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Dayhoum A.H.M. Al-Bassel

A general survey of the helminth parasites of fish from inland waters in the Fayoum Governorate, Egypt

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Abstract During the present investigation, 450 fishes belonging to seven genera and seven species were examined for helminth parasites. Of these, 220 fishes (48.8%) were found to harbour Acanthocephala (14%), cestodes (16.22%), Digenea (10.66%), Monogenea (1.77%), or nematodes (6.22%). The species richness and intensity of infections are given. Results summarized from nine studies on the helminth parasites of fish from inland waters are presented. The incidence of infection is reported and compared in host/parasite lists.

Materials and methods

Most of the fishes collected from the three localities were captured alive and were examined for helminth parasites as soon as possible. Obtained cestodes and trematodes were first relaxed and then fixed in hot 70% alcohol or 5% formalin. Worms were then stained using aceto-alum-carmin stain. Nematodes were fixed in hot 70% alcohol and cleared in lactophenol. Acanthocephala were put in the refrigerator before being fixed in 5% formalin. Drawings were made using a camera lucida. The name of each fish was identified according to Boulenger (1907).

Introduction

In Egypt, there are nine lakes and about 1,300 fish farms, distributed all over the country. Lakes Bardaweel, Burullus, Edku, Manzala, Maryut, Port-Foad and Wadi Al-Raiyan contain brackish water, Lake Nasser has fresh water and lake Qarun has salt water. The Delta Governmental fish farms Al-Abassa, Al-Manzala, Al-Zawya, Barseek and Maryut have brackish water and Al-Rasswa is filled with salt water. Fayoum fish farms use brackish water.

The parasites of fish from inland waters in Egypt have been studied by several investigators (Imam 1971; Wannas 1977; Mohammed 1978; Hassan 1980; Sahlab 1982; Abo Al-Hag 1985; Al-Bassel 1987, 1990; Negm-Eldin 1987; Abo El-Ez 1988). Three localities, Lake Qarun (a closed basin, water level about 44 m below mean sea level and occupying the deepest part of the Fayoum depression in the Western Desert), Bahr Youssef (a small branch of the Nile, the main fresh water supply of the Fayoum Governorate) and the Fayoum fish farms situated close to Lake Qarun were selected as sites for the present work.

Results and discussion

Incidence of helminthic groups in the fishes of the three different locations

Trematode infections

Monogenea were found only in *Tilapia galilaea* from Fayoum fish farms; and their incidence was 1.77% (Table 1). Recent surveys on the helminth parasites of *Tilapia* spp in different localities in Egypt failed to demonstrate these parasites (Wannas 1977; Hassan 1980; Sahlab 1982; Abo Al-Hag 1985; Al-Bassel 1987; Negm-Eldin 1987; Table 2). Al-Bassel (1990) re-described these parasites from *T. nilotica* from the fish farm Maryut in Egypt, with an incidence of 0.58%.

Although the present work did not include the investigation of encysted metacercariae, these parasites were reported by several investigators from the Nile: El-Aroussi (1984) from *Clarias lazera* with an incidence of 60.66%, El-Naffar and El-Shahawy (1986) from *C. lazera*, *Mormyrus kannume* and *T. galilaea*, with an incidence of 90.89%, 76% and 71.51%, respectively, and El-Dally (1988) from *C. lazera*, with an incidence of 71.25%. Al-Bassel (1990) reported encysted metacercariae from *C. lazera*, *Schilbe mystus* and *T. galilaea* from Lake Nasser, with an incidence of 70%, 92% and 82%, respectively.

Digenean infections were reported in *C. lazera*, *Mugil capito* and *Synodontis schall*. The incidence (30%) in

D.A.H.M. Al-Bassel
Department of Zoology, Faculty of Science,
Cairo University, Fayoum Branch, Fayoum, Egypt
E-mail: dayhum@yahoo.com

