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PARASITOSIS IN CLARIAS GARIEPINUS AND ITS RELATION TO SOME ENVIRONMENTAL CONDITTIONS IN ASSIUT GOVERNORATE, EGYPT

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Abstract

Fish like any other organisms, are susceptible to ecto & endo-parasites, which have a risky impact in aquaculture specially those because skin infection with secondary bacterial infection. This study estimated the parasitic infections in freshwater Catfish (*Clarias gariepinus*) in Assiut Governorate, and evaluated environmental factors affecting them.

A total of 100 samples of different sexes and sizes were randomly collected weekly over one year from different localities in Assiut City. The fish were examined parasitological for ecto-parasites and dissected for endo-parasites as well as histopathological examination of muscles.

The results showed an overall parasitic rate of 82%. Ecto-parasites were *Gyrodactylus*, *Dactylogrus*, *Henneguya* and *Icthyophthirius multifiliis* (2%, 8%, 2% & 5%) respectively, while endoparasites were trematode *(Orientocreadium batrachoides* 26%*)*, cestode (*Polyochobothrium clarias* and *Monobothrioides* 6% & 21% respectively), nematode (*Paracamallanus* spp. 12%), encysted metacercaria (66%) and protozoa (*Entamoeba* spp. 15%). The variation between the parasitic number length, weight, and sex seasonally were statistically analyzed.

Key words: Assiut, *Clarias gariepinus*, parasitic infection, environmental factors.

Introduction

Fish is one of the most nutritive, flavorful, tasty, and easily digestible proteins available to man with low cholesterol levels (Hadyait *et al*, 2018). Environmental factors have serious effect on spread of parasitic infections, which lead to immunosuppression and made them susceptible to parasites (Gopko *et al*, 2020). Catfish (*Clarias gariepinus*) are omnivores or predators feeding mainly on aquatic insects, fish, higher plants debris and snails and being one of the commonest Egyptian species with cheap price and palatable taste (Solomon, 2017). However, parasitosis is common problem in aquaculture with a negative impact on the health of fish with welfare loss (Weber and Govett, 2009). These included weight loss, disruption of reproduction or impotency, blindness, aberrant behavior, epithelial lesions, gill abnormalities, and others (Iwanowicz *et al*, 2011). The Egyptian warm weather caused parasites flourishing (Eissa *et al*, 2013) whether ectoparasites or endoparasites (Tessema, 2020).

Ectoparasite infestations cause fish serious effect as abrasions, body ulcerations, hemorrhagic spots on skin, and eroded fins that predispose risky secondary infections (Crafford *et al*, 2014), or even mortalities (El-Seify *et al*, 2018)

Endoparasites physiological reduce fish meat product by detrimental effects on functional organs (Shaheen *et al*,2014) Three helminths types infect fish, flat worms, round worms and Acanthocephala or spiny headed worms (Wali *et al*, 2016). About 20,000 to 30,000 species were reported worldwide causing risky to fish industry (Hefnawy *et al*, 2019).

This study aimed to estimate the prevalence of parasitic infection in freshwater catfish (*Clarias gariepinus*) in Assiut Governorate, and evaluate the environmental factors affecting parasitic infections

Materials and Methods

This cross-sectional study was done in Assiut City, with municipality of 27.252ºN 31.01ºE.

Sample collection: One hundred samples were weekly collected from January 2021 to December 2021 from different city fish markets. Cat fishes were captured alive or freshly dead and transported in a separate labeled plastic bag to the experimental Parasitology laboratory.

Parasitological examination: This was done for detection and identification of external parasites by skin scraping and gill mounts macroscopically (Saad *et al,* 2019) and internal parasites by dissecting of the fish intestinal content microscopically using direct smear, flotation and sedimentation concentration methods, and small muscles compression between two slides for encysted metacercariae (Reavill and Roberts, 2007).

Parasites: Worms were collected, washed carefully, left in refrigerator at 4°C till complete relaxation, carefully compressed between two glass slides, fixed for 24 hours 60°C and stained with acetic acid alum carmine (Garcia, 2007).

Histopathological examination: Muscle samples were fixed in 10% formalin, dehydrated in descending ethanol, and embedded in paraffin blocks. Sections were stained by haematoxylin and eosin and examined (Attia *et al,* 2015).

