

Study seasonal variation of infected fish *Boops boops* (Sparidae) with three Types of external Parasites in marine waters of Latakian coast

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□ ABSTRACT □

The current study focused on studying the infection of *Boops boops* fish in the coastal marine waters of Latakia Governorate with three types of external parasites and the changes that occur in this infestation throughout the year. The research was conducted during the period from 12/1/2024 to 12/12/2024. A total of 140 fish were collected, and morphometric measurements (total length, standard length) were taken. The fish were examined for parasites, including the external body surface, fins, oral cavity, nostrils, eyes and gills. Parasites were isolated and classified based on the approved taxonomic keys. The Examination results showed the presence of three types of parasites on the gills of *B. boops* fish. *Microcotyle erythrini*, *Choricotyle* sp. and *Gnathia* sp.

The examination of the seasonal samples clearly showed that the infection of the fish with the parasites *M. erythrini* peaked during the summer, recording 57.1%, while the lowest infection rate was recorded in the winter at 5.71%. As for *Choricotyle* sp., the highest infection rate was also in the summer at 34.3%, and the lowest rate was recorded in the winter at 2.86%. As for the parasites *Gnathia* sp., the highest infection rate was recorded in the spring at 37.14%, and no infection was recorded in the winter and autumn.

Keywords: *Boops boops*, *Gnathia* sp., *Microcotyle erythrini*, *Choricotyle* sp., Syrian marine waters.

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دراسة التغيرات الفصلية لإصابة النوع السمكي الغبس *Boops boops* (الأسبورات Sparidae) بثلاثة أنواع من الطفيليات الخارجية في المياه البحرية لساحل محافظة اللاذقية

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□ ملخص □

تركز البحث الحالي حول دراسة إصابة أسماك *Boops boops* في المياه البحرية لساحل محافظة اللاذقية بثلاثة أنواع من الطفيليات الخارجية والتغيرات التي تحدث في هذه الإصابة خلال أشهر السنة. أُجري البحث خلال الفترة الممتدة من 2024/1/12 إلى 2024/12/12 م، جمعت الأسماك البالغ عددها 140/ فرداً سمكياً، أُخذت القياسات المورفومترية (الطول الكلي، الطول القياسي)، وفحصت الأسماك بحثاً عن الطفيليات، حيث تم فحص السطح الخارجي للجسم، الزعانف، التجويف الفموي، الفتحات الانفية، العيون والغلاصم. عُزلت الطفيليات وصُنفت. أظهرت نتائج الفحص وجود ثلاثة أنواع من الطفيليات على غلاصم أسماك *B. boops* وهي: *Gnathia sp.*، *Microcotyle erythrini*، *Choricotyle sp.* أظهر فحص العينات الفصلي بوضوح أن إصابة الأسماك بالطفيلي *M. erythrini* بلغت ذروتها خلال فصل الصيف وسجلت 57.1% بينما سجلت أقل نسبة إصابة في فصل الشتاء 5.71%، أما بالنسبة للطفيلي *Choricotyle sp.* فسجلت أعلى نسبة إصابة في فصل الصيف 34.3% وأقل نسبة في الشتاء 2.86%. أما بالنسبة للطفيلي *Gnathia sp.* أعلى نسبة إصابة به في فصل الربيع 37.14%، ولم تسجل أية إصابة في فصلي الشتاء والخريف.

الكلمات المفتاحية: *Boops boops*، *Gnathia sp.*، *Microcotyle erythrini*، *Choricotyle sp.*، المياه البحرية السورية.

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Introduction:

Many fish parasites, or their larval stage, are transmitted to humans through the consumption of raw or undercooked fish [1]. Parasites are among the most important pathogens affecting fish. These parasites may be external or internal. The presence of parasites in freshwater and marine fish indicates a disease infection, but it does not necessarily mean that symptoms will appear. A large proportion of parasitic infections can be latent. The importance of such infections lies in their significant role in reducing the immunity of the infected fish, making it more susceptible to other fungal, bacterial, or viral diseases. They also reduce the fish's growth and productivity [2].

Several studies have been conducted to investigate fish parasites on different fish species. A study was conducted in multiple locations in the northwestern Mediterranean on the Sparidae family to study the parasites that infect it [3], in which 20 species of parasites belonging to the genus *Lamellodiscus* that infest fish species of the Sparidae family were identified.

