Crustacean Infestations in Some Cultured Marine Fishes in Relation To Economical Impact.
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Abstract:  
This study was conducted on 525 marine fishes represented as 175 of each seabass *Dicentrarcus labrax*, *Mullet* sp (*Mugil cephalus* and *Moolgarda seheli*). The clinical examination of the infested fishes showed respiratory distress, surface swimming, bulging of opercula, sluggish movement, emaciation, severe erosion and hemorrhages of gills. Hemorrhagic areas were found on gill cover and in late stages, as well as external ulcers located in the gill filaments. Caligus and Lernanthropus species were isolated and identified from all the examined fish species. The total prevalence of the examined fish species was 55.05% . The prevalence of crustaceans in *D. labrax*, *M. cephalus* and *M. seheli* were 48.57, 78.28 and 38.29% respectively. The infested fishes with such crustaceans led to loss of body weight consequently, high economic losses at marketing in marine farms.  
This problem was recorded and discussed.  
**Key words:** Cultured marine fish, crustacean infestations and economic Losses.

Introduction:  
Fish become the hope for overcoming protein shortage problem all over the world. Aquaculture is necessary to increase fish production (*Eissa et al.*, 2010). The gradual increase of fish production resulted in serious pathological problems in all countries including Egypt where intensive aquaculture is practiced. Parasitic infestations represent the majority of the known infectious diseases affecting fish, they cause mortality, deformity, weight loss and different clinical abnormalities among the affected fish (*Eissa, 2002*). In recent years, crustacean parasitic diseases are becoming more frequent in marine aquaculture and they are associated with high morbidity and mortality causing substantial economic losses. (*Tansel and Fatih, 2012*). The present study was planned to investigate the parasitic crustaceans among some cultured marine fishes seabass *Dicentrachus labrax* and Mullet species *Mugi Icephalus* and *Moolgarda seheli* in relation to economic impact.
Materials & Methods:
Fishes:
A total number of 525 alive marine fishes were represented as 175 of each Dicentrarchus labrax, Mugil cephalus and Moolgarda seheli of different body weights were randomly collected and seasonally from some private fish farms at Deba triangle in Port Said, Damiata Way.

Aquaria:
Fully prepared glass aquaria (100 x 50 x 50 cm.) were used for holding fishes. The aquaria were supplied with water from the farm; continuous aeration was maintained in each aquarium using an air pump (Elmassy, Model EM-148). Thermostatic heaters (Type CMI, Germany) were used along the course of the study in winter, early spring and late autumn to maintain the temperature at 23±1°C, while in late spring, summer and early autumn the temperature was the room temperature (22 to 32°C).

Clinical examination:
Clinical examination was done on live fishes and / or freshly dead ones. They were grossly examined to determine any clinical abnormalities or presence of crustacean parasites. Also, the postmortem examination was performed on all fishes according to Lucky (1977).

Parasitological examination:
The collected crustaceans from gills, skin and buccal cavity were washed with distilled water, preserved in equal amount of 70% alcohol-5% glycerin in test tubes. Permanent mounts were prepared by passage the parasite in descending grades of glycerine alcohol (70, 50 and 30%), cleared in glycerin and mounted in glycerin gelatin according to Lucky (1977) then examined microscopically. They were identified according to Badawy (1994).

Detection of economic impact:
Data used for detection of economic impact were obtained from the available records of such farms, as well as the research questionnaire designed for those that do not keep records according to El-Telbany and Atallah, (2000). The economic impact was recorded at season of marketing on 100 fish from each species. The economic analysis was done for the total costs and for the total returns. These parameters were calculated per Kilogram (Kg) bodyweight to overcome variations in the numbers of fish used as the following:
1. Total fish yield:
   Total fish yield = Mean fish weight at marketing X number of fish.
2. Total return:
   Total return (LE) = Price of kg X Total yield.
3. Total Loss:
   Total Loss (LE) = Total return (LE) in non-infested fish - Total return (LE) in infested fish

Results
Clinical picture:
The infested fishes from the 3 examined species showed rubbing
the body against sides in the farms and flashing with trying to gulp atmospheric air. In *M. cephalus* and *Moolgarda seheli*, the main clinical signs were the aggregation in groups at the water inlet with severe respiratory distress. They moved rapidly in circles, with sluggish movement. Some infested fishes were suffering from emaciation, bulging of operculi and jumping out of water, this especially in *M. cephalus*. Infested *Dicentrarchus labrax* showed haemorrhagic areas on gill cover and abdomen, ulcers on the back and bases of fins with the crustacea attached to gill cover of *M. cephalus*, mouth cavity of *Dicentrarchus labrax* and body surface of *M. seheli*. (Plate 1)

**Results of parasitological examination:**

The detected crustaceans were:

1- *Caligus* spp:
   It was isolated from body surface, gill cover and attached to mouth cavity of infested *D. labrax*, *M. cephalus* and *Moolgardaseheli*. Plate (2).