Statistical analysis: Data were verified, coded and analyzed using IBM-SPSS 24.0 (IBM-SPSS Inc., Chicago, IL, USA). Descriptive statistics as means, standard deviations frequency, and percentages were calculated. Test of significances as Chi square/ Monte Carlo Exact test compared the difference in frequencies distribution among groups. For continuous variables independent sample t-test test compared the means between groups. P-value less than 0.05 were considered significant.

Results

The one hundred *Clarias gariepinus* (22 females & 78 males) with weight ranged from 168 to705gm and length ranged from 22to 45cm. The infection overall positive samples were 82 samples (82%).

The overall parasites among fish samples were 82 samples (82%) with a highly significant relationship between length and weight and significant relationship between total infection and spring season (30.5%).

Effect of environmental factors on ectoparasites: Monogeneans was 10% (*Gyrodactylus* and *Dactylogyrus*, 2% and 8% respectively), while it was 7% with protozoa (*Henneguya* and *Icthyophthirius multifiliis,* 2% and 5% respectively), the infection rate increased significantly with the smaller and lighter fish, with highly significant relationship between summer season and external parasitic infection.

Effect of environmental factors on endo parasites: They were trematodes *Orientocreadium batrochoides (*26%), its significantly related to males and to less extent to spring season, cestodes *Polyonchiobothrium clarias and Monobothrioides* (6% and 21% respectively), its significantly increased in lighter fish, highly significantly related to spring season, Nematodes Paracamallanus *spp (*12%), which is distributed equally in different sex, weight and seasons, and *Entamoeba spp* (12%), showing significant relationship between it and lighter weight.

Details were given in tables (1, 2, 3, 4, & 5) and in figures (1 & 2).

Table 1: Distribution and infection rate of parasites infecting cat fish

Parasite group	Parasitic infections	% of infection
External parasites		
1- Monogenetic trematodes	*Gyrodactylus spp.* *Dactylogrus spp.*	2% 8%
2- External protozoa	*Icthyophthirius multifiliis* *Henneguya* spp.	5% 2%
Internal parasites		
Trematodes(digenea)	*Orientocreadium batrochoides*	26%
Cestode	*Polyonchiobothrium clarias* *Monobothrioides*	6% 21%
Nematode	*Paracamallanus spp.*	12%
Internal protozoa	*Entamoeba spp.*	15%

Table 2: Distribution and infection rate of parasites infecting cat fish

Parameter	Infected (n = 82)	Non-infected (n = 18)	P-value*
Female	19 (23.2%)	3 (16.7%)	= 0.546*
Male	63 (76.8%)	15 (83.3%)	
Length/cm	28.27 ± 6.4	42.06 ± 2.1	< 0.001**
Weight/gram	253.67 ± 18.1	656.62 ± 48.8	< 0.001**

Table 3: Relationship between ecto-parasites and environmental factors

Parameter	Non-infected (n=90)	Infected (n=10)	P-value*	Non-infected (n= 93)	Infected (n=7)	P-value*
parasite	Trematode (Monogeneans)			External Protozoa		
Female	19 (21.1%)	3 (30%)	= 0.520*	18 (19.4%)	4 (57.1%)	
Male	71 (78.9%)	7 (70%)		75 (80.6%)	3 (42.9%)	= 0.020*
Length/cm	31.34± 8.1	26.10± 4.7	= 0.048**	30.93± 8.1	29.14± 6.3	= 0.108**
Weight/gram	341.14± 25.1	191.80± 23.2	= 0.001**	334.51± 24.5	216.01± 18.2	= 0.012**
Autumn	21 (23.3%)	2 (20%)		23 (24.7%)	0 (0%)	
Spring	24 (26.7%)	3 (30%)	= 0.028***	27 (29%)	0 (0%)	< 0.001***
Summer	24 (26.7%)	2 (20%)		19 (20.4%)	7 (100%)	
Winter	21 (23.3%)	3 (30%)		24 (25.8%)	0 (0%)	

Table 4: Relationship between trematode, cestode infections and environmental factors

