Egyptian Journal of Zoology (EJZ), Vol. 79: 95-107 (June, 2023) p-ISSN: 1110-6344
Publisher: The Zoological Society of A. R. Egypt e-ISSN: 2682-3160
DOI: 10.21608/ejz.2022.150510.1086

RESEARCH ARTICLE

PARASITIC HELMINTHS OF THE FRESHWATER CATFISH (*CLARIAS GARIEPINUS*) FROM FAYOUM GOVERNORATE, EGYPT

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Article History:
Received: 16 July 2022
Revised: 9 September 2022
Accepted: 14 September 2022

Published Online:
13 October 2022

Keywords:
Bahr Youssef
Clarias gariepinus
Infection rates
Paracamallanus cyathopharyn
Parasitic helminths

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ABSTRACT

The parasitic diseases are one of the potential factors that restrict the development of fish aquaculture because fish parasites not only can cause injuries, but can even lead to death of the fish. The present study aimed to record/update the prevalence and intensity of parasitic helminths in the freshwater catfish "*Clarias gariepinus*" in Fyoum Governorate, Egypt. A total of 368 *Clarias gariepinus* samples were collected from Bahr Youssef (line of the River Nile) from Fayoum Governorate during the period from January 2019 to February 2020, and were examined for the presence of helminth parasites. Out of 368 examined fish, 227 (61.7%) were found to be infected with six species of helminthes (three trematodes, two cestodes, and one nematode): *Dactylogyrus claridii*, *Acanthostomum spiniceps*, *Orientocreadium batrachoides*, *Polyonchobothrium clarias*, *Monobothrium* sp., and *Paracamallanus cythopharynx* with infection rates = 13.0%, 2.2%, 5.4%, 9.2%, 13.3%, and 18.5%, respectively. Regarding to the seasonal variations, the obtained results showed that the highest rate of infection was recorded during the spring (76.9%), followed by the summer (70.0%) and the winter (53.5%), while the autumn represented the lowest rate of infection (52.3%). In addition, this study provides additional morphological characters for the parasite *Paracamallanus cyathopharynx* based on the scanning electron microscopy.

INTRODUCTION

Fishes are one of the most effective ways to supply protein with relatively competing prices, as other animal's proteins are so expensive[1]. *Clarias gariepinus* is widely distributed in Africa as a source of food[2]. *Clarias gariepinus* is regarded as one of the best models of omnivorous fish[3]. It is considered as an important fish for farming in Africa because it has many advantages, such as having a wide range of geographical distribution, an extraordinary growth rate, nearly unaffected with handling and trauma, and well appreciated in many African countries[4]. Infectious and parasitic diseases of fish cultured are important factors that obstruct the development of fish aquaculture[5]. In Egypt, parasitic diseases represent about 80% of fish disease[6]. The management and control of infectious

disease is the main hurdles to sustainable fin fish aquaculture in many regions[5]. The study of fish parasites is therefore attractive for many parasitologists, since they not only cause injuries but even death to the fish[5,7]. Helminth parasites can cause damages such as disruption and compression of the vital organs[8]. Parasitism is considered an important factor for mortality and morbidity all over the world causing heavy economic loss[9]. Therefore, the information about the parasites infecting fish and their prevalence in fish host is needed to improve fish health and aquaculture. So the present study was suggested to survey the parasites infecting *Clarias gariepinus* in Bahr Youssef in Fayoum Governorate with determination their prevalence, mean intensity, and seasonal variations.

MATERIAL AND METHODS

Fish collection

Fishes were collected by fishermen from Bahr Youssef, then brought to the laboratory either in a live form (in containers containing water from their source with oxygen pumps) or freshly dead fishes (in ice bags). Fishes ranged between 50 to 350 g in weight and from 20 to 40 cm in length. The study design and animal experiments were approved (2/2018) by the Research Ethics Committee at Faculty of Science, Fayoum University prior to the commencement of the study.

External examination of fishes

Smears from the skin and fins surface were taken on glass slides and then examined by using light microscope. Smears from mucus were made from gills, skin, and fins on a glass slide, then covered with a coverslip to be examined by microscope. The gills were covered with gill cover, the inner surface of gill cover and the branchial cavity were examined firstly with naked eyes for any lesion or cyst or both. The gill arches and lamellae were separated in petri dish filled with small amount of tap water to keep the gill arches wet. Small pieces of gill arches and lamellae were examined with microscope for any lesion or parasitic cyst and smear were prepared from the gill mucous and examined microscopically for any monogeneans, then air dried and fixed for further staining.

Internal examination of fishes

The abdominal cavity was examined with naked eyes for any cysts or worms. The alimentary canal was separated completely from esophagus to cloacal opening, examined externally with naked eyes for any cyst of parasites, then dissected completely in petri dish filled with saline solution (0.7%) and examined microscopically for the presence of any parasites. Gall bladder and liver were separated and dissected in petri dish with saline solution (0.7%) and examined microscopically.

