(41.8-50.6) µm in width. The body is divided externally by a permanent equatorial ciliary girdle motionless into an oral part measures 29.7±2.2(27.5-33) µm in length and a basal part measures 17.9±6.9(11-27.8) µm in length (Fig. 8). The peristomial disc represent one turn around the slightly elevated epistomial disc. Infundibulum is triangular in shape (Fig. 2A). Macronucleus is ribbon-like forming an orally situated U-shape sinuous; its limbs descend parallel to each other and ends at the level of the ciliary girdle by hook-like shape. It measures 126.5X4.4 µm. Micronudeus is rounded situated adjacent to one end of macronucleus and measures 4.4X2.2 µm. Food vacuoles are distributed in the oral part. Scopula is in the form of a broad undulate disc but never exceeds the body width (38.6 µm in width). Reproduction in *A. ameiuri* is usually accomplished by binary fission, in which a new organism is pinched off the adult (Fig. 2B).

V- Genus: *Amphileptus*

***Amphileptus* sp.** (Figs. 2C & 9)

This ciliate is compressed, long and lanceolate in outline. It measures 53.9±13.8(39.1-70.4) µm in length X 19.5±5.3 (14.2-24.7) µm in width. Longitudinal kineties (7-9) were observed on the right side while the left side bears longitudinal ciliary rows. Along the anterior edge of the body, there is a cytostomial slit which does not exceed one third of the body length. Nuclear apparatus consists of two oval macronuclei which are closely adjacent to each other being separated by only 1.3-1.9 µm distance (Fig. 2C). The macronuclei measure 8.5(8.1-9.0) µm in length X 6.4(5.3-7.5) µm in width. The micronucleus measures 2.7(2.1-3.4) µm in length X 2.2(2.1-3.2) µm in width, is often found in close contact with one of the macronuclei, in the area separating the macronuclei. Large contractile vacuole is always found in the posterior region of the body (Figs. 2C & 9). There are many food vacuoles with various sizes.

VI- Genus: *Chilodonella*

Chilodonella hexastcha (Figs. 2D,E, &10a,b)

The body is typical oval to foliate-shape dorsoventrally compressed and characterized by the presence of a notch at the anterior body margin. It measures 39±6.4(27.9-50.1) µm in length X 28.4±7.2(22.1-40.5) µm in width. The cytoplasm is coarsely granulated ventrally the ciliature of the body composed of right ventral ciliary band, three circumoral kineties and left ventral ciliary band (Fig. 2E). The right ciliary band is arched, long, number of ciliary kineties range from 6-8(mean7) and is meeting with the left one. The three oral kineties; two short circumoral ones in front of the oral opening and a long preoral one extending along the anterior line of contact of the two ciliary bands (Fig. 10a). The left ciliary band is straight, short and number of its kineties ranges from 7-9 (mean 8). There is a non-ciliated zone (naked zone). The cytostome occurs at the anterior part of the naked zone. It leads into a conspicuous cytopharynx (Fig. 2E). Cytopharynx is prominent and reinforced by 8-10 conspicuous nematodesmata (cuticular bands), forming a funnel-shaped tube with curved inner end (Fig. 10b). The cytopharynx may be slightly extruded to serve for boring into and disrupting the epithelial cells. Two contractile vacuoles are present. The macronucleus is rounded and measures 15.4 (13.1-17-8) µm in length X 13.2(12.2-14.3) µm in width. The micronucleus lies closely adjacent to the macronucleus and measures 4.4(3.2-5.1) µm in length X 3.1(2.3-4.1) µm in width.

VII- Genus: *Tetrahymena*

T. corlissi (Figs. 2F,3A &11)

Body is pyriform and measures 38.1±6.3(25.4-46.4) µm in length X 28.6±4.8(21.1-34.7) µm in width. The body is wholly covered with cilia. The number of meridional kineties ranges from 18-32(mean 25). All these kineties converge anteriorly around an apical loop (Fig. 3A). There are many contractile vacuoles with different sizes (Fig. 2F). Macronucleus measures 22.1(20-24.3) µm in length X 14.6(13.2-15.4) µm in width. Micronucleus is far from the macronucleus and measures 4.8(4.4-6.5) µm in length X 3.4(2.2-3.3) µm in width (Fig. 2F). Cytostome is small, oval and is situated at the anterior end (Fig.11).

VIII- Genus: *Trypanosoma*

1- *T. Mansouri* (Figs. 3B-D &12)

This trypanosome is polymorphic, showing three forms: small, intermediate and large (Figs. 3B-D). All morphometric data are shown in Table (2). The intermediate forms were the most abundant.