2- *Lernanthropus* spp:
   They were collected from gills of *D. labrax*, *M. cephalus* and *Moolgardaseheli*. Plate (2).

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**Plate(1)**:
A. Infested *D. labrax* showing hemorrhagic areas on gill cover and abdomen, B. Showing *caligussp* attached to body surface of *Moolgardaseheli*, C. Showing attached *caligussp* to gill cover of *M. cephalus*, D. Showing heavy infestation of *caligussp* attached to mouth cavity of *D. labrax*. 

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Plate(2) : A. Showing female caligus sp. (Whole copepode), B. Anterior end showing first & second maxilla and claws. C. Female Lernanthropus sp. (whole copepode).

Table (1): Total prevalence of crustacean infestations in the different examined fish species:

<table>
<thead>
<tr>
<th>Fish species</th>
<th>No of examined fish</th>
<th>No. of infested fish</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>D. labrax</em></td>
<td>175</td>
<td>85</td>
<td>48.57</td>
</tr>
<tr>
<td><em>M. cephalus</em></td>
<td>175</td>
<td>137</td>
<td>78.29</td>
</tr>
<tr>
<td><em>M. seheli</em></td>
<td>175</td>
<td>67</td>
<td>38.29</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>525</td>
<td>289</td>
<td>55.05</td>
</tr>
</tbody>
</table>

Table (2): Seasonal prevalence among different examined fishes:

<table>
<thead>
<tr>
<th>Season</th>
<th>Autumn</th>
<th>Winter</th>
<th>Spring</th>
<th>Summer</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>D. labrax</em></td>
<td>4(16%)</td>
<td>7(28%)</td>
<td>10(40%)</td>
<td>64(64%)</td>
<td>85(48.57%)</td>
</tr>
<tr>
<td></td>
<td>n=25</td>
<td>n=25</td>
<td>n=25</td>
<td>n=100</td>
<td>n=175</td>
</tr>
<tr>
<td><em>M. cephalus</em></td>
<td>22(88%)</td>
<td>11(44%)</td>
<td>12(48%)</td>
<td>92(92%)</td>
<td>137(78.28%)</td>
</tr>
<tr>
<td></td>
<td>n=25</td>
<td>n=25</td>
<td>n=25</td>
<td>n=100</td>
<td>n=175</td>
</tr>
<tr>
<td><em>M. seheli</em></td>
<td>40(40%)</td>
<td>3(12%)</td>
<td>10(40%)</td>
<td>14(56%)</td>
<td>67(38.28%)</td>
</tr>
<tr>
<td></td>
<td>n=100</td>
<td>n=25</td>
<td>n=25</td>
<td>n=25</td>
<td>n=175</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>66(44%)</td>
<td>21(28%)</td>
<td>32(42.67%)</td>
<td>170(75.56%)</td>
<td>289(55.05%)</td>
</tr>
</tbody>
</table>

n=No. of examined fish in each season
Table (3): Economic impact in relation to crustacean infestations in different examined fish Species

<table>
<thead>
<tr>
<th>Fish species</th>
<th>D.labrax</th>
<th>M.cephalus</th>
<th>M.seheli</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average costs of 1 Kg</td>
<td>45 LE</td>
<td>20 LE</td>
<td>15 LE</td>
</tr>
<tr>
<td>Average marketing price / Kg</td>
<td>65 LE</td>
<td>25 LE</td>
<td>50 LE</td>
</tr>
<tr>
<td>Marketing weight/fish(non infested)</td>
<td>900g</td>
<td>600g</td>
<td>100g</td>
</tr>
<tr>
<td>Weight of infested fish</td>
<td>a.light infested fish(750-850g)</td>
<td>a.light infested fish(450-550g)</td>
<td>a.light infested fish(50-100g)</td>
</tr>
<tr>
<td></td>
<td>b.heavy infested fish (550-650g)</td>
<td>b.heavy infested fish (350-450g)</td>
<td>b.heavy infested fish (&lt;50g)</td>
</tr>
<tr>
<td>Total number of fish per feddan at marketing</td>
<td>15000</td>
<td>17500</td>
<td>6000</td>
</tr>
<tr>
<td>Production per feddan</td>
<td>a.non infested fish =13.500 tons</td>
<td>a.non infested fish=10.500 tons</td>
<td>a.non infested fish=600 Kg</td>
</tr>
<tr>
<td></td>
<td>b. infested fish=12.180 tons</td>
<td>b. infested fish=8.540 tons</td>
<td>b. infested fish=528 Kg</td>
</tr>
<tr>
<td>Total losses/Tons</td>
<td>1.320Tons</td>
<td>1.960Tons</td>
<td>72Kg</td>
</tr>
<tr>
<td>Total losses/LE</td>
<td>85.800LE</td>
<td>49.000LE</td>
<td>3.600LE</td>
</tr>
</tbody>
</table>

Fig (1). Expected total production in the examined fishes.

