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

JIHAN F.K. ABOD-ESA¹, H.A. SAMAHÁ² AND N.A. MAHMOUD¹

1 Animal Health Research Institute, Agricultural Research Centre, Dokki, Giza, Egypt.
2 Faculty of Veterinary Medicine, Alexandria University.

(Manuscript received 25 March 1998)

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%, 45.5% and Zero % in Sebastes marinus, Boops boops and Sardina pilchardus, respectively, 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 lisa bica 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 (Thania, 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 Bagoar pagrus (Morgan ahmer) it was 37.8% in the ventral muscles. Azza (1994) revealed that Sardine species from fish market 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 (Khall, 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 recovered 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 excystic 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, 1991 and Amany, 1997). Fixation, staining and mounting were carried out according to Soulaby (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 biological 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-Anfosh 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 *Sagrus pigrus* (Morgan ahmer), but disagreed with Mahmoud (1986) who recorded 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 metacercariae in both El-Anfosh 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 Maryout, Nobareya canal and Mahmodya canal that are pouring in this Bay (Taha, 1985). So, these chemical waste pollutants might have an affect on the intermediate 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.

<table>
<thead>
<tr>
<th>Locality</th>
<th>Marine water fish samples</th>
<th>Number of examined fish</th>
<th>Number of infected fish</th>
<th>Incidence %</th>
</tr>
</thead>
<tbody>
<tr>
<td>El-Anfosh market</td>
<td><em>Sebastes marinus</em></td>
<td>90</td>
<td>40</td>
<td>44.4</td>
</tr>
<tr>
<td></td>
<td><em>Sardina pilchardus</em></td>
<td>65</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td><em>Boops boops</em></td>
<td>46</td>
<td>20</td>
<td>43.5</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>201</td>
<td>60</td>
<td>29.9</td>
</tr>
<tr>
<td>El-Mex market</td>
<td><em>Sebastes marinus</em></td>
<td>65</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td><em>Sardina pilchardus</em></td>
<td>85</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td><em>Boops boops</em></td>
<td>47</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>398</td>
<td>60</td>
<td>15.1</td>
</tr>
</tbody>
</table>
Table 2 shows the Percentage of the encysted metacercariae in large band muscles of the infested fish.

The percentage of the encysted metacercariae in muscles of infested Sebastes marinus was higher in the posterior third and anterior third than in the middle third of the fish body (57.5%, 67.5% and 57.5%), respectively. In Boops boops, it was higher in the posterior third (30%) 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 metacercariae 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 (Ginestszinkaya, 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 various metacercariae in large band muscles of infected fish.

<table>
<thead>
<tr>
<th>Locality</th>
<th>Post</th>
<th>Mid</th>
<th>Large</th>
<th>Total</th>
<th>Exanthemia</th>
<th>Sebastes marinus</th>
<th>Sebastes bipectoralis</th>
<th>Sebastes schlegelii</th>
<th>Other</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Heterocercariae in Muscles</td>
<td>%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>8</td>
<td>48</td>
<td>29</td>
<td>31</td>
<td>60</td>
<td>27</td>
<td>67</td>
<td>27</td>
<td>67</td>
<td>67</td>
</tr>
<tr>
<td>46</td>
<td>60</td>
<td>46</td>
<td>62</td>
<td>62</td>
<td>62</td>
<td>62</td>
<td>62</td>
<td>62</td>
<td>62</td>
<td>62</td>
</tr>
<tr>
<td>40</td>
<td>60</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
</tr>
</tbody>
</table>

*Number of Infected Fish

Note: The table includes data for various fish species and localities, showing the percentage of heterocercariae in muscles.
Table 3. The average number of encysted metacercariae in different parts of muscles/gramme.

<table>
<thead>
<tr>
<th>Locality</th>
<th>Fish sp.</th>
<th>Anterior third</th>
<th>Middle third</th>
<th>Posterior third</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Range</td>
<td>Mean</td>
<td>Range</td>
</tr>
<tr>
<td>El-Anfoshy market</td>
<td><em>Sebastes marinus</em>, <em>sardina pilchardus</em>, <em>Boops boops</em></td>
<td>1-10</td>
<td>2.2</td>
<td>1-15</td>
</tr>
</tbody>
</table>
Table 4. Experimental infection of Ibis-Ibis with encysted metacercariae.