Collection and preparation of the detected helminths

The collected worms were cleaned by washing several times with saline solution (0.7%) and shaking to remove away debris and mucus, which usually adhere to worm's surface. Before fixation, relaxation was carried out for trematodes and cestodes by placing them between two glass slides or between a glass slide and cover slip and press gently on the cover slip. Ethyl alcohol (70%) and formalin (5 % and 7%) were used as fixatives for trematodes and cestodes, while glycerol-alcohol (5% glycerin in 70% alcohol) was used for nematodes fixation, and large specimen was cleared in lacto phenol and mounted in gelatin. Formalin (5% and 7%) was used as fixative for scanning electron microscope (Carl ZEISS Sigma 500 VP, Oberkochen, Germany). Specimens were fixed without relaxation to give best result. The staining processes was carried out by using acetic acid alum carmine stain and alum carmine stain for platyhelminths, while nematodes were examined without staining. Differentiation was carried out slowly by using a dilute solution of acid alcohol

(0.5 mL of concentrated HCl in 1000 mL of 70% alcohol). Dehydration was carried out by placing the specimen in ascending series of ethyl alcohol. Clearing was carried out by using clove oil for trematodes and cestodes, while lactophenol is suitable clearing agent for nematodes. Mounting was carried out by using Canada balsam and DPX. All measurements of helminths were in millimeter (mm). All used chemicals in the present study were of high purity and purchased from Thermo Fisher Scientific (Waltham, MA, USA).

RESULTS

Incidence and seasonal variations of parasitic helminths in *Clarias gariepinus*

The results of the present study showed that out of 368 examined fish, approximately 227 specimens proved to be infected with gastrointestinal parasites (infection rate = 61.7%, Table 1). Concerning with seasonal variations, the highest rate of infection was recorded during spring (76.9%), followed by summer (70.0%) and winter (53.5%), while autumn represented the lowest rate of infection (52.3%, Table 1).

Table 1: Incidence and seasonal variations of parasitic helminths in *Clarias gariepinus*.

	Winter	Spring	Summer	Autumn	Total
The number of examined samples	99	78	80	111	368
The number of infected samples	53	60	56	58	227
Infection (%)*****	53.5	76.9	70.0	52.3	61.7
Number[a] and percentage[b] of fishes infected with each parasitic helminths					
Dactylogyrus claridii	7[a]	13	18	10	48
	13.2[b]	21.7	32.1	17.2	21.1
Acanthostomum spiniceps	4[a]	2	1	1	8
	7.5[b]	3.3	1.8	1.7	3.5
Oreintocreadium batrachoides	3[a]	8	5	4	20
	5.7[b]	13.3	8.9	6.9	8.8
Polyonchobothrium clarias	8[a]	12	9	5	34
	15.1[b]	20.0	16.1	8.6	14.9
Monobothrium sp.	16[a]	13	0	20	49
	30.2[b]	21.7	0.0	34.5	21.6
Paracamallanus cyathopharynx	15[a]	12	23	18	68
	28.3[b]	20.0	41.1	31.0	29.9

*****Infection (%) = The number of infected samples / The number of examined samples × 100
[b]The number of fish infected with each parasite / The total number of infected fish × 100

Winter represented the highest rate of infection for *Acanthostomum spiniceps* among other seasons (7.5%), while it represented the lowest rate of infection for *Dactylogyrus claridii* and *Orientocreadium batrachoides* among other seasons (13.2% and 5.7%, respectively, Table 1). Spring represented the highest rate of infection for *Orientocreadium batrachoides* and *Polyonchobothrium clarias* among other seasons (13.3% and 20.0%, respectively), while it represented the lowest rate of infection for *Paracamallanus cythopharynx* among other seasons (20.0%). Summer showed the highest rate of infection for *Dactylogyrus claridii* and *Paracamallanus*

cythopharynx among other seasons (32.1% and 41.1%, respectively), while it represented the lowest rate of infection for *Acanthostomum spiniceps* and *Monobothrium* sp. among other seasons (1.8% and 0.0%, respectively). Autumn represented the highest rate of infection for *Monobothrium* sp. among other seasons (34.5%), while it represented the lowest rate of infection for *Acanthostomum spiniceps* and *Polyonchobothrium clarias* among other seasons (1.7% and 8.6%, respectively, Table 1).

