ROLE OF SOME MARINE WATER FISH IN TRANSMITTING SOME PARASITES TO MAN

JIHAN F.K. ABOD-ESA[1], H.A. SAMAHA[2] AND N.A. MAHMOUD[1]

1 Animal Health Research Institute, Agricultural Research Centre, Dokki, Giza, Egypt.

2 Faculty of Veterinary Medicine, Alexandria University.

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Abstract

The zoonotic helminths parasitized in tissues of marine water fish clarify the significance of biological pollution in sea water. The incidence and intensity of larval stages of parasites in marine fish were recorded as 44.4%, 43.5% and Zero % in *Sebastes marinus*, *Boops boops* and *Sardina pilchardus*, respectively, which which were caught from El-Anfoshy Bay. Marine water fish of species *Siganus rivulatus, Sardina pilchardus* and *Boops boops* were caught from El-Mex Bay resulting free from any encystation of metacercariae. The number of encysted metacercaria per gramme in tissues of the infested marine water fish varied from 1 to 3. These were identified after experimental infection of *Ibis ibis* as families *Heterophyidae* and *Echinostomatidae.*

The water samples were taken from El-Anfoshy and El-Mex Bays due to their similarity in hydrobiological features as they are sites of accumulation of some domestic sewage of Alexandria (Thanaa, 1979).

INTRODUCTION

In Egypt, the knowledge about the parasites of sea fish (final or intermediate host) is still little or sporadic (Azza, 1990 and Mahmoud, 1990).

Abd El-Maksoud (1992) recorded that marine water fish *Sardina pilchardus* had an incidence of encysted metacercariae infestation Zero %, but in *Bagrus pagrus* (Morgan ahmer) it was 37.8% in the ventral muscles. Azza (1994) revealed that Sardine species from fish morkets at port said city was free from any encystation in its muscles. Water pollution, including the biological side, is associated with the record of many kinds of Gastropoda inhabitants and a huge number of cercariae were released (Khalil, 1993).

The relationship between parasitism and water pollution is less widely available for marine species (Aho *et al.*, 1976). Therefore, the aim of the present study is to clarify the relationship between the biological pollution of sea water and the existence of the encysted larval stages in marine fish flesh.

MATERIALS AND METHODS

A total of 398 fishes were collected from El-Anfoshy and El-Mex markets in Alexandria Governorate. They included 90 *Sebastes marinus*, 65 *Sardina pilchardus* and 46 Boops boops from El-Anfoshy market, 65 *Siganus rivulatus*, 85 *Sardina pilchardus* and 47 Boops boops from El-Mex market. Each sample was placed in a plastic bag and transferred to the laboratory with the minimum delay in keeping cool container (Syme, 1988 and Schaperclaus, 1992).

The macroscopic and microscopic examinations were carried out to detect the encysted metacercariae or any other encysted larval stages lodged or attached to the different edible fish parts in the body of the fish samples, especially, in the large band muscles (Roberts, 1978 and Schaperclaus, 1992). The recoverd metacercariae were prepared for further study by applying the tissue digestion method recommended by Oshima *et al.* (1966), Yokogawai and Sono (1968) for excystation and isolation of cysts and detecting the viability of exocystic metacercariae or larval stages.

The in-Vivo experimental infection was recommended by using *Ibis-ibis* free from any fish parasites, four *Ibis ibis* were infected and 2 were left as control. The feeding experiments were carried out to recover and identify the adult stages of the metacercarial fish parasites (Olfat, 1991and Amany, 1997). Fixation, staining and mounting were carried out according to Soulsby (1982).

Analysis of marine water included a total number of 8 samples of sea water collected from El-Anfoshy and El-Mex bays (4 samples each) to determine and analyse the bialogical pollution. Water samples were collected in clean, sterile and colourless glass bottles of one liter capacity each for chemical analysis. The water samples were taken from the surface of sea water according to Boyd (1979) and sent to the Institute of Oceanography and Fisheries in Alexandria to estimate 4 parameters which indicated the biological pollution with sewage in sea water (ammonia, nitrate, phosphate and organic matter).

RESULTS AND DISCUSSION

The results of this investigation are represented in the following tables and figures:

Table 1 shows the incidence of encysted metacercariae in marine water fish.