The general body of three forms is thin elongated and slender in shape and in many times they are curved in S-shape (Fig.12). The anterior end is more acute than the posterior one. The cytoplasm is finely granular and stained light red with Giemsa stain. The nucleus is situated mostly in the anterior half of the body or at least in front of the middle of the body. It is reniform-shaped and occupies the entire width of the body. Kinetoplast is oval. The flagellum originates from the kinetoplast and extends along the border of

undulating membrane. The undulating membrane bends into deep fold in close contact with the body cell and rise above body margin forming 8 to 15 festoons in plicate-shape. Then the flagellum extends beyond the anterior end of the body as a free flagellum. In the small forms, the undulating membrane is narrow, hyaline and produces not more seven folds (Fig. 3D).

2- *T. cyanophilum* (Figs. 3E & 13)

The body is elongated cylindrical, sinuously curved in horseshoe shape (Fig.3E). The anterior end is more acute than the blunt posterior one and both of them are folded back on themselves. The maximum width is at the nucleus level. This species is characterized by its deeply blue stained cytoplasm. The cytoplasm is also finely granular and has scattered vacuoles with different sizes. The nucleus is situated in the posterior half of the body. It is oval, occupies the entire width of the body and stained pink with Giemsa stain. The kinetoplast is oval and close to the posterior end of the body. Highly conspicuous, sinuous undulating membrane forms strong 8 to 9 folds with about 33-35 festoons (Fig.13). The free flagellum is short. All morphmetric data are shown in Table (3).

3- *Trypanosome* sp. (Figs. 3F & 14)

Body of this species is stout with pointed anterior end and a short snout represent the posterior end. The cytoplasm is finely granular and stained light pink with Giemsa-stain. The nucleus is situated in the anterior half of the body or at least in front of the middle of the body (Fig. 3F). It is rounded and occupies the entire width of the body. The kinetoplast is oval shape lying at some distance from the posterior end. A distinct vacuole is often found in front of the kinetoplast. The undulating membrane is broader, less folded and end with hook-like shape at the level of the nucleus, then it becomes narrow and weakly folded (Fig. 14). The free flagellum is relatively long. Morphometric data are show in Table (3).

Table 1. Protozoan parasites reported in the present study.

Parasites spp.	Host fish species	Site of infection	References
Ph: Ciliophora			
1- Apiosoma piscicolum	Tilapia zillii	gills	Shulman (1984) ; present study
2- A. conica	T. zillii	gills	Shulman (1984) ; present study
3- Scopulata epibranchiails	Sarotherodon galilaeus	skin & gills	(Viljoen and Van As, 1983); present study
4- Vorticella sp.	S. galilaeus	skin	Present study
5- Ambiphrya ameiuri	S. galil	gills	(Lom and Dykova ,1992) ; the present study
6- Amphileptus sp.	S. galilaeus	gills & skin	Shulman (1984); (Lom and Dykova ,1992) ; present study
7- Chilodonella hexasticha	T. zillii S. galilaeus	gills skin	Shulman (1984); (Lom and Dykova ,1992); Ahmed et al., (2000) ; present study
8- Tetrahymena corlissi	S. galilaeus	skin	Shulman (1984); (Lom and Dykova ,1992) ; present study
Phylum: Mastigophora			
9- Trypanosoma mansouri	T. zillii	blood	Mohammed (1978) ; present study
10- T. syanophilum	T. zillii	blood	Mohammed (1978); Ahmed et al., (2000) ; present study
11- Trypanosoma sp.	T. zillii	blood	Present study

Table 2. Measurements (in µm) of various parts for the three forms of *Trypanosoma mansouri* from blood smears of *Tilapia zillii*.

Parameters	Small form	Intermediate form	Large form
Total length of the parasite including free flagellum	40.7(37.4-44)	48.4(46.2-50.6)	61.1(57.2-64.9)
Length of cell body	38(31.9-44)	35.8(33-38.5)	52.3(49.5-55)
Breadth of cell body	3.3(2.2-4.4)	3.3(2.2-4.4)	4.4(3.3-5.5)
Length of free flagellum	5.5(4.4-6.6)	12.7(12.1-13.2)	7.7(6.6-8.8)
Length of nucleus	4.4(3.3-5.5)	3.9(3.3-4.4)	5.0(4.4-5.5)
Breadth of nucleus	2.8(2.2-3.3)	2.8(2.2-3.3)	4.4(3.3-5.5)
Distance from anterior margin of nucleus to anterior end of body.	14.3(12.1-16.5)	12.1(9.9-14.3)	20.9(19.8-22)
Distance from posterior margin of nucleus to kinetoplast	22(18.7-25.3)	20.9(19.8-22)	25.3(24.2-26.4)
Distance from kinetoplast to posterior tip	2.8(1.1-4.4)	2.2(1.1-3.3)	1.1(0.8-1.3)
Length of kinetoplast	1.1(0.5-1.5)	1.7(1.1-2.2)	1.1(0.6-1.5)
Breadth of kinetoplast	0.9(0.8-0.9)	1.0(0.9-1.1)	0.9(0.9-1.1)
Width of undulating membrane	1.1(0.7-1.4)	2.2(1.0-3.4)	1.7(1.1-2.2)