Table 1 Incidence of helminth parasites in fish at different localities in Egypt

Fish species	Locality	Total examined	Total infected		Trematoda				Cestoda		Nematoda		Acanthocephala	
			No.	%	Monogenea		Digenea		No.	%	No.	%	No.	%
					No.	%	No.	%						
<i>Mugil capito</i>	Lake Qarun	50	15	30	0	0	15	30	0	0	0	0	0	0
	Fayoum fish farms	50	23	40	0	0	20	40	0	0	0	0	3	6
<i>Tilapia galilaea</i>	Bahr Youssef	50	45	90	0	0	0	0	0	0	5	10	40	80
	Fayoum fish farms	50	12	24	8	16	0	0	0	0	0	0	4	8
<i>Clarias lazera</i>	Bahr Youssef	50	16	32	0	0	7	14	6	12	3	6	0	0
<i>Barbus bynni</i>	Bahr Youssef	50	25	50	0	0	0	0	25	50	0	0	0	0
<i>Lates niloticus</i>	Bahr Youssef	50	26	52	0	0	0	0	0	10	20	16	32	0
<i>Synodontis schall</i>	Bahr Youssef	50	12	24	0	0	6	12	2	4	4	8	0	0
<i>Mormyrus kannume</i>	Bahr Youssef	50	46	92	0	0	0	0	40	80	6	12	0	0

Table 2 The incidence of helminth parasites in freshwater fish from different localities in Egypt. *Acanth.* Acanthocephala, *Cest.* cestodes, *Digen.* digenetic trematodes, *Monog.* Monogenea, *Nema.* Nematoda

Fish	Author	Locality	Total examined	Total infected (%)	Monog. (%)	Digen. (%)	Cest. (%)	Nema. (%)	Acanth. (%)
<i>Tilapia galilaea</i>	Wannas (1977)	Lake Nasser	40	100.0	0.0	62.5	0.0	20.0	100.0
	Hassan (1980)	Lake Nasser	200	50.0	0.0	0.0	0.0	46.0	43.0
	Abo Al-Hag (1985)	Nile, in Sharkiya	10	0.0	0.0	0.0	0.0	0.0	0.0
	Al-Bassel (1987)	Lake Wadi Al-Rayin	18	22.2	0.0	0.0	0.0	0.0	22.2
	Al-Bassel (1990)	Lake Nasser	50	100.0	0.0	0.0	0.0	100.0	6.2
<i>Clarias lazera</i>	Wannas (1977)	Lake Nasser	20	15.0	0.0	0.0	5.0	0.0	10
	Mohammed (1978)	Nile, near Cairo	24	81.3	0.0	81.3	0.0	0.0	0.0
	Hassan (1980)	Lake Nasser	50	82.0	0.0	44.0	62.0	6.0	0.0
	Sahlab (1982)	Lake Manzala	66	68.1	0.0	30.3	15.2	22.7	0.0
	Abo Al-Hag (1985)	Nile, in Sharkiya	86	68.6	0.0	56.9	12.7	12.7	0.0
	Al-Bassel (1987)	Lake Wadi Al-Raiyan	86	17.4	0.0	17.4	0.0	0.0	0.0
	Negm-Eldin (1987)	Nile, in Delta	166	85.5	0.0	82.5	16.3	40.4	0.0
	Abo El-Ez (1988)	Nile, in Giza	111	89.2	0.0	75.7	32.4	39.6	0.0
	Al-Bassel (1990)	Lake Nasser	50	92.0	0.0	32.0	22.0	60.0	0.0
<i>Barbus bynni</i>	Wannas (1977)	Lake Nasser	60	91.6	0.0	53.0	83.3	0.0	0.0
	Hassan (1980)	Lake Nasser	100	66.0	0.0	38.0	54.0	7.0	0.0
	Abo Al-Hag (1985)	Nile, in Sharkiya	10	20.0	0.0	0.0	0.0	20.0	0.0
	Al-Bassel (1987)	Lake Wadi Al-Raiyan	30	13.3	0.0	0.0	13.3	0.0	0.0
	Al-Bassel (1990)	Lake Nasser	50	70.0	0.0	0.0	52.0	18.0	0.0
<i>Synodontis schall</i>	Abo El-Ez 1988	Nile, in Giza	72	62.5	0.0	48.6	41.7	8.3	0.0
	Al-Bassel (1990)	Lake Nasser	50	84.0	0.0	14.0	2.0	68.0	0.0
<i>Lates niloticus</i>	Abo El-Ez (1988)	Nile, in Giza	87	64.4	0.0	0.0	0.0	24.1	50.6
	Al-Bassel (1990)	Lake Nasser	50	98.0	0.0	0.0	0.0	72.0	52.0
<i>Mormyrus kannume</i>	Al-Bassel (1990)	Lake Nasser	50	100.0	0.0	0.0	86.0	42.0	0.0

