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Diseases caused by helminthes in cultured *Oreochromis niloticus* and *Clarias gariepinus*, in ismailia province

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Abstract
A total of 300 freshwater fishes of two species (160 *O. niloticus* and 140 *CL. gariepinus*) of different sizes and life stages were randomly collected in different seasons alive or freshly dead from September 2018 to August 2019 from fish farms in Ismailia governorate, Egypt. Naturally infested fishes revealed few phatho gnomonic clinical signs as leathergy, erosion in fins, ulcers on skin in *O. niloticus* and *Cl. gariepinus* in severe cases. Postmortem examination showed presence of yellow cysts embeded in musculature and kidney of *Cl. gariepinus* and enlargement of liver with yellowish discoloration in *O. niloticus.* The total infestation rate was (74.33%); in *O. niloticus* (73.13%) and in *Cl. gariepinus* (75.71%). The isolated helminthes from *O. niloticus* were *Eumesenia aegypticus (Digenetic trematodes)* which isolated from intestine and *Acanthocentis tilapiae* was also found in its intestinal contents. *Cl. gariepinus* was infested with *Orientocredium batrachoides* (Digenetic trematodes), *Monobothrioides* species, *Polyonchobthorium clarias* (Cestodes) and *Procamallanus laeviconchus*, *Paracamallanus cyathopharynx* (Nematodes) which were isolated from intestine. While encysted metacercariae (EMC) were isolated from different organs of infested *O. niloticus* and *Cl. gariepinus* as gills, air sac, kidney, heart and musculature. Molecular diagnosis (PCR) was used to confirm infestation with helminthes parasites.

Keywords: freshwater fish, helminthes, *Oreochromis niloticus, Clarias gariepinus*, PCR

Introduction
Throughout history, fish have been utilized as human food sources by catching wild fish or by practicing aquaculture and fish farming, which has been occurred in china since about 3,500 BCE (Spalding, 2015) [33]. Tilapia culture has been practiced in Egypt since the beginning of recorded history. Nile tilapia is, essentially, the only tilapia species cultured in Egypt. Tilapia production in Egypt also represented 81 percent of total tilapia production in Africa in 2015. Egypt is currently ranked as the third-largest tilapia producer globally, behind only China and Indonesia. El-Sayed (2017) [13]. *Clarias gariepinus* inhabits in fresh waters and it is very important to fish farming in Africa because it is widely spread geographically, resistant to handling and stress, high grower and it is well appreciated in wide range of African countries (Ikechukwu *et al*., 2017) [20]. Helminthes are one of the most important parasites and include nematodes, trematodes, cestodes and acanthocephalans that infect both wild and cultured fishes (Hussen *et al.*, 2012) [19]. Intensive fish farming encourages the spread of parasites and can lead to serious outbreaks (Iwanowicz, 2011) [21]. Therefore, the present study was planned out to determine the influence of diseases caused by helminthes in *O. niloticus* and *Cl. gariepinus* in Ismailia Province.

Material and Methods
Samples Collection
A total number of 300 specimens of two freshwater fish species (160 *Oreochromis niloticus* and 140 *Clarias gariepinus*) were collected seasonally from fishermen and cultured fishponds in Ismailia governorate –Egypt, between September (2018) to the end of August (2019) were examined for common helminthes. During each sampling weight (gm), body length (cm) and sex of fish were recorded.

Clinical Pictures
Specimens of Live fishes and dead ones were clinically inspected by magnifying lens for any external or internal lesions according to Conroy and Herman (1981) [5].

Parasitological Examination
First, it was carried out to the fish specimens macroscopically and microscopically.

Permanent Slide Preparation
Trematodes and Cestodes Parasites
The collected flukes were washed in physiological saline then fixed in 5% neutral formalin solution. Then the fixed worms rewashed in physiological saline several times, then staining in alum carmine stain till reach good staining degree in which differentiation can be occur in acid alcohol using dissecting microscope. Then dehydrated in ascending alcohol grades 70, 80, 90 and 100% and cleared by clove oil then xylol and finally mounted on glass slide in Canada balsam and covered with cover slide. Then slides dried in an oven at 40°C then examined for microscopical identification *(Lucky, 1977)* [24].

Nematode Parasites
Nematodes were placed in warm ethyl alcohol for relaxation then in hot glycerol alcohol (ethyl alcohol 70 -90 parts and glycerol 10 parts) for preservation. We made clearance to the collected worms by lactophenol. Then the nematodes mounted in gelatin glycerin on glass slides and covered by cover slide. According to Yamaguti (1961) [39] the identification of collected helminthes was displayed.

Acanthocephalan Parasites

Acanthocephela was collected carefully to keep the hooks of the proboscis be intact and placed in refrigerator for relaxation till the proboscis was fully protruded. Then the worms fixed in AFA (Alcohol formalin acetic acid) then stained by semichon's acetocarmine, cleared and mounted as trematodes.

Detection of Trematodes using PCR

Extraction of DNA according to QI Aamp DNA mini kit instructions, Preparation of PCR Master Mix according to Emerald Amp GT PCR mastermix, Cycling conditions of the different primers. Temperature and time conditions of the primer differentiated according to the target gene ITS2 during c PCR, DNA molecular weight marker by mixing the ladder gently by pipetting up and down. 6 µl of the required ladder were directly loaded. Finally, extraction performed for Agrose gel electrophoreses according to *Sambrook et al. (1989)* [31].