Fig (2). Total loss/ feddan in the examined fishes.
4. Discussion:
The main clinical signs observed in the infested fishes with parasitic crustaceans were manifested as rubbing the body against hard objects and sides of aquaria to get rid the irritation induced by the parasites. Opercula were bulging. Fish gathered at water surface with gulping the atmospheric air. These results are in agreement with those reported by Ragias et al. (2004) and Eissa et al. (2012).

In Mugil cephalus and Moolgarda seheli the main clinical signs were the aggregation in groups at the water inlet with severe respiratory distress and swam rapidly in circles. These signs may be attributed to massive mucous secretions due to the irritation from contact of crustacean parasites and with their egg strings on the gill filaments which leads to gill damage. Such results were nearly similar to that found by Eissa (2004), and Lester and Hayward (2006).

Based on the morphological and parasitological examinations, the isolated crustaceans were belonged to Caligus and Lernanthropus sp. Lernanthropussp was isolated from gills of D. labrax, M. cephalus and M. seheli. This result coincides with the findings of Tosken et al. (2008) and Eissa et al. (2012) who isolated the same genus from the same site in D. labrax.

Caligus sp isolated from gills, oral cavity and skin of D. labrax, M. cephalus and M. seheli. This result is agreement with Maran et al. (2009) and Eissa et al. (2012) that isolated the same genus from gill cavities and body surface of M. labrax.

In this work, the total prevalence of parasitic infestation in the examined fish species was 55.05%. These results are lower than met by Maather El-Lamie (2007) and Eissa et al. (2012) who reported the prevalence of parasitic infestation as 70% among three marine fish species (Scomberomorus commerson, Morone labrax and Siganus revulatus). This variation in prevalence may be due to the differences of the examined hosts and difference in the locality from which fish samples were obtained as well as time difference.

Concerning seasonal variation of the parasitic infestation, it was clear that the peak was the highest in summer 75.56%, followed by autumn 44% then Spring 42.67% and winter 28%. This sequence nearly agreed with Noor El-Deen et al. (2013) who recorded the highest infestations were during summer and spring and decreased in winter and autumn.

When D. labrax, M. cephalus and Moolgarda seheli reached to harvesting weight, the results indicated that the infested fishes showed decrease in body weight in comparison with the non-infested ones. So, there was an economic loss. In D. labrax, the total fish yield of non-infested fish per feddan was 13.500 tons, but total fish yield of
infested fish per feddan was 12.180 tons, so the total losses were 1.320 tons. In *M. cephalus*, the total fish yield of non-infested fish per feddan was 10.500 tons but total fish yield of infested fish per feddan was 8.540 tons so the total losses were 1.960 tons. In *M. seheli*, the total fish yield of non-infested fish per feddan was 600Kg but total fish yield of infested fish per feddan was 528Kg, so the total losses were 72Kg. These results agreed with those of *Faruket al.* (2004) and *Thorarinson and Powel* (2006) who reported that market price and harvest weight greatly affect the economics of fish production and farm profitability. Thus, farmers are subjected to substantial economic losses as a result of crusacean fish diseases.

**References:**


**Maran B.A,Venmathi, Seng L.T., Ohtsuka S. and Nagasawa K.**


الملخص العربي

أجريت هذه الدراسة على 175 من أسماك البارو و 175 من أسماك البرو و 175 من أسماك السهللي وقد أسفرت النتائج الإحصائية أن الأسماك المصابة بالطفلية كانت تعاني من ضيق في التنفس وكانت تتعرض لضغوط المياه مما أظهرت تضخماً ل手下ى الخيشومي وهزال وكذلك ظهرت تعرفات خارجية على جسم السمكة وأيضاً الشعرات الخيشومية. وبعد فحص الأسماك أظهرت إصابتها بالكاليس واللبانثروس. وكانت نسبة الإصابة الكلية 55.05% وكانت نسبة الإصابة في أسماك البارو 48.57% ونسبة الإصابة في أسماك البرو 78.08% ونسبة الإصابة في أسماك السهللي 38.29% وكانت الإصابة في فصل الصيف هي الأعلى بنسبة 75.6% وليليها الخريف 44% وليليها الربيع 42.67% وأقلهم نسبته في الشتاء 28%. ونذكر أظهرت الدراسة أن زيادة الوزن السمكة تزيد نسبة الإصابة بالطفلية القشرية وكذلك السمك الإصابة ظهرت به نسبة إصابة أعلى من الذكور، وأيضاً كلما زاد طول السمكة زادت مساحة سطح السمك وبالتالي تكون أكثر عرضة للإصابة بالطفلية القشرية. إن إصابية الأسماك بالطفلية القشرية تؤدي إلى إقفال وزن الأسماك وبالتالي تؤثر اقتصادياً على مزارع الأسماك البحرية.