The infection rate of marine water fish collected from El-Anfoshy market, with encysted metacercariae was nearly similar in *Sebastes marinus* and *Boops boops* (44.4 and 43.5%, respectively). These results were in agreement with Abd El-Maksoud (1992) being 37.8% in ventral muscles of *Bagrus pagrus* (Morgan ahmer), but disagreed with Mahmoud (1986) who reorded that the muscles of *Sebastes marinus* fish were free from encysted metacercariae. These variations might be due to the range of differences from one habitat to another, locality and water pollution (Han Paperna, 1980). *Sardina pilchardus* was free from any encysted metacercariac in both El-Anfoshy and El-Mex markets. This was in agreement with Mahmoud (1986), Abd El-Maksoud (1992), and Azza (1994). These results might be due to the individual susceptibility of fishes to the infection with encysted metacercariae. Moreover, as noticed in El-Mex market, the marine water fish of species *Siganus rivulatus* and *Boops boops* were free from encysted metacercariae in their muscles. This might be due to the receiving of El-Mex Bay a heavy load of waste water from Misr Chemical Industries effluents, lake Maryiout, Nobareya canal and Mahmodeya canal that are pouring in this Bay (Thanaa, 1985). So, these chemical watter pollutants might have an affect on the internediate hosts (snails) in parasitic life cycle and the free living life cycle stages of parasites (Sindermann, 1990).

Table 1. The incidence of encysted metacercariae in marine water fish samples.

Locality	Marine water fish samples	Number of examined fish	Number of infcted fish	Incidence %
El-Anfoshy market	*Sebastes marinus*	90	40	44.4
	Sardina pilchardus	65	-	-
	Boops boops	46	20	43.5
Total		201	60	29.9
El-Mex market	*Sebastes marinus*	65	-	-
	Sardina pilchardus	85	-	-
	Boops boops	47	-	-
Total		398	60	15.1

Table 2 shows the Percentage of the encysted metacercarriae in large band muscles of the infested fish.

The percentage of the encysted metacercariae in muscles of infcted *Sebastes marinus* was higher in the posterior third and anterior third than in the middle third of the fish body (67.5%, 67.5% and 57.5%), respectively. In *Boops boops*, it was higher in the posterior third (90%) than in the middle and anterior thirds (30% and 20%), respectively. These results coincided with Mahmoud (1990), Jihan (1993), Olfat *et al.* (1995) and Amany (1997), but they disagreed with El-Naffar and Shahawy (1986), Al-Bassel (1990) who recorded that the highest percentage of metacercarise was in the anterior third of fish body. These variations were due to the presence of predilection site of each type of metacercariae (Ilan Paperna, 1980).

Table 3 shows the average number of the encysted metacercariae in different parts of fish muscles/gramme

It is clear that, the average number of metacercariae in muscles of *Sebastes marinus* were (2.2, 2.1 and 2.3/g.), and in *Boops boops* were (1.0, 1.0 and 1.6/g.) in the anterior, middle and posterior thirds of fish, respectively. These results supported those of Jihan (1993) and Amany (1997), but disagreed with Al-Bassel (1990), who recorded that the highest average number of metacercariae was (47/g.) in the anterior third of Tilapia sp., and Olfat (1991) who recorded that the anterior third of Tilapia sp. had the highest number of encysted metacercariae (43/g.).

It was noticed that the average number of encysted metacercariae per gramme in marine water fish was fewer in number than in freshwater fish. This might be due to the high salinity of sea water which leads to rapid decline in intensity of cercarial emergence from snail intermediate host (Ginestsinkaya, 1988).

Table 4 shows the Experimental infection in *Ibis-ibis* with encysted metacercariae.

By experimental infection of *Ibis-ibis* with encysted metacercariae isolated from *Sebastes marinus* and *Boops boops*, the adult trematodes recovered were belonging to families *Heterophydae* and *Echinostomatidae*. These results were in agreement with Olfat (1991) and Amany (1997) with regard to the fish species, locality, types of metacercariae and host specificity.

Table 2. Percentage of the encysted metacercariae in large band muscles of infected fish.

Locality	Marine water fish samples	No. of exam-ined fish	No. of infected fish	Metacercariae in muscles					
				Ant. third		Mid. third		Post. third	
				*	%	*	%	*	%
El-Anfoshy market	*Sebastes marinus*	90	40	27	67.5	23	57.5	27	67.5
	sardina	65	-	-	-	-	-	-	-
	pilchardus	46	20	4	20	6	30	18	90
Total	*Boops boops*	201	60	31	52	29	48	45	75

* Number of infected fish

Table 3. The average number of encysted metacercariae in different parts of muscles/gramme.

Locality	Fish sp.	Anterior third		Middle third		Posterior third	
		Range	Mean	Range	Mean	Range	Mean
El-Anfoshy market	*Sebastes marinus*	1-10	2.2	1-15	2.1	1-13	2.3
	sardina pilchardus	-	-	-	-	-	-
	Boops boops	1	1	1	1	1	1

Table 4. Experimental infection of *Ibis-ibis* with encysted metacercariae.

