Abstract:
Parasitic infestation is considered as serious problem in both wild and cultured fish and has great impacts on the growth, reproduction and survival of their hosts. In Egypt, marine aquaculture is in continuous development so the importance of parasitic infestation studies becomes more evident. The present study investigated the gill parasitic infestation in both wild and cultured *Dicentrarchus labrax* (Seabass) and *Sparus aurata* (Seabream). A total of 236 samples of *D. labrax* (126 wild and 110 cultured) and 294 of *S. aurata* (150 wild and 144 cultured) were collected during 2016/2017 from different localities along Mediterranean sea (wild fish samples) and some private marine fish farms (cultured fish samples) in Egypt and examined for parasitic gill infestation. The isolated parasites were identified and the infestation rates of both wild fish species were compared with that of the cultured same species. Results revealed that out of the total examined (530) samples, 378 (71.32%) were found parasitized by monogenean and crustacean parasite species. The examined *D. Labrax* recorded a total infestation rate of 77.1% where *Lernanthropus kroyeri*, *Caligus* species (Copepoda) and *Diplectenum aequans* (Monogenean) were the most prevalent parasitic species, while *Nerocila orbegnyi* (isopod) and *Furnestinia echeneis* (monogenea) were the dominate species among *S. aurata* which recorded 66.7% as total infestation rate. The study also concluded that gill parasitic infestation rates among the examined wild samples of both fish species were found higher than those of the examined cultured ones. The infested *S. labrax* gills with *Caligus spp.* showed excessive mucus secretions and paleness in addition to the detected hyperplasia and necrosis of epithelial cells of primary gill filaments by histopathlogical examination.

Key words: Gill- Ectoparasites- Marine- Wild- Cultured- Egypt.
INTRODUCTION

Fish are expected to offer a great hope in solving the problem of animal protein deficiency especially with the continuous increase in human population and the subsequent increase of demand.

The majority of the water resources are of marine nature where marine fishes are considered as one of the healthy food sources (Osman et al., 2014), so that there is an intensification and increasing in aquacultural industry nowadays. Sea Bass (Dicentrarchus labrax) is the important and acceptable species to be commercially farmed in Europe in the Mediterranean sea cages. The major producers of D. labrax are Greece, Italy, Spain, Turkey and Egypt FAO (2008). Also, Seabream (sparus aurata) are marine fishes with economic value and wide spread all over the world especially in the Mediterranean Sea. In Egypt farming of those two fish species has been expanded and developed in the last few years (Abu el sadaat 2015).

Gill parasites are considered as one of the most serious problem in both wild and cultured fish which have a great impact on the growth, reproduction and survival of their hosts (Reed 2005). Monogenaean and crustacean parasite species are among the rich classes of fish parasite..

High infestation with Caligus spp. Reduce the growth rate marketing value and may lead to death (Eissa, et al 2010),as consequence of respiratory distress ,tissue damage and secondary bacterial and fungal infection (Ho and Lin 2004) and (Ragias, etal 2004).

The present study was conducted to record the ectoparasites infesting gills of both wild and cultured D. labarax (Sea bass) and S. aurata (Sea bream) from different localities along Mediterranean Sea (the wild fish samples) and from private marine fish farms( the cultured fish samples).The prevalence ,seasonal dynamics and histopathological impact of the most prevalent parasite was estimated .

MATERIAL AND METHODS

Fish sampling

A total of 236 samples of D. labrax (126 wild and 110 cultured) and 294 of S. aurata (150 wild and 144 cultured) were collected during 2016/2017 from different localities along Mediterranean sea (wild fish samples) and some private marine fish farms (cultured fish samples) in Egypt. Samples were transported to the laboratory in aerated tanks partially filled with its natural water and was kept alive until investigation.

Parasitological examination

1. Macroscopic examination

Gills were examined by naked eyes and with the help of dissecting microscope for any attached parasites, lesions, or external lesions.

2. Microscopic examinations

Mucous smears were immediately prepared from the gills with the aid of microscopic slides and subsequently examined with the aid of a dissecting microscope. Fish were killed by severing the spinal cord behind the head. Gills were then removed and put in normal saline for removing excess mucus. Gill arches were separated and examined for monogenean and crustacean
parasites under a stereomicroscope. The collected parasite were fixed in 4% formalin for permanent whole mount preparation (paperna 1991). Measurements were taken using ocular micrometer calibrated against a stage micrometer. Microphotographs were taken. Identification of the parasites was made according to the available literatures.

Histopathological examination:
Specimens for histopathological investigation were taken from the infested gills with the most prevalent ectoparasitic species. Samples were trimmed and fixed in 10% phosphate buffered formalin. Then washed in running tap water for 24 hours and dehydrated in different concentration gradients of alcohol then cleared in xylol. Samples were embedded in paraffin wax and sectioned into thin sections of 5 microns thickness. Sections were stained with Hematoxyline and Eosin (H&E) stain and examined microscopically according to Roberts (2001).