M. capito from Lake Qarun was less than that in the same species (40%) from Fayoum fish farms and less than the 72.85% reported by Al-Bassel (1990) in the same host from Lake Qarun. This decrease in the incidence may be due to the increase in salinity and pollution influx into the Lake Qarun during the past 10 years. Moravec and Libosvsky (1975) reported an incidence range of 15–90% in *M. capito* from Lake Burullus in Egypt. An incidence of 12–14% was reported in *C. lazera* and *S. schall* from Bahr Youssef (Table 1). Digenetic trematodes were not found in *Barbus bynni*, *Lates niloticus* and *Mormyrus kannume*. Imam (1971) reported an incidence of 92.4% in *M. capito* and 96.61% in *S. schall* from the river Nile. Various investigators reported different incidences in the same fishes from further localities (Table 2).

Cestode infections

These infections were reported from *C. lazera*, *Barbus bynni*, *M. kannume* and *S. schall* from Bahr Youssef, their incidence reaching 4%, 12%, 50% and 80%, respectively (Table 1). Al-Bassel (1990) described these infections in the same hosts from Lake Nasser, with an incidence of 2%, 22%, 52% and 86% respectively. Imam (1971) described such infections in *B. bynni*, *C. lazera* and *S. schall* from the Nile in Cairo, their incidence being 6%, 41% and 100% respectively. No cestodes were found in other examined fishes. Al-Bassel (1987) reported cestode infections in *B. bynni* from Lake Wadi Al-Raiyan in Fayoum, with an incidence of 13.3%. Various investigators

reported cestodes in freshwater fishes from different localities in Egypt. The incidence is shown in Table 2.

Nematode infections

These infections are widely distributed in most examined fishes, except *Mugil capito* and *B. bynni*, which were free of nematodes. The highest incidence (20%) was reported in *Lates niloticus* and the lowest (6%) in *C. lazera* (Table 1). Imam (1971) observed nematodes in Nile fishes, with an incidence of 92.54% in *S. schall* and 3.8% in *Bagrus bayad*. Various other workers found nematodes in freshwater fishes, as shown in Table 2.

Acanthocephalan infections

Such infections were reported in *L. niloticus*, *M. capito* and *T. galilaea*. The lowest incidence was 6% in *M. capito* from Fayoum fish farms and the highest

reached 80% in *T. galilaea* from Bahr Youssef (Table 1). Moravec and Libosvsky (1975) described the lowest incidence (5%) in *M. capito* and the highest (18.2%) in *M. cephalus*, both fish originating from Lake Burullus in Egypt. Differences in the incidence are compiled in Table 2.

With respect to the incidence of specimens of the above-described four groups of worms, three observations are very important:

1. Monogenean infections were restricted to fresh-water fish (*Tilapia* spp) from fish farms (Maryut, Fayoum).
2. No cestodes or nematodes were observed in *M. capito*.
3. Acanthocephalan infections recorded in *M. capito* from Fayoum fish farms (brackish water) were not found in the same fish species from Lake Qarun (salt water).

These findings may be based on the presence or absence of appropriate intermediate hosts (e.g. Dogiel 1962).

Table 3 Intensity of infection and list of parasites for the different fishes examined. The intensity is the number of parasitic species/fish. A Acanthocephala, C cestodes, M Monogenea, N Nematoda, T digenetic trematodes