Results

Clinical Pictures

Most of the examined fish showed few pathognomonic lesions as paleness of the skin (plate 1, A), hemorrhages all over body surface (plate 1, B) and marbling appearance of gills (Telangiectasis) (plate 1, C) in *O. niloticus*. While infected *Cl. gariepinus* showed hemorrhagic ulcers (plate 1, D), detached tail fins (plate 1,E) and haemorrhage on the ventral sides of the fish (plate 1,F). Air sac of infected *O. niloticus* showed red patches on its surface. (Plate 1, G), liver of the infected fish show increasing in its size with paleness in both *O. niloticus* and *Cl. gariepinus*. Kidney appeared normally in *O. niloticus* while in *Cl. gariepinus* showed yellowish cysts that embeded on its surface (plate 1, H). Spleen in *O.niloticus* revealed blackish discoloration (Plate 1, I). Musculature showed yellowish cysts embedded in different parts of *Cl. gariepinus.* (Plate 1, J).

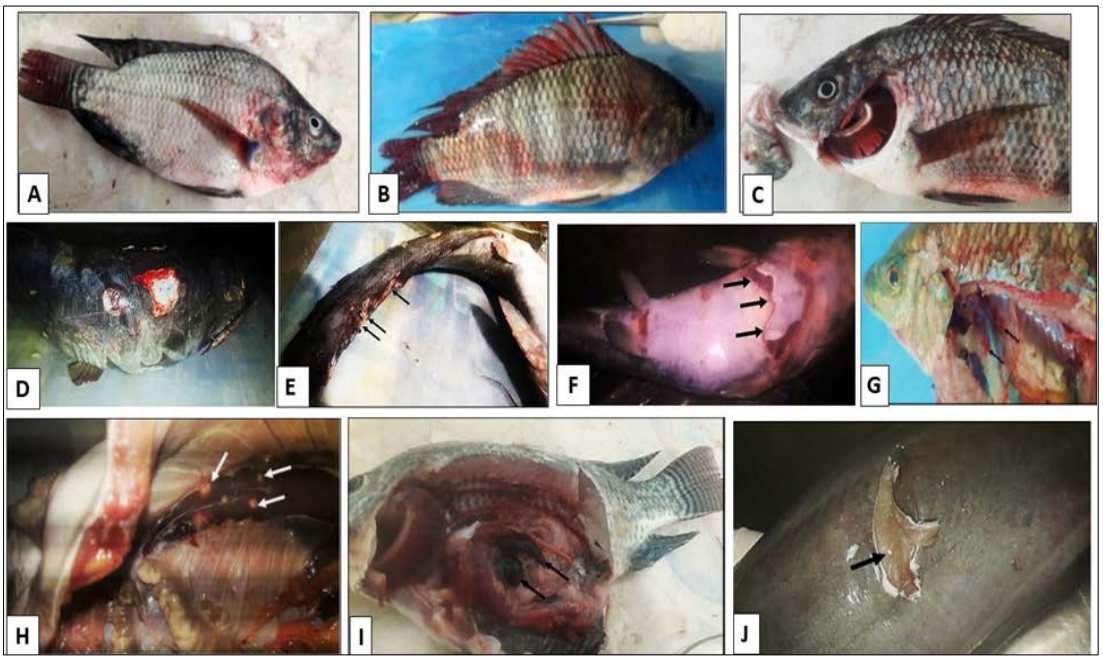


Plate 1: A- Paleness of the skin. B-hemorrhage all over body surface. C-Marbling appearance of the gills of *O. niloticus*. D-Hemorrhagic ulcers, E-Detached tail fin, F-Hemorrhage on the ventral surface of infected *Cl. gariepinus.* G-Red patches on air sac of infected *O. niloticus* (arrows). H-Yellowish cyst embeded on the surface of the kidney of *Cl. gariepinus* (arrows).I- Blackish discoloration in the spleen and gall bladder of infected *O. niloticus*(arrows).J- White cyst embeded in musculature of *Cl. gariepinus*(arrow).

Parasitological Examination

Digenetic Trematodes

1. ***Eumesenia aegypticus*:** It was isolated from the intestine of *O. niloticus*. (Plate 2, a).

2. **Orientocredium Batrachoides:** It was obtained from the intestine of Cl. *gariepinus* (Plate 2, b).

3. **Unidentified encysted metacercariae of digenetic trematodes (EMC)**: EMC recovered from different internal organs as, air sac, gills, kidney, heart and musculature of *O. niloticus*. (Plate 3).EMC also were obtained from gills, liver, spleen, kidney, heart and musculature of *Cl. gariepinus* (plate 4).

Cestodes

1. ***Monobothrioides* species:** It was isolated from the intestine of *Cl. gariepinus.* (Plate 2, c, d)

2. ***Polyonchobthorium Clarias*:** The study showed a white long cylindrical tape like worm found in the upper part of the intestine which was seen by necked eye. (Plate 2, e, f, g, h).