Table 3. Measurements (in µm) of various parts for *Trypanosoma cyanophilum* and *Trypanosoma* sp. from blood smears of *Tilapia zillii*.

Parameters	*T. cyanophilum*	*Trypanosoma* sp.
Total length of the parasite including free flagellum	42.5(40.1-44.9)	43.3(41.1-45.2)
Length of cell body	38.2(36.7-39.7)	36.1(34.6-37.5)
Breadth of cell body	2.8(2.1-3.4)	4.2(3.2-5.2)
Length of free flagellum	6.3(5.4-7.2)	7.5(6.6-7.8)
Length of nucleus	4.2(3.5-4.9)	2.2(1.9-2.4)
Breadth of nucleus	2.4(2.2-2.6)	2.1(1.8-2.3)
Distance from anterior margin of nucleus to anterior end of body.	21.2(19.8-22.4)	15.2(14.1-16.2)
Distance from posterior margin of nucleus to kinetoplast	11.8(9.8-13.7)	19.1(18.2-20.1)
Distance from kinetoplast to posterior tip	1.4(0.9-1.9)	2.9(2.3-3.5)
Length of kinetoplast	1.3(1.2-1.4)	1.2(1.0-1.4)
Breadth of kinetoplast	0.7(0.3-1.0)	1.0(0.8-1.2)
Width of undulating membrane	1.2(0.9-1.4)	1.4(1.1-1.7)