Incidence and range/mean intensity of each parasite in *Clarias gariepinus*

Paracamallanus cythopharynx represented the highest infection rate (18.5%) followed by *Monobothrium* sp. (13.3%), *Dactylogyrus claridii* (13.0%), *Polyonchobothrium clarias* (9.2%), *Orientocreadium batrachoides* (5.4%), and the lowest infection rate was recorded in *Acanthostomum spiniceps* (2.2%, Table 2). *Orientocreadium batrachoides* and *Monobothrium* sp. represented the highest mean intensity of infection, while the lowest mean intensity was recorded in *Acanthostomum spiniceps* and *Polyonchobothrium clarias* (Table 2).

Parasitic co-infection:

In the present study, 227 fishes were infected with different parasitic species, about 16 fishes of them were infected with two parasitic species together. Mixed infection was recorded in four fishes with *Orientocreadium* + *Paracamallanus*, six fishes were infected with *Polyonchobothrium* + *Paracamallanus*, and six fishes were infected with *Monobothrium* + *Paracamallanus*. In the present study, all helminthic parasites are collected from fish intestine except *Dactylogyrus claridii*, which was collected from the gills.

Table 2: Incidence and range/mean intensity of each parasite in the examined fishes "*Clarias gariepinus*".

Fish species	*Clarias gariepinus*			
Total number of examined fishes	368			
Parasite species	The number of infection	Infection (%)	Number/fish (range)	Mean intensity
Dactylogyrus claridii	48	13.0	4-10	7
Acanthostomum spiniceps	8	2.2	2-6	3
Orientocreadium batrachoides	20	5.4	1-38	10
Polyonchobothrium clarias	34	9.2	2-18	3
Monobothrium sp.	49	13.3	2-40	9
paracamallanus cythopharynx	68	18.5	2-12	6

Characteristic features of trematodes infection in *Clarias gariepinus*

Based on studying specimens of *Dactylogyrus claridii* (Class: Monogenea), the body was flat/elliptical and measured 0.56-0.75 mm long and 0.12-0.25 mm wide (Figure 1a). It has four eyespots at its anterior end, while the posterior end consists of haptoral sclerites, which include a pair of anchors, two roots, and dorsally oriented blades. *Dactylogyrus claridii* has seven pairs of marginal hooks and a pair of additional needle like structure (Figure 1a).

The body of *Acanthostomum spiniceps* (Class: Digenea) is elongated, covered with sharp spines, and measuring 2.0-3.5 mm long and 0.4-0.6 mm wide (Figure 1b). The oral sucker is funnel in shape, measuring

0.32-0.40 mm long, 0.3-0.39 mm wide, and armed with 24-28 (26) simple fine spinules. The ventral sucker is globular and measuring 0.25-0.32 mm long and 0.25-0.28 mm wide. The pharynx is oval in shape and measuring 0.13-0.16 mm long and 0.14-0.17 mm wide. *Acanthostomum spiniceps* has short esophagus. The intestinal caeca extend to a short distance behind the posterior testis and ended with two lateral anal pores. The testes are slightly diagonal and located at the posterior end of the body. The anterior testis measured 0.19-0.29 mm in length and 0.20-0.32 mm in width, while the posterior one measured 0.18-0.27 mm in length and 0.17-0.30 mm in width. The ovary is spherical and sub-median, located in front of the anterior testis, and measured 0.13-0.2 mm long and 0.10-0.12 mm wide (Figure 1b).

The body of *Orientocreadium batrachoides* (Class: Digenea) is ellipsoid, elongate, and measured 2.0-2.6 mm and 0.6-0.8 mm (long and wide, respectively; Figure 1c). The tegument is covered with small spines. The oral sucker is slightly oval in shape and the ventral sucker is larger than the anterior one, the oral sucker measured 0.18-0.23 mm and 0.19-0.23 mm (long and wide, respectively). The ventral sucker is round in shape at the anterior third of the body, measuring 0.19-0.24 mm and 0.20-0.24 mm (long and wide, respectively). The pharynx is well developed and measured 0.1-0.15 mm and 0.1-0.15 mm (long and wide, respectively). *Orientocreadium batrachoides* possesses short esophagus, which is 0.03-0.07 mm in length. The caecum is short/bifurcate and extends to the posterior end. There are two testes, located dorsal to the uterus. The anterior testis is smaller than the posterior one. The anterior testis may be median or submedian, measuring 0.21-0.31 mm and 0.2-0.33 mm (long and wide, respectively), while the posterior testis is median, measuring 0.24-0.33 mm and 0.18-0.36 mm (long and wide, respectively). The ovary is spherical, median, and pretesticular, measuring 0.15-0.25 mm long and 0.19-0.24 mm wide (Figure 1c).

