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New Data on Digenean Parasites of Rusty Blenny, *Parablennius sanguinolentus* (Pallas, 1814) in the Black Sea

Türkay ÖZTÜRK* and Arzu GÜVEN

Sinop University, Faculty of Fisheries and Aquatic Sciences, Sinop, Turkey

Abstract

Rusty blenny, *Parablennius sanguinolentus* (Blenniidae) caught in Sinop coasts of the Black Sea between May to June 2016 was investigated for digenean parasites. A total of nine digenean species including adults of *Peracreadium genu* Nicoll, 1909, *Phyllodistomum acceptum* Looss, 1909, *Magnibursatus blennii* (Paggi and Orecchia, 1975), *Monorchis monorchis* (Stossich,1890) Monticelli, 1893, and metacercaria of *Galactosomum lacteum* (Jägerskiöld, 1896), *Bucephalus marinus* Vlasenko, 1931, *Rhipidocotyle* sp., *Prosorhynchoides* sp. and Opecoelidae gen. sp. were identified. The infection prevalence (%), mean intensity levels and photomicrographs of identified parasites are presented in tables and figures, respectively. Overall infection prevalence (%) and mean intensity values were 100% and 506.40 ± 120.78 respectively. This investigation is the first on the digenean parasites of *P. sanguinolentis* in Turkish Black Sea coasts. *Bucephalus marinus* was the core species. *Peracreadium genu* and *Magnibursatus blennii* are new parasite record for Turkey.

Keywords: Blenniidae, *Parablennius sanguinolentus*, digenean, parasites, Black Sea

Karadeniz'deki Horozbina Balığının, *Parablennius sanguinolentus* (Pallas, 1814) Digenea Parazitleri İle İlgili Yeni Veriler

Öz

Karadeniz'in Sinop kıyılarından Mayıs-Haziran 2016 tarihleri arasında yakalanan horozbina balığı, *Parablennius sanguinolentus*, digenea parazitleri yönünden incelenmiştir. Ergin *Peracreadium genu* Nicoll, 1909, *Phyllodistomum acceptum* Looss, 1909, *Magnibursatus blennii* (Paggi and Orecchia, 1975), *Monorchis monorchis* (Stossich,1890) Monticelli, 1893 ve metaserker *Galactosomum lacteum* (Jägerskiöld, 1896), *Bucephalus marinus* Vlasenko, 1931, *Rhipidocotyle* sp., *Prosorhynchoides* sp. ve Opecoelidae gen. sp. olmak üzere toplam 9 digenea türü tanımlanmıştır. Tanımlanan parazitlerin fotomikrografları, enfeksiyon oranı (%) ve enfekte balık başına ortalama parazit sayıları tablo ve şekiller ile sunuldu. Toplam enfeksiyon oranı ve enfekte balık başına ortalama parazit sayısı değerleri sırasıyla %100 ve 506.40 ± 120.78 olarak hesaplandı. Bu araştırma, Türkiye'nin Karadeniz kıyılarındaki *P. sanguinolentis* balığının digenea parazitleri üzerine yapılan ilk araştırmadır. *Bucephalus marinus* ana türdü. *Peracreadium genu* ve *Magnibursatus blennii* türleri Türkiye parazit faunası için yeni kayıttırlar.

Anahtar Kelimeler: Blennidae, *Parablennius sanguinolentus*, digenea, parazit, Karadeniz

* Corresponding Author: ORCID ID: orcid.org/0000-00001-5568-3214
e-mail: turkay.ozturk@gmail.com

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Introduction

The class Trematoda is the largest group of Platyhelminths and includes two subclasses: Aspidogastrea and Digenea [1]. Digeneans, also called digenetic trematodes or flukes, comprises more than 18 000 species that are obligatory parasitic in both invertebrate and vertebrate organisms [2]. Digeneans are permanent parasites in most marine fishes, and in many freshwater fishes, amphibians, reptiles, mammals and birds. The life cycle of digeneans is quite complex and characterized by succession of several stages known as the egg, miracidium, sporocyst, redia, cercariae, metacercaria and adult. Moreover, they use at least two hosts as intermediate and final hosts besides free-living stages in their complex life cycles. Digeneans are important fish parasites and fish serve as both intermediate and final hosts. Adults usually occur in the intestine, stomach or mouth, or occasionally internal organs, while larval forms occur in almost any tissue of fishes [3].