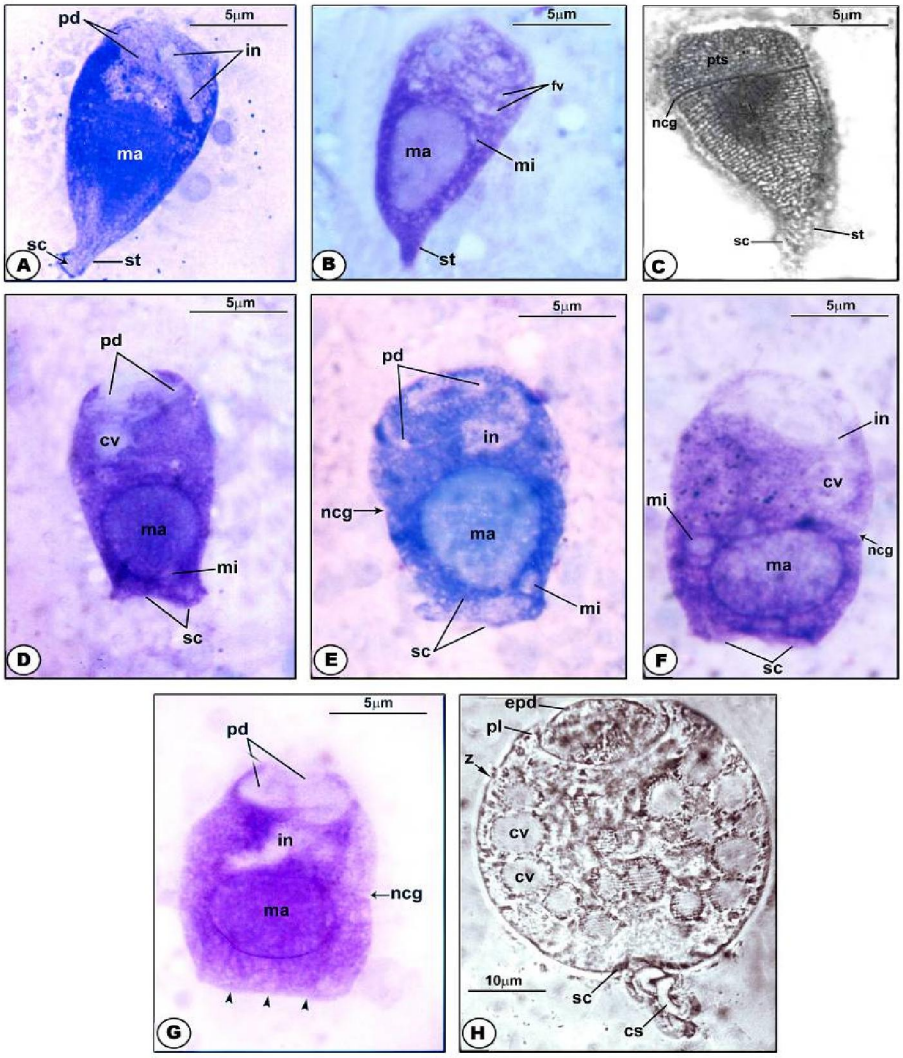


Figure 1

Fig. 1. Morphology of Giemsa-stained *Apiosoma piscicolum* (A and B), silver-impreganated (C), Giemsa-stained of *A. conica* (D and E), *Scopulata epibranchialis* (F and G). Note broad and flat scopula arrow heads. Phase-contrast microscope of fresh *Vorticella* sp (H). cs, contractile stalk; cv, contractile vacuole; epd epistomial disc; fv, food vacuoles; in, infundubulum; ma, macronucleus, mi, micronucleus; ncg, non-ciliated groove; prestomial disc; pl, presomial lip; pts, pellicle transverse striations; sc, scopula; st, stalk; z, zooid.