RESULTS
Results of parasitological examination:

Prevalence and infestation dynamics:
Of 530 total examined fish, 378 (71.32%) were found infested with different ectoparasite species. The examined Dicentrarcus labrax (Seabass) showed higher infestation rate reached 77.1% (65.9% in wild and 34.1% in cultured fish) while the total infestation rate of Sparus aurata (Seabream) was 66.7% (66.8% in wild and 33.2% in cultured fish). Comparing between the infestation rate of the same examined wild and cultured fish species, it was recorded that wild fish showed higher rate of infestation (65.9% and 66.8% for D. labrax and S. aurata respectively) than that of the same but cultured species (34.1% and 33.2% for D. labrax and S. aurata respectively) (table 2). Seasonally, autumn showed the highest rate of infestation while the lowest rate was recorded during spring (table 3, fig. 3).

The detected parasitic species:
Five species of ectoparasites were recorded which are; two types of monogeneans (Diplectanum aequanus and Furnestinia echeneis), one isopod species (Nerocila orbegnyi) and two copepod species (Caligus spp. and Lernanthropus Kroyeri). The detected species and the rate of infestation were reported in table (4). Caligus species was of the highest prevalence among the examined Seabass while Furnestinia echeneis was the most prevalent among the examined Seabream.

Result of histopathological examination:
The S. labrax gills infested with Caligus spp. showed excessive mucus secretions and paleness in addition to the detected hyperplasia and necrosis of epithelial cells of primary gill filaments. (Fig. A and B)

Discussion
In the present work, two species of marine fishes were investigated for gill ectoparasitic infestation. Result revealed a total infestation rate of 71.32%. Among the examined D. labrax, 65.9% and 34.1% of the wild and cultured samples were found infested respectively with total rate of 77.1%, the data which differed from that reported by Eissa et al. (2012) for wild sea bass at Esmailia province (47%), by Elgendy et al. (2015) from the same cultured specie at Alexandria province and by Noor el deen et al. 2015 (16%). S. aurata showed 66.8% and 33.2% infestation rate of wild and cultured examined samples
respectively (a total rate of 66.7%), the data which considered higher than that reported by Mahmoud et al. (2014) from cultured S. aurata at Domiita province (32%). These differences might be attributed to the variation of the examined areas, the ecological and environmental factors and the periods of investigation. Regarding the detected monogenean species, Furnestinia Echeneis (Diplectanidae) was identified according to Reversal (1992) and recorded from 59.1% of the investigated S. aurata, the rate which nearly the same that reported by Mahmoud et al. (2014) but considerably higher than that recorded by Robet et al. (2016) from the same cultured species in Tunisia (1.36%). Diplectanum aequanus (Diplectanidae) was isolated from gills of D. labrax and identified according to González-Lanza et al. (1991) with a rate of 42.8%. Higher rate was recorded from the same species in Italy by Dezfuli et al. 2007 (73.6%). Dealing with the recorded crustacean species, Nerocila orbegnyi (isopod) was identified according to Brusca. (1987), the species was previously isolated by Noor El-Deen et al. (2013) from cultured D. labrax but with a lower rate of 6% and by Mahmoud et al. (2016) from Solea vulgaris and Tilapia zilli from lake Qarun with infestation rate of 26% and 18% respectively. The detected Lernanthropus kroyeri was identified according to Toksen (2007). The infestation rate of Lernanthropus kroyeri was 20.8%. This result is lower than that obtained by Eissa et al., (2012) from the Red Sea D. labrax (47%) and that reported by Noor El-Deen et al., (2013) (10%). This difference may be attributed to the locality of sampling and the variation of ecological factors. Two Caligus spp. were also recorded from seabass(48.4%) and Seabream (15.3%). According to our results we can conclude that wild marine fish species was subject to higher infestation rate with ectoparasitic monogenea and crustacea than that of the same cultured species, that is might be due to the control strategies that could be applied in the fish farms including prevention and treatment protocol. Results of pathological investigation were in agreement with that reported by Rubal (1994) and Easa and Abu El-Wafa (1995).
Table (1): Infestation rate of ectoparasites among the examined fish species

<table>
<thead>
<tr>
<th>Fish species</th>
<th>Number of examined</th>
<th>Number of infested</th>
<th>Of infestation %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sea bass</td>
<td>236</td>
<td>182</td>
<td>77.1</td>
</tr>
<tr>
<td>Sea bream</td>
<td>294</td>
<td>196</td>
<td>66.7</td>
</tr>
<tr>
<td>Total</td>
<td>530</td>
<td>378</td>
<td>71.32</td>
</tr>
</tbody>
</table>

Fig. (1): Infestation rate of ectoparasites among the examined fish species.

Table (2): Infestation rate among the examined fish species.