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

* Het. = Heterophyidae
** Ech. = Echinostomatidae
The recovered adult trematodes were recorded as fish-borne zoonotic parasites 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 represented by oxidizable organic matter by alkaline permanganate, 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 industrial, 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 permissible 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>
<thead>
<tr>
<th>1. Ambient Nitrogen Dioxide (NO2)</th>
<th>2. Nitrogen Dioxide (NO2)</th>
<th>3. Proportion to 1</th>
<th>4. mg/l</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.86</td>
<td>2.72</td>
<td>1.6</td>
<td>0.4</td>
</tr>
<tr>
<td>0.22</td>
<td>0.11</td>
<td>0.33</td>
<td>0.26</td>
</tr>
<tr>
<td>0.26</td>
<td>0.41</td>
<td>0.30</td>
<td>0.4</td>
</tr>
<tr>
<td>0.26</td>
<td>0.49</td>
<td>0.02</td>
<td>0.06</td>
</tr>
<tr>
<td>0.11</td>
<td>0.07</td>
<td>0.08</td>
<td>0.06</td>
</tr>
<tr>
<td>0.14</td>
<td>0.14</td>
<td>0.08</td>
<td>0.14</td>
</tr>
</tbody>
</table>

Note: The table represents the ambient nitrogen dioxide levels and their proportion to a baseline value. The values are given in milligrams per liter (mg/l).
Fig. 1. Heterophyid metacercariae from muscles of *Sebastes marinus* and *Boops boops* marine fish (Haplorchid 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.
REFERENCES


دور بعض الأسماك البحرية في نقل بعض الأمراض الطفيلية للإنسان

جهان فتح الله خليفة أبو عمسي 1، حameda ساحة، نشأت عبد المتعال سحور 2

1 معرض بحوث صحة البيئة - مركز بحوث الزراعية - الدقهلية - جيزة - مصر

2 كلية الطب البيطري - جامعة الإسكندرية

توفي هذه الدراسة فحص 398 سمكة من أسماك البحر المتوسط بمحافظة الإسكندرية من منطقة الأنفوشي وألكس. شملت 50 سمكة من أسماك الروك من منطقة الأنفوشي و49 سمكة من أسماك السردين 47 سمكة من أسماك الصووحة من منطقة الكس. وقد أظهر الفحص المعملي لنسجية هذه الأسماك وجود الفيروس البيليكي المتحول للميدان الطفيلية داخل مفاعلها وأن أسماك الروك والروك من منطقة الأنفوشي كانت مصابة بهذا الفيروس المتحول بنسبة 12.8% على النحو الفني بينما كانت أسماك السردين من نفس المنطقة بنسبة 4.1% من هذه البريقات وأيضًا كانت أسماك منطقة الكس خالية من أي بريقات طفيلية متحولة.

تم تحليل عينات من مياه البحر المتوسط في حيائين منطقتي إنستيا وبورك التلوث البيولوجي والإصابة بالبرمجيات المتحولة لديدان الطفيلية في مضارب الأسماك البحرية. وقد وجد أن منطقة الأنفوشي بها تلوث بيولوجي مبكر وصفر الصيف فقط وأن أسماك هذه المنطقة مصابة بالبرمجيات المتحولة لديدان الطفيلية في حين أن منطقة الكس بها تلوث بالصرف الصحي ومخلفات الصناعي والصرف الزراعي وكل هذه اللوائح مجتمعة وما تؤثر على الفيروس اليوم وهو الفوقااع أو أنها تؤثر على أي مرحلة من مرحله دورة حياة الفيروس وبالتالي لا يوجد إصابة بالبرمجيات المتحولة لديدان الطفيلية في أسماك هذه المنطقة. بينما في منطقة الأنفوشي فإن التلوث البيولوجي يساعد على وجود الفوقااع، وعلى استكمال الدورة حياة الديدان الطفيلية وذلك فالأسماك مصابة بالبرمجيات الطفيلية المتحولة.

بإجراء العديد من دراسات البيروقوبية لهذه البريقات المتحولة في البحر، فإن طرق تمتلك تكثيف البيانات في مجموعات كل مجموعة تكون من أربعة طيوخ للحمض واثنين ككشواب للفيروس. مجموعة الحمض بالإصابة بالبرمجيات المتحولة لديدان الروك ومسار الأخرى للبرمجة والبرمجيات المتحولة لديدان الروك. وقد تم زعيم البيروقوبية التي تمت في مستشفى الهجرود في الأوزبكستان ليكون لها أهمية على الصعيد العام حيث إنه قد ثبت انتقالها للإنسان عن طريق تناول هذه الأسماك دون طهباً جيداً.