



Gill parasites of some wild and cultured marine fish in Egypt

Nisreen.E.Mahmoud*
; W.M.Mousa*;
Mai Abuwarda M*
and Eman.S.Hasanin
*Department of
Parasitology, Faculty of
Veterinary Medicine,
Cairo University, Egypt

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 histopathological 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) .

Monogenean 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, et al 2004).

The present study was conducted to record the ectoparasites infesting gills of both wild and cultured *D. labrax* (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 parasites 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 *Dicentrarchus 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). (table 1&2). 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 aequanum* and *Furnestinia echeneis*), one isopod species (*Nerocila orbegnyi*) and two copepod species (*Caligus spp.* and *Lernanthropus Kroyeri*). (plate 1). 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 species 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 subjected 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

Fish species	Number of examined	Number of infested	Of infestation %
Sea bass	236	182	77.1
Sea bream	294	196	66.7
Total	530	378	71.32

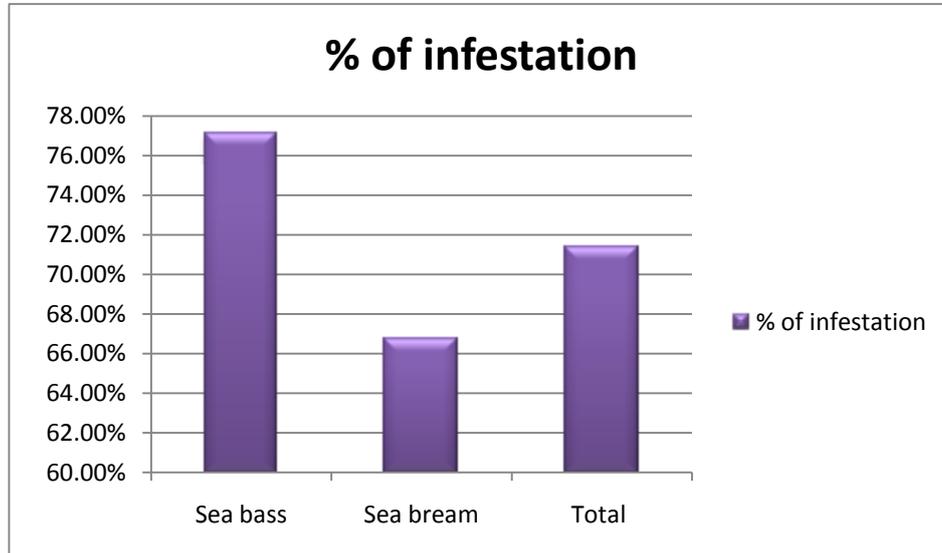


Fig.(1): Infestation rate of ectoparasites among the examined fish species.

Fish species	Number of wild	Number of infested	% of infestation	Number of cultured	Number of infested	% of infestation
Sea bass	126	120	65.9%	110	62	34.1%
Sea bream	150	131	66.8%	144	65	33.2%

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



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

Table (3):Seasonal dynamics of ectoparasitic infestation among the examined fish species

season fish sp.	autumn	winter	spring	summer
Sea bass	72(39.5%)	40(21.9%)	22(12.2%)	48(26.4%)
Sea bream	56(28.5%)	58(29.5%)	32(16.3%)	50(25.5%)