Nematodes

1. ***Procamallanus laeviconchus*:** It was isolated from intestinal content of *Cl. gariepinus.* (Plate 2, I, j, k)

2. ***Paracamallanus cyathopharynx*:** It was obtained from intestinal content of *Cl. gariepinus.* (Plate 2, l, m, n)

Acanthocephalan Species

1. ***Acanthocentis tilapiae*:** It was isolated from intestine of *O. niloticus.* (Plate 2, o, p, q)

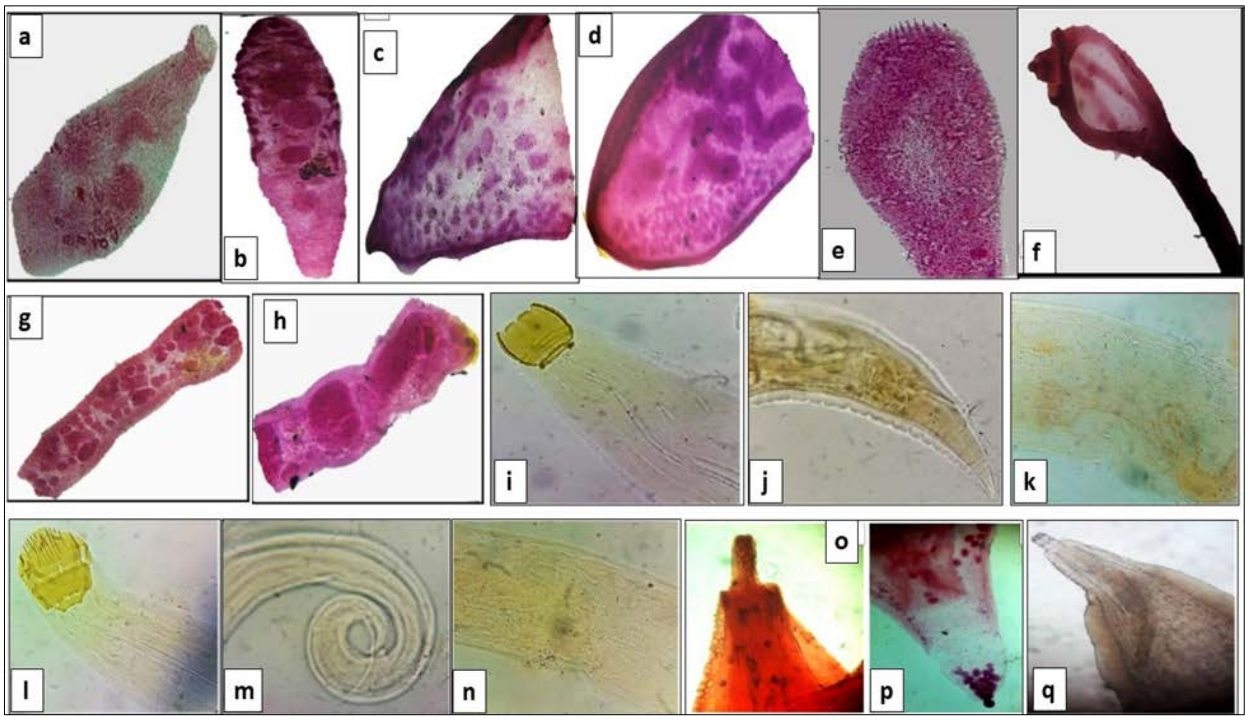


Plate 2: a- *Eumesenia egypticus.* b- *Orientocredium batrachoides.* C-Monobothrioides anteriorend. D-Monobothrioidesposterior end. E-Polyonchobthorium *Clarias* invaginated scolex. F-Polyonchobthorium *Clarias* evaginated scolex. g- *Polyonchobthorium clarias* (mature segment).h- *Polyonchobthorium clarias* (gravid segment). I-Procamallanus *laeviconchus* (anterior end). J-Procamallanus *Laeviconchus* (female posterior end). k- *Procamallanus laeviconchus (*female vulvar end). L-Paracamallanus *cyathopharynx* (anterior end). M-*Paracamallanus cyathopharynx* (male posterior end). n- *Paracamallanus cyathopharynx* (vulvar region). O- *Acanthocentis tilapiae* anterior end. p. *Acanthocentis tilapiae* posterior end female. Q- Unstained *acanthocentis tilapiae*, anterior end.