The rusty blenny or Black Sea blenny, Parablennius sanguinolentus, is a member of Blenniidae and distributed in the eastern Atlantic including the Mediterranean, and the Black Seas [4]. Despite its widespread distribution, studies on the parasites of this fish is very limited [5, 6, 7, 8, 9]. So far, 9 digenean species have been reported in *P. sanguinolentis* from the Black Sea [8; 10, 11], but there were no data on the digenean parasite fauna of the rusty blenny in the Turkish coasts of the Black Sea. This paper is the first report on the digenean parasites of rusty blenny, *P. sanguinolentus* from Sinop coasts of the Black Sea.

Material and Methods

Fish specimens were caught from Sinop coasts of Black Sea. A total of 5 fish specimens were collected in between May to June 2016. Parasitological investigation was conducted at parasitology laboratory in the Faculty of Fisheries and Aquatic Sciences in Sinop. Dissections were performed under a dissecting microscope using standart parasitological techniques. The examination included skin, muscles, internal organs, brain, eyes, gills, body cavity, and visceral organs (heart, stomach, intestine, liver, swim bladder and gonads). Isolated parasite species and their site of infection in the host were recorded. The prevalence (the percentage of infected fish), mean intensity (the average number of parasites in the total number of infected fish) were calculated according to Bush et al. [12]. The standard error (SE) for mean intensity is given.

Results and Discussion

A total of 9 digenean parasite species belonging to Bucephalidae, Opecoelidae, Derogenidae, Gorgoderidae, Monorchidae and Heterophyiidae were detected. These are; *Bucephalus marinus* Vlasenko, 1931, *Rhipidocotyle* sp., *Prosorhynchoides* sp., *Peracreadium genu* Nicoll, 1909, and Opecoelidae gen. sp., *Phyllodistomum acceptum* Looss, 1909, *Monorchis monorchis* (Stossich,1890) Monticelli, 1893, *Magnibursatus blennii* (Paggi & Orecchia, 1975), and *Galactosomum lacteum* (Jagerskiöld, 1896). Infection indices such as the infection prevalence (%), mean intensity values and microhabitat preferences of each parasite species are presented in Table 1. Overall infection prevalence (%) and mean intensity (MI) values were 100% and 506.40 ± 120.78 parasites per infected fish, respectively (Table 1). *Bucephalus marinus* was the core species.

Table 1. *Digenean parasite species found in the rusty blenny, Parablennius sanguinolentus*

Digenean species	**Microhabitat**	**P (%)**	**Mean Intensity ± S.E**
Bucephalus marinum met.	gills, heart	100	504.6 ± 121.19
Rhipidocotyle sp. met.	heart	100	25.60 ± 18.83
Prosorhynchus sp. met.	heart	60	26.00 ± 17.89
Opecoelidae gen. sp. met.	gills	60	1.70 ± 0.67
Peracreadium genu	Intestine	40	7.00 ± 4.00
Phyllodistomum acceptum	kidney, urinary bladder	40	11.50 ± 10.5
Monorchis monorchis	intestine	20	8.00 ± 0.00
Magnibursatus blennii	gills	40	1.00 ± 0.00
Galactosomum lacteum met.	kidney	20	4.00 ± 0.00

P: prevalence (%); **met.:** metacercaria; **S.E.:** Stardard Error

Family Bucephalidae Poche, 1907

This family is commonly found in marine, brackish and freshwater teleost fish and is frequently reported [13]. The members of this family lack suckers, having instead a muscular organ called a "rhynchus" at the front end which they use to attach to their hosts. Sucker-like rhynchus is characterised by having a with a hood bearing usually seven tentacles. The morphological features of Rhynchus are important in defining the genus level of the family. The family Bucephalidae includes 36 genera.