Fish sp.	Exp. birds	Cons./day for each gram	feeding period (day)	Total cons.	No. of E.M.C/g	Total cons. of E.M.C for each	Prepatent period	No. of flukes	Recovery rate	Types of worms
Sebastes marinus	4 Ibis ibis 2 Ibis ibis (control	10 --	3 --	30 --	3 --	90 --	7 7	10-15 --	14.2 --	Het.* Ech.**
Boops boops	4 Ibis ibis 2 Ibis ibis (control	10 --	3 --	30 --	1 --	30 --	7 7	4-6 --	15.8 --	Het.* Ech.**

* Het. = Heterophydae

** Ech. = Echinostomatidae

The recovered adult trematodes were recorded as fish-borne zoonotic paraites causing Heterophyosis and Echinostomiosis in human (Yil Chai and Lee, 1990).

Table 5 shows the Chemical analysis of sea water for estimating the pollution with sewage.

The estimation of the biological water pollution in the sea water was carried out by estimating ammonia and nitrate represented by nitrogen, phosphate represented by phosphorus and organic matter represeted by oxidizable organic matter by alkaline permenganate, according to Holl (1972).

The sea water analysis showed that, the averages of ammonia, nitrate, phosphate and organic matter were 0.11 mg/l, 0.08 mg/l, 0.04 mg/l and 1.28 mg O/l, respectively in El-Anfoshy Bay, but in El-Mex Bay they were 1.2 mg/l, 0.26 mg/l and 0.22 mg/l and 2.88 mg O/l, respectively. These results showed that the average of the biological pollution in El-Mex Bay was higher than that in El-Anfoshy Bay. This might be due to the accumulation of industerial, agricultural waste water and domestic sewage in El-Mex Bay (Thanaa, 1979), but in El-Anfoshy Bay, there was only sewage pollution. Otherwise, all results of sea water analysis for estimating the pollution were under the perimissible limit of coast pollution law (law 4/1994, discharge in coastal environment) that stated the Egyptian legal standards of ammonia NH3-N was from 0 to 3 mg/l, nitrates NO3-N was 40 mg/l and phosphates-T 5 mg/l, but the limit of organic matter was 3-8 mg O/l according to Holl (1972).

The relationship of parasitism and pollution

Reviewing the results of the present study, the chemical water pollutants in El-Mex Bay might have an affect on the intermediate host snail in parasitic life cycle or/and the free living life cycle stage of parasites. So, the marine fishes from this Bay were free from encysted metacercariae, but in El-Anfoshy Bay, there was only the domestic sewage pollution which helps the presence of intermediate hosts, and consequently, the prevalence of encysted metacercariae in marine fishes in this Bay.

Table 5. Chemical analysis of sea water for estimating the pollution with sewage .

Fish sp.	El-Anfoshy Bay					Sl-Mex Bay				
	Sewage effluent	Behind Kayet Bey castle	Behind Institute of Oceanography	Eastern harbour	Average	After the bridge	Tolombat canal	From the sea water coast	From the sea water by boat	Average
Ammonia (mg/l)	0.14	0.08	0.14	0.06	0.11	1.28	1.99	0.62	0.91	1.2
Nitrate (mg/l)	0.11	0.07	0.08	0.06	0.08	0.17	0.16	0.30	0.41	0.26
Phosphate (mg/l)	0.06	0.01	0.06	0.04	0.04	0.26	0.33	0.11	0.18	0.22
Organic matter (mg 0/l)	0.8	0.32	0.32	1.28	1.28	3.04	4.16	1.6	2.72	2.88

Egyptian legal standards and permits with regards to water pollution law 4/1994, discharge in coastal environment.

1. Ammonia NH3-N 0-3 mg/l. 2. Nitrates NO3-N 40 mg/l.

3. Phosphate - T 5 mg/l.

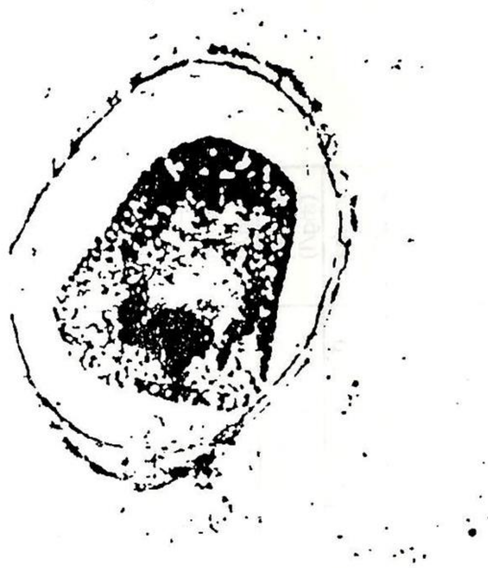

Fig. 1. Heterophyid metacercariae from muscles of *Sebastes marinus* and *Boops boops* marine fish (Haplorchd metacercariae) x 400.

Fig. 2. Heterophyid metacercariae from muscles of *Sebastes marinus* and *Boops boops* marine fish x 400.