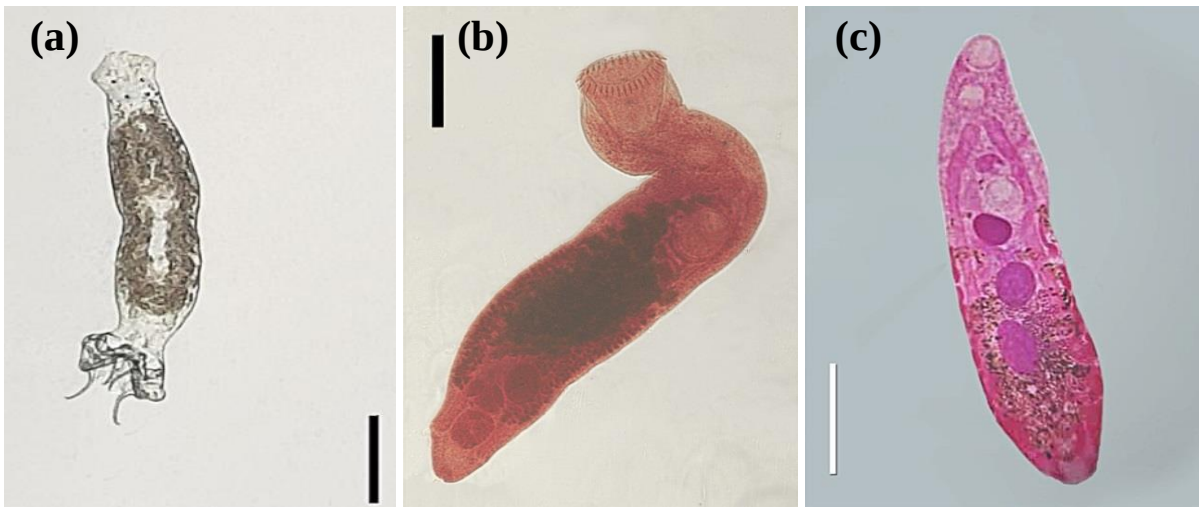

Figure 1: Photomicrographs of adult worms of (**a**) *Dactylogyrus claridii* (Scale bar = 0.5 mm), (**b**) *Acanthostomum spiniceps* (Looss, 1899; Scale bar = 0.5 mm), and (**c**) *Orientocreadium batrachoides* (Tubangui, 1931; Scale bar = 4 mm).

Characteristic features of cestodes infection in *Clarias gariepinus*

Polyonchobothrium clarias appeared grey to whitish in color and measured 22-41 (mean = 31.5) mm in length, with a total number of proglottids ranging from 60 to 124 (mean = 97). The scolex is rectangular with a slightly raised rostellum armed with a crown of 26-30 (mean = 28) hooks. It measures 0.37-0.55 (mean = 0.46) mm in

length and 0.16-0.25 (mean = 0.20) mm in width (Figure 2). The rostellum is divided into two semicircles each bearing 13-15 hooks. There is no neck, where the scolex is followed directly by the immature proglottids, about 29-55 (mean = 45) in number, and measuring 0.075-0.150 (mean = 0.112) mm long and 0.136-0.169 (mean = 0.152) mm wide. The mature proglottids is about 16-30 (mean = 24) in number, 0.121-0.180 (mean = 0.150) mm long, and 0.127-0.219 (mean = 0.173) mm wide, each containing a single set of genitalia. The testes are in two lateral fields, oval in shape, ranging from 25 to 55 in number per proglottid, and each measuring 0.09-0.13 mm long and 0.05-0.08 mm wide. The ovaries are large in size, distinctly bi-lobed, and situated near the posterior border of the proglottid. The gravid proglottids are about 15-39 (mean = 28) in number, measuring 0.23-0.341 (mean = 0.311) mm in length and 0.28-0.69 (mean = 0.51) mm in width, and the larger portion occupied by the uterus is filled with eggs (Figure 2).

Figure 2: Photomicrographs of adult worm of *Polyonchobothrium clarias* (Woodland, 1925). (**a**): The scolex (scale bar = 0.05 mm), (**b**): mature proglottids (scale bar = 0.2 mm), and (**c**): gravid proglottids (scale bar = 0.2 mm)

Monobothrium sp. was isolated from the intestine of *Clarias gariepinus*; infection with this worm was found in large number that led to intestinal obstruction. It is elongated, white in color, the body length ranged between 7-40 mm, and the body width ranged between 2.5-4.5 mm (Figure 3). The scolex is rounded or triangular in shape measuring 0.685-1.257 mm in wide and bears six shallow longitudinal grooves and terminal funnel-shaped introvert. The ovary is located in the posterior part of the worm, occupying the two lateral sides. The uterus is formed of coils distended in the posterior extremity. The testis is located laterally and appeared as oval follicles. The male genital pore opens slightly anterior to the female one. The female genital pore is located in the middle part of the worm (Figure 3).