In the present study, three digenean species recorded as encysted metacercariae belonging to Bucephalidae were identified (Table 1 and Figure 1) and these were *Bucephalus marinus* (Figure 1A), *Rhipidocotyle* sp. (Figure 1B) and *Prosorhynchoides* sp. (Figure 1C).

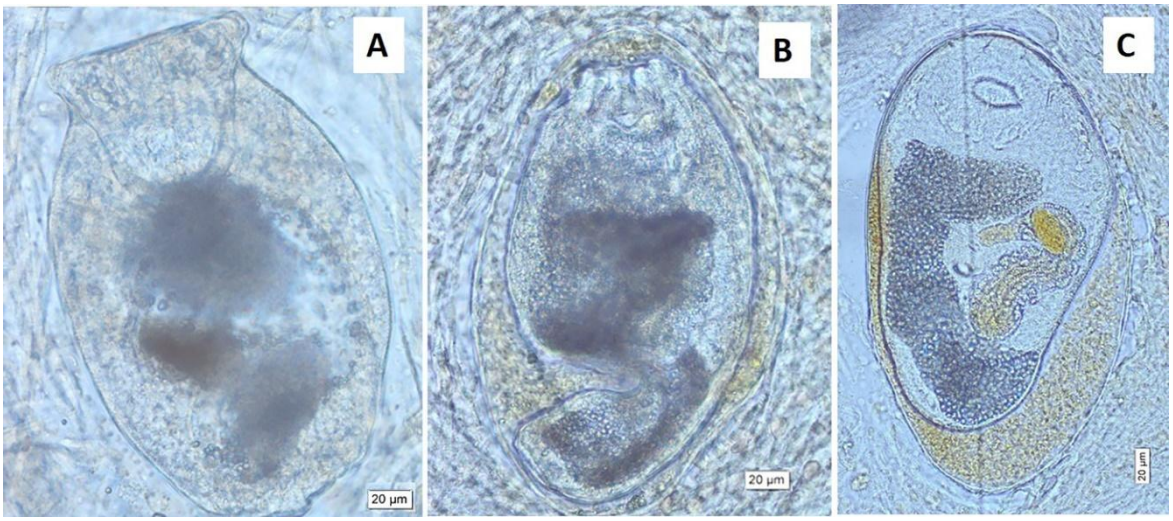

Figure 1. *Metacercariae belonging to Bucephalidae.* ***A.*** *excysted metacercaria of Bucephalus marinus,* ***B.*** *encysted metacercaria of Rhipidocotyle sp.,* ***C.*** *encysted metacercaria of Prosorhynchoides sp.*

***Bucephalus marinus* Vlasenko, 1931** (Figure 1A)

Syns: *Bucephalus marinum*

Infection values: The data are presented in Table 1.

This digenean species have previously been reported from *P. sanguinolentus* in the Black Sea [8, 10, 11]. Moreover, it has been previously reported from another blenniid species, *P. tentacularis*, in Sinop coasts of the Black Sea [14]. But this is its first report from *P. sanguinolentis* in the Turkish coasts.

***Rhipidocotyle* sp.** (Figure 1B)

Syns: *Gasterostomum*

Infection values: The data are presented in Table 1.

The genus *Rhipidocotyle* is represented by a very large number of species parasitic in marine fishes but only a few from freshwater fishes. So far, two species of this genus, *Rhipidocotyle illense* and *R. genovi* has been reported in the Black Sea [11, 15]. The encysted metacercariae of *R. genovi* have been reported in the musculature and fins of blenniid fishes, while its adults in the intestine of *Gaidropsarus mediterraneus*

[15]. Although we couldn't identify at the species level, the encysted metacercariae of *Rhipidocotyle* sp., we have determined in *P. sanguinolentis.* But we have found the encysted metacercariae in the heart, not in the muscles and fins of the fish.

***Prosorhynchoides* sp.** (Figure 1C)

Syns. *Bucephalopsis* Diesing, 1855; *Neobucephalopsis* Dayal, 1948; *Bucephaloides* Hopkins, 1954

Infection values: The data are presented in Table 1.