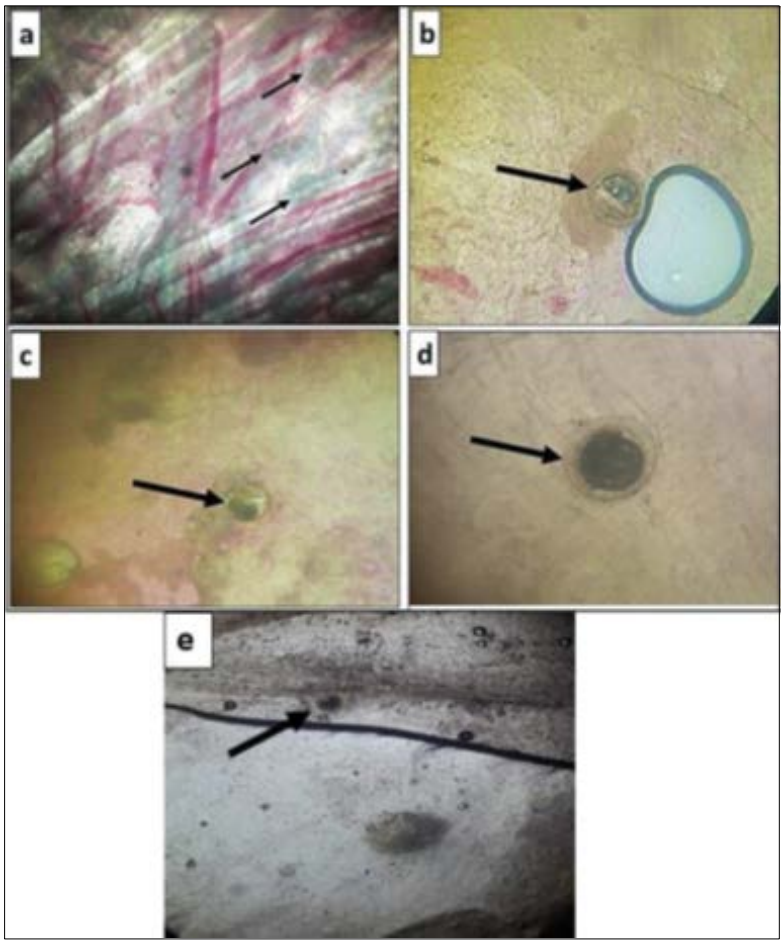


Plate 3: Showing wet mount preparation of organs of Cl. gariepinus (a) musculature tissue (b) kidney tissue, (c) heart tissue (d) musculature (e) air sac

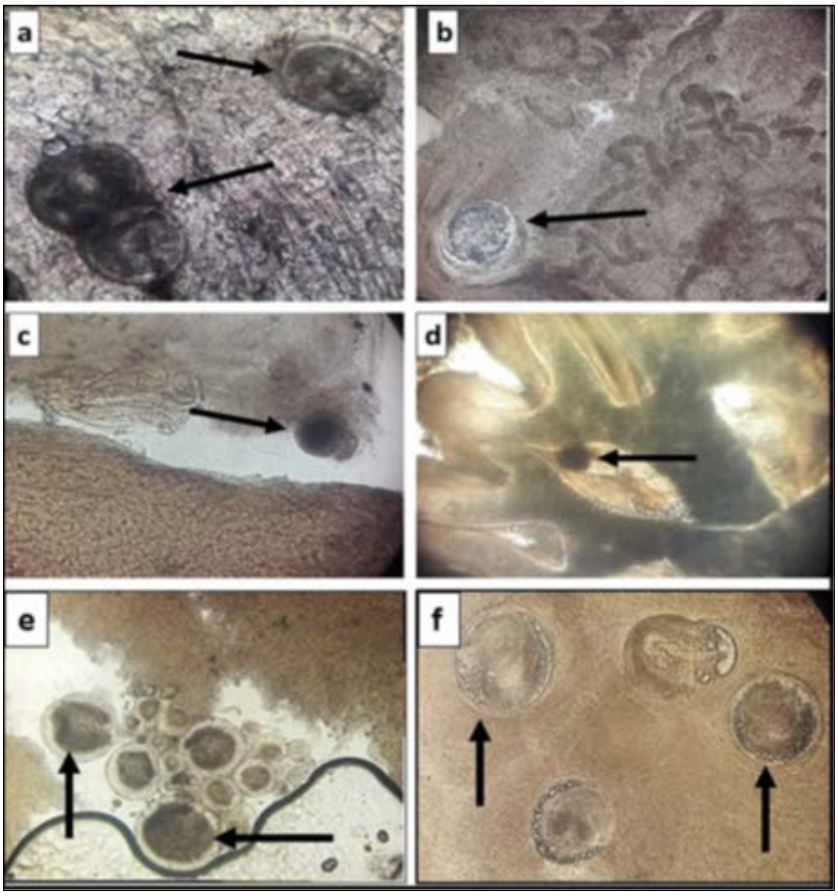


Plate 4: Showing wet mount preparation of different organs of *O. niloticus* (a) gill tissue, (b) kidney tissue, (c) heart, (d) gill tissues, (e) spleen, (f) liver

Prevalence of Helminthes Infestation among Examined Fishes

Total prevalence of helminthes infestation among examined *O.niloticus* and *Cl.gariepinus*: appeared in table (1)

Table 1: Prevalence of helminthes infestation of examined fishes

Fish Species	No. of Examined Fish	No. of infected fish	Prevalence %
O. niloticus	160	117	73.13
Cl. gariepinus	140	106	75.71
Total	300	223	74.33

Total prevalence and seasonal prevalence of different helminthes diseases recovered from examined *O. niloticus* and *Cl.gariepinus:* appeared in table (2)

Table 2: Total prevalence and seasonal prevalence of different helminthes diseases recovered from examined *O.niloticus* and *Cl. garipinus.*