In a Study [4] in the Mediterranean Sea (Italy), the presence of *Gnathia* sp. Was recorded as a parasite on the fins of a group of bony fish, including *Diplodus sargus* and *Dentex dentex*. Researchers [5] Were able to identify three species of Isopods in the *Boops boops* fish (family Sparidae) in the Gulf of Antalya. As Study by [6] on the *Pagellus erythrinus* (family Sparidae) off the coast of El Kalaa, Algeria, showed a high diversity of parasites relative to the fish size. This included four monoecious species, two species of annelids, five species of copepods, and one species of nematode. The Study indicated an increased incidence in the spring and summer and a decrease in the autumn and winter.

Another study by researchers [7] conducted in Algeria focused on identifying the external parasites of two fish species, *Boops boops* and *Mullus barbatus*. A difference in infection rates was observed monthly and among fish size categories. The high rates of parasitic infection were observed in the *Boops boops* fish species during the spring and the lowest in the Autumn and winter, while in the *barbatus* fish species, the infection rate showed a gradual increase during the summer months of July and August. Another study by [8] conducted in Algeria, the parasite *Gnathia* sp. was isolated from the gill of *Boops boops* and several species of Sparidae fish. In a Study conducted in France [9]. the parasite *Furnitinia echeneis* was isolated from the gill of *Sparus aurata*, and *Lamellodiscus elegans* was also isolated from the gill of *Diplodus annularis*, and the parasite *Furnitinia echeneis* from the gill of *Sparus aurata* in the northwestern Mediterranean. In a study on *Boops boops*, the parasitic species *Cerathoa oestroides* (isopoda) was isolated in the Adriatic Sea [10].

In Syria, studies on the parasitic fauna of *Boops boops* are very rare and still incomplete. There is only one study that aimed to Investigation of Exo-parasites of some fish species in the Syrian coast [11]. This study included 140 fish belonging to two species of Sparidae (*Sparus aurata*, *Boops boops*) collected from different regions of the coastal water of Lattakia city. The results showed that three species of ectoparasites on the gill of *Sparus aurata* were identified: *Lamellodiscus elegans*, *Furnitinia echeneis*, and *Gnathia* sp. while two species on the gill of *Boops boops* were isolated: *Axine belones*, *Furnitinia echeneis*.

Research objectives and importance:

As a result of the increasing demand for marine fish as a food source rich in animal protein and unsaturated fatty acids on the one hand and the lack of marine fish resources on

the other hand. The importance of the research is clear in the study of ectoparasites of *Boops boops* fish, which is one of the species belonging to the Marine Sparidae Family and is one of the economically important fish species.

The aim of the present research is to investigation of ectoparasite of *Boops boops* from Syrian marine water, and the changes that occur in this infestation throughout the months of the year.

Methods And Materials

Monthly samples of *Boops boops*; were collected between 12 January and 12 December 2024 using fishing nets. 110 Fish sample were transferred directly to the marine Biology and Fisheries Laboratory at the Higher Institute of Marine Research – Latakia University for laboratory examination and detection of parasites, and measurements were taken (Total length, weight and age) of the studied fish from marine waters of the coast of Latakia Governorate.