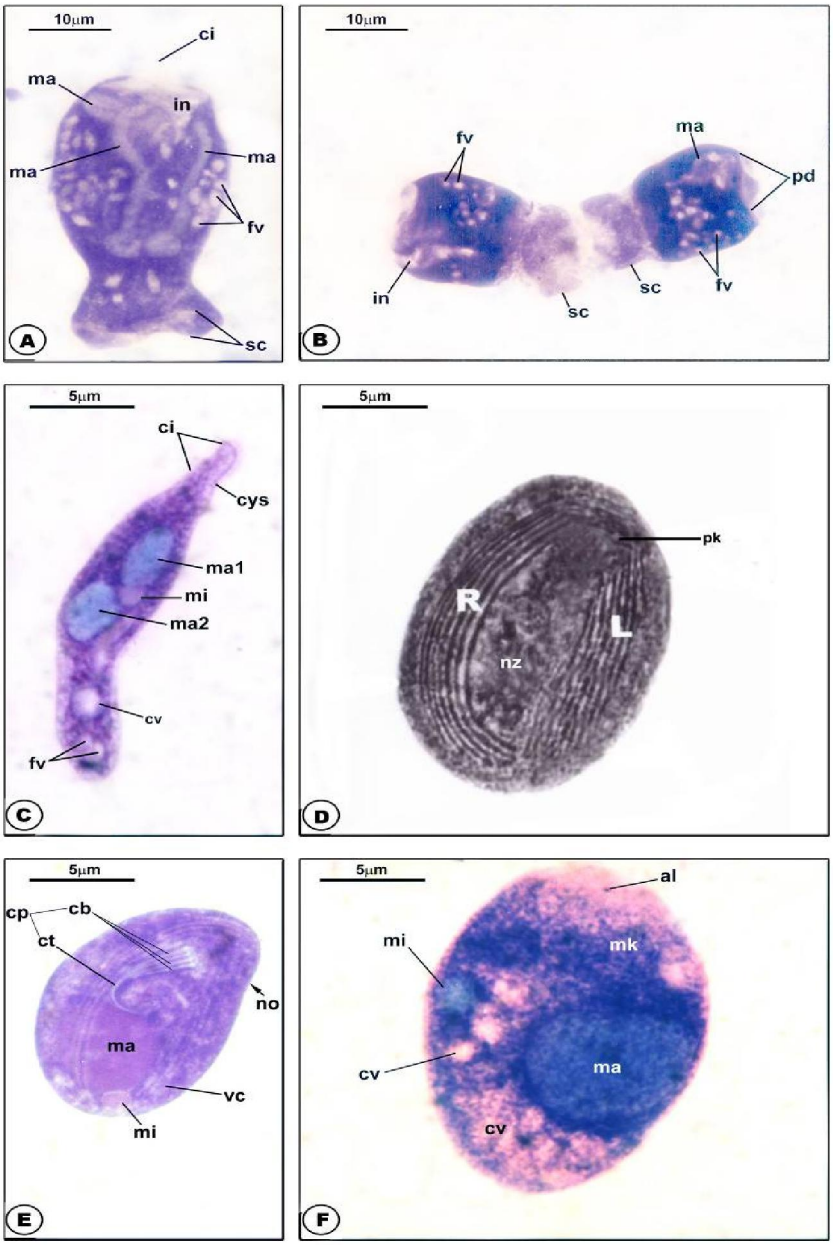


Figure 2

Fig. 2. Morphology of Giemsa-stained *Ambiphrya ameiuri* and two small individuals (A and B), *Amphileptus* sp. (C), silver-impreganated of *Chilodonella hexastcha* (D); Giemsa-stained of *C. hexastcha* and *Tetrahymena corlissi* (E and F) al, apical loop; cb, cuticlar bands; ci, cilia; cp, cytopharynx, ct, curved tube; cys, cytostomal slit; L, left ciliary band; ma1 and ma2, macronucleus 1 and 2; mk, meridional kineties; no, notch; nz, naked zone; pk, preoral kinety; R, right ciliary band.

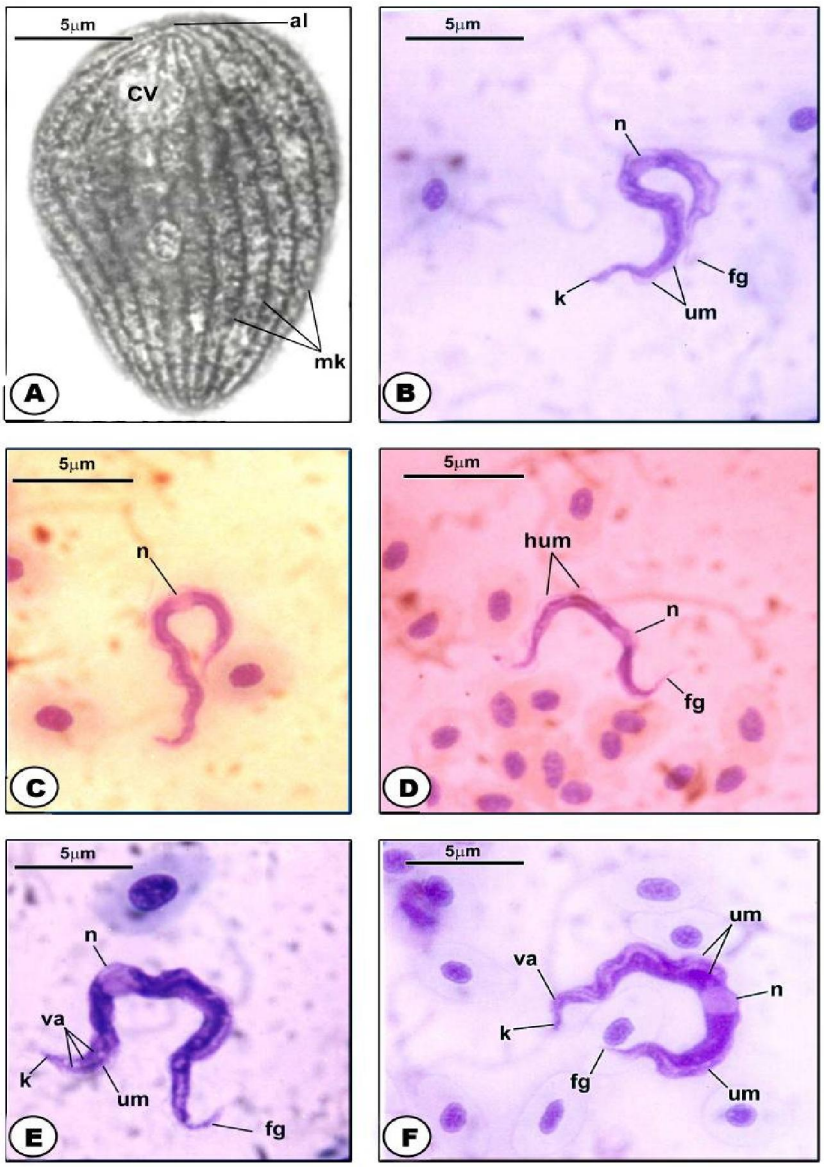
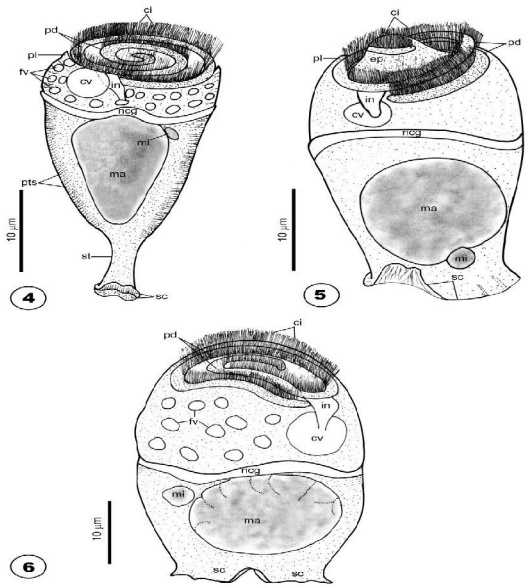
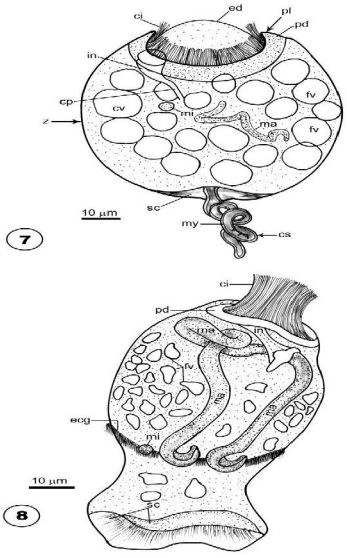


