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Clavellotis briani (Copepoda, Lernaeopodidae) Infestation on Striped Seabream, *Lithognathus mormyrus* (Sparidae) from the Northeast Mediterranean Sea, Turkey

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ABSTRACT

There is increasing interest in the striped seabream, *Lithognathus mormyrus* (Linnaeus, 1758) as an alternative fish species in aquaculture in the Mediterranean region. This paper provided information on the infestation of species of *Clavellotis briani* Benmansour et al (2001) (Lernaeopodidae) collected from striped seabream in Northeast Mediterranean Sea waters off the Turkish coast. A total of 234 fish were examined between May 2011 and April 2012 and female parasites were collected from the branchial arches of fish and identified. During a 12-month survey the prevalence was calculated as 3.4% for *C. briani*. The striped seabream is known as an alternative culture species for Mersin Bay. This is the first report of *Clavellotis briani* in wild population of *L. mormyrus* from Mersin Bay (Northeast Mediterranean Sea) and Turkish waters.

Keywords: *Clavellotis briani; Lithognathus mormyrus;* Northeast Mediterranean Coast; Turkey

Türkiye'nin Kuzeydoğu Akdeniz Kıyısından Çizgili Mercan (*Lithognathus mormyrus*: Sparidae) Balığında, Parazit *Clavellotis briani* (Copepoda, Lernaepodidae) Enfestasyonu

ESER BİLGİSİ

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ÖZET

Çizgili mercan, *Lithognathus mormyrus* (Linnaeus, 1758) Akdeniz'de artan bir ilgi ile alternatif tür yetiştiriciliği için dikkati çeken bir türdür. Bu çalışmada, Türkiye'nin Kuzey-Doğu Akdeniz kıyılarından yakalanan çizgili mercan (*Lithognathus mormyrus*) balıklarının solungaç kemerlerinden *Clavellotis briani* Benmansour et al (2001)

(Lernaeopodidae) izole edilmiş ve tanımlanmıştır. Mayıs 2011 ile Nisan 2012 aralığında 12 aylık örnekleme ile incelenen 234 balıkta bulunan *C. briani* (dişi) prevalansı % 3.4 olarak hesaplanmıştır. Çalışma, yetiştiricilik açısından önemli bir türün doğal popülasyonunda ve gelecekte en popüler yetiştiricilik sahalarından biri olan Mersin Körfezi'nden ve Türkiye sularından *Clavellotis briani* için ilk rapordur.

Anahtar Kelimeler: *Clavellotıs briani; Lithognathus mormyrus;* Kuzeydoğu Akdeniz Sahili; Türkiye

1. Introduction

The aquaculture industry has developed to such an extent that Turkey is currently the third largest finfish aquaculture producer (i.e. excluding shellfish) in Europe, and the second largest producer of sea bass, seabream, and rainbow trout (after Norway). Furthermore, Turkey is in third place in terms of average annual percentage of growth rate in aquaculture production (FAO 2008). In recent years, great efforts have been made for the commercial production of alternative fish species particularly broodstock management, larval development, culture protocols and health status including striped seabream (*Lithognathus mormmyrus*) in the Mediterranean region (Fırat et al 2005; Kallianiotis et al 2005; Yavuzcan 2008; Yavuzcan 2009; Emre et al 2010; Kusku et al 2011). Some important bacterial, viral, and parasitic agents cause significant economic losses in cultured sea bass (*Dicentrachus labrax*), seabream (*Sparus aurata*), and rainbow trout (*Oncorhynchus mykiss*) (Genc 2011). The control of fish parasites requires knowledge of the parasites, their hosts, and their prevalence and also distribution (Mitchum 1995). Continuously, new parasites and hosts were reported from Turkey and all over the world. This information is considered valuable data for the aquaculturists and fish disease researchers (Genc 2011).

Fish disease outbreaks are an increasing threat to wildlife, intensified by increases in the human population and cultured animals (Macdonald & Laurenson 2006; Thirgood 2009; Price et al 2010). The most common route of transmission to wildlife is from artificial reservoirs of host populations (McCallum & Dobson 1995; Daszak et al 2000; Price et al 2010).

Among the copepods that parasitize marine fish, the family of Lernaeopodidae includes 45 genera (Boxhsall 2013), some on teleost and others on elasmobranch fish. As is common in parasitic copepods, Lernaeopodidae display an unusual sexual differentiation. Only the female lernaepodid is attached as a parasite on the fish. The small male lives in temporary association, often on the body of its partner. The female generally presents characteristic attachment organs (Kabata 1979; Kabata 1990; Kabata 2004; Benkirane et al 1999).

Lernaeopodidae have been reported in cultured fish all over the world, including *Clavellotis fallax* (Heler 1965) on *Dentex dentex* from Malorco (Gonzalez 2005), