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CERTAIN ASPECTS OF THE HOST-PARASITE RELATIONSHIP OF SYNOTONTID FISH FROM ALEXANDRIA SHORE.

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ABSTRACT

Some host-parasite relationships were studied in 287 specimens of Synodontid fish (135 **Synodus saurus** and 152 **Saurida undosquamis**) from Alexandria. Parasites of these fishes were identified as nematode (**Thynnascaris**) larvae, trematode (**Lecithochirium floridense**) and cestode (Pleurocercoid) larvae. Both fishes were heavily infected with nematode larvae. Trematode and cestode infection was higher in **Synodus** than in **Saurida** fish. Prevalence of the three species of parasites increases with increasing the length of **Synodus** fish. In **Saurida** fish, this phenomenon was only observed in cestode infection while in nematode and trematode infections there was a steady increase followed by a decrease in larger fishes. With the increase of fish weight there was a corresponding increase in the prevalence of all parasites in both fishes except with plerocercoid larvae where a decrease was observed in larger **Synodus**. In **Synodus** fishes the prevalence of parasitic infection in both sexes was the same, except for trematode infection where males were slightly more infected than females. In **Saurida**, females were more infected than males with all types of parasites. Mature **Synodus** and **Saurida** were more infected than immature fishes in case of all parasites except with trematode infection where the contrary was observed in **Synodus** fish. Total parasitic infection in **Synodus** fish was high allover the year, while in case of **Saurida** fish, spring and summer appeared to be the two seasons of high prevalence of infection. Fluctuation of each parasitic infection in both fishes showed no regular pattern. The previous results were fully discussed.

INTRODUCTION

Helminthic parasites of fishes not only endanger the fish population itself, but they may be a source of danger to man when transmitted to him (Van Thiel et al., 1960). This reveals the importance of studying the helminthic fauna of fishes and their interrelations allover the world. Berland (1961) studied larval and adult nematodes from some Norwegian marine fishes. Overstreet (1968) studied the parasites of the inshore lizard fish **Synodus foetens** from

South Florida, he reported Contracaecum sp. larvae with other helminths. He also studied the incidence and intensity of some of these parasites, where the associations between parasitic species were analyzed and discussed in relation to the ecology of the fish. Khalil (1969) studied larval nematodes in the herring from British coastal waters. She described the relationship between the length, age and locality of the fish and the degree of infection. Henning (1974) studied larval Anisakis from Southwest African anchovy and refered to the effect of weight on the intensity of infection. Parukhin (1974) studied the helminthic fauna in fishes of the family Synodontidae from the Indian Ocean. Worner (1974) studied the relationship between the size of the nematode Contracaecum aduncum and the percentage of fish infected and the size of fish under study. Wooten (1978) studied the occurrence of larval anisakid nematodes in small gadoids from Scottish waters and compared the infection in relation to the host length and age. In Egypt, Moharram (1980) studied Anisakis and Thynnascaris larvae infecting Merluccius merluccius and discussed the relationship between the seasonal fluctuation and the effect of length and sex of the fish on the intensity and incidence of infection. The infection of herring in Sakhalin waters with the larvae of the nematode Anisakis sp. was discussed by Pushnikova and Pushnikov (1982). Data were given on the rate of fish infection depending on the habitat, sizes of specimens and season. Larval and adult Thynnascaris aduncum were recorded from marine and fresh water fishes in Japan by Moravec et al. (1985).

As for larval cestodes infecting fishes Subramanian (1948) described plerocercoids of Tetraphyllidea (Scolex pleuronectis), Pseudophyllidea and Trypanoryncha from fishes of British India. Hickey and Harris (1944) recorded two species of pseudophylludean plerocercoids causing epizootic in trout in a newly formed reservoir in Ireland. Larvae of Tetraphyllidea were reported from the White Sea, Barents Sea, Amur and Kamchatka by Dogiel et al. (1958).

Anantaraman (1963) studied larval cestodes infecting marine fishes from the sea of Madras. In his study he listed the tetraphyllidean larvae found in seven types, according to the host, locality, site of infection and general morphology of the larvae. Becker and Brunsin (1967) studied the ecological relationship between Diphyllobothrium sp. and four species of stocked salmonids in the state of Washington. Overstreet (1968) reported larvae of tetraphyllidean and tetrarhynchidean species in the intestine of Synodus foetens from South Florida. Freeman and Thompson (1969) discussed the incidence of infection of lake trout with pleurocercoids of Diphyllobothrium sp.

As regards the digenitic trematodes of the genus Licithochirium (Syn. Sterrhurus) it attracted the attention of many authors particularly from zoological point of view. Crowcroft (1946), described Sterrhurus macrorchis n. sp. found in rock cod from Tasmania waters. In 1957, Sparks reported S. musculus from Synodus foetens. Sogandares -

Bernal and Hutton (1959) reported three species of Sterrhurus from the Gulf of Panama and Bimine. McCauley (1960) while studying some hemiurid trematodes of Oregon marine fishes reported Lecithochirium exodixum. Lecithochirium neopacificium was recorded from Philippine fishes by Velasquez (1962).

Fischthal and Kuntz (1963) studying trematode parasites of marine fishes from Egypt, reported six new hemiurids (Lecithochiriids). Reid et al. (1965) upon the examination of four species of Formosan marine fishes, recovered three species of hemiurid trematodes belonging to the subfamily Lecithochirinae. Overstreet (1968) reported Sterrhurus musculus from Synodus foetens from South Florida.

Little attention has been paid to fluctuation in the prevalence of these parasites in marine fishes. The present work is a contribution to study the parasitic fauna of two marine fishes (Synodus saurus and Saurida undosquamis) from the Egyptian Mediterranean coast with special reference to their host-parasite relationships.

MATERIALS AND METHODS

A total number of 287 Synodontid fishes (135 Synodus saurus and 152 Saurida undosquamis) were brought from Alexandria markets for parasitological studies during the different seasons of a whole year. The total length, weight, sex and maturity of each fish were determined. Fishes were then divided according to their weights into 50 gram weight groups, and according to their lengths into 5 cm length groups. For detection of parasites, careful examination of mouth cavity, opercular cavity, external surface, body cavity and visceral organs was performed. Muscles were microscopically examined after squeezing a piece of flesh between two slides. Different parasites were collected, stained and mounted for identification.

RESULTS

General Prevalence of Helminthic Parasites :

Table 1 summarizes the prevalence of helminthic infections in the fish examined. All the autopsied specimens of Synodus saurus (except one) were found to be infected by one or more types of parasites with a prevalence of 99 %. While the prevalence of infection in Saurida undosquamis was 90 %.

Nematode infection :

Larval nematodes belonging to the genus Thynnascaris were found in the body cavity, liver, intestine and encysted in

Table 1.

Prevalence of parasitic infection in the examined fishes.

Fish host	No of fish examined	Infected fish		Fish infected with: Nematode		Trematode		Cestode	
		No	%	No	%	No	%	No	%
Synodus saurus	135	134	99	127	94	126	93	111	82
Saurida undosquamis	152	136	90	133	88	18	12	21	14

the mesenteries and other internal organs of the infected fishes. The prevalence of infection was 94 % in Synodus and 88 % in Saurida.

Trematode infection :

Only one genus was found in both fishes. This was **Lecithochirium floridense** (Syn. **Sterrhurus floridensis**), the prevalence of infection was 93 % in **Synodus saurus** and 12 % in **Saurida undosquamis**. This trematode was collected from the stomach, intestine, buccal and opercular cavities of the infected fishes.

Cestode infection :

No adult cestodes were found in these fishes, only plerocercoids were found belonging to the following ordes: Tetraphyllidea, Trypanorhyncha and Pseudophyllidea. The total prevalence of cestode infection is illustrated in Table 1, 82 % in Synodus and 14 % in Saurida. Table 2 illustrates the prevalence of infection by the three order.

Tetraphyllidean larvae were the most frequently encountered cestodes. The prevalence of infection by these cestodes was 64.4 % in Synodus and 1.32 % in Saurida. In infected Synodus fishes, these pleurocercoids were mainly seen in the pyloric caeca, followed by the intestine, stomach and gall bladder respectively. While in Saurida undosquamis they were found only in the pyloric caeca and gall bladder of the infected fishes.

As for trypanorhynchid plerocercoids, the prevalence of infection was 43.70 % in Synodus and 1.97 % in Saurida. Most of these pleurocercoids were seen in the pyloric caeca followed by gall bladder, stomach and intestine of Synodus. In Saurida they were also found in the gall bladder, pyloric caeca, intestine and not in the stomach.

Table 2.

Prevalence of infection with different orders of Cestode larvae in fish hosts.

Fish host	No of fish examined	Infected fish		Fish infected with plerocercoid (larvae)					
				Nematode		Trematode		Cestode	
		No	%	No	%	No	%	No	%
Synodus saurus	135	111	82	87	64.4	59	43.7	10	7.41
Saurida undoquamis	152	21	14	2	1.32	3	1.97	14	9.21

Pseudophyllidean plerocercoids were always present in the body cavity free or encysted in some internal organs. The prevalence of infection was 7.41 % in Synodus and 9.21 % in Saurida.

Some factors affecting the prevalence of infection by the different helminthes :

I- Effect of length : Table 3.

It was noticed that with the incease in the length of the fish there was a corresponding over all increase in the prevalence of all parasites in Synodus (although a slight fluctuation was observed in case of trematode and nematode infections). While in Saurida the prevalence of infection increased reaching a maximum in the group of the size 25 cm host length followed by a decrease in the following group, except for cestode larvae in which there was a steady increase throughout the length range.

II- Effect of Weight: Table 4.

It was found that in both Synodus and Saurida there was a positive relation between the total prevalence of infection and the weight-group, thus with the increase in weight there was a corresponding in the prevalence of infection. In addition it was observed that for each parasitic group, the prevalence of infection increased in proportion with the host weight throughout the weight range both in Synodus and Saurida, although in some parasites, Thynnascaris and Lecithochirium in Synodus the prevalence increased with increasing weight of fish up to 150 and 200 gm groups respectively, and above that weight a relatively constant prevalence was maintained. It was also observed that there was a slight decrease in the prevalence of infections of plerocercoid larvae in group of over 250 gm in the same fish.

Table 3.

Prevalence of helminthic parasites in relation to length groups in fish hosts.

Fish host	Length group (cm.)	No of fish examin	Infected fish No	%	Fish infected with: Trematode No	%	Cestode No	%	Nematode No	%
Synodus saurus	< 20	11	11	100	10	90.91	7	63.64	10	90.91
	20-	54	54	100	51	94.44	43	79.63	48	88.89
	25-	53	52	98.11	48	90.57	46	86.79	52	98.11
	30-	15	15	100	15	100	13	86.67	15	100
	35-	2	2	100	2	100	2	100	2	100
Saurida undosqu-quamis	< 20	24	19	79.17	1	4.17	1	4.17	19	79.17
	20-	74	66	89.19	8	10.81	8	10.81	65	87.84
	25-	45	43	95.56	8	17.78	8	17.78	41	91.11
	30-	9	8	88.89	1	11.11	4	44.44	8	88.89
	35-	-	-	-	-	-	-	-	-	-

Table 4.

Prevalence of helminthic parasites in relation to weight groups in fish hosts.

Fish host	weight group (cm.)	No of fish examin	Infected fish No	%	Fish infected with: Trematode No	%	Cestode No	%	Nematode No	%
Synodus saurus	< 100	53	52	98.11	48	90.57	37	69.81	47	88.68
	100-	36	36	100	33	91.67	32	88.89	34	94.44
	150-	27	27	100	26	96.3	25	92.59	27	100
	200-	9	9	100	9	100	9	100	9	100
	250-	10	10	100	10	100	8	80.00	10	100
Saurida undosqu.	< 100	88	77	87.50	7	7.95	8	9.09	75	85.23
	100-	46	42	91.30	7	15.22	6	13.04	41	89.13
	150-	15	14	93.33	3	20.00	5	33.33	14	93.33
	200-	3	3	100	1	33.33	2	66.67	3	100
	250-	-	-	-	-	-	-	-	-	-

III- Effect of Sex : Table 5.

In relation to the sex of the fish the following results were observed; the total prevalence of infection was slightly higher in male fishes than in females in Synodus, while in Saurida it was higher in females than in males. This observation was also found with Lecithochirium floridense infection. With Thynnascaris and plerocercoid larvae, no difference was observed between the prevalence of both sexes of Synodus. While in Saurida the prevalence of infection was higher in females than in male fishes.

IV- Effect of Maturity : Table 5.

It was evident that the total and individual prevalence of helminthic parasites of Saurida undosquamis each was higher in mature than in immature fishes. However, in Synodus saurus the total prevalence of parasites as well as the prevalence of infection with Lecithichirium floridense was lower in mature than in immature individuals. The other helminthic infections (Thynnascaris and cestode larvae) showed prevalence in mature than in immature fishes.

V- Seasonal Fluctuation ; Table 6.

The total prevalence of helminthic parasites in Synodus was found to be high allover the year. In Saurida it was found that the general prevalence was in the lowest level during winter. There was a rise during spring reaching its high level during summer and followed by a decline during autumn.

As regards the seasonal prevalence of each parasite individually, it was found that the same pattern of prevalence was observed in case of infection with Lecithochirium floridense and cestode larvae in Synodus where a relatively low level was observed during winter, followed by an increase during spring, while in summer there was a drop in the prevalence of infection, followed by a second increase during autumn.

In Saurida the prevalence of infection with these parasites individually was found to be different. Light infection was observed with trematode reaching minimum during winter, with a slight increase during spring and this increase continued during summer and reached maximum during autumn. With cestode infection the prevalence was moderate in winter, increasing slightly to the maximum during spring and a decline was observed during summer reaching a minimum during autumn.

The prevalence in Synodus saurus and Saurida undosquamis with Thynnascaris larvae was found to be in a minimum level during winter. A gradual rise in the prevalence was observed during spring, reaching maximum during summer. This was followed by a decline in autumn.

Table 5.

Prevalence of helminthic parasites in relation to sex and maturity in the fish hosts.

Fish host	No of fish examined		Infected fish				Fish infected with :									
							Trematode				Plerocercoid larvae				Nematode larvae	
	Male	Female	Male		Female		Male		Female		Male		Female		Male	Female
			No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Synodus saurus	51	84	51	100	83	98.8	48	94.1	78	92.9	42	82.35	69	82.1	48	94.1	79	94
Saurida undosquamis	44	108	37	84.1	99	91.7	2	4.6	16	14.8	5	11.4	16	14.8	37	84.1	96	88

	Mature	Immature	Mature		Immature		Mature		Immature		Mature		Immature		Mature		Immature	
			No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Synodus saurus	94	41	93	98.9	41	100	86	91.49	40	97.56	81	86.2	30	73.2	91	96.8	36	87
Saurida undosquamis	123	29	114	92.7	22	75.86	17	13.82	1	3.45	19	15.45	2	6.9	110	89.4	23	79

Table 6.

Prevalence of helminthic parasites in relation to seasons in fish hosts.

Fish host	seasons	No of fish examin.	Infected fish No.	%	Fish infected with: Trematode No.	%	Cestode No.	%	Nematode No.	%
Synodus saurus	Winter	53	52	98.11	48	90.57	41	77.36	48	90.57
	Spring	46	46	100	44	95.65	41	89.13	45	97.83
	Summer	13	13	100	11	84.62	8	61.54	13	100
	Autumn	23	23	100	23	100	21	91.3	21	91.30
Saurida undosq.	Winter	39	30	76.92	1	2.56	5	12.82	30	76.92
	Spring	28	26	92.86	2	7.14	7	25.00	24	85.71
	Summer	68	65	95.59	11	16.18	8	11.76	64	94.12
	Autumn	17	15	88.24	4	23.53	1	5.88	15	88.24

DISCUSSION

The absence of ectoparasites in the present study might be due to the burrowing behaviour displayed by the lizard fish.

The very high prevalence of parasitic infection in both Synodus and Saurida fish may be due to the accumulation of parasitic infection during the life span of the fish. This proposition is in accordance with Overstreet (1968) who found that all autopsied specimens of **Synodus foetens** from the Buttonwood collections were found to be infected by one or more species of parasites. Also Parukhin (1974) reported a very high incidence of helminthic infection (100 %) for each of Saurida undosquamis, **Saurida gracilis** and **Trachinocephalus myops** and 96 % for **Saurida tumbil**.

The high prevalence of nematode infection in both fishes may be due to the fact that these fishes consume regularly a certain type of food (invertebrates or smaller fishes) which harbour the earlier larval stage.

The presence of **Lecithochirium floridense** in different sites other than the stomach of the host fish (normal habitat) may be due to the movement of this parasite from the stomach after death of the host. Stunkard and Nigrelli (1934) reported **Sterrhurus branchialis** (Syn. **Lecithochirium floridense**) from the gills and intestine of **Trichiurus lepturus** fish and Crowcroft (1946) reported **S. macrorchis** from the stomach and pharynx of rock cod, no interpretation

was given. Overstreet (1968) found that **Sterrhurus** was normaly present in the stomach and attributed its presence in the intestine of twelve Synodus to the salinity of the water.

The high prevalence of trematode and cestode infection in Synodus than in Saurida may be due to the differences in their feeding habits, although both fish are known to be carnivorous. Yet it was observed in the present study that the stomach contents of Synodus were mainly composed of small fishes and other invertebrates eg. shrimps, sibia, bivalvia and anemone, while in **Saurida** most of the individuals'stomachs were found full of seaweeds, invertebrates and few small fishes.

In the present study the progressive increase of length and weight of fish was accompanied by a progressive increase in the prevalence of infection in most cases of different parasites. This may be due to the presence of the intermediate host as an essential component of the fish diet throughout the size range, also the increase in size of the host necessitated the increase in food volume which may cause the increase in infection level.

This agrees with the observations of Overstreet (1968), Rumpus (1974), Wooten (1978) and Moharram (1980). All these authors studying different hosts believed that the only logical explanation for their observation was that probably larger fish must consume larger amount of food which in turn increase the level of infection and increase the possibility for re-infection. They also believed that the increase in infection with size range must also be due to the longevity of the larvae and their continuing acquisition by the fish. Dogiel et al. (1958) considered that large intermediate hosts which may have accumulated larger number of infected larvae will be available to the larger fishes.

In few cases of this study an increase in the level of infection with length and weight of fish was followed by a decrease in larger fish. This was probably due to a change in the nature of the host diet, the resistance of the host or the interaction of other factors. Wooten (1978) declared that larval **Thynnascaris** found in young fish probably acquired the infection mainly by feeding on copepods which form an essential component of their diet, as the fish grow older and their diet became more diverse. It is possible that other hosts become important in the transmission of these larvae (eg. fish hosts). Zdzitowiecki (1988) during studying the occurrence of digenetic trematodes in notothenid fish observed a relation between infestation and fish size. **Macvicaria pennelli** was found to be the most frequent parasite of medium-size fishes (body length 25-33 cm). Other trematode species were noted mainly in larger fishes (at least 31 cm long).

Concerning the effect of host sex on the prevalence of infection, it can be concluded that in Synodus there was no definite difference in the prevalence of the different parasitic infection between male and female fishes (except a minor increase in the prevalence of Lecithochirium in males than females which slightly affects the overall picture of the total infection in Synodus). This conclusion is in agreement with Overstreet (1968) who found no obvious relationship between parasitic infection as regards the difference in sexes of Synodus foetens. On the other hand female Saurida had a higher prevalence of total and single infection than male. This observation agrees well with the finding of Rumpus (1974), Moharram (1980) and Ramadan (1990), who found that female fishes were generally more parasitized than males. This result may be attributed to physiological condition of the fish. The higher prevalence of infection in female Saurida than males may be due to the fact that the majority of the females were mature and the result showed that mature individuals were generally more infected than immature ones. Thomas (1964) found that there was a tendency for sexually mature females when spawning or recovering from spawning to be more heavily infected with parasites than males. He attributed his result to physiological resistance than behavioral or ecological resistance. The same author declared that the condition factor of females tends to be less than that of males after spawning, because they constitute relatively more reproductive material, expend more energy and eat less food than males at this time.

As regards the effect of seasonal fluctuation, it was noted that for Synodus there was a high prevalence of total infection allover the year i.e. there was no clear seasonal cycle for Synodus. This may indicate that the intermediate hosts transmitting the helminthic infection are a steady components of this fish diet allover the year, while in case of Saurida and with individual parasitic infection, fluctuations showed no regular pattern.

This result declared that each parasite had its own season of flourishing which vary in different hosts or many factors had interfered and might be responsible for this fluctuation. In this respect Overstreet (1968) declared that Sterrhurus was probably acquired through intermediate hosts and those hosts could be affected by the salinity and temperature of water. He also added that other physical or chemical factors could affect the infection rate of Sterrhurus. Rumpus(1974) declared that the presence or absence of seasonal cycle of a helminthic parasite was consistent with the availability of the infective larvae in the intermediate host. Thomas (1964) related the monthly difference of parasitic infection in brown trout to changes in feeding habits, sexual maturity and spawning of fish. Finally it can be concluded that there are numerous factors affecting the pattern of infection by different parasites, and the results in the present study were those of the interaction of all the factors present in nature.

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