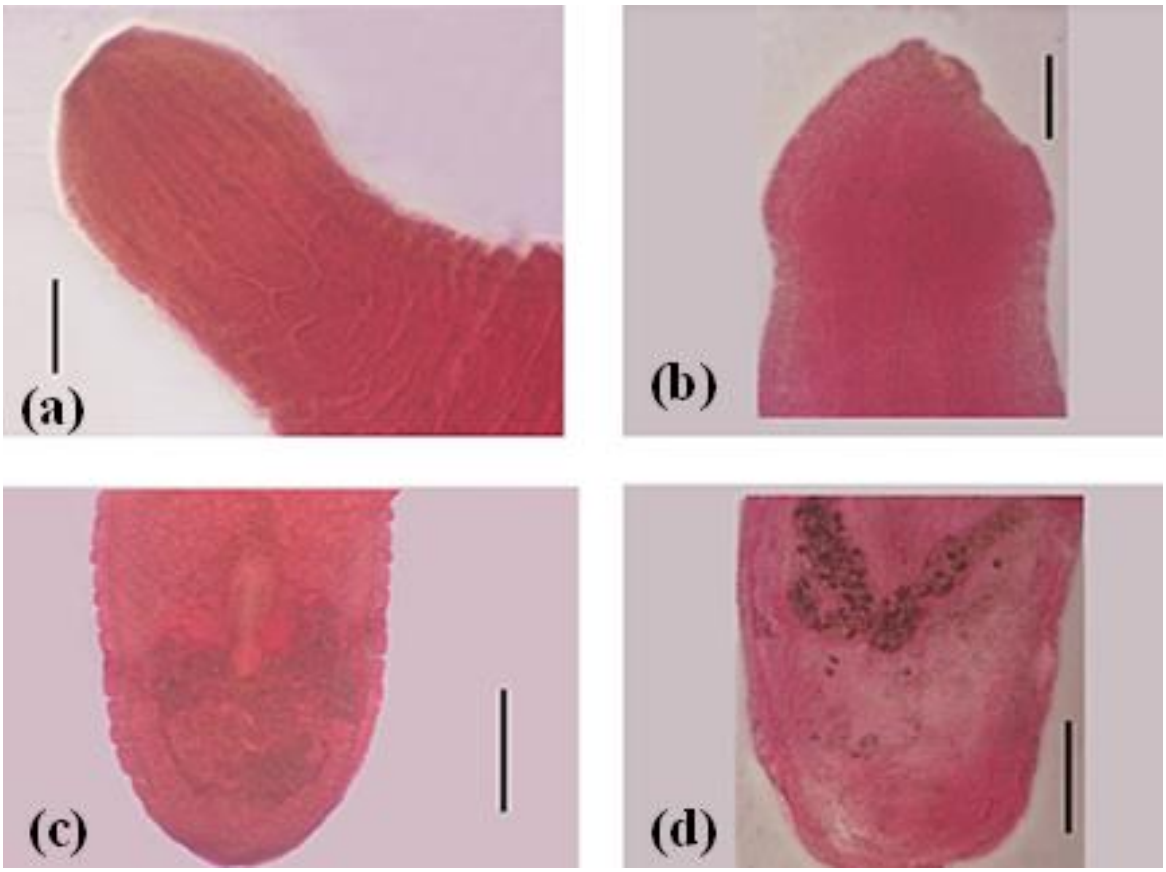

Figure 3: Photomicrographs of adult worm of *Monobothrium* sp. (**a, b**): The anterior end (scale bar = 0.2 mm), (**c, d**): the posterior end (scale bar = 0.2 mm)

Characteristic features of nematode infection in *Clarias gariepinus*

Paracamallanus cythopharynx is cylindrical, yellowish brown in color, the body of females measured 7.1-10.4 mm long and 0.134-1.18 mm wide, while males measured 3.8-6.3 mm long and 0.09-0.11 mm wide (Figure 4). The buccal capsule is yellowish, highly sclerotized, and consisting of two lateral shells-like valves with a large buccal cavity or pharynx behind the valves. A narrow bridge is separating the anterior portion of buccal capsule from the posterior one. The anterior portion of capsule has two lateral valves, each valve bears smooth longitudinal ridge extending towards posterior portion of valves. The anterior ends of the ridges are formed of six distinct teeth. The outer surface of each valve is provided with two large V-shaped strongly sclerotized plates near anterior margin and two large papillae; one dorsolateral and one ventrolateral. Dorsal and ventral sides of anterior portion

of buccal capsule have large tridents. Small tridents are found anteriorly to the larger one. The pharynx is cylindrical, terminating in cup-shaped structure consisting of 2 parts. Anterior portion is longer than posterior one and more sclerotized, has thick wall surrounding spacious cavity. The posterior portion is smaller, with thin walls. The esophagus consists of muscular and glandular part. In female, a genital tube is extending anteriorly, equal in length to the glandular portion of esophagus and ending in the vulva at the middle of the worm. The tail is conical shape, ending with four large digitate processes (Figure 4h). In males, the posterior end of the tail is curved in shape, measuring 0.043-0.061 mm long. The males had five pairs of pre-anal papillae, three pairs of post-anal papillae, and one pair of similar papillae nearly at mid-length of the tail. There are two unequal spicules, the right spicule is larger, more sclerotized, while the left spicule is smaller and less sclerotized (Figure 4j).