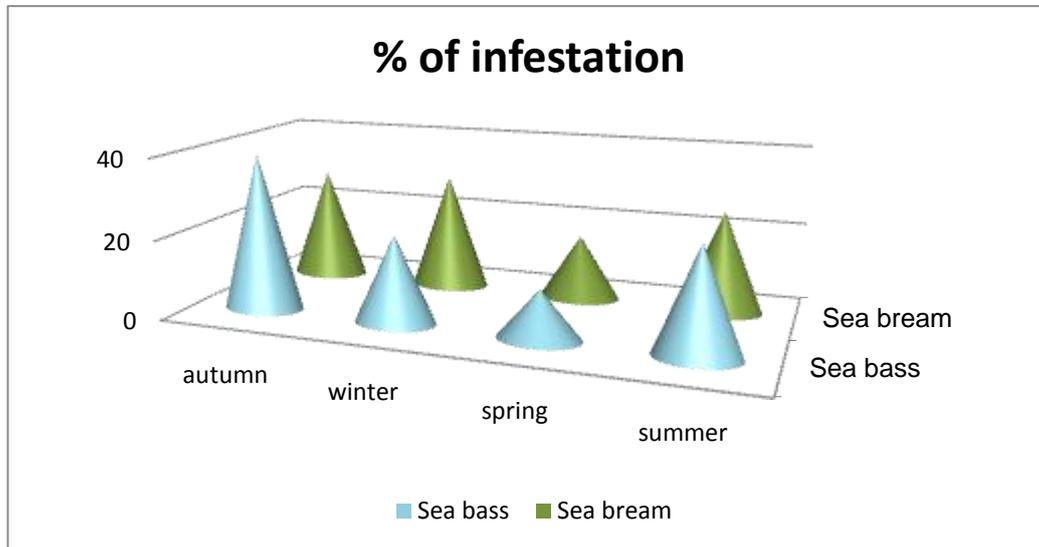


Fig.(3):Seasonal infestation dynamics.

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

parasit sp fish sp.	<i>Caligus spp.</i>	<i>Lernanthropus kroyeri</i>	<i>Diplectanum aequanus</i>	<i>Nerocila orbegnyi</i>	<i>Furnestinia echeneis</i>
Sea bass	88(48.4%)	38(20.8%)	78(42.8%)		
Sea bream	30(15.3%)			72(36.7%)	116(59.1%)

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

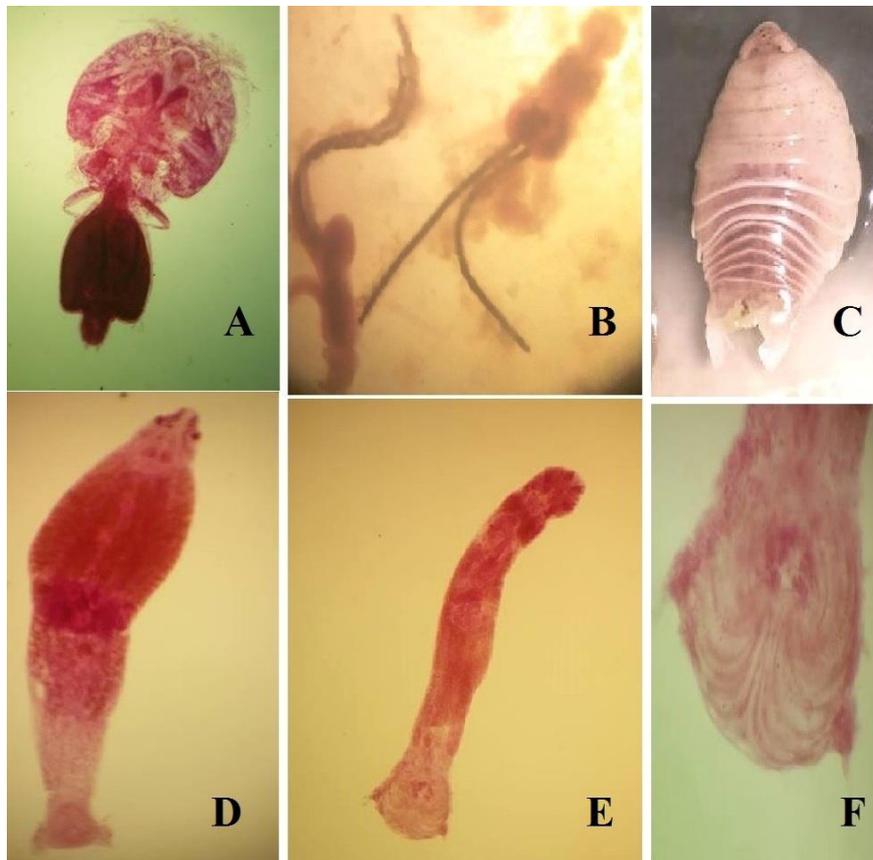
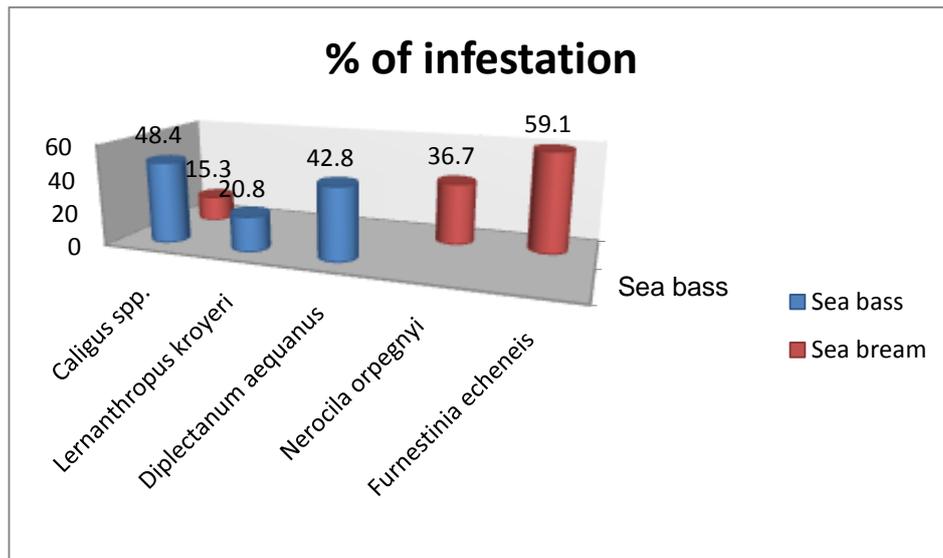