Adult members of genus *Prosorhynchoides*, infect the intestine of freshwater and marine fishes. In the Black Sea fishes, mature worms of only two *Prosorhynchoides* species have so far been recorded *Prosorhynchoides* [= *Bucephalopsis] gracilescens* in *Sarda sarda, Lophius piscatorius* [11] and *P. arcuatus* in *Sarda sarda* and in *Pomatomus saltatrix* [16]. Juvenile stages of *P. gracilescens* have been reported from *Belone belone euxini*, *Merlangius merlangus euxini* in the Black Sea [11]. The metacercariae of *Prosorhynchoides* sp. has not previously been reported in *P. sanguinolentis*, this is the first report from this fish in the Black Sea.

Family Opecoelidae Ozaki, 1925

The family Opecoelidae is the largest digenean family including the highest number of genera and species among trematodes. To date, belonging to this family more than 90 genera and nearly 900 species have been reported in almost exclusively marine and freshwater teleost fish [17].

In this study, Opecoelidae was represented with 2 species, 1 adult (*Peracreadium genu*) and 1 metacercariae stage (Opecoelidae gen. sp. met.) (Table 1 and Figure 2). The presence of Opecoelidae gen. sp. met. has been previously reported in *P. sanguinolentis* from Black Sea by Lushchina [10] and Gaevskaya and Kornychuk [11].

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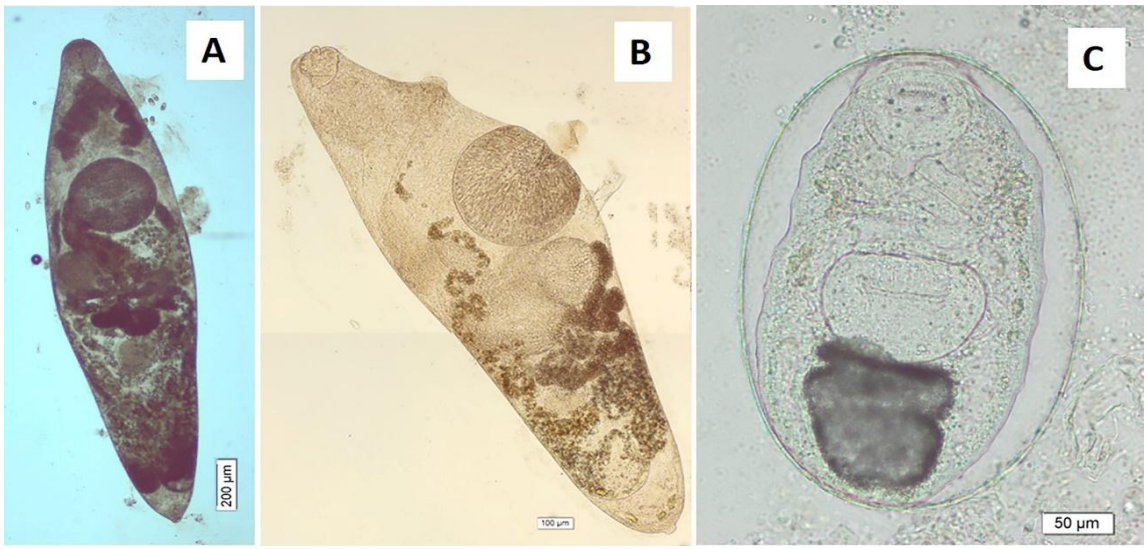

Figure 2. *Species of Opecoelidae determined in this study (original).* ***A.*** *Peracreadium genu (adult, ventral view),* ***B.*** *Peracreadium genu (adult, lateral view),* ***C.*** *metacercaria of Opecoelidae gen. sp.*

***Peracreadium genu* Nicoll, 1909 (Figure 2A-B),**

Syns: *Distoma genu*, *Distomum fasciatum*, *Allocreadium genu*

Infection values: The data are presented in Table 1.

