Chapter 8
Fish Parasites and Diseases

Considerable attention has been given to fish parasites in Lake Nasser by various investigators, dating back to the seventies. Wannas (1977) recorded 10 genera of helminth parasites in his investigation in 1974 - 1976. During the last five years some tilapia fish procured from the Lake and sold in various fish markets in Cairo, were found to be harbouring a heavy infection of nematodes in the head and viscera. This caused panic among consumers and raised a lot of inquiries about their nature and how they affect public health. To stop worries of the consumers, the authorities took a decision to decapitate tilapias of Lake Nasser before selling them to the public, and until now, they are still sold decapitated, a fact that has had a great effect upon marketing of Lake fishes in general. Therefore many studies of the Lake fish parasites and their impact on public health have been conducted during the last twenty years.

PREVALENCE OF PARASITE INFECTION

Saoud & Wannas (1984), in their investigation during 1974 to 1976 on fish parasites of Lake Nasser, examined 850 fishes belonging to 19 species. They examined the fish for trematodes, cestodes, nematodes, aspidocotyleans and acanthocephalans. Their results are shown in Table 98 and can be summarized as follows :

General prevalence. 615 fishes out of 850 (72.4%) were positive for helminth infections. The positive hosts were infected with one or more groups of trematodes, cestodes, aspidocotyleans, nematodes and acanthocephalans. Prevalence of different groups arranged in their order of frequency was 26.6% for trematodes, 24.8% for acanthocephalans, 22.6% for nematodes, 11.7% for cestodes and 0.1% for aspidocotyleans.

Trematode infections. Digenetic trematodes have been reported in eight host species belonging to five genera. The hosts were *Barbus bynni, Bagrus bajad, B.*

docmak, Synodontis schall, S. serratus and *Tetraodon lineatus.* One type of metacercaria was found in *Oreochromis niloticus* and *Sarotherodon galilaeus*. Amongst infected fish, the highest prevalence of digenetic trematodes was recorded in *Bagrus bajad* (88.9%) while the lowest was found in *O. niloticus* (33.3 %).

Cestode infections. Cestodes were recorded from *Barbus bynni, Clarias gariepinus* and *Malapterurus electricus.* The highest prevalence was found in *Malapterurus electricus* (96%) while the lowest was recorded in *Clarias gariepinus* (5%).

Aspidocotylean infections. These parasites were very rarely seen, being only recorded in one fish species *Synodontis schall,* with a prevalence of 2.0%.

Nematode infections. These were recorded from 8 species belonging to 5 genera. The positive hosts include: *Labeo horie, L. coubie, Synodontis schall* and *S. serratus, Lates niloticus, O. niloticus* and *S. galilaeus* and *Hydrocynus forskalii.* The highest prevalence of nematodes was found in *Labeo horie* (75.0%) and the lowest in *Lates niloticus* (10.0%).

Acanthocephalan infections. These helminth parasites were reported from 7 species of fish, belonging to 5 genera. The fish hosts were: *Clarias gariepinus, Bagrus bajad, B. docmak,Lates niloticus, S. galilaeus, O. niloticus* and *Tetraodon lineatus.* The highest prevalence of acanthocephalans was found in *S. galilaeus* (100%) and the lowest in *Clarias gariepinus* (10.0%).

Saoud & Wannas (1984) determined the prevalence of the digenetic trematodes, aspidocotyleans as well as acanthocephalans collected from different fishes, that can be summarized as follows:

A. Digenetic trematode infections

1. *Astiotrema* infections. This genus was recorded only from *Tetraodon lineatus* without a single exception, all helminthologically positive fish were infected with this genus of trematodes.

2. *Acanthostomum* infections. This genus was found only in genus *Bagrus*. Its prevalence in the two infected *Bagrus* species, varied from 76.9% in *Bagrus docmak* to 87.5% in *Bagrus bajad*.

3. *Allocreadium* infections. This genus was recorded only from *Babrus bynni*. Its prevalence reached 58.2%.

4. *Haplorchoides* infections. This trematode genus was only found in genus *Bagrus*. Without a single exception, all examined fish of either *B. bajad* or *B. docmak* were infected with this trematode genus.

5. *Basidiodiscus* infections. This genus was only found in the genus *Synodontis*. Its prevalence was high, varying from 96.4% in *S. schall* to 100% in *S. serratus.*

6. *Sandonia* infections. This trematode genus was recorded only in genus *Synodontis*, with a prevalence of 96.4% in *S. schall* and 100% in *S. serratus.*

Table 98 **Prevalence of trematodes, cestodes, aspidocotyleans, nematodes and acanthocephalans in fishes of Lake Nasser (Saoud & Wannas 1984) (* Metacercariae).**

Species	Infections												
	No.	Positive		Trematodes		Cestodes		Aspidocotylea		Nematodes		Acanthocephala	
	Examined	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Labeo horie **Heck.**	40	30	75.0	0	0	0	0	0	0	30	75.0	0	0
Labeo coubie **Rüpp.**	20	14	70.0	0	0	0	0	0	0	14	70.0	0	0
Barbus bynni **(Forsk.)**	60	55	91.7	32	53.3	50	83.3	0	0	0	0	0	0
Clarias gariepinus **(Burch.)**	20	3	15.0	0	0	1	5.0	0	0	0	0	2	10.0
Schilbe mystus **(L.)**	25	0	0	0	0	0	0	0	0	0	0	0	0
Bagrus bajad **(Forsk.)**	45	45	100	40	88.9	0	0	0	0	0	0	5	11.1
Bagrus docmak **(Forsk.)**	15	15	100	13	86.7	0	0	0	0	0	0	2	13.3
Chrysichthys auratus **(Geoffro.)**	20	0	0	0	0	0	0	0	0	0	0	0	0
Synodontis schall **(Bloch. & Sch.)**	50	45	90	27	54.0	0	0	1	2.0	32	64.0	0	0
Synodontis serratus **Rüpp.**	10	7	70.0	6	60.0	0	0	0	0	3	30.0	0	0
Malapterurus electricus **(Gm.)**	50	48	96.0	0	0	48	96.0	0	0	0	0	0	0
Lates niloticus **(L.)**	100	100	100	0	0	0	0	0	0	10	10.0	95	95.0
Oreochromis niloticus **(L.)**	60	58	96.7	20*	33.3*	0	0	0	0	10	16.7	58	96.7
Sarotherodon galilaeus **(Arf.)**	40	40	100	25*	62.5*	0	0	0	0	8	20.0	40	100
Tetraodon lineatus **L.**	75	70	93.3	63	84.0	0	0	0	0	0	0	9	12.0
Mormyrus kannume **(Forsk.)**	50	0	0	0	0		0	0	0	0	0	0	0
Mormyrus cachive **L.**	50	0	0	0	0	0	0	0	0	0	0	0	0
Hydrocynus forskalii **(Cuv.)**	100	85	85.0	0	0	0	0	0	0	85	85.0	0	0
Alestes dentex **(L.)**	20	0	0	0	0	0	0	0	0	0	0	0	0
Total	**850**	**615**	**72.4**	**226**	**26.6**	**99**	**11.7**	**1**	**0.1**	**192**	**22.6**	**211**	**24.8**

Clinostomum **(metacercaria) infections.** This metacercarial stage of the genus *Clinostomum* was found in tilapiine fishes. All infected fish had this metacercaria. The prevalence of infection was 27.9%. Mohamed & Sahlab (1993) found that the intensity of infection was up to 19 cysts in a fish. They were recovered from the branchial organs, eye sockets and pharynx, where they were localized as hypodermic cysts: whitish yellow in colour, of pea-sized, and embedded in tissues or attached free. The average size of each cyst was up to 5 mm in diameter.

B. Aspidocotlean infections

***Aspidogaster* infections**. An infection with this genus had been found only in a single specimen of *Synodontis schall* out of 50 specimens examined.

C. Acanthocephalan infections

1. ***Acanthosentis* infections**. This genus was only recorded from tilapiine fish. All infected *O. niloticus* and *S. galilaeus* had this genus of Acanthocephala. The intensity of infection was at its maximum in summer and reached a minimum in winter. The number of parasites per fish ranged from 8 to 23 in summer, while the corresponding figure for winter was 3 to 7.

2. ***Paragorgorhynchus* infections.** A new species of this genus (*P. aswanensis*) was described for the first time by Saoud & Wannas (1990) in Lake Nasser. This species was recorded from five fish species belonging to four genera including *Lates niloticus*, *Bagrus docmak*, *B. bajad, Tetraodon lineatus* and *Clarias gariepinus*. The highest prevalence amongst infected fish was 95% in *Lates niloticus* while the lowest was 11.1% in *Bagrus bajad*, 13.3% in *B. docmak* and 12.8% in *Tetraodon lineatus*. The intensity of infection also varied in different fish genera, being 87-200 per fish in *Lates niloticus*, 9-22 in *Tetraodon lineatus*, 4 -15 in *Bagrus bajad* and *B. docmak* and 4 - 7 in *Clarias gariepinus*.

The worms collected from *Lates niloticus* were larger in size than those from other hosts. Also the number of eggs in female worms, used as an indication of fertility, was highest in *Lates niloticus* compared to other hosts. This would indicate that *Lates niloticus* is a more favourable host of *P. aswanensis* than the other hosts.

In another more detailed survey of the helminth parasites in Lake Nasser, El-Naffar *et al*. (1983) examined 4733 fishes, belonging to 30 species. Out of the total number examined, 2645 (55.88%) were found to harbour one or more species of parasites, 403 (8.5%) were found harbouring trematodes, 220 (4.65%) harboured cestodes, 2256 (47.66%) harboured nematodes and 498 (10.52%) harboured acanthocephalans (Table 99). The highest prevalence of infestation with trematodes occurred in *Tetraodon lineatus* (92%), while the maximum prevalence of cestode parasites was 65.7% in *Clarias anguillaris*. The maximum prevalence with nematode parasites was found in *Hydrocynus forskalii* and *H. vittatus* (95.2% and 94%, respectively). The maximum prevalence of acanthocephalans was 80% in *Lates niloticus*. El-Naffar *et al.* (1983) did not record any helminth parasite in *Anguilla anguilla*, *Mormyrus caschive, M. kannume, Chrysichthys auratus, C. rueppelli* and *Malapterurus electricus*, thus, confirming the previous finding of Saoud & Wannas (1984) in 1974 - 1976.

El-Naffar *et al*. (1983) recorded nine trematode species in Lake Nasser (Table 100), including a new species *Astiotrema lazeri*. This species is a rare parasite collected from the intestine of *Clarias gariepinus*. Out of 50 fish examined, only one (2%) was found harbouring this species (*Astiotrema lazera*)

and the number of collected parasites was five (El-Naffer *et al*., 1984a). The latter authors also recorded 8 species of nematodes, three species of acanthocephalans and five species of cestodes including a new species: *Marsypocephalus aegyptiacus.* The latter parasite is a rare species collected from the intestine of *Clarias anguillaris*. Fifty fish were examined, but only four cestodes were collected from a single host (El-Naffar *et al*. 1984b).

Table 99 **The relative prevalence of helminths in different species of fish examined (El-Naffar *et al*. 1983).**

FISH Species	Parasites										
	Total			Trematodes		Cestodes		Nematodes		Acanthocephalans	
	Examined	Positive		No.	%	No.	%	No.	%	No.	%
	No.	No.	%								
Anguilla anguilla	3	-	-	-	-	-	-	-	-	-	-
Mormyrus cachive	50	-	-	-	-	-	-	-	-	-	-
Mormyrus kannume	65	-	-	-	-	-	-	-	-	-	-
Hydrocynus forskalii	500	476	95.2	-	-	-	-	467	95.2	-	-
Hydrocynus vittatus	300	282	94	-	-	-	-	282	94	-	-
Hydrocynus brevis	300	270	90	-	-	-	-	270	90	-	-
Brycinus nurse	300	206	68.66	-	-	-	-	206	68.66	-	-
Alestes dentex	100	45	45	-	-	-	-	45	45	-	-
Alestes baremoze	100	10	10	-	-	-	-	10	10	-	-
Labeo niloticus	100	45	45	45	45	-	-	-	-	-	-
Labeo horie	150	23	15.33	23	15.33	-	-	-	-	-	-
Labeo coubie	150	20	13.33	20	13.33	-	-	-	-	-	-
Barbus bynni	100	66	66	38	38	54	54	7	7	-	-
Clarias anguillaris	35	28	80	12	34.28	23	65.71	1	2.85	-	-
Clarias gariepinus	50	41	82	22	44	31	62	3	6	-	-
Bagrus bajad	150	110	73.33	1000	66.66	-	-	64	42.65	-	-
Bagrus docmak	200	150	75	120	60	-	-	98	49	35	17.5
Chrysichthys auratus	100	-	-	-	-	-	-	-	-	-	-
Chrysichtys rueppelli	100	-	-	-	-	-	-	-	-	-	-
Synodontis schall	200	70	35.5	-	-	65	32.6	57	26.5	-	-
Synodontis serratus	150	52	34.66	-	-	47	31.33	40	26.66	-	-
Schilbe(Eutropius) niloticus	200	8	4	-	-	-	-	8	4	-	-
Schilbe* (*S.*) *mystus	150	70	46.66	-	-	-	-	70	46.66	-	-
Schilbe* (*S.*) *uranoscopus	200	85	42.5	-	-	-	-	85	42.5	-	-
Malapterurus electricus	5	-	-	-	-	-	-	-	-	-	-
Lates niloticus	300	260	86.66	-	-	-	-	260	86.66	240	80
Oreochromis niloticus	300	140	64.65	-	-	-	-	117	39	137	45.66
Sarotherodon galilaeus	200	100	50	-	-	-	-	92	46	86	4.3
Tilapia zillii	150	65	43.33	-	-	-	-	65	43.33	-	-
Tetraodon lineatus	25	23	92	23	92	-	-	-	-	-	-
Total	**4733**	**2645**	**55.88**	**403**	**8.51**	**220**	**4.65**	**2256**	**47.66**	**498**	**10.33**

Table 100 **The relative prevalence of helminth parasites in different species of fish from Lake Nasser (El-Naffar *et al.* 1983). Plates 50 to 62.**

Fish species	Parasites	No. of fish examined	Positve		No. of Parasites per inf.	Mean /fish
			No.	%		
	TREMATODA					
Labeo niloticus	*Nematobothrium labeonis*	100	45	45	2 - 6	(3)
Labeo horie	*Nematobothrium labeonis*	150	23	15.3	2 - 6	(4)
Labeo coubi	*Nematobothrium labeonis*	150	20	13.3	2 - 6	(4)
Barbus bynni	*Allocreadium aswanensis*	100	38	38	5 -14	(9)
	Allocreadium bynni	100	26	26	3 - 4	(3)
Clarias anguillaris	*Pristotrema clarii*	35	12	34.29	4 - 5	(4)
Clarias gariepinus	*Astiotrema lazeri*	50	1	2	5	(5)
	Orientocreadium lazeri	50	1	2	2	(2)
	Pristotrema clarii	50	20	40	6- 8	(7)
Bagrus bajad	*Acanthostomum spiniceps*	150	72	48	9-15	(12)
	Acanthostomum absconditum	150	50	33.3	7-17	(10)
Bagrus docmak	*Acanthostomum spinceps*	200	83	41.5	7-11	(9)
	Acanthostomum absconditum	200	90	45	7-15	(11)
Tetraodon lineatus	*Astiotrema impletum*	25	23	92	5-26	(14)
	NEMATODA					
Hydrocynus forskalii	*Philometroides hydrocyonae*	500	476	95.2	12-23	(7)
	Rhabdochona aegyptiacus	500	48	9.6	1-4	(3)
	Amplicaecum sp. (Larvae)	500	315	63	20-34	(25)
Hydrocynus vittatus	*Philometroides hydrocyonae*	300	282	94	10-17	(14)
	Rhobdochona aegyptiacus	300	35	11.6	3-5	(4)
	Amplicaecum sp. (Larvae)	300	168	56	12-25	(16)
Hydrocynus brevis	*Philometroides hydrocyonae*	300	270	90	9-20	(15)
	Rhabdochona aegyptiacus	300	36	12	3-4	(4)
	Amplicaecum sp. (Larvae)	300	49	16.3	7-15	(9)
Brycinus nurse	*Amplicaecum* sp. (Larvae)	300	206	68.66	5-15	(7)
Alestes dentex	*Amplicaecum* sp. (Larvae)	100	45	45	6-15	(12)
Alestes baremoze	*Amplicaecum* sp. (Larvae)	100	10	10	8-10	(8)
Barbus bynni	*Cucullanus barbi*	100	7	7	2-5	(3)
Clarias gariepinus	*Amplicaecum* sp. (Larvae)	50	3	6	12-15	(12)
Clarias anguillaris	*Amplicaecum* sp. (Larvae)	35	1	2.85	10	(10)
Bagrus bajad	*Thwaitia bagri*	150	14	9.3	3-5	(3)
	Amplicaecum sp. (Larvae)	150	64	42.6	8-22	(15)
Bagrus docmak	*Amplicaecum* sp. (Larvae)	200	98	49	14-25	(17)
Synodontis schall	*Cithariniella citharini*	200	57	28.5	6-20	(14)
Synodontis serratus	*Cithariniella citharini*	150	40	26.66	5-17	(10)
Schilbe niloticus	*Amplicaecum* sp. (Larvae)	200	8	4	6-10	(10)
Schilbe mystus	*Amplicaecum* sp. (Larvae)	150	70	46.66	7-23	(20)
Schilbe uranoscopus	*Amplicaecum* sp. (Larvae)	200	85	42.5	8-20	(15)
Lates niloticus	*Dichelyne fossor*	300	52	17.3	3-8	(5)
	Philometroides sp.	300	4	1.3	2-6	(4)
	Amplicaecum sp. (Larvae)	300	235	78.33	15-70	(41)
Oreochromis niloticus	*Amplicaecum* sp. (Larvae)	300	117	19	3-8	(5)
Sarotherodon galilaeus	*Amplicaecum* sp. (Larvae)	200	92	46	2-5	(3)
Tilapia zillii	*Amplicaecum* sp. (Larvae)	150	65	43.33	3-5	(3)
	CESTODA					
Barbus bynni	*Caryophyllaeus laticeps*	100	39	39	3-10	(5)
	Bothriocephalus barbus	100	15	15	3-4	(3)
Clarias gariepinus	*Proteocephalus sulcatus*	50	30	60	6-10	(7)
Clarias anguillaris	*Marsypocephalus aegyptiacus*	50	1	2	4	(4)
Synodontis schall	*Proteocephalus sulcatus*	35	23	65.71	6-10	(8)
Synodontis serratus	*Wenyonia virilis*	200	65	32.5	5-41	(14)
	Wenyonia virilis	150	47	31.3	3-28	(11)
	ACANTHOCEPHALA					
Bagrus docmak	*Neoechinorhynchus* sp.	200	35	17.5	3-5	(3)
Lates niloticus	*Tenuisentis niloticus*	300	240	80	7-16	(12)
Oreochromis niloticus	*Acanthosentis tilapiae*	300	137	45.66	3-10	(8)
Sarotherodon galilaeus	*Acanthosentis tilapiae*	200	86	43	4-7	(5)

On dealing with the habitat of the parasites in different organs in their hosts, El-Naffar *et al*. (1983) reported that the highest percentage (92.9%) of trematode parasites occurred in the intestine, while the lowest (7.06%) was in the orbital cavity of the eye. All the cestodes and acanthocephalans were found only in the intestine (100%). Regarding the nematodes, the highest percentage (59.55%) occurred in the muscles, followed by 40.54% in the fins.

In addition to fish parasites mentioned by El-Naffar *et al.* (1983) and Saoud & Wannas (1984), Al-Bassel (1990) recorded 4 more parasitic trematodes: *Cynodiplostomum* metacercariae from the muscles of *S. galilaeus* and *Clarias gariepinus, Prohemistomum* metacercariae from the muscles of *C. gariepinus; Metagonimus* metacercariae from the muscles of *Schilbe mystus,* and *Glossidium pedatum* from the intestine of *C. gariepinus.* He also recorded two cestodes: *Polyonchobobothrium clarias* from the intestine of *Clarias gariepinus* and *Proteocephalus pentastoma* from the intestine of *Mormyrus kannume;* as well as one nematode *Procamallanus laeviconchus* from the intestine of *C. gariepinus;* and one acanthocephalan *Paragorgorhynchus chariensis* from the intestine of *Lates nilotics.*

In 1992 Mohamed *et al*. (1994) isolated another two species of acanthocephalans from Lake Nasser fish, namely *Paragorgorhynchus albertianum* and *Acanthocephalus* sp. The prevalence of infestation in *Lates niloticus* was 85% with an intensity of 19 worms/microscopic field. The acanthocephaliasis was pronounced and manifested by heavy intestinal infestation with thorny headed worms which were strongly attached to the intestinal mucosal membrane using their proboscis' hooks. The histopathological alterations were moderate to severe inflammatory reactions characterized by hypertrophy, hyperplasia, and completely necrotic and sloughing areas in the intestinal mucosa with leucocytic infiltration, mainly by lymphocytes.

On the other hand, Garo (1993) in her study on parasitic nematodes of some locally consumed fish in Egypt, recorded two species in fish from Lake Nasser viz. *Cucullanus barbi* Baylis, 1923 and *Contracaecum* sp. Garo (1993) found 42 adult worms of *C. barbi* in the intestine of the fish hosts *Barbus bynni, Mormyrus kannume, M. caschive* as well as *Lates niloticus,* but El-Naffar *et al*. (1983) encountered them from *Barbus bynni* only. The juveniles of *Contracaecum* sp. were encountered in the branchial cavity and mainly in the sinus venosus of *Sarotherodon galilaeus*. However, Al-Bassel (1990) collected such juveniles from the abdominal and branchial cavities of a variety of fish species from Lake Nasser, viz. *Clarias gariepinus, Barbus bynni, Lates niloticus, Synodontis schall, Sarotherodon galilaeus* and *Mormyrus kannume.* On the other hand, Garo (1993) claimed that Ibrahim & Mahmoud (1988) misidentified such juveniles as belonging to *Amplicaecum* sp. when they were studying their histopathological effect on some Nile fish. Easa *et al.* (1989) recorded the infection of both tilapiine species in Lake Nasser by the nematode larvae type *Amplicaecum* (Baylis, 1920). The parasites were accumulated in the pericardial cavity and sinus venosus of the heart at a density of 3-15 worm larvae per infected fish.

SINGLE (PURE) INFECTION WITH ONE GENUS OF TREMATODA

Saoud & Wannas (1984) reported that in Lake Nasser the total prevalence of pure infections with one genus of trematodes was almost twice that of double infections with two genera of trematodes, being 65.5 and 34.5%, respectively. The lowest prevalence with one genus of trematodes was recorded from *Bagrus bajad* (12.5%) and *B. docmak* (23.0%), while in other species of fish that prevalence was 100% in all cases.

Pure infections with one trematode genus recorded from five genera of fishes with eight species are as follows:

1. Genus *Astiotrema*. The prevalence of this genus in pure infections is very high (100%) in *Tetraodon lineatus*.

2. Genus *Haplorchoides*. The prevalence of pure infections in this genus is low (12.5%) in *Bagrus bajad* but high in *Bagrus docmak,* it was 23%.

3. Genus *Allocreadium*. The prevalence of pure infections in this genus is 100% in *Barbus bynni*.

4. Genus *Clinostomum* (metacercaria). The metacercarial stage of genus *Clinostomum* is recorded in 100 % of infected *O. niloticus* and *S. galilaeus*.

SIMULTANEOUS INFECTIONS WITH TWO GENERA OF TREMATODES

Simultaneous infections of some fishes with two genera of trematodes have been encountered by Saoud & Wannas (1984) in Lake Nasser. The total prevalence of double infections with trematode genera was 34.5%. These infections were recorded from two genera of fishes with four species. The following combinations of trematode genera have been found in such infections:

1- *Acanthostomum* + *Haplorchoides*. The prevalence of this combination was 76.9% in *Bagrus docmak* and 87.5 % in *Bagrus bajad*. This combination was more commonly seen in young fish than in older ones.

2- *Basidiodiscus* + *Sandonia:* this combination was recorded from all infected *Synodontis schall* and *S. serratus*. In no single case was either parasite found alone in the infected host.

DISPERSION OF PARASITES WITH THE AGE OF HOST

In Lake Nasser, some parasites showed a significant dispersion relation throughout the age of their host, including the prevalence and intensity of infection (Saoud & Wannas, 1984). They found this relation in many examples such as:

1. The prevalence and intensity of infection with the acanthocephalan species *Paragorgorhynchus aswanensis* in *Lates niloticus* increased with the age of fish.

2. The prevalence and intensity of infection with the acanthocephalan *Acanthogyrus* (*Acanthosentis*) (Verma & Datta 1929) in *O. niloticus* and *S. galilaeus* increased with age of fish.

3. The prevalence and intensity of infection with trematodes of sub-genus *Acanthostomum* (*Atrophocaecum*) Bhalero, 1940 in *Bagrus bajad* and *Bagrus docmak* decreased with the age of fish.

4. The prevalence of genus *Haplrochoides* Chen, 1949, was almost constant throughout the age of fishes of genus *Bagrus,* but the intensity of infection decreased with the increase of age. The same result was obtained with trematodes of genus *Astiotrema* Looss, 1900 from *Tetraodon lineatus.*

5. The infection of *Bagrus bajad, B. docmak, Tetraodon lineatus* and *Clarias gariepinus* with Acanthocephala of the species *Paragorgorhynchus aswanensis* was only recorded from older fish; no young fish were infected.

6. The prevalence and intensity of infection with nematodes increased with age in *Hydrocynus forskalii.*

DISEASES FROM FISH PARASITES AND MEASURES FOR THEIR PRVENTION

Disease from *Contracaecum* arises in humans at a density of 3-15 worm larvae per infected fish when improperly cooked, smoked, or raw fish are eaten (Cheng 1976). Medical literature contains annually over 3000 cases of nematode infection only from Japan (Fontaine 1985). Generally, the risk of infection from nematodes is reduced when fish are gutted soon after capture; salting may also decrease prevalence. However, neither smoking nor light salting of fish normally affect larvae. Freezing at -20 °C for 72 hours or heating above 55 °C for 10 seconds kills adult parasites (Khalil 1969). Because infection of fillets may be related to body cavity burdens, subsamples that cannot be immediately frozen or gutted could be checked for numbers of parasites. If the number exceeds 15, the fish should be banned for human consumption (Bier *et al*. 1987).