Plate (1): A; *Caligus spp.* B; *Lernanthropus kroyeri* C; *Nerocila orpegnyi* D; *Diplectanum aequanum* E; *Furnestinia echeneis* F; *E. echeneis posterior haptor*

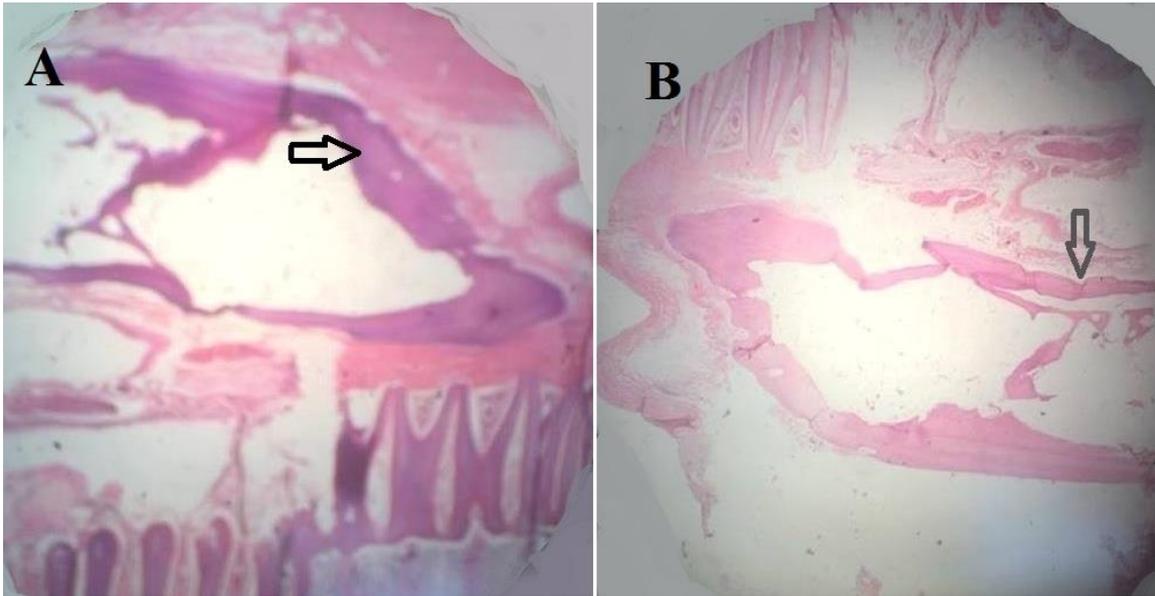


Fig.A: The attachment parts of the parasite deeply embedded in the gill raker surrounded with oedema and inflammatory reaction together with haemorrhage.(x1000)(arrow).

