التسجيل الأول للطفيلي الخارجي *Ergenstrema* sp. (Tetraonchidae: Monogenea) Paperna, 1964 على غلاصم أسماك البوري أفطس *Mugil cephalus* في المياه البحرية السورية وفي العالم

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الملخص

يُعد الطفيل *Ergenstrema* sp. من الطفيليات الخارجية التابعة لصف الديدان وحيدات الجيل Monogenea. يتطفل على غلاصم الأسماك، ويبدو أنه متخصص بالعائلة البورية Mugilidae. حتى تاريخه، تم وصف نوعين من هذا الجنس: *E. mugilis*، الذي تم عزله وتعريفه على أسماك *Chelon ramada*، و *E. labrosi* على أسماك *Chelon labrosus* . في الورقة الحالية، قمنا بتسجيل ولأول مرة في المياه البحرية السورية وفي العالم الجنس *Ergenstrema* sp. على غلاصم أسماك البوري أفطس البري *Mugil cephalus*.143 فرداً سمكياً *M. cephalus* تم جمعها من المياه الساحلية لمدينة جبلة (اللاذقية، سورية) بين شهري تموز لعام 2020 ونيسان لعام 2021. فُحصت الغلاصم، التجويف الفموي، الجلد لجميع الأفراد السمكية. عُزل الطفيل *Ergenstrema* sp. وتم توصيفه، وتسجيله لأول مرة على النوع السمكي *M. cephalus* في الساحل السوري في شهر شباط بنسبة إصابة قدرها 1.4 %، وشدة إصابة 1.5 طفيلي/ الفرد السمكي. تؤكد هذه النتيجة على احتمالية التأثيرات البيئية والاقتصادية والصحية لطفيليات الأسماك البحرية، خاصة عند استخدام نظام التربية الموسعة للنوع السمكي *M. cephalus*.

الكلمات المفتاحية الطفيليات الخارجية، *Ergenstrema* sp.، الطفيليات وحيدة الجيل، البوري أفطس، المياه البحرية السورية.

First record of the Ectoparasite *Ergenstrema* sp. Paperna, 1964 (Monogenea: Tetraonchidae) on the gills of *Mugil cephalus* (Mugilidae) in Syrian marine waters and in the world

Abstract

The monogenea ectoparasite *Ergenstrema* sp. Paperna, 1964 infecting the gills of fish, seems to be specific to Mugilidae family. To date, only two species of this genus have been described: *E. mugilis*, isolated and identified in *Chelon ramada*, and *E. labrosi* in *Chelon labrosus*. In the present paper, we report for the first time, in the Syrian marine waters and in the world, the occurrence of *Ergenstrema* sp. on the gills of wild *Mugil cephalus*. A total of 143 individuals of *M. cephalus* were collected from coastal waters of Jableh city (Latakia, Syria), between July 2020 and April 2021. The gills, mouth cavity, skin, of all individuals were examined. *Ergenstrema* sp. was isolated and described for the first time in *M. cephalus* in the Syrian coast in February month , with a prevalence of 1.4% and intensity of 1.5 parasite/individual. This result underlines the potential for ecological, economical and health influences of marine fish parasites, mainly when the extensive rearing system of *M. cephalus* is used.

Key words Ectoparasites, *Ergenstrema* sp, Monogenea, *Mugil cephalus*, Syrian marine waters.

Introduction

Studies concerning marine fish parasites in Syria are very scarce. In fact, [1] have been carried out the initial study, and some ectoparasites in three marine fish species were described for the first time in the Syrian marine waters. Later, nine endoparasites spieces in some Mugilidae marine fish were recorded [2]; three ectoparasites species belonging to the genus *Lamellodiscus* and one species belong to the genus *Chilodonella* in *Diplodus* (Sparidae) were also reported [3]. Moreover, two parasites species belonging to Monogenea *Grubea cochlear* and *Kuhnia scombri* were identified in *Mullus surmuletus* [4, 5]. Recently, *K. scombri* was recorded on *Scomber scombrus* for the first time in Syrian marine waters [6].

The flathead grey mullet (*Mugil cephalus*) is an economically important fish species in many countries [7]. It has been recognized as a potential species for aquaculture diversification in the Mediterranean region and other regions, where is generally reared extensively in mono- or polyculture systems [8]. It constitutes a large part of the marine fish stock, and can tolerate a wide range of water salinity [9]. In Syria, it is

among the desirable species for local consumption and recently introduced to fish farming projects.