Fish	Locality	Genus of parasite	Species	Intensity		
<i>Mugil capito</i>	Lake Qarun	<i>Saccocoelium</i> Looss, 1902 (T)	<i>S. tensum</i> Looss, 1902	9-90		
			<i>S. obesum</i> Looss, 1902	9-70		
			<i>S. gohari</i> Al-Bassel, 1987	3-7		
			<i>S. saoudi</i> Al-Bassel, 1990	2-3		
			<i>Haploporus</i> Looss, 1902 (T)	<i>H. lateralis</i> Looss, 1902	9-50	
				<i>H. lossii</i> Al-Bassel, 1990	3-5	
				<i>H. benedenii</i> Looss, 1902	8-60	
			<i>Lecithobotryes</i> Looss, 1902 (T)	<i>L. putrescens</i> Looss, 1902	7-40	
				<i>L. helmymohamedi</i> Al-Bassel, 1987	4-7	
		<i>Neohaploporus</i> Manter, 1963 (T)	<i>N. qarunensis</i> Al-Bassel, 1987	1-2		
		<i>Unicoelium</i> Thacher and Dossmann, 1975 (T)	<i>U. fayoumensis</i> Al-Bassel, 1987	2-4		
		<i>Neosaccocoelium</i> Al-Bassel, 1990 (T)	<i>N. aegyptiacus</i> Al-Bassel, 1990	1-2		
		<i>Unisaccus</i> Martin, 1983 (T)	<i>U. elnaffari</i> Al-Bassel, 1990	2-3		
		<i>Haplospianchus</i> Looss, 1902 (T)	<i>H. stunkardi</i> Gupta and Ahmad, 1979	6-9		
			<i>H. indica</i> Gupta and Ahmad, 1979	8-9		
			<i>H. pachysoma</i> Looss, 1902	5-30		
			<i>H. otolithi</i> Gupta and Ahmad, 1979	3-5		
			<i>H. edkuensis</i> Al-Bassel, 1990	1-2		
			<i>S. elgindy</i> Al-Bassel, 1990	2-4		
<i>H. pachysomus</i> Looss, 1902	5-35					
<i>D. contractus</i> Looss, 1902	4-6					
<i>D. maryutensis</i> Al-Bassel, 1990	1-2					
<i>S. magniovatus</i> Szidat, 1954	1-2					
<i>Tilapia galilaea</i>	Bahr Youssef	<i>Saccocoelioides</i> Szidat, 1954 (T)	<i>N. ichthyobori</i> Saoud et al., 1974	2-5		
			<i>Contraecaecum</i> Railliet and Henry, 1912 (N)	<i>Contraecaecum larvae</i> Mayers, 1962	3-5	
		<i>Neoechinorhynchus</i> Stiles and Hassall, 1904 (A)	<i>A. tilapiae</i> Baylis, 1948	5-8		
		<i>Acanthosentis</i> Verma and Datta, 1929 ()	<i>G. funduli</i> Hargis, 1955	9-32		
		<i>Gyrodactylus</i> Nordmann, 1832 (M)	<i>A. tilapiae</i> Baylis, 1948	1-2		
		<i>Acanthosentis</i> Verma and Datta, 1929 ()	<i>O. batracoides</i> Tubangui, 1931	3-5		
		<i>Clarias lazera</i>	Bahr Youssef	<i>Polyonchobothrium</i> Diesing, 1854 (C)	<i>P. clarias</i> Meggitt, 1930	2-4
				<i>Procamallanus</i> Baylis, 1923 (N)	<i>P. laeiconchus</i> Baylis, 1923	3-6
		<i>Barbus bynni</i>	Bahr Youssef	<i>Bothriocephalus</i> Rudolphi, 1808 (C)	<i>B. barbus</i> Fahmy et al., 1978	6-9
		<i>Lates niloticus</i>	Bahr Youssef	<i>Cucullanus</i> Mueller, 1777 (N)	<i>C. barbi</i> Paperna, 1964	4-6
<i>Paragorhynchus</i> Golvan, 1957 (A)	<i>P. chariensis</i> Troncy, 1969			3-5		
<i>Synodontis schall</i>	Bahr Youssef	<i>Sandonia</i> McClelland, 1957 (T)	<i>S. sudanensis</i> McClelland, 1957	1-2		
		<i>Wenyonia</i> Woodland, 1923 (C)	<i>W. virilis</i> Woodland, 1923	1		
<i>Mormyrus kannume</i>	Bahr Youssef	<i>Cithariniella</i> Khalil, 1964 (N)	<i>C. citharini</i> Khalil, 1964	3-4		
		<i>Proteocephalus</i> Fuhrmann and Baer, 1925 (C)	<i>P. pentastoma</i> La-Rue, 1911	2-4		
		<i>Cucullanus</i> Mueller, 1777 (N)	<i>C. barbi</i> Paperna, 1964	4-6		

Presence of specific genera of parasites in fishes from the three locations

Helminth parasites were identified to species level. It is worth mentioning that double and triple infections with specimens of the major groups of helminth parasites were reported in all fish examined, except the single infection with cestodes seen in *B. bynni* from Bahr Youssef (Table 1).