Parameter	Non-infected (n = 74)	Infected (n = 26)	P-value*	Non-infected (n = 73)	Infected (n = 27)	P-value*
parasite	Trematode			Cestode		
Male	9 (12.2%)	13 (50%)		14 (19.2%)	8 (29.6%)	
Female	65 (87.8%)	13 (50%)	< 0.001*	59 (80.8%)	19 (70.4%)	= 0.263*
Length/cm	31.17± 8.7	29.81± 5.3	= 0.355**	31.56± 8.5	28.81± 5.8	= 0.072**
Weight/gram	345.34± 28.8	271.77± 32.8	= 0.097**	355.37± 29.5	247.37± 26.1	= 0.037**
Autumn	19 (25.7%)	4 (15.4%)		22 (30.1%)	1 (3.7%)	
Spring	18 (24.3%)	9 (34.6%)		19 (26%)	8 (29.6%)	
Summer	15 (20.3%)	11 (42.3%)	= 0.028***	9 (12.3%)	17 (63%)	< 0.001***
Winter	22 (29.7%)	2 (7.7%)		23 (31.6%)	1 (3.7%)	

Table 5: Relationship between nematode, internal protozoa infections and environmental factors

Parameters	Non-infected (n = 88)	Infected (n = 12)	P-value*	Non-infected (n = 85)	Infected (n = 15)	P-value*
parasites	Nematode			Protozoa		
Female	21 (23.9%)	1 (8.3%)	= 0.163*	22 (25.9%)	0 (0%)	
Male	67 (76.1%)	11 (91.7%)		63 (74.1%)	15 (100%)	= 0.026*
Length/cm	30.73± 8.1	31.33± 6.9	= 0.789**	30.93± 8.1	29.14± 6.3	= 0.108**
Weight/gram	330.14± 25.1	297.42± 19.3	= 0.619**	334.51± 24.5	216.01± 18.2	= 0.012**
Autumn	22 (25%)	1 (8.3%)		20 (23.5%)	3 (20%)	
Spring	23 (26.1%)	4 (33.3%)	= 0.117***	22 (25.8%)	5 (33.3%)	
Summer	20 (22.7%)	6 (50%)		22 (25.8%)	4 (26.7%)	= 0.929***
Winter	23 (26.1%)	1 (8.3%)		21 (24.7%)	3 (20%)	

Discussion

Generally speaking, fish is one of the most valuable nutritive, tasty, palatable and easily digested animal proteins for human with low cholesterol level in human diets.

In the present study, the total parasitic infection was 82%. This was higher than Mahmoud *et al.* (2018) result in Assiut they reported infection in Assiut (60.4%), such a difference may be due to increased pollution which affect the immunity of fish.

In the present study, external parasitic infestation was 17%. This more or less agreed with Bichi and Yelwa (2010) in Nigeria reported (12.2%) and Tesfaye *et al.* (2018) in Ethiopia reported (25%), but was low than (44.4%) reported in Sharkia (Diab *et al*, 2006), or (33.3%) reported in Nigeria (Tachia and Omeji, 2013), less than (91%) reported in Iraq (Abdullah and Shwani, 2010).

In the present study, ecto-parasites were Monogeneans 10% (*Dactylogyrus* and *Gyrodactylus* (8% & 2%) and protozoa (7%). This was higher than (0.8%) reported by Diab *et al.* (2006) in Sharkia, but much lower than 56% in Benha City (Abdel Latif *et al*, 2009), and 42% & 34% in Kafrelsheikh by Gado *et al.* (2017) & El-Seify *et al.* (2018).

In the present study, external protozoa infection was 7% (5% *Icthyophthirius multifiliis*, and 2% *Henneguya* spp. This agreed with El-Seify *et al.* (2013) in Qena who detected *Henneguya sp.* (1.9%), but Mahmoud *et al.* (2018) in Assiut detected *Trichodina* sp. (14.1%) & *Henneguya* spp. (32.0%) and Manbe *et al.* (2020) in Nigeria reported a total (23.36%) protozoa

In the present study, catfish showed highest infection rates in winter and spring (30%), followed by summer and autumn (20%). This more or less agreed with Abdel Latif *et al.* (2009) in Benha detected highest prevalence of monogeneans during spring (82%) and the lowest in winter (36%).