DISCUSSION

Biological examination for 368 of *Clarias gariepinus*, obtained from Bahr Youssef in Fayoum Governorate, was carried out in the laboratory to investigate the infection with helminth parasites. Regarding the seasonal variations, the highest infection rate was recorded in spring, while the lowest one was recorded in autumn. Same results were previously recorded at other governorates (Kafr El-Sheikh and Qena) in Egypt[10,11]. On the other hand, Hefnawy *et al*.[12] recorded the highest infection rate of *Clarias gariepinus* with helminths in summer and spring. Concerning to *Dactylogyrus claridii*, it is highly specific to *Clarias* species. The present description of this parasite was in agreement with the same species recorded by Gado *et al*.[13] from *Clarias gariepinus* at Kafr El-Sheikh Governorate in Egypt. In the present work the highest seasonal incidence of helminthic infection in *Clarias gariepinus* was recorded in summer. Gado *et al*.[13] also reported that the seasonal prevalence for monogenean infection was the highest in summer season among *Clarias gariepinus*. The highest infection recorded in summer may be attributed to the high water temperature and water physical and chemical changes[13]. High water temperature was accompanied with decreasing in lympho-cytes, while the granulocytes count and the red blood cell degradation increased, resulting in increasing the susceptibility of fish to diseases[14]. The incidence of *Dactylogyrus claridii* in the present work was 13%, which was lower than that reported by Gado *et al*.[13] (incidence rate = 34%), this may be attributed to the differences of area of infection.

Regarding to *Acanthostomum spiniceps*, the general characters were highly agreed with that reported by Morsy *et al*.[15] and Abdel- Gaber *et al*.[16]. The measurements in the present work are slightly larger than that mentioned by Morsy *et al*.[15]. The number of perioral spines was 26 in the current study, more than that of Morsy *et al*.[15] and Abdel-Gaber *et al*.[16] (23 perioral spines). On the other hand, the incidence of *Acanthostomum spiniceps* infection in the present work was 2.2%, lower than that reported by Morsy *et al*.[15] who recorded incidence rate of *Acanthostomum spiniceps* infection in *Lates niloticus* = 40%, this may be attributed to the differences of fish host. With regard to *Orientocreadium batrachoides*, it was in agreement with that was reported by Tepe *et al*.[17] who recorded this species from *Clarias gariepinus* from the Asi River (Southern Turkey). The incidence of *Orientocreadium batrachoides* in the present work was 5.4%, greatly lower than that reported by Tepe *et al*.[17] (76.2%), this may be attributed to the differences of area of infection (the Asi River, southern Turkey, where it was considered as contaminated area since pollution released by agro-industrial plants affects its water quality). *Orientocreadium batrachoides* was recorded by Al-Bassel[18] in *Clarias gariepinus* from Bahr Youssef in Fayoum Governorate (Egypt) with infection rate (14%), which was higher than that recorded in the present work (8.8%).