Monogenea presents one of the largest groups of Ectoparasites flatworms. They are small organisms (<1-5 mm long), with an attachment organ called haptor armed with hooks. They attach on gills, fins and body surface of host. Affected fish have pale skin and gills with increased mucus production, frayed fins and the cornea may become opaque [10].

Gills of *M. cephalus* are exposed to infection of flatworms from Gyrodactylidae, Dactylogyridae, Capsalidae, Microcotylidae and Tetraonchidae families [11]. Two genera *Ergenstrema* Paperna, 1964 and *Tetraonchus* Diesing, 1858 are known as ectoparasites from the Tetraonchidae [12].

Ergenstrema genus was named in the honor of Dr. R. Ergens who first described this species as *Dactylogyroidea* sp from *C. ramada* (*Liza ramada*) in Albania in 1960[13]. This genus differs from *Tetraonchus* by the structure of the opisthaptor, its armature is considerably reduced in size, and has only one bar to which an additional plate is attached. It also differs by the anterior location of the reproductive organs [11].

Little information is available about *Ergenstrema*, but it seems to be specific to Mugilidae family. To date, two species of *Ergenstrema* have only been described: *E. mugilis*, was first isolated and identified from the gills of *C. ramada* in the Eastern Mediterranean and the Adriatic Sea [11], *E. labrosi* was then described on the gills of *C. labrosus* in Plymouth British [12]. To our knowledge, no other records are available in other fish species (Merella, personal communication).

Aim of the search

Report for the first time the occurrence of the ectoparasite *Ergenstrema* sp. on the gills of wild *M. cephalus* in Syrian marine waters and in the world.

Methods

A total of 143 individuals of *M. cephalus* were collected from coastal waters of Jableh city (Latakia, Syria), between July 2020 and April 2021. Fish samples were kept in plastic bags containing ice to the laboratory of parasitology at the Higher Institute for Environmental Research, Tishreen University. Gills were carefully removed and placed in separate Petri dishes containing normal saline to remove any excess gill mucus, and they were examined for parasites under a microscope. Skin, fins, mouth cavity, nostrils and gills of each specimen were examined by naked eyes

for any attached parasites. Identification of the parasites species was made according to the specific classification keys using the following characters: total length, width, length and shape of (transverse bar, vagina) [14]. Once isolated the parasite was photographed using a digital camera. Prevalence and intensity were also determined according to [15].

Results and discussion

The present paper reports the ectoparasite species *Ergenstrema* sp. on the gills of wild *M. cephalus* for the first time in the Syrian marine waters and in the world (Fig. 1). This parasite species was described and classified as follows [16]: Class: Monogenea Van Beneden, 1858; Subclass: Monopisthocotylea Odhner, 1912; Order: Dactylogyridae Bychowsky, 1933; Family: Tetraonchidae Monticelli, 1903; Genus: *Ergenstrema* Paperna, 1964.

Description of the genus *Ergenstrema* sp. isolated in this study

This parasite was isolated from the gills of *M. cephalus* in February 2021. Three parasite individuals were only detected, so the prevalence was 1.4% and the intensity was 1.5 parasite/individual. This parasite has been specially distinguished by the spiral shape of the vagina (Fig. 2).

The average of total length was (1200 ± 0.4 µm), width (290 ± 1.1 µm). A transverse bar in the shape of an inverted T (14 ± 0.6 µm length) was observed between the hamuli ventral. These measurements are in agreement with those described by [14]. The vagina has a spiral shape, its length is 110 ± 0.8 µm, and this is inconsistent with the measurements of *E. mugilis* (140-150) µm and *E. labrosi* (170- 220 µm) as reported in [14] (Table 1). This difference in vagina length could be related to the host or the environmental conditions, but it may also suggest a new species.

Table 1. A comparison of the lengths of vagina of *Ergenstrema* sp. from several sources.

Species	Host	Vagina (µm)	Source
E. mugilis	***Chelon ramada***	140-150	Paperna, 1964
E. labrosi	***Chelon labrosus***	170-220	Anderson,1981
Ergenstrema sp.	***Mugil cephalus***	109-111	Present study

Fig. 1: A picture of Ergenstrema sp. (10x) showing the two eye spots in the anterior region and the spiral shape of the vagina.