Fish species	No/season	Total Prevalence %	Seasonal Prevalence							
			Autumn		Winter		Spring		Summer	
			No	%	No	%	No	%	No	%
O. niloticus	40	73.13	35	87.5	30	75	27	67.5	25	62.5
Cl. gariepinus	35	75.71	30	85.7	29	82.86	26	74.29	21	60

Total prevalence of different helminthes recovered from examined fishes: As shown in table (3)

Table 3: Total prevalence of different helminthes recovered from examined *O. niloticus* and *Cl. garipinus.*

Fish species	Total No of examined fish	Total No of infested fish	% of infestation	Recovered Helminth Parasites				
				Digenetic Trematodes		Cestode	Nematode	*Acanthocephala*
				EMC	Flukes			
				No & %	No & %	No& %	No & %	No &%
O. niloticus	160	117	73.13	96	50	0	0	78
				82.05	42.74	0	0	66.67
Cl.gariepinus	140	106	75.71	91	71	32	23	0
				85.85	66.98	30.19	21.7	0

Seasonal prevalence of different helminthes parasites in examined *O. niloticus* and *Cl.gariepinus.* As appeared in chart (1)

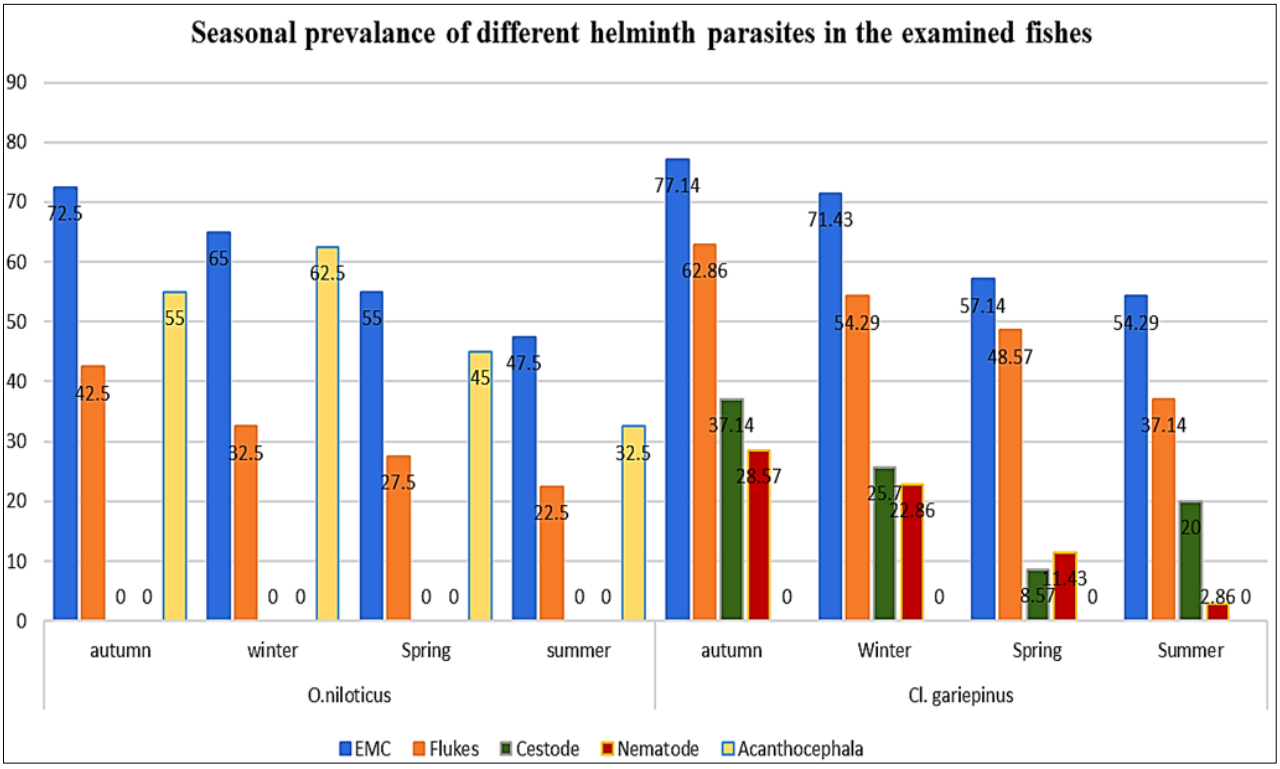


Chart 1: Seasonal prevalence of different helminthes parasites in examined *O. niloticus* and *Cl. garipinus.*

Prevalence of helminthes infestation according to different body weights of the examined *O. niloticus* and *Cl. gariepinus*: As shown in table (4)

Table 4: Prevalence of helminthes infestation according to different body weights of the examined fishe

Weight of Fish (G)	Fish Species					
	O. niloticus			*Cl. gariepinus*		
	No of examined fish	No of infected fish	%	No of examined fish	No of infected fish	%
<100	30	10	33.33	25	6	24
100-200	70	64	91.43	50	40	80
>200	60	43	71.67	65	60	92.31
Total	160	117	73.13	140	106	75.71

Prevalence of helminthes infestation in relation to different body length of the examined *O. niloticus* and *Cl. gariepinus.* According to table (5)

Table 5: Prevalence of helminthes infestation among different body length of the examined fishes.