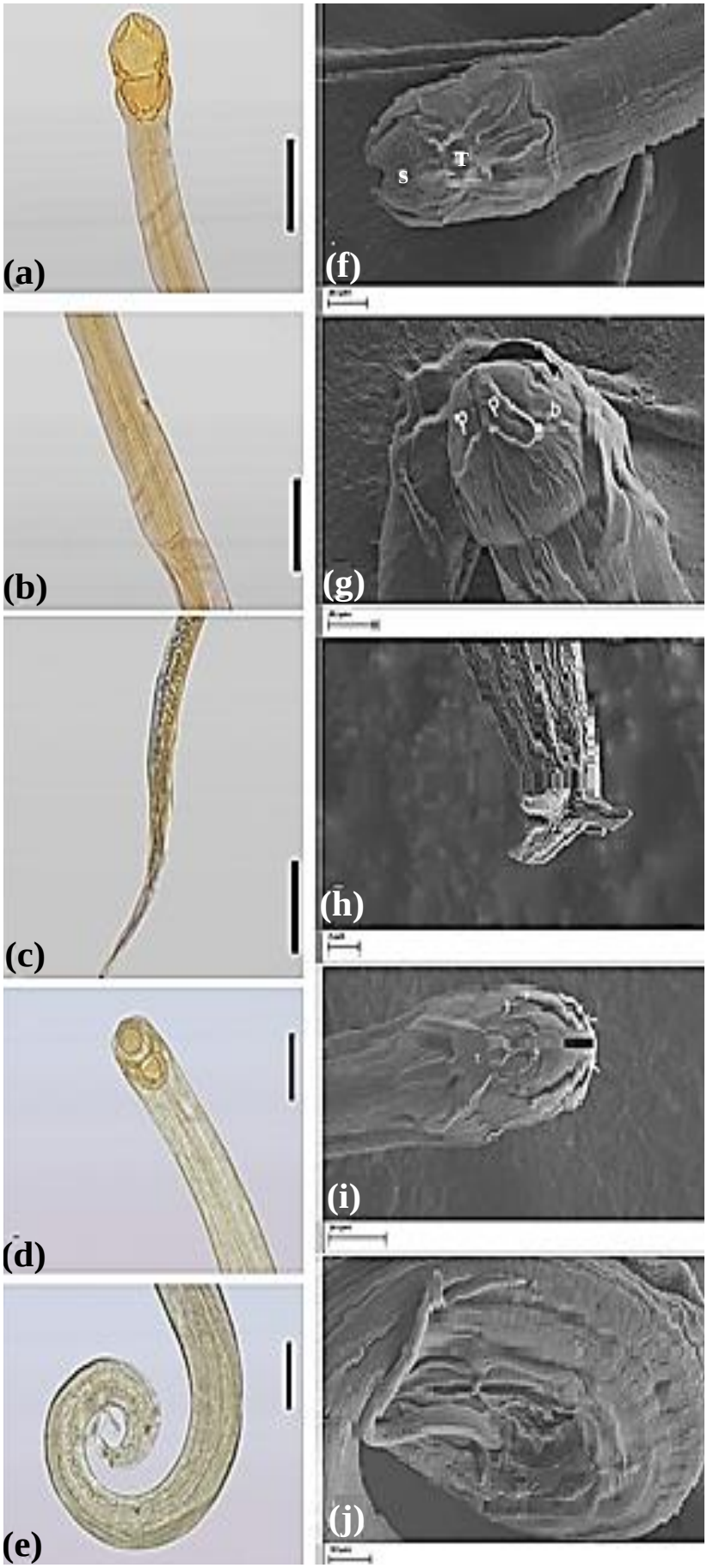

Figure 4: Photomicrographs (**a-e**) and scanning electron microscope **(f-j)** of female and male of *Paracamallanus cyathopharynx*. (**a**): The anterior end (scale bar = 0.05 mm), (**b**): the middle part (scale bar = 0.05 mm), (**c**): the posterior end (scale bar = 0.05 mm) of female, (**d**): the anterior end (scale bar = 0.05 mm), (**e**): the posterior end (scale bar = 0.05 mm) of male, (**f**): lateral view of the anterior end (buccal capsule; scale bar = 0.02 mm), (**g**): dorsal view of the anterior end (buccal capsule; scale bar = 0.02 mm), (**h**): the posterior end showing four digital processes (scale bar = 0.002 mm) of female, (**i**): lateral view of the anterior end (buccal capsule; scale bar = 0.02 mm), (**j**): the posterior end showing harpoon-shaped right spicule; scale bar = 0.01 mm) of male. S: small trident, T: large trident, P: sclerotized plate under cuticle, b: pair of submedian cephalic papillae in anterior part of female and male with scanning electron microscope.

Polyonchobothrium clarias was recorded by Barson and Avenant-Oldewage[19] in *Clarias gariepinus* from South Africa, by Al-Bassel[18] from Bahr Youssef in Fayoum Governorate (Egypt), and Abdel-Gaber *et al*.[20] from Lake Manzala (Egypt). The highest prevalence of *Polyonchobothrium clarias* in the present work was recorded in spring followed by summer and the lowest prevalence was recorded in autumn, these results were in agreement with that mentioned by Eissa *et al*.[10] at Kafr El-Sheikh governorate. The infection rate of *P. clarias* in the present work was 9.2%, smaller than that recorded by Al-Bassel[18], Eissa *et al*.[10], and Barson and Avenant-Oldewage[19] (12.0%, 50.5% and 71.0%, respectively). The description of *Monobothrium* sp. in the present work was similar to that described by Oniye *et al*.[21] and Olofintoye[22] .This species was closely similar in morphology to that mentioned by Eissa *et al*.[10] who collected specimens from the River Nile at Kafr El-Sheikh Governorate. The infection rate of *Monobothrium* sp. in the present study was 13.3%, which was very close to that reported by Eissa *et al*.[10] (14.5%). The prevalence of this worm in the present study was lower than that described by other researchers[11,23,24]. This may be attributed to various factors, such as the difference in locality, climate conditions, the numbers of examined fishes, seasonal variations and the different hydrobiological factors, which play an important role in the transmission of the parasites. Generally, the differences in prevalence of parasites in fish may be attributed to many factors, as suggested by Williams and Jones[25], where parasitism is determined by the interaction between both biotic and abiotic factors and varies in different aquatic ecosystems. Reports have shown that helminths are generally found in all freshwater fishes, with their prevalence and intensity dependent on factors of parasite species, host and its feeding habits, type of pollution in the water body, and presence of intermediate hosts for the parasites[26].