<table>
<thead>
<tr>
<th>Fish species</th>
<th>Number of wild</th>
<th>Number of infested</th>
<th>% of infestation</th>
<th>Number of cultured</th>
<th>Number of infested</th>
<th>% of infestation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sea bass</td>
<td>126</td>
<td>120</td>
<td>65.9%</td>
<td>110</td>
<td>62</td>
<td>34.1%</td>
</tr>
<tr>
<td>Sea bream</td>
<td>150</td>
<td>131</td>
<td>66.8%</td>
<td>144</td>
<td>65</td>
<td>33.2%</td>
</tr>
</tbody>
</table>

Fig. (2): Infestation rate among the examined fish species.
Table (3): Seasonal dynamics of ectoparasitic infestation among the examined fish species

<table>
<thead>
<tr>
<th>season</th>
<th>autumn</th>
<th>winter</th>
<th>spring</th>
<th>summer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sea bass</td>
<td>72(39.5%)</td>
<td>40(21.9%)</td>
<td>22(12.2%)</td>
<td>48(26.4%)</td>
</tr>
<tr>
<td>Sea bream</td>
<td>56(28.5%)</td>
<td>58(29.5%)</td>
<td>32(16.3%)</td>
<td>50(25.5%)</td>
</tr>
</tbody>
</table>

Fig. (3): Seasonal infestation dynamics.

Table (4): The rate of infestation of the detected parasite species among the examined fish species

<table>
<thead>
<tr>
<th>parasite sp.</th>
<th>Caligus spp.</th>
<th>Lernanthropus kroyeri</th>
<th>Diplectanum aequanus</th>
<th>Nerocila orbegnyi</th>
<th>Furnestinia echeneis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sea bass</td>
<td>88(48.4%)</td>
<td>38(20.8%)</td>
<td>78(42.8%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sea bream</td>
<td>30(15.3%)</td>
<td></td>
<td></td>
<td>72(36.7%)</td>
<td>116(59.1%)</td>
</tr>
</tbody>
</table>

Fig. (4): The rate of infestation of the detected parasite species among the examined fish species
Sea bass

Plate (1): A; Caligus spp. B; Lernanthropus kroyeri C; Nerocila orbegnyi
D; Diplectanum aequanus E; Furnestinia echeneis F; E.echeneis posterior haptor
Fig. A: The attachment parts of the parasite deeply embedded in the gill racker surrounded with oedema and inflammatory reaction together with haemorrhage (x1000)(arrow).

Fig. B: The attachment part appear segmented remnant of the parasite deeply penetrate the gill racker, stained deeply aesinophilic (x1000)(arrow).
References


FAO (2008): Cultured aquatic species Information Programme-Dicentrarchus labrax (Linnaeus, 1758). A fishery Resource under Fisheries and Aquaculture on the food and


الملخص العربي

طفيليات الخياريش في بعض الأسماك البحرية البرية والمستزرعة في مصر

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تعد الإصابة بالطفيليات مشكلة خطيرة في كل من الأسماك البرية والمستزرعة، كما أن لها تأثيراً بات على النمو والتكرار أيضًا على حياة عوائناها. ولأن الاستزراع المائي البحري في مصر في طور التطوير المستمر فإن أهمية دراسات الإصابة بالطفيليات تصبح أكثر وضحا، وقد بحثت هذه الدراسة في الإصابة الطفيلية لخياريش في كل من أسماك الفالوت والدنين حيث تجمع عينة من الفالوت (132) البرية، و110 المستزرعة و294 من الدنين (105 البرية، و 144 المستزرعة) خلال 2017-2018، من أبيناء مختلفة طول البحر الأبيض المتوسط (عينات الأسماك البرية) وبعض مزارع الأسماك البحري الخاصة (عينات الأسماك المستزرعة) بمصر. وقد تم عمل الفحص الطفيلي لخياريش وتصنيف أنواع الطفيليات التي تم عزلها وكذلك مقارنة معدلات الإصابة في الأسماك البرية من كلا النوعين بملايها في الأسماك المستزرعة. من مجموع العينات التي تم فحصها (360) تبين ان عدد (378) منها كانت مصابة بأنواع من الدنا وحيدة العائل والفصليات المتسلقة. سجلت أسماك الفالوت معدل الإصابة الإجمالي 77.1% حيث كانت ليرناثروبوس كوري، كلايسيس (كوبيرندا) و كليكتيتيوم كرويتيز (حيدة العائل) في الأنواع التي تم عزلها. بينما كانت نيوسيا أوربيسيني (تماثلات الأرجل) و فورسيستيا أفين ليت (حيدة العائل) هي التي تم تسجيلها بين أسماك الدنين والتي سجلت 76.7% كجمالي معدل الإصابة. وخلصت الدراسة أيضاً إلى أن معدلات الإصابة بالطفيليات في الخياريش بين عينات الأسماك البرية التي تم فحصها لكل النوعين من الأسماك كانت أعلى من تلك التي تم رصدها من مزيجاتها المستزرعة. وقد أظهر الفحص الظاهر لخياريش أسماك الفالوت المصابة بطفيل الكالينجس وجود زيادة في كمية الخفط وذوبان إضافي إلى وجود فرط في التنسج ونخر في الخلايا الظهارية من الخيوط الخيشوية الأولية تم تبينه من خلال الفحص النسيجي.