In the present study, endo-parasites, trematode was (26%). This nearly agreed with El-Seify *et al.* (2017) in Qena reported (27%), but higher than Abdel-Gaber *et al.* (2015) in Lake Manzala reported (8.33%). The high rate was in summer (42.3%), followed by spring (34.6%) autumn (15.4%) then winter (7.7%). This agreed with El-Seify *et al.* (2017) reported highest infection in summer.

In the present study, cestode infection rate was (27%). This nearly agreed with Abdel-Gaber *et al.* (2015) reported (25.0%) in Lake Manzala, but less than El-Seify *et al.* (2017) reported (35.4%), but, the result was higher than Al-Bassel (2003) in Fayoum (16.22%), Shaheen *et al.* (2014) in Benha City (11.6%) and El-Shahawy *et al.* (2017) in southern Egypt (11.1%), as well as Owolabi (2008) and Osimen and Anagha (2021) in Nigeria (8.44% & 4.27% respectively). Cestode was higher in smaller sized fish with high significant correlation between infection and weight less. This agreed with Mohammed *et al.* (2018). As to season, infection was highly significant variation (P< 0.001) seasonally, highest was in summer (63%) followed by spring (29.6%), but in autumn and winter showed same infection rate (3.7%). This agreed with Mohammed *et al.* (2018) reported the highest infection rate in summer and the lowest in winter. But, this disagreed with Shaheen *et al.* (2014) found the highest rate in spring followed by summer, autumn and winter. El-Seify *et al.* (2017) reported a high infection rate in spring, followed by summer, winter and autumn. The differences may be due to different temperature and humidity, influencing the parasites abundance by enhances suitable conditions for snail hosts (Paull and Johnson, 2011).

In the present study, total nematode (*Paracamallanus* spp.) infection was (12%). This agreed Elseify *et al.* (2015) in Qena reported (8.3%), but was lower than that of Sorour and Hamouda (2019) in Kafrelsheikh reported *Procamallanus laeviconchus* (44%) and *Paracamallanus cyathopharynx* (37.5%) and Osimen and Anagha (2021) in Nigeria reported (65.50%). Sexual infection was insignificantly high in males than females and highest infection rate was summer (50%), followed by spring (33.3%), and autumn and winter showed equal infection (8.3%). This agreed with El-Seify *et al.* (2017) reported the highest infection was in summer but infection was similar in both sexes. The present endo-protozoa were (15%). This was lower than 50% in Sharkia (Aly *et al*, 2005), who added that protozoa must be controlled.

Conclusion

The high rate of parasites were in *Clarias gariepinus*, as nine genera of parasites *Dactylogrus and Icthyophthirius multifiliis* were the commonest external parasites, and *Orientocreadium batrachoides* was the main of internal parasites. Length, weight, sex abundance differed seasonally. Feasible control measures must be carried by the Agricultural Authorities to protect *C. gariepinus* to reduce economic losses caused by parasitosis.

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Explanation of figures

Fig .1: *Gyrodactylus* spp. A- wet mount attached to gill filament X10, B- skin showed *Icthyophthirius multifiliis* X40, C- accessory respiratory organ of catfish with round shaped cyst with *Henneguya* spores, D- Sperm like spores of *Henneguya* spp, released from cysts X100, E- *Orientocreadium batrochoides* recovered from catfish intestines X10: *Polyonchiobothrium clarias*, F- scolex with crown hooks and unsegmented neck, G- mature segments, H- gravid segments with uterus full of egg X10: *Monobothrioides chalmersius* from intestine, I- anterior region (scolex & indistinguishable neck), J- posterior region with coiled uterus: *Paracamallanus* spp from intestine, K-whole body X 4 L- Anterior end funnel shape buccal capsule X10, M-female uterus of fully mature one filled with larvae X40, N- female posterior end with conical tail X40, O- male X40 posterior end : *Entamoeba* sp. P- wet mount from intestine X100 : Cyathocotylidae EMC Q- in catfish muscle (R) EMC in catfish muscle (H&E X40)

Fig.2: Relationship between total parasitic infection and seasonal variations.