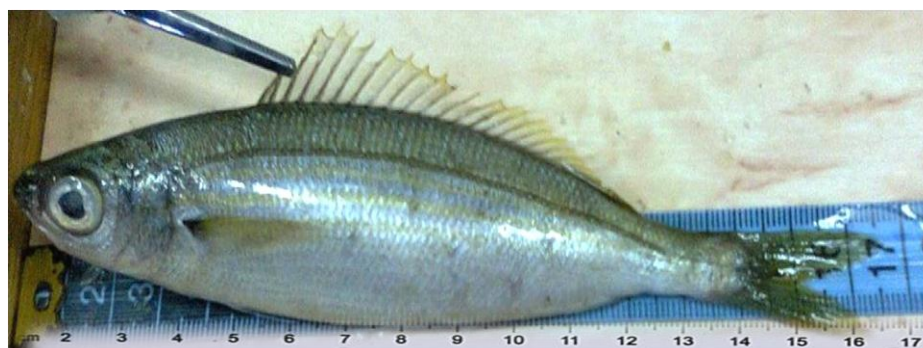


Figure 1: *Boops boops* sample

Skin surface, fins, mouth cavity, nostrils and gills of each specimen were examined with the naked eye for any attached parasites. Gills were carefully removed, and placed in separate Petri dishes to remove any excess gill mucus, and examined for parasites under a microscope [12]. Monogenea worms and copepoda were isolated from wet smears using fine needles, then placed in a drop of water on a glass slide, then fixed directly in 10% formaldehyde, then washed and stained using lactic acid [13, 14]. The preparations were studied microscopically to determine the morphometric character of the taxonomically important parts of the body. Taxonomic identification of monogenea is based upon the morphology of the posterior attachment organ (shape and dimensions of the chitinized parts of Opisthaptor), and the shape and dimensions of the Copulatory organ and the presence or absence of eyespots [15,16,17]. The prevalence (%) was calculated as the percentage of the total number of fish infected out of the total number of fish examined. The mean intensity was calculated as the number of parasites in infected fish [18].

Results And Discussion:

In the current study, the three parasite species *Microcotyle erythrini*, which belongs to the family Microcotylidae and *Choricotyle* sp., which belongs to the family Diclidophoridae and *Gnathia* sp. which belongs to the family Gnathidae were isolated and identified from the gills of *Boops boops* Fish for the first time in the Coastal Water of Latakia Governorate.

Belong to the genus *Microcotyle*, most of which are ectoparasites. The attachment clasps are located on a separate disc or extend along the body margin and sometimes anteriorly above the level of the ovary. The head glands are located at the anterior end in 3 groups. The oral cavity contains strong suckers. The intestinal canal has two branches that merge at the posterior end of the body, forming numerous lateral growths. The Tests are multi-porous, and the ovary is flask- shaped and usually S- curved. They affect the host by attaching to fish larvae and gills. They are characterized as ciliated, free –swimming larvae that continue to grow to the adult stage, with species in this group reaching a length of 13 mm [19].

Species of the genus *Microcotyle* parasitise only one host, where they complete their life cycle. They are oval- shaped, hermaphroditic, with the testes maturing before the ovaries, and contain flame cells that function as kidneys. They infect various types of freshwater and marine organisms, as well as different types of fish. The body then consists of the anterior part or prohaptor, which is used mainly for feeding and attachment (it is not considered the primary attachment organ, as it is mainly used to connect the parasite to the host's body). The posterior part, the opisthaptor, is the primary attachment organ and is present in all species of this genus [20], Figure (2, 3, 4).

The mouth of *M. erythrini* is sub-ventral, conical in shape with a pair of separate hollow suckers Fig 2. The pharynx is nearly spherical, the esophagus is short, and the intestine branches posteriorly to give the genital atrium. The testes are numerous, ranging in number from 12 to 20. The copulatory organ is muscular and located in the posterior part of the reproductive atrium. The reproductive atrium consists of a transverse, medially muscular chamber equipped with 216-408 small conical spines [20].

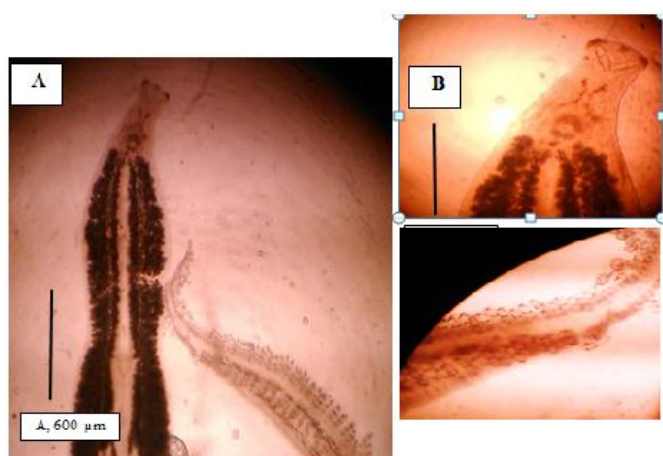


Figure 2. (A) general Form of *Microcotyle erythrini* (10×) (B) prohaptor (40×)(C) opisthaptor (10×)