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

References

- Agriculture Organization (FAO) of United Nation website. Accessed: 20 June 2010. <http://www.fao.org/fishery>
- González-Lanza C, Alvarez-Pellitero P and Sitja-Bobadilla A (1991):** Diplectanidae (Monogenea) infestations of sea bass, *Dicentrarchus labrax* (L.), from the Spanish Mediterranean area. Histopathology and population dynamics under culture conditions. *Parasitol Res*, 77, 307–314}
- Ho,J.S. and C.L. Lin, (2004):** Sea lice of Taiwan Copepoda: Siphonostomatoida: Caligidae. Sueichan Press, Taiwan, pp: 213-215.
- Mahmoud, N. E., Fahmy, M. M., Abuowarda, M. M. and Khattab, M. S. (2016):** Parasitic Cymothoid Isopods and their Impacts in Commercially Important Fishes From Lake Qarun, Egypt. *International Journal of Chem Tech Research*, Vol. 9, No. 12 pp, 221-229. 10
- Mohey El-S. Easa and Salah A. El-Wafa (1995):** Pathological studies on an epidemic of *Caligus curtus* (Copepoda) among captive *Mugil* and *Sparus* in Egypt with reference to Malathion control. *Journal of Applied Aquaculture*, 5(2): 25-29.
- Noor El-Deen, A. E.; Zaki, M.S. and Shalaby, I. S.(2013):** Some investigations observed in culture seabass, *Dicentrarchus labrax* L. infested with *Lernanthropus kroyeri* and *Nerocila orbigny* and Exposed to Pollution during different seasons at Dammaitte province. *Life Science Journal*; 10(3): 1877– 1884.
- Osman H.A.M., Hassan M.A. and EL-Refaey A.M.E. (2014):**Studies on Sarcataces sp.(Copepoda;Philichthyidae) infestation
- Abu El-Saadat E. I. (2015):** Studies on parasitic diseases affecting some marine fishes. Ph. D. thesis, Fac. Vet. Med. Alexandria Univ.
- Bahram S. Dezfuli . Luisa Giari. Edi Simoni, Roberto Menegatti, Andrew P. Shinn and Maurizio Manera(2007):** histopathology of cultured European sea bass, *Dicentrarchus labrax* (L.), infected with *Diplectanum aequans* (Wagener 1857) Diesing 1958 (Diplectanidae: Monogenea) *Parasitol Res* (2007) 100:707–713
- Brusca N.L. (1987):** Australian Species of *Nerocila* Leach, 1818 and *Creniola* n. gen. (Isopoda: Cymothoidae), Crustacean Parasites of Marine Fishes, Records of the Australian Museum, 39(6): 355412.
- Bush A O, Lafferty K D, Lotz J M, and Shostak A W (1997):** Parasitology meets ecology on its own terms: Margolist et al . revisited. *J Parasitol* 83: 579-583.
- Chisholm L A and Whittington I D(1998):** Morphology and development of haptors among the Monocotylidaen(monogenea) *Hydrobiologica* 383: 251-261
- Eissa I.A.M., El-Lamie M.M. and Zakai M. (2012):** Studies on crustacean diseases of Sea bass, *MoroneLabrax*, in Suez Canal,Ismailia governorate. *Life Science Journal*, 9(3):512-518.
- Eissa I.A.M.; Maather, El-Lamie and Mona, S. Zaki (2012):** Studies on Crustacean Disease of Seabass, *Morone Labrax*, in Suez Canal, Ismailia Governorate.*Life Science journal*, 9(3).512-518.
- FAO (2008):** Cultured aquatic species Information Programme-*Dicentrarchus labrax* (Linnaeus, 1758). A fishery Resource under Fisheries and Aquaculture on the food and

and *C. apodus* Brain, 1924 infection in Lagoon cultured Sea bass in Greece. *Aquaculture*, 242: 727-733.

Reed.P, Ruth Francis- Floyed and Ruth Ellen klinger(2005): Monogenean parasites of marine fish. I.F.A.S. Florida Univ.

Roberts R.J. (2001): *Fish Pathology*. 3rd edition, W.B. Saunders, New York

Roubal, F. R. (1994): Histopathology caused by *Caligus epidemicus* Hewitt (Copepoda: Caligidae) on captive *Acanthopagrus australis* (Günther) (Pisces: Sparidae). *Journal of Fish Diseases*, 17: 631–640.