Length of Fish (G)	Fish Species					
	O. niloticus			*Cl. gariepinus*		
	No of examined fish	No of infected fish	%	No of infected fish	No of examined fish	%
<15	28	15	53.57	25	11	44
15-25	62	52	83.87	55	44	80
>25	70	50	71.43	60	51	85
Total	160	117	73.13	140	106	75.71

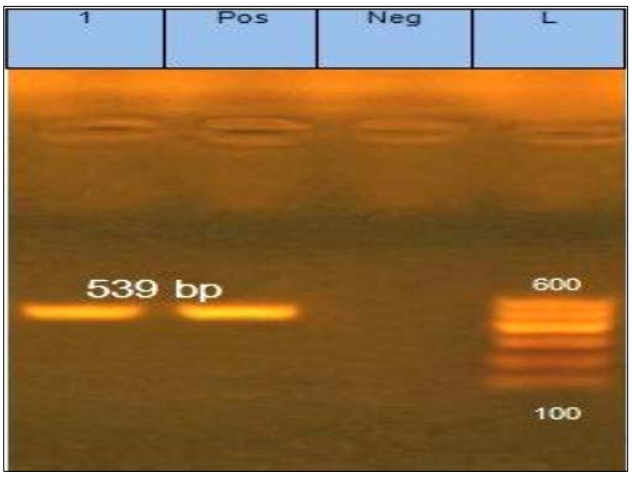
7-Prevalence of helminthes diseases in relation to the sex of examined *O.niloticus* and *Cl. gariepinus*: As appeared in Table (6)

Table 6: Prevalence of helminthes in relation to the sex of examined *O.niloticus* and *Cl.garipinus*

	Sex	No. of Examined Fish	No. of Infected Fish	Prevalence %
O. niloticus	Male	96	75	78.13
	Female	64	42	65.63
Cl. Gariepinus	Male	103	85	82.53
	Female	37	21	56.76

PCR Results of Trematodes identification

The trematodes were identified by using target gene ITS2 (specific primer) that have the specific sequence (GGTACCGGTGGATCACTCGGCTCGTG) and (GGGATCCTGGTTAGTTTCTTTTCCTCCGC). PCR amplification of a specific product and agrose gel electrophoresis yielded a positive result of the used sample at 539bp. (Photo 1).



(Photo 1)

Discussion

In the present study, we investigate some parasitic diseases (Helminthes) that affect *O. niloticus* and *Cl. gariepinus* which are considered cheap, palatable and widely spread fishes in Egypt. The most common clinical signs that observed on *O. niloticus* infested with helminthes diseases were paleness of the skin, loss of condition, dullness and leathery. Others showed hemorrhages all over body surface. While *cl. gariepinus* showed hemorrhagic ulcers, detached tail fins and injuries on the skin and haemorrhage on the ventral sides of the fish. These results agreed with that obtained by Heba Abd El-Moula (2005) [18], Nourhan Sayed (2018) [26], Derwa *et al*. (2019) [7].

In the postmortem examination of *O. niloticus*, there was paleness in internal organs and congestion of intestine. Also, some whitish yellow cysts were embedded in the kidney and the musculature of *Clarias gariepinus* which decrease the body gain and lowered the marketability of infected fish, these results agreed with that recorded by Walaa El-Shaer (2008) [38]. Enlargement of the gall bladder, gonads and spleen and pale discoloration was observed on liver and kidney of *Cl. gariepinus*. These results were agreed with that obtained by Eissa (2002) [8] and Shaheen *et al*. (2014) [32].

According to the parasitological examination, parasites obtained from *O. niloticus* were *Eumesenia aegypticus* and unidentified encysted metacercariae isolated from different internal organs as gills, air sac, kidney, heart and musculature. In *Cl. gariepinus* we recorded adult digenean trematode, *Orientocredium batracoides* and encysted metacercariae which infest gills, heart, kidney and musculature. The fluke isolated from *O. niloticus* intestine was pyriform in shape and its cuticle coverd with spines. The anterior sucker is a cub-shaped followed by short pharynx. Morphological and parasitological examination proved that the fluke is *Eumesenia aegypticus*. This description is similar to what described by Derwa *et al*. (2019) [7].

In this study, *Orientocredium batrachoides* was obtained from the intestines of *Cl. gariepinus*. It was characterized by small, elongated body shape which covered with fine spines. Anterior sucker was subterminal and nearly rounded in shape, while the ventral sucker was larger. These descriptions agreed to that recorded by Abbass *et al.* (2006) [2]. In this study, the recovered EMC were obtained from different internal organs as, gills, air sac, kidney, heart and musculature of *O. niloticus* and *Cl. gariepinus.* They were double-walled circular bodies with thick outer membrane and thin inner layer they were spherical or sub spherical in shape and their color varied from grayish white to yellowish brown. This result as that obtained by Endrawes (2001) [15] who obtained prohemiphistomum encysted metacercariae from musculature of *Cl.lazara.* Shaheen *et al*. (2014) [32] who obtained encysted and exested metacercariae from *O, niloticus* and *Cl. gariepinus*, and El-Assal (2018) [10] who recovered encysted metacercariae in *Cl. gariepinus*.