Figure 3

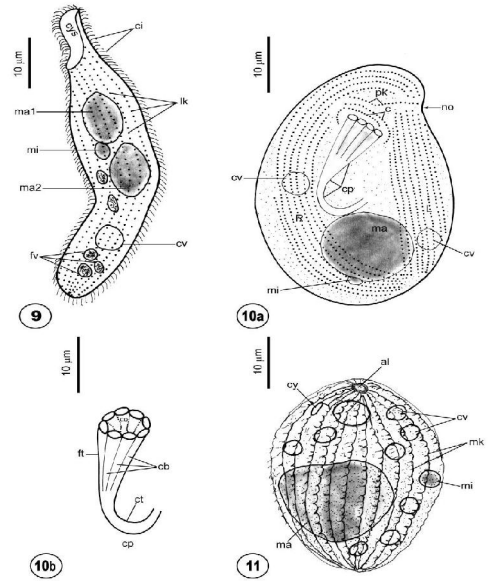
Fig. 3. Morphology of silver-impreganated *Tetrahymena* corlissi (A); Giemsa-stained *Trypanosoma mansouri* forms (B - D), *T. cyanophilum* (E); *Trypanosoma* sp. (F). fg, flagellum; hum, hyaline undulating membrane; k, kinety; n, nucleus; um, undulating membrane; v, vacuole.



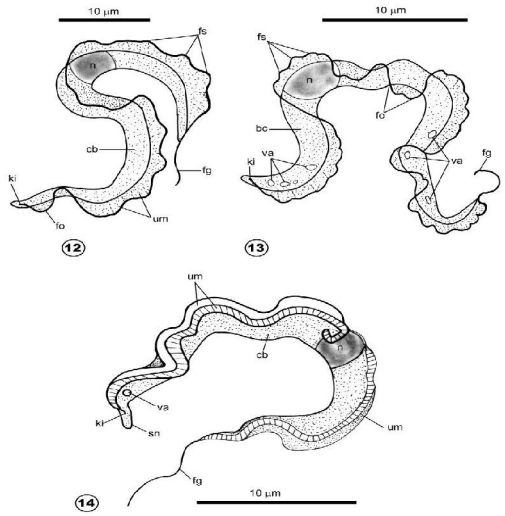
Figs. 4, 5 &6. Line diagram of *Apiosoma piscicolun* (4); *A. conica* (5); Scopulata epibranchialis (6). Abbreviations as in Fig. (1).



Figs. 7 & 8. Line diagram of *Vorticella* sp. (7); *Ambiphrya ameiuri* (8). ecg, equatorial ciliary girdle; my, myonemes. Other abbreviations as in Figs. 1 and 2.



Figs. 9, 10a, b & 11 Line diagram of *Amphileptus* sp. (9); *Chilodonella hexasticha* (10a); apical view of cytopharynx (10b); *Tetrahymena corlissi* (11). c, circum oral kineties; co, cytostomal opening; cy: cytostome; lk: longitudinal kineties. Other abbreviations as in Fig. (2).



Figs. 12, 13 & 14. Line diagram of *Trypanosoma mansouri* (12); *T. cyanophilum* (13); *Trypanosoma* sp. (14); bc, body cell; fo, fold; fs, festoones; ki, kinetiy; sn, snout. Others abbreviations as in Fig. (3).