Toksen E (2007): *Lernanthropus kroyeri* van Beneden, 1851 (Crustacea: Copepoda) infections of cultured sea bass (*Dicentrarchus labrax* L.). *Bull Eur Ass Fish Pathol*, 27, 49-53.

(Black bag disease) among some marine fish species of Arabian Gulf, Saudi Arabia. *World Applied Sciences Journal*, 32(9): 1780-1788.

Paperna I (1978): Occurrence of fatal parasitic epizootics in Mari cultured tropical fish. Fourth international congress of parasitology, Warsawa 1980.

Paperna I (1991): Diseases caused by parasites in the aquaculture of warm water fish. *Annual Review of fish diseases* 1: 155-194.

Rabet C M, Ensibi C, Dhaouadi R and Yahia O K. .(2016): A preliminary study on gill parasites of gilthead sea bream *Sparus aurata* (Linnaeus 1758) (Pisces: Teleostei) from the eastern Tunisian sea-cage aquaculture. *GERF Bull Biosc*. June; 7(1):1-5.

Ragias,V., D.Tontis and F.Athanassopoulous (2004): Incidence of an intense *Caligus minimus* sotto 1821, *C.pageti* Russel, 1925, *C. mugilis* Brain, 1935

الملخص العربي

طفيليات الخياشيم في بعض الأسماك البحرية البرية والمستزرعة في مصر

*نسرين .ع .محمود , *وحيد .ا. موسى , *مى ابو ورده .م , ايمان .س.حسانين

*قسم الطفيليات كلية الطب البيطرى جامعة القاهرة

تعتبر الإصابة بالطفيليات مشكلة خطيرة في كل من الأسماك البرية والمستزرعة ; كما ان لها تأثيرا بالغا على النمو والتكاثر وايضا على حياة عوائلها . ولان الاستزراع المائي البحري في مصر في طور التطوير المستمر فان أهمية دراسات الإصابة بالطفيليات تصبح أكثر وضوحا . وقد بحثت هذه الدراسة في الإصابة الطفيلية للخياشيم في كل من اسماك القاروص و الدنيس حيث تم تجميع ٢٣٦ عينة من القاروص (١٢٦ البرية و ١١٠ المستزرعة) و ٢٩٤ من الدنيس (١٥٠ البرية و ١٤٤ المستزرعة) خلال ٢٠١٦ / ٢٠١٧ من اماكن مختلفة على طول البحر الأبيض المتوسط (عينات الأسماك البرية) وبعض مزارع الأسماك البحرية الخاصة (عينات الأسماك المستزرعة) بمصر وتم عمل الفحص الطفيلي للخياشيم بها وتصنيف انواع الطفيليات التي تم عزلها وكذلك مقارنه معدلات الاصابه فى الاسماك البريه من كلا النوعين بمثيلاتها فى الاسماك المستزرعة . من مجموع العينات التي تم فحصها (٥٣٠) تبين ان عدد ٣٧٨ (٧١.٣٢٪) منها كانت مصابه بانواع من الديدان وحيدة العائل والقشريات المتطفلة. سجلت اسماك القاروص معدل الإصابة الإجمالي ٧٧.١٪ حيث كانت ليرنانثروبيوس كروييري، كاليجوس (كوبيبودا) و دييلكتينوم أكوانز (وحيدة العائل) هي الانواع التي تم عزلها، بينما كانت نيروسيليا أوربيغني (متماثلات الأرجل) و فورنيستينيا إشيونيس (وحيدة العائل) هي التي تم تسجيلها بين اسماك الدنيس والتي سجلت ٦٦.٧٪ كإجمالي معدل الإصابة. وخلصت الدراسة أيضا إلى أن معدلات الإصابة بالطفيليات في الخياشيم بين عينات الاسماك البرية التي تم فحصها لكلا النوعين من الأسماك كانت أعلى من تلك التي تم رصدها من مثيلاتها المستزرعة. وقد اظهر الفحص الظاهري لخياشيم اسماك القاروص المصابة بطفيل الكاليجس وجود زيادة في كميته المخاط وذبول اضافة الى وجود فرط في التنسج ونخر في الخلايا الظهارية من الخيوط الخيشومية الأولية تم تبينه من خلال الفحص النسيجي.