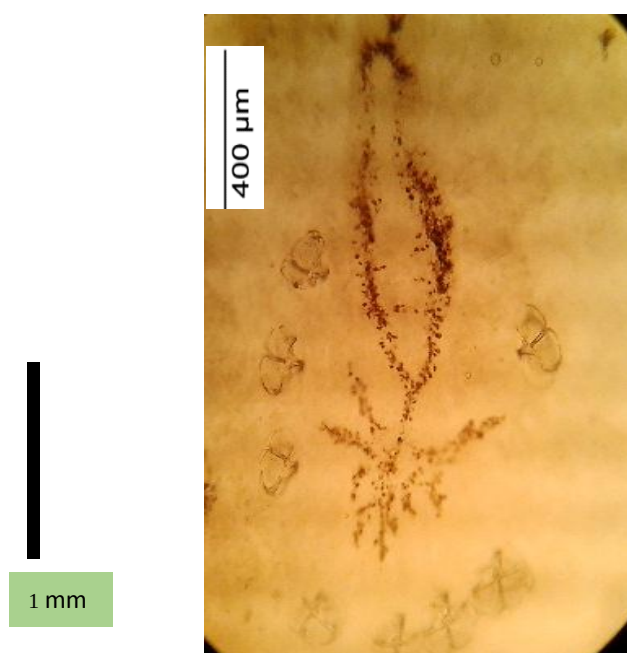


Figure (3): General Form of *Choricotyle* sp. ,(10×)

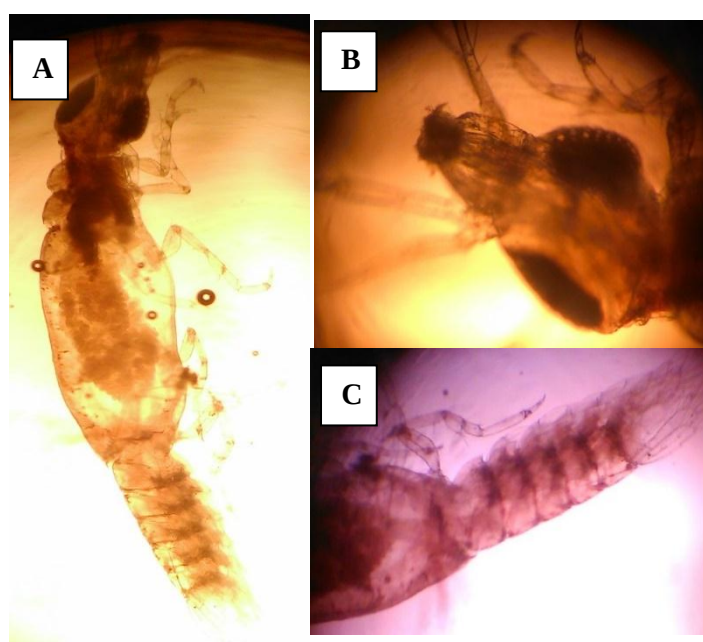


Figure (4) A: General Form of *Gnathia* sp.(10×) B: The Head of *Gnathia*, (10×) C: the Abdomen with Telson,(10×).

Prevalence and Intensity of Infection with *Microcotyle erythrini* Parasites:

The infection of *B. boops* with these parasites has been recorded during all seasons of the year. The highest number of parasites recorded during the summer season, with Prevalence of (57.1 %), which reached 30 parasites individuals, and the lowest number of parasites in the winter and autumn season, which reached in winter only 3 individuals, with

Prevalence of 5.71, and in Autumn 5 individuals, with Prevalence of (14.3%), while in the Spring it reached 28.6%, and this indicates the predilection of this parasitic species and the association of infection with it with warmer (Table 1).