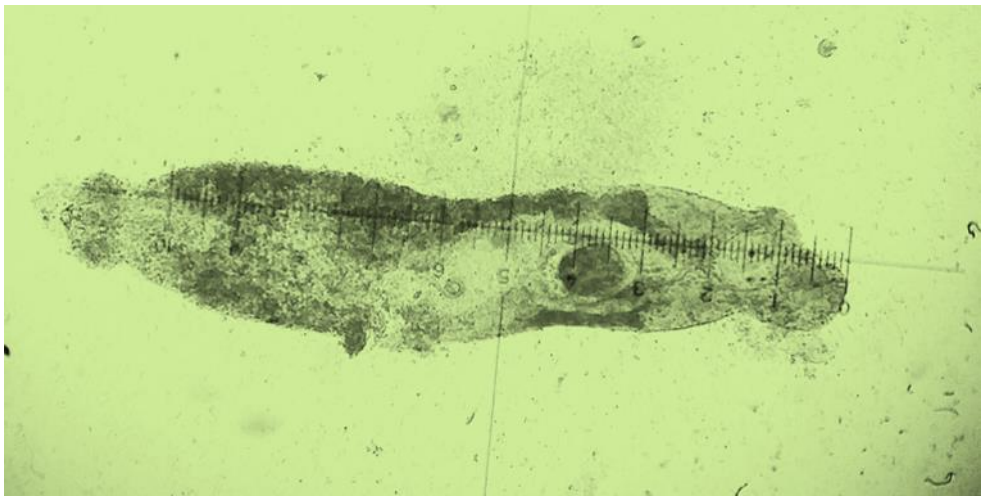
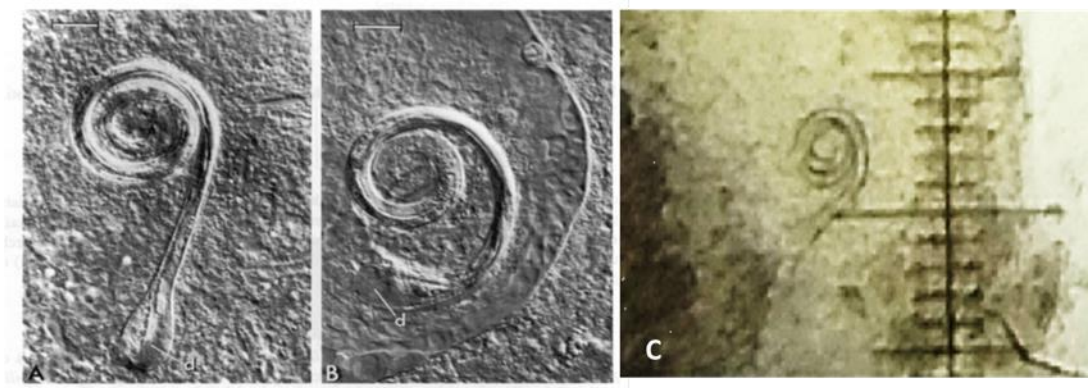


Fig. 2: The vagina of *Ergenstrema* sp. from (A) *C. labrosus*; (B) *L. ramada* [1]; (C) *Mugil cephalus.*



It is known that *M. cephalus* is subjected to the infection of different groups of parasites; a comprehensive review of its parasites was published by [17]. [18] provided a list of 13 parasites from the Black Sea. Regarding Monogenea, [19] have reported 10 different species from Chinese marine waters. These different species belong to three genera: *Ligophorus*, *Metamicrocotyla* and *Solostamenides*. To our knowledge, no record of *Ergenstrema* has been reported in the literature since 1981. However, our new record of this genus on the gills of wild *M. cephalus*, is also the third report of *Ergenstrema* worldwide following *E. mugilis* and *E. labrosi*. Hence, this new record is also the first one in the Syrian marine waters. More investigations are required to have a comprehensive image of this genus that infect fish species in Syrian marine waters and Mediterranean Sea.

Conclusions

This is the first report of *Ergenstrema* sp. in wild *M. cephalus* in Syria and in the world. Accordingly, this ectoparasite could infect the gills of a third species of Mugilidae family, in addition of *C. ramada* and *C. labrosus*. This result supports the need for concerted research efforts to better quantify the nature, intensity and consequences of the infection of marine fish species by the parasites.

Recommendations and Suggestions

Continue the studies of ecto and endo parasites that could affect the marine fish in Syria, for enriching the list of fish parasites in Syria and for disclosing their potential impact of fish meat qulity.

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