The characters of *paracamallanus cyathopharynx* in the present work were in agreement with Moravec and Van As[27] and Rindoria *et al*.[28]. Scanning electron microscope showed that there were small tridents anterior to the larger tridents of the buccal capsule. This character was not observed previously for *paracamallanus cyathopharynx* or any camallanid. In the present work, the study of the caudal ends of *paracamallanus cyathopharynx* females indicated that they possessed four digitate processes. This character was in agreement with Rindoria *et al*.[28] who illustrated four digitate processes at the tip of female's tail. On the other hand, Moravec and Van As[27] recorded only three caudal processes from females. Regarding the caudal ends of males, scanning electron microscope observed the presence of two spicules in males; right and left spicules. The right spicule was large, harpoon-shaped and highly sclerotized. It also had a sharp and pointed end. The infection rate with *paracamallanus cyathopharynx* in the present work was 18.5%, lower than that recorded by Rindoria *et al*.[28] (52.91%). In conclusion, the present study updated the prevalence and intensity of parasitic helminths in *Clarias gariepinus* in Fyoum Governorate, as well as provided additional morphological characters for *Paracamallanus cyathopharynx* based on the scanning electron microscopy.

FUNDING SOURCE DISCLOSURE

This study did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

CONFLICT OF INTEREST

The authors have no potential financial conflict of interest.

AUTHORS' CONTRIBUTION

DAA: master assay supervisor, planned, guided the data collection, and reviewed the manuscript. SNA: master's student responsible for the assay, participated in the planning, data analysis, and writing the manuscript. HMA: assistant supervisor,

assisted in the setup and evaluation of experiments and in the analysis of the data. MTMA: assistant supervisor, assisted in the setup and evaluation of experiments and in the analysis of the data. All authors have read and approved the manuscript.

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How to cite this article:
Al-Bassel, D. A.; Abu-Elhasan, Sh. N.; Abdel-Haleem, H. M. and Atwa, M. Th. M. (2023). Parastitic helminths of the freshwater catfish (*Clarias gariepinus*) from Fayoum governorate, Egypt. Egyptian Journal of Zoology, 79: 95-107 (DOI:10.21608 /ejz.2022.150510.1086).

الديدان الطفيلية لقرموط المياه العذبة (*Clarias gariepinus*) من محافظة الفيوم، مصر

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تُعد الأمراض الطفيلية واحدة من أهم العوامل التى تعيق تنمية تربية الأحياء المائية، حيث إن طفيليات الأسماك لا تسبب فقط إصابات للأسماك، بل قد تؤدى أحيانا إلى الوفاة. هدفت الدراسة الحالية إلى تسجيل وتحديث المعلومات عن انتشار وشدة الإصابة الداخلية بالديدان الطفيلية في سمك القرموط "*Clarias gariepinus*" بمحافظة الفيوم، مصر. تم جمع عدد "368" عينة من سمك القرموط من بحر يوسف (خط نهر النيل) بمحافظة الفيوم فى الفترة من يناير 2019 إلى فبراير 2021، وفحصها للتعرف على أنواع الديدان الطفيلية التى تصيب هذه الأسماك. ومن بين "368" سمكة تم فحصها، تبين أن "227" سمكة (61.7%) مصابة بستة أنواع من الديدان الطفيلية (ثلاثة تريماتودا، واثنتين من الديدان الخيطية، ونيماتودا واحدة) ، وهي
"*Dactylogyrus claridii, Acanthostomum spiniceps, Orientocreadium batrachoides, Polyonchobothrium clarias, Monobothrium* sp. and *Paracamallanus cythopharynx*"
وبمعدلات إصابة = 13.0%، و 2.2%، و 5.4%، و 9.2%، و 13.3%، و 18.5%، على التوالي. وفيما يتعلق بالتغيرات الموسمية، وجدت النتائج المتحصل عليها أن أعلى نسبة إصابة سُجلت كانت خلال فصل الربيع (76.9%)، يليه فصلي الصيف (70.0%) والشتاء (53.3%)، بينما فصل الخريف يمثل أقل معدل إصابة (52.3%). بالإضافة لذلك، فإن هذه الدراسة توصلت لبعض الخصائص الشكلية الإضافية للطفيلي "*Paracamallanus cyathopharynx*" بناء على دراسة بالمجهر الإلكترونى الماسح.