4. Discussion:

Surveying of some ectoparasitic protozoa and blood parasites from *Sarotherodon galilaeus* and *Tilapia zillii* revealed the parasitism of these host fishes by 11 species representing 8 genera as follows:

Apiosoma piscicolum

This species was characterized by its goblet-like shaped body, narrow stalk, conspicuous transverse striations of pellicle and triangular compact macro-nucleus. The present parasite showed quite similarity to previously reported apiosomes by (Viljoen and Van As ,1985; Lom and Dykova ,1992).

A. conica

The investigated parasite was characterized by its conical body shape, stalkless and rounded compact macronucleus. This species closely resembles in the general shape and the size of body to *A. conica* reported by Shulman (1984), but the latter differs in site of infection (skin), host (9-spined sticklebacks) and locality (Neva Gulf). So the present parasite represent the first record in Egypt.

Scopulata epibranchialis

(Viljoen and Van As ,1985) created the genus *Scopulata*. Members of this genus are solitary, sessile, stalkless and the body is cylindrical with broad scopula. There are three species in the genus *Scopulata*; *S. constrica*, *S. epibranchialis* and *S. dermata*. However, some distinct features could be revealed between the present *Scopulata* and other three forms. *S. constrica* has a markedly constricted body at the groove. In *S. dermata* has triangular macronucleus. Accordingly, the parasite recorded herein is clearly not *S. constrica* or *S. dermata*. On the other hand the present recorded *Scopulata* conform well to the type specimens of *S. epibranchialis* in the shape of the body, shape and position of macronucleus and micronucleus. Thus the present specimens are comfortably identified as *S. epibranchialis*.

***Vorticella* sp.**

According to (Lom and Dykova ,1992), the members belonging to this genus are free-living organisms and have contractile stalk, single zooid, ribbon macronucleus. The present recorded species conform well to genus characters. As far as our knowledge is concerned, this is the first record of *Vorticella* sp. from skin of *S. galilaeus*. The problem faced the identification of this organism is that it is free-living ciliates and colonize the fishes skin as facultative parasites. Therefore, (Migala and Kazubski ,1972), suggested that a great number of free-living ciliates teem on the skin of debilited, moribund fish which lacking any defence reaction under adverse environmental conditions. The ciliates prey on the body surface of the fishes and feed on the tissues. The stalk coiling is produced by the contraction of myonems that resides in a helical form.

Ambiphrya ameiuri

Members of the genus *Ambiphrya* are characterized by a cylindrical and permanent equatorial ciliary fringe and macronucleus is in the shape of a long, thin and sinuous ribbon. Within this genus there exists two closely related species, *A. ameiuri* and *A. neobolae*. However, according to (Vijoen and Van As ,1985), *A. neobolae* have a deep constriction above scopula and the macronucleus ribbon shaped extends throughout the body. On the other hand, *A. ameiuri*, according to (Lom and Dykova 1992), has a ribbon-like macronucleus forming an orally situated horseshoe, the tips of which descend into the basal part with no deep constriction. Accordingly, *Ambiphrya* recorded in the present study identified as *A. ameiuri*. *A. ameiuri* described by (Thompson et al., 1947) for the first time from the gills of *Ameiurus melas melas* in North America then introduced in Russia and then in Europe and lastly the present study in Africa. This is the first recorded parasite from *S. galilaeus* gills.

Pathogenicity

All the previously mentioned sessilines utilize gills and skin merely as a substrate for attachment with their scopula. The scopula adheres directly to the substrate often being cemented to it with a thin layer of sticky substance. Heavy infection of these parasites can cause ulcers and may cause the fish to be more vulnerable to bacterial infections and lead to “red sore disease” Durborow (2003).

***Amphileptus* sp.**

According to (Shulman, 1962; Lom and Dykova, 1992), members of this genus have lancet-like bodies bearing longitudinal arched ciliary rows on one side only and two oval macronuclei and single micronucleus. The present amphileptid showed some resemblance to *A. branchiarum* in the shape of the body and nuclear apparatus. However, *A. branchiaum* has large dimensions (56-120X35-70) µm and a larger number of kineties (20-25). The present Amphileptus sp. showed close resemblance to *A. piger* described by (Sonntag and Foissner, 2004) where the latter has body dimensions (55X13) µm and a single contractile vacuole. Due to the scarce literature about *Amphileptus* and the above mentioned differences, it was found to allocate the present parasite under the generic name only.