Infections of *M. capito*

Nine genera and 20 species of digenetic trematodes were reported in specimens from Lake Qarun, while three genera and four species were reported from Fayoum fish farms. No acanthocephalans were reported in Lake Qarun, although these parasites were found in Fayoum fish farms (Table 3). The genera *Haploplanchnus* and *Saccocoeloides* were found in two localities (Lake Qarun, Fayoum fish farms). The genera *Dicrogaster* and *Neoechinorhynchus* were restricted to Fayoum fish farms, but the genera *Haploporus*, *Lecithobotryes*, *Neohaploporus*, *Neosaccocoelium*, *Saccocoelium*, *Unicoelium* and *Unisaccus* were restricted to Lake Qarun. The genera *Haploplanchnus* and *Saccocoelium* were the first competitors of other trematode genera in Lake Qarun, while the genera *Dicrogaster* and *Haploplanchnus* were the first competitors of the other genera in Fayoum fish farms (Table 3). Infections with *Haploplanchnus* and *Saccocoelium* were more numerous, compared with other genera in Lake Qarun. Here, the highest intensity of infections (9–90 parasites/fish) was noted in the case of *S. tensus* and the lowest (1–2 parasites/fish) was noted for *H. edkuensis*, *Neohaploporus qarunensis*, *Neosaccocoelium aegyptiacus*

In Fayoum fish farms, the highest intensity (5–35 parasites/fish) was recorded for infection with *H. pachysomus* and the lowest (1–2 parasites/fish) was noted for *S. magniovatus* (Table 3). It is interesting to note that all the above recorded genera of trematodes were known from mullets in the Mediterranean Sea. Accordingly, it may be assumed that the original specimens of *Mugil* spp which were transferred from the Mediterranean Sea to Lake Qarun must have carried the parasites. The parasites survived in Lake Qarun due to the presence of suitable intermediate hosts (Al-Bassel 1990).

Infections of *T. galilaea*

The acanthocephalan parasite *Acanthosentis tilapiae* was found in Bahr Youssef and Fayoum fish farms. The infection intensity ranged from 1–2 parasites/fish to 5–8 parasites/fish, respectively. The larvae of the nematode *Contracaecum* were found only in Bahr Youssef, with an intensity of 3–5 parasites/fish. Al-Bassel (1990) reported the same parasite from the same host in Lake Nasser with an intensity of 1–25 parasites/fish. Bahr

Youssef represented a new locality-record for this parasite. The monogenean parasite *Gyrodactylus funduli* was found in Fayoum fish farms with an intensity of 9–32 parasites/fish. Al-Bassel (1990) reported the occurrence of this parasite in *T. nilotica* at the Maryut fish farm, reaching 10–50 parasites/fish. *T. galilaea* and the Fayoum fish farms were found to be a new host and locality record for this parasite.

Infections of other fish from Bahr Youssef

Five species of freshwater fish were examined (Table 3). *Clarias lazera* were found infected with *Orientocreadium batracoides*, *Polyonchobothrium clarias* and *Procamallanus laeviconchus*, with intensities of 3–5, 2–4 and 3–6 parasites/fish, respectively. *Barbus bynni* were found infected with the cestode genus *Bothriocephalus barbui*, reaching 6–9 specimens/fish. *Lates niloticus* were infected with *Cucullanus barbi* (4–6 parasites/fish) and *Paragorgorhynchus chariensis* (3–5 parasites/fish). *Synodontis schall* were found infected with *Cithariniella citharini* (3–4 parasites/fish), *Sandonia sudanensis* (1–2 parasites/fish) and *Wenyonia virilis* (1 parasite/fish). Finally, *Mormyrus kannume* was infected with *Cucullanus barbi* and *Proteocephalus pentastoma* with an intensity of 4–6 and 2–4 parasites/fish, respectively (Table 3).

Thus, the infection rates in *Clarias lazera* and *Synodontis schall* were higher than those in *Barbus bynni*, *Lates niloticus* and *Mormyrus kannume*. The highest intensity of infection (6–9 parasites/fish) were noted in *B. bynni* and the lowest (1 parasite/fish) in *S. schall*.

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