In the present study, the morphological description of *Acanthocephalan* species which were isolated from intestine of *O. niloticus* showed that the body of both sexes was composed of an anterior narrow retractable fore body and abroad club-shaped hind body. The fore body contained anteriorly the proboscis that followed by proboscis sac for its invagination and the proboscis was provided with three rows of hooks. These agreed with Heba Abd El-Moula (2005) [18], and Shaheen *et al*. (2014) [32].

From the morphological point of view *Monobothrioides* species which was isolated from the intestine of *Cl. gariepinus* had elongated fusiform body. The scolex was so variable from one specimen to another, it contained numerous furrows. The posterior extremity of the worm contained the ovary and uterus. This description was similar to that recorded by El- Bouhy *et al*. (2010) [11] and El-Shahawy *et al*. (2017) [14]. Concerning *Polyonchobothrium clarias*, the study showed a white long cylindrical tape like worm found in the upper part of the intestine which was seen by nacked eye. Under microscope the worm had a nearly triangular scolex which had one row of hooks with two undeveloped elongated botheria of equal length. This description was similar to that recorded by Ayanda (2009) [3].

From the morphological point of view, *Procamallanus laeviconchus* was a small larviparous nematode. The cuticle was thick with transverse striation. The mouth was rounded with fine cuticular membrane in its margin. The male was smaller than the female with short, curved, conical tail and provided with narrow alae and short spicules. The tail of the female was conical, and uterus of fully mature females were filled with larvae. This agreed to what recorded by Heba Abd El-Moula (2005) [18]. Regarding Paracamallanus cyathopharynx, it was descriped as a medium sized larviparous nematode and its buccal capsule was large, shell shaped, yellowish in color armed with large trident. The buccal capsule followed by long cylindrical pharynx that was followed by oesophagus. The posterior end was provided with transverse cuticular striations. Male was small in size with curved posterior end and spicules were unequal and dissimilar. The female larger than male, its tail was conical in shape. Uterus of fully mature female was filled with larvae. This result agreed with Ayanda (2009) [3], Shaheen *et al*. (2014) [32].

In the present study the total prevalence of the helminthes infestation in *O. niloticus* and *Cl. gariepinus* was 74.33%. The overall prevalence of infestation in *Cl. gariepinus* was 75.71% and 73.13% in *O. niloticus*. There was slight

difference may be due to difference in type of feeding as *Cl. gariepinus* are carnivorous and bottom feeder fishes which feed on food with low value as mud, water invertebrates like arthropods, mollusks, and young infested fish, also they are devoid of scales so allow infective stage to penetrate its external body surface, but *O. niloticus* body surface covered with scales which protect it from penetration of parasites in addition to that *O. niloticus* reach its marketable size in short time. These results were near to that mentioned by Shaheen *et al*. (2014) [32] who reported that the overall prevalence of internal parasitic diseases infestation of *Cl. gariepinus* (74.88%), in *O. niloticus* (67.5%). and Otor *et al*. (2016) found that total prevalence of helmith parasites were 89 % and 85 % in *Clarias gariepinus* and *Tilapia zilli* respectively. Nearly similar results were reported by Eissa *et al*. (2009) [9] who recorded that total prevalence of parasitic infestation in *Cl. gariepinus* was 81%. But the results obtained differ from that recorded by Mavuti *et al*. (2017) [25] who mentioned that the parasitic infestation in *O. niloticus* was 67.8% and 32.2% in *Cl. gariepinus* and Peter *et al*. (2012) [29] who reported that prevalence of parasitic infestation was (89%) in the *Oreochromis niloticus* and (54%) in *Clarias gariepinus* and this lower than that recorded in *O. niloticus* in this study. This variation may be due to the difference in the environmental conditions, or the presence of intermediate and final hosts.

Regarding the seasonal variations, the result of this study showed the highest infestations in *O. niloticus* and *Cl. gariepinus* in autumn (87.5%) and (85.7) followed by winter (75%) and (82.86%) then spring (67.5%) and (74.29%) and the lowest rate was in summer (62.5%) and (60%) in both *O. niloticus* and *Cl. gariepinus* respectively. These results was nearly similar to which recorded by Walaa El-Housieny (2008) [38] who reported that the seasonal prevalence among the examined fishes was the highest rate in autumn season (100%) and (87.34%) followed by winter (100%) and (62.13%) then spring (95.45%) and (32.25%) and summer at a rate of (88.23%) and (31.29%) in both *Clarias gariepinus* and *tilapia* species respectively. But these results were disagreed with those obtained by El-Shahawy *et al*. (2017) [14] who recorded that the prevalence of infestation was highest in spring season (44.4 %) followed by summer (35.2 %) then winter (29.6 %) and the lowest rate was in autumn (20.3 %). Seasonal variation in the prevalence of parasites in this study may be due to ecological conditions, distribution of intermediate hosts and the age of the host and the life cycle of the parasite. Regarding to overall percentage of parasite infections in this study, the highest prevalence of helminthes infestation in *O. niloticus* were *Acanthocephala* in rate (66.67%), then flukes of digenetic trematodes with rate (42.74%). While the highest prevalence of infestation that recovered from *Cl. gariepinus* (66.98%) for flukes followed by cestodes in rate (30.19%), then nematodes (21.7%). These results were in contrary to the observation made by Jossy *and Daniel* (2015) who concluded that nematodes recovered from the gastrointestinal tract (8.60%) in *Oreochromis niloticus* and (19.02%) in *Clarias gariepinus* and trematodes found in rate of (7.24%) and (5.52%) from *Oreochromis niloticus* and *Clarias gariepinus* respectively. Abba *et al. (*2018) reported that among helminth parasites community namely, nematode, trematode, cestode and acanthocephalan recorded from fishes in the study areas, nematode dominated the helminth fauna of the fishes followed by cestode, trematode and very rarely infection were recorded was that caused by acanthocephalans. That difference may be regarded to the changes of the environmental conditions, habitat, and Immunity level.