Clinostomiasis (yellow grub disease) is caused when humans ingest *Clinostomum* metacercariae. Mohamed & Sahlab (1993) recorded *Clinostomum* metacercariae from both tilapiine species procured from Lake Nasser. Ilan Paperna (1980) reported that clinostomiasis is a zoonotic disease of which few cases were recorded in the Near East inducing laryngopharyngitis (Halzuun) as a result of ingesting inadequately cooked infected fish with *Clinostomum complanatum.* Cases of acute clinostomiasis (Halzuun-like disease) caused by *Clinostomum complanatum* metacercariae were recorded by various investigators (Umezaki *et al.* 1990, Yohimura *et al.* 1991, Chung *et al.* 1995). It is worth mentioning that *Clinostomum complanatum* is a common parasite of both tilapiine species in Lake Nasser. Hence, it is recommended that the fish is gutted soon after capture and adequately cooked before consumption. Until now no cases of clinostomiasis have been recorded in Egypt.

CONCLUSIONS

Examination of 850 fishes in 1974 - 1976 (Saoud & Wannas 1984) belonging to 19 fish species from Lake Nasser revealed that 72.4% of the fishes were infected by helminth parasites including trematodes, cestodes,

aspidocotyleans, nematodes and acanthocephalans. The prevalence of infections were 26.6, 11.7, 2.0, 22.6, and 24.8% respectively.

In another survey of helminth parasites (El-Naffar *et al*. 1983) 4733 fish, belonging to 30 species, were examined. Out of the total number examined, 2645 (55.9%) were found to harbour one or more species of parasites. Nine trematode species were recorded, including a new species, *Astiotrema lazeri* from the intestine of *Clarias gariepinus.* The authors recorded also 8 species of nematodes, 3 species of acanthocephalans and 5 species of cestodes, including a new species, *Marsypocephalus aegyptiacus,* from the intestine of *Clarias gariepinus.*

In 1988/1989, El-Bassel (1990) examined 400 fishes belonging to 8 species in Lake Nasser, and revealed that about 88% of the fishes were infected by helminth parasites. He recorded 21 species; 9 trematodes, 4 cestodes, 5 nematodes and 3 acanthocephalans.

Trematode parasites were recorded in *Bagrus* spp., *Labeo* spp., *Clarias* spp, *Synodontis* spp., *Barbus bynni, Tetraodon lineatus* and one type of metacercaria in both *O. niloticus* and *S. galilaeus.* Cestode infections were recorded from *Barbus bynni, Synodontis* spp. *Clarias* spp. and *Malapterurus electricus.* Nematode infections were found in *Labeo* spp., *Alestes* spp., *Barbus bynni, Clarias* spp., *Bagrus* spp. *Synodontis* spp., *Lates niloticus* and both tilapiine species, *Hydrocynus* spp. and *Schilbe* sp. Acanthcephalan infections were recorded in *Clarias gariepinus, Bagrus* spp., *Lates niloticus,* both tilapiine species and *Tetraodon lineatus.* Aspidocotylean infection was rarely observed and has been recorded in *Synodontis schall, Bagrus docmak, Lates niloticus* and both tilapiine species.

Oreochromis niloticus and *Sarotherodon galilaeus* were infected by the same parasites i.e. *Clinostomum complanatum* (metacercaria), *Clinostomum* spp., *Acanthogyrus tilapiae* and larvae of *Amplicaecum*. In only *S. galilaeus* infection with *Contracaecum* (as larvae) was recorded. Other parasites may be found later with further investigations.

At least 40 helminth parasites were recorded from the common fish species from Lake Nasser. The intensity of infection may vary with season and age. It was found that the total prevalence of pure infection with one genus of trematodes was almost twice that of double infection with two genera.

Contracaecum (as larvae)-which was misidentified as *Amplicaecum* in some fish species - was found in the abdominal and branchial cavities of *Sarotherodon galilaeus, Lates niloticus, Barbus bynni, Clarias gariepinus, Synodontis schall* and *Mormyrus kannume.* Although no human infection with *Contracaecum* has been reported from Egypt, cases of this infection were reported from other countries as Japan. Hence as a precautionary measure to kill the parasite, fish must be gutted soon after capture, well cooked or properly salted. Freezing at -20 °C for 72 hours or heating above 55 °C for 10 seconds will kill adult

parasites. Neither smoking nor light salting of fish normally affects *Contracaecum* larvae.