Prevalence and seasonal dynamics of *Microcotyle erythrini* (Table 1)

Season	The number of studied fish	The number of infected fish	Prevalence %	The number of isolated parasites	Intensity (parasites/fish)
Winter	35	2	5.71	3	1.5
Spring	35	10	28.6	20	2
Summer	35	20	57.1	30	1.5
Autumn	35	5	14.3	7	1.4

The species *M. erythrini* was also isolated from the gills of *Pagellus* by [21]. [22] confirmed this in their study conducted on *Dentex macrophthalmus* fish in the Coastal Water of Lattakia, Syria, in which the parasitoid genus *M. erythrini* which, the presence of the parasite was more noticeable in the warmer seasons, as the rate of infection was highest in the summer. Our results also agreed with a study conducted by [7] in Algeria, in which the parasitic species *Microcotyle erythrini* was isolated from the gills of two species of fish, *Boops boops*, *Mullus barbatus*, where the highest rate of infection with this parasite was recorded in the fish *Boops boops* in the spring, to gradually decrease in the autumn and winter seasons, and the highest percentage of infection with this parasite was recorded in *M. barbatus* fish in the summer (August), where it reached (27%). *Microcotyle erythrini* was also isolated in a study by [16] and by [23] from the gills of *Pagellus erythrinus*.

Prevalence and Intensity of infection with *Coricotyle* sp. Parasites:

A high Prevalence of infection with *Coricotyle* sp. parasites was recorded in summer (20 %), while the lower prevalence was in winter with (2.86 %) (Table 1).

(Table 2): Prevalence and seasonal dynamics of *Choricotyle* sp

Season	The number of studied fish	The number of infected fish	Prevalence %	The number of isolated parasites	Intensity (parasites/fish)
Winter	35	1	2.86	1	1
Spring	35	4	11.43	4	1
Summer	35	12	34.3	20	1.67
Autumn	35	3	8.57	4	1.33

Choricotyle sp. were reported from Sparids in Mediterranean and Atlantic water [24]. This parasitic species was first recorded in Syria by [25], on the gills of *Pagellus erythrinus* and *Pagellus acarne* in the warmer season. It was also isolated at a rate of 56% in spring, from the *Sargocentron rubrum* fish in the same study. This was confirmed by [6] in their study conducted in Al Qalaa Coast, Algeria, in which the parasitoid genus *Choricotyle* sp. in which the presence of the parasite was more noticeable in the warmer seasons, as the rate of infection was highest in the summer and then in the spring to a lesser extent. The current study agreed with the results of the study conducted in Syria on *Dentex macrophthalmus* where the parasitic genus *Choricotyle scapularis* was isolated from the gills of this fish, and the highest percentage of infection with this parasite was recorded in the summer (13.95%).

Prevalence and Intensity of Infection with *Gnathia* sp. Parasites:

Gnathia sp. was recorded on the gills of *B. boops* only in spring and in summer. The average percentage of infection with these parasites was (37.14%), while the prevalence during summer was (5.7 %) (Table 3).

(Table 3): Prevalence and seasonal dynamics of *Gnathia* sp.

Season	The number of studied fish	The number of infected fish	Prevalence %	The number of isolated parasites	Intensity (parasites/fish)
Winter	35	0	-	0	0
Spring	35	13	37.14	12	0.92
Summer	35	2	5.7	4	
Autumn	35	0	0	0	0

This parasitic species was first recorded in Syria by [26], where it was isolated at an infection rate of 8% in *Siganus rivulatus* in the spring, and at an infection rate of 10% in *S. Luridus*. In spring, it was also isolated at a rate of 56% in the *Sargocentron rubrum* fish in the same study. The parasites were also isolated in the study [11] from the gill of *Sparus aurata*, with an infection rate of 3.63% during the spring season only. This may be attributed to the fact that this parasitic genus reproduces in this season, thus having a greater spread. In another study also conducted in Algeria, the parasitic genus *Gnathia* sp. was isolated from 12 species of the Sparidae family: *Boops boops*, *Diplodus* sp. and *Pagellus* sp [8].

Conclusions And Recommendations:

In the current study, the three parasite species *Microcotyle erythrini*, which belongs to the family Microcotylidae and *Choricotyle* sp., which belongs to the family Diclidophoridae and *Gnathia* sp. which belongs to the family Gnathiidae were isolated and identified from the gills of *Boops boops* Fish for the first time in the Coastal Water of Latakia Governorate. We recommended:

- Continue the study to determine the Endoparasitic species of the studied Fish species, in addition to continuing the study of the Marine Fish Parasites to establish a taxonomic database for the Marine Fish Parasites.
- Studying the effect of parasites on the productivity of these economically important fish.

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