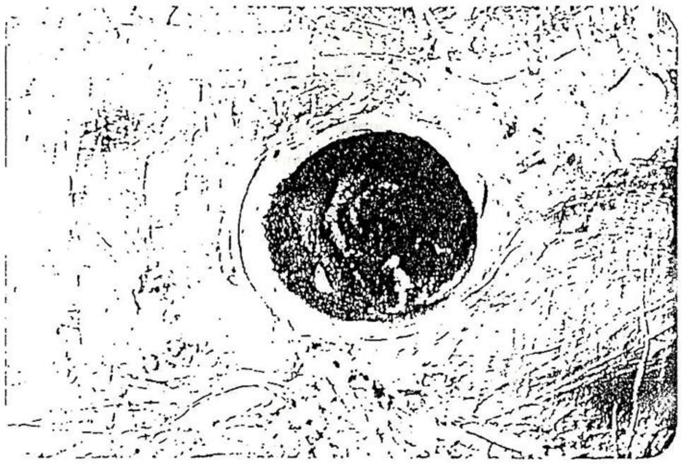

Fig. 3 . Echinostomatid metacercariae from muscles of *Sebastes marinus* and *Boops boops* marine fish (encysted metacercariae) x 100.

Fig. 4. Echinostomatid metacercariae from muscles of *Sebastes marinus* and *Boops boops* marine fish (encysted metacercariae) x 100.

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دور بعض الأسماك البحرية في نقل بعض الأمراض الطفيلية للإنسان

جيهان فتح الله خليفة أبو عيسي ١ ، حامد سماحة٢، نشات عبد المتعال محمود١

١ معهد بحوث صحة الحيوان - مركز البحوث الزراعيه - الدقى - جيزة - مصر .
٢ كلية الطب البيطري - جامعة الإسكندرية.

تم في هذه الدراسة فحص ٣٩٨ سمكة من أسماك البحر المتوسط بمحافظة الاسكندرية من منطقتي الأنفوشي والمكس، شملت ٩٠ من أسماك المرجان الأحمر، ٦٥ من أسماك السردين، ٤٦ من أسماك الموزة من منطقة الأنفوشي و ٦٥ من أسماك البطاطا، ٨٥ من أسماك السردين، ٤٧ من أسماك الموزة من منطقة المكس. وقد أظهر الفحص المعملي لانسجة هذه الأسماك وجود الطور اليرقي المتحوصل للديدان الطفيلية داخل عضلاتها وأن اسماك المرجان الأحمر والموزة من منطقة الأنفوشي كانت مصابة بهذه اليرقات المتحوصلة بنسبة ٤٤,٤٪ ، ٤٣,٥٪ علي التوالي، بينما كانت أسماك السردين من نفس المنطقة خالية من هذه اليرقات وأيضا كانت أسماك منطقة المكس خالية من أية يرقات طفيلية متحوصلة.

تم تحليل عينات من مياه البحر المتوسط في هاتين المنطقتين لإستبيان العلاقة بين التلوث البيولوجي والإصابة باليرقات المتحوصلة للديدان الطفيلية في عضلات الأسماك البحرية. وقد وجد ان منطقة الأنفوشي بها تلوث بيولوجي بمياه الصرف الصحي فقط وأن أسماك هذه المنطقة مصابة باليرقات المتحوصلة للديدان الطفيلية في حين أن منطقة المكس بها تلوث بالصرف الصحي ومخلفات المصانع والصرف الزراعي وكل هذه الملوثات مجتمعة ربما تؤثر علي العائل الوسيط وهو القواقع أو أنها تؤثر علي أية مرحلة من مراحل دورة حياة الطفيل وبالتالي لايوجد إصابة باليرقات المتحوصلة للديدان الطفيلية في أسماك هذه المنطقة، بينما في منطقة الأنفوشي فإن التلوث البيولوجي يساعد علي وجود القواقع وعلي استكمال دورة حياة الديدان الطفيلية ولذلك فالأسماك مصابة باليرقات الطفيلية المتحوصلة.

باجراء العدوي التجريبية لهذه اليرقات المتحوصلة في طيور أبو قردان تمت العدوي في مجموعتين كل مجموعة تتكون من أربعة طيور للعدوي و إثنين كضوابط للتجربة. مجموعة للعدوي باليرقات الطفيلية المتحوصلة لأسماك المرجان الأحمر والأخري للعدوي باليرقات الطفيلية المتحوصلة لأسماك الموزة. وقد تم عزل الديدان المفلطحة التي تنتمي لعائلتي الهيتروفيدي والإكينوستوماتيدي اللتين لهما أهمية علي الصحة العامة حيث انه قد ثبت إنتقالهما للإنسان عن طريق تناول هذه الأسماك دون طهيها جيدا.