This digenean species have previously been reported from *Blennius pholis*, *Labrus berggylta* [18, 19] and from *Labrus merula* and *L. viridis* [20]. So far, the only member of the genus *Peracreadium*, *P. gibsoni* has been reported in *Puntazzo puntazzo* from Black Sea by Korniychuk and Gaevskaya [21]. This study is the first report on presence of *P. genu* in *Parablennius sanguinolentis* and in the Black Sea.

Family Gorgoderidae Looss, 1899

The family Gorgoderidae is a specific family of trematodes having different morphological features, especially the non-spinous tegument, simple male terminal genitalia, highly narrow vitellarium and wide uterus [22]. Member of the family is relatively unusual among trematodes in being significantly spread in various aquatic vertebrates such as chondrichthyes, actinopterygii and tetrapods. Infections in teleost fishes are typically in the urinary bladder, whereas those in chondrichthyans are usually in the body cavity; a few species are reported from other sites such as swim bladder, gall bladder and intestine [23, 24]. Within the Gorgoderinae, *Phyllodistomum* Braun, 1899 is by far the largest genus,

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containing over 110 species [25]. Indeed, according to Cribb et al. [26], *Phyllodistomum* is one of the two largest genera of trematodes.

***Phyllodistomum acceptum* Looss, 1901 (Figure 3)**

Syns: -

Infection values: The data are presented in Table 1.

Figure 3. *Phyllodistomum acceptum Looss, 1901 (original), (adult, ventral view)*

Phyllodistomum species have a wide distribution in both marine and freshwater fish. To date, *Phyllodistomum acceptum* have been reported from labrid fishes (*Symphodus cinereus, S. ocellatus* and *S. tinca), Serranus scriba* and *Mullus barbatus* in the Black Sea [11]. It has been previously reported from another blenniid species, *P. tentacularis*, in Sinop coasts of the Black Sea [14]. This study is the first report on the presence of *P. acceptum* in *P. sanguinolentis*.

Family Monorchiidae Odhner, 1911

Members of this family are characterized by the dominion of a spiny tegument, complex terminal genitalia armed with spines, limited vitelline follicles and well- developed uterine coils. They ocur in the gastro-intestinal tract of marine fishes throughout the world. The family includes more than 290 nomimal species in 58 genera [27]. Among members of this family, several genera including *Monorchis* are characterized by a single testis.

***Monorchis monorchis* (Stossich, 1890) Monticelli, 1893 (Figure 4),**

Syns: *Distomum monorchis*

Infection values: The data are presented in Table 1.

Monorchis monorchis has been reported from various marine fish belonging to Sparidae and Blenniidae in European waters [5, 28]. Moreover, it has been previously reported from *P. sanguinolentis* from Black Sea [29]. But this is its first report from *P. sanguinolentis* in the Turkish coasts.

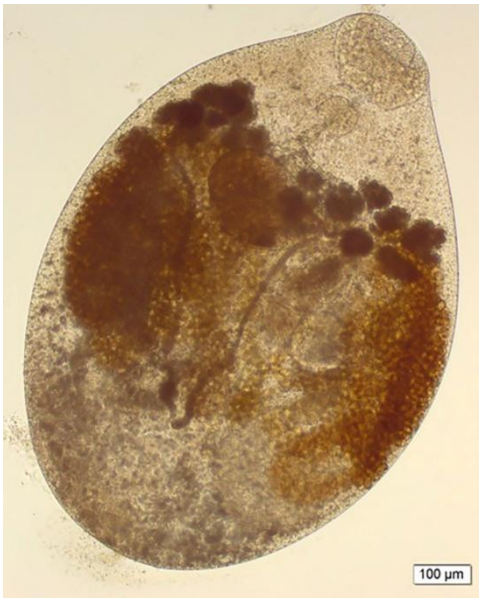

Figure 4. *Monorchis monorchis (Stossich, 1890) Monticelli, 1893 (original), (adult, ventral view)*