The overall prevalence of infestation of encysted metacercaria of digenetic trematodes was (82.05%) in *O. niloticus* which recovered mainly from gill tissues, air sac, musculature and kidney, and (85.85%) in *Cl. gariepinus*. These results were higher than that obtained by Ghada Kirrella *et al. (*2018) which resemble (24%) and (30%) in *O, niloticus* and *Cl. gariepinus*. Prevalence of our result was closely related to that obtained by Reda *et al*. (2010) (80.30%) and Taher (2009) (78.25%) in *O. niloticus*. While in *Cl. gariepinus*, it was near that recorded by Eldaly *et al*. (2008) [8] (87.5%). The highest rate was in autumn (72.5%) followed by winter (65%) then spring (55%) and the lowest was in summer (47.5 %). This seasonal prevalence was disagreed with that obtained by Nourhan sayed (2018) [26] who reported the highest rate in spring (80%) followed by winter (70%) then summer (52.5%) and the lowest was in autumn (35%). The distribution of the snails makes the life cycle of flukes easily completed and the difference in prevalence might be due to different topographic areas investigated. The seasonal prevalence of Flukes was (42.74%) and (66.98%) in both *O. niloticus* and *Cl. gariepinus* respectively. They were in the highest rate (42.5% and 62.86%) in autumn, followed by winter (32.5% and 54.29%) then spring (27.5% and 48.57%) and the lowest rate obtained at summer (22.5% and 37.14%) in both *O. niloticus* and *Cl, gariepinus* respectively. these results come along with that mentioned by (Walaa El-Hossieny 2008) [37].

The prevalence of cestodes in this investigation (30.19%) in *Cl. gariepinus* which was nearly like Heba Abd El- Moula (2005.) [18] The highest prevalence was in autumn (37.14%) followed by winter (25.7%), then spring (8.57%) and the lowest rate was in summer (20%) and these results agreed with those recorded by Bichi and Bizi (2002) [4].

The total prevalence of nematodes in *Cl. gariepinus* in this study was (21.7%) which was nearly like Jossy *and Daniel* (2015). Regarding the seasonal variations, the highest prevalence was in autumn (28.57%) followed by winter (22.86%) then spring (11.43%) and lowest was in summer (2.86%), these results were nearly like the results recorded by (Walaa El-Hossieny 2008 and Nourhan Sayed 2018) [37, 26] and disagreed with (Kishiya *et al*. 2013 and Shaheen *et al*. 2014) [23, 32]. The overall prevalence of *acanthocephalan* species in *O. niloticus* in this study was (66.67%), this result was markedly higher relative to the report of De la-Cruz *et al*. (2013) [6] among cultured Nile tilapia in Sampaloc Lake with 29 % prevalence rate and lower than that obtained by Vachel (2016) [36] who recorded (74 %). The seasonal prevalence reported the highest rate in winter (62.5) followed by autumn (55%) then spring (45%) and the lowest rate obtained in summer (32.5%). this result higher than obtained by Shaheen *et al. (2014*) [32] who resulted (1.5%) total prevalence with seasonal rate (6.19%) only in spring.

In this investigation, the infestation by Helminthes was higher in males than females in rates of (78.13%) and (65.63%) respectively in which these data were similar to those mentioned by (Goselle *et al*., (2008) [17], Shaheen *et al*. 2014 [32] and Abba *et al*. 2018) [1]. Concerning the length in this study the highest prevalence of infestation in both *O. niloticus* and *Cl. gariepinus* occured in length higher than (<25cm) and that may be due to that the parasitic load increases as the fish grow and the bigger fish is exposed longer to the environment. These results are similar to that

obtained by (Nourhan Sayed 2018) [26]. Regarding the weight, in this study the prevalence of infestato was in the highest rate in fish groups weights (> 200 g) which may consider as indicator to that the increasing in the fish size (weight and length) may lead to increasing in parasitic infestation. This finding may be due to that the bigger fishes cover wider areas in searching of food than smaller ones and takes food more than smaller ones which makes it more susciptable to the parasitic infestation. These results agreed with that reported by (Omeji *et al.* 2010) [27] but disagrees with (Tasawar *et al.* 2007) who reported that the highest parasitic infestation occur in smaller than the bigger fish.

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