Chilodonella hexasticha

Shulman (1966) reported that all the members of genus *Chilodonella* are mostly free-living and two serious pathogenic species infecting freshwater fish. Until the 1970 the two parasitic *Chilodonella* species were usually confused, and it was mostly only *C. piscicola* that was recorded. (Kazubski and Migala, 1974) had redescribed the *Chilodonella* species and confirmed the occurrence of the two parasitic species on fish, based on a morphological analysis of the two ciliates. According to (Lom and Dyková, 1992), *C. hexasticha* rarly speices differs from *C. piscicola* the most dominant species in that it lacks a notch at the posterior body margin, has less numerous and more loosely arranged spaced kineties and smaller body size. The present species satisfy the characters mentioned above, and it is identified as *C. hexasticha*. *S. galilaeus* is recorded as a new host for *C. hexasticha.* The present result agrees with that of (Paperna, 1980; Lom and Dykova, 1992; Ahmed et al., 2000).

Pathogenicity

Since these ciliates are morphologically well adapted to adhesion to body surface and gills of fishes and have a rigid projected cytostomal opening, they will be obligate parasites of fishes and directly injure the fishes by boring and disrupting the epithelial cells. (Paperna and Van As, 1983) reported that the parasitium with *C. hexasticha* produced severe gill damage in the form of epithelial hyperplasia, which shrouded the fine respiratory epithelium and led to the death of the fish. Langdon et al. (1985) reported that heavy *C. hexasticha* infestation causes mass mortality among farmed and wild fish, the cases of death involving gill damage and fusion of adjacent filaments.

Tetrahymena corlissi

According to Jerome et al. (1996), the ciliates of genus Tetrahymena comprise at least 33 species. Most of these ciliates are free living, few are infecting various invertebrates. However, in literature we find tetrahymenids infesting fishes is very scarce. Based on the form of the body and the number of kineties, (Lom and Dykova, 1992) identified three species of genus *Tetrahumena* infected freshwater fishes; *T. pyriformis* has 17-21 kineties, while *T. corrlissi* has 25-31 kineties and *T. rostrata*, has 32-35 kineties. The present tetrahymenid is identified as *T. corrlissi*

Trypanosoma mansouri

Polymorphic trypanosome with three forms (small, intermediate and large) and there is no doubt that these forms belong to one species. The three forms resemble each other in general characters, such as position of the nucleus, structure and staining reaction of the cytoplasm and presence of free flagellum. (Tandon and Joshi, 1973) mentioned polymorphism in *T. maguri* from the blood of *Clarias batrachus* from India. Qadri (1962) reported dimorphism of *T. batrachi* from the blood of the same host *C. batrachus*. In Egypt, Mohamed (1978) described *T. mansouri* from the blood of *Chrysichthys auratus* and *Ch. reuppelli* as a polymorphic trypanosome. Comparing the general features of the present trypanosome with those of other previously described from freshwater fishes, it appears that these features resemble those of *T. mansouri* which was originally described by Mohamed (1978) from *Chrysichthys auratus* and *Ch. reuppelli*. The present trypanosome has greater body measurements where, the body length ranges from 57.2-64.9 µm while in *T. mansouri* Mohamed (1978), it ranges from 34.7-50.8 µm.

T. cyanophilum

Monomorphic trypanosome is characterized by its deeply blue stained cytoplasm, nucleus lies posteriorly and well festooned undulating membrane. This species originally described by Mohamed (1978) as dimorphic trypanosome from *Chrysichthys auratus* and *Ch. reuppelli*. Abu El- Wafa (1988) identified this species as *T. tilapiae* from different species of fishes. Later Negm El-Din (1991) synonymized this species with *T. cyanophilum*. The present investigated trypanosoma was in accordance with trypanosome described by Ahmed et al. (2000).

***Trypanosoma* sp.**

Monotrophic parasite, characterized by stout body, nucleus is situated interiorly and presence of a distinct vacuole in front of the kinetoplast. Comparing the morphological description and morphometric data of this species with *T. mansouri* and T. *syanophilum* described in the present study from the blood of the same host *T. zillii* showed significant differences. Therefore the present parasite is tentatively identified as *Trypanosoma* sp.

Pathogenicity

The pathogenic potential of fishes trypanosomes depends on the intensity of infection. The heavy infection induces series of changes as anemia that induced by hemolysins secreted by live trypanosomes which lyse the RBCs and lead to mortality (Lom and Dykova ,1992).

Corresponding author
Enayat Salem Ahmed Reda

Department of Zoology, Faculty of Science, Mansoura University, Mansoura, Egypt
enayatsalem40@yahoo.com

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