Family Derogenidae Nicoll, 1910

Members of this family are characterised by an elongated body, an unarmed tegument, well developed oral and ventral suckers, a short oesophagus, two symmetrical or tandem testes, an oval ovary, numerous eggs with or without filaments, and one or two vitelline masses. These digeneans are parasitic in the gut of freshwater and marine teleosts, but are occasionally recorded from reptiles and fresh water shrimps [30]. Mediterranean and Black Sea records of members of this family are few and being mainly limited at one genus, *Magnibursatus* Naidenova, 1969. To date, the genus *Magnibursatus* Naidenova (1969) consists of 7 nominal species, most of them being parasites of sparid fishes from Black and Mediterranean Sea fishes [31, 32, 33].

Magnibursatus blennii **(Paggi and Orecchia, 1975) (Figure 5A-C)**

Syns: *Tyrrhenia blennii* Paggi and Orecchia, 1975

Infection values: The data are presented in Table 1.

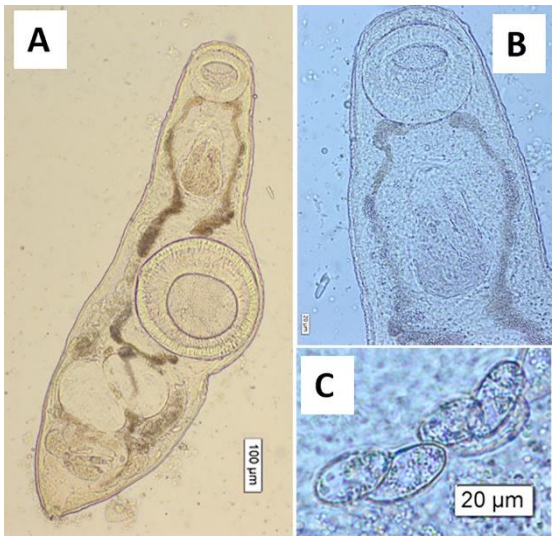

Figure 5A. *Magnibursatus blennii* (Paggi *and Orecchia, 1975) (original).* ***B.*** *anterior end (ventral view),* ***C.*** *eggs with filament.*

Tyrrhenia is synonymy of *Magnibursatus* and *T. blennii* is transferred to *M. blennii*. *Magnibursatus* (= *Tyrrhenia*) *blennii* was identified *Parablennius* (= *Blennius*) *gattorugine* and *Parablennius* (= *Blennius*) *sanguinolentus* from the Gulf of Gaeta, Italy [5]. Later, *M. blennii* is recorded from *Salaria pavo*, *Paralipophrys trigloides* and *Parablennius* sp. in Corsica coasts [32]. This study is the first report

on presence of *Magnibursatus blennii* in *P. sanguinolentis* from the Black Sea.

Family Heterophyidae Leiper, 1909

Members of this family are characterised by spiny tegument. They are predominantly intestinal parasites of fish eating birds and mammals including humans. Their metacercariae are encysted in diferent organs of fresh-brackishwater and marine fishes. Adult heteropyhid digeneans are parasitic and are important of fish borne zoonoses via consumption of raw or undercooked fish containing metacercaria, the infective larval stages.

***Galactosomum lacteum* (Jägerskiöld, 1896) (Figure 6A-C)**

Syns: *Monostomum lacteum* Jägerskiöld, 1896

Infection values: The data are presented in Table 1.

Figure 6A. *excysted metacercaria of Galactosomum lacteum,* ***B.*** *encysted metacercaria. C. anterior end (original)*

Galactosomum lacteum was first described by Jägerskiöld (1896) as *Monostomum lacteum*. Until today, it has been reported in at least 29 fish species including blenniid fish from Black Sea [11].

Conclusions

In conclusion, a total of 9 digenean species were identified from the rusty blenny, *Parablennius sanguinolentus* in Turkish Black Sea coasts for the first time. The present study on digenean fauna yielded new records: while *Peracreadium genu* and *Magnibursatus blennii* are considered as new records for Turkish and Black Sea parasite fauna, *P. sanguinolentis* is a new host record for *Phyllodistomum acceptum* and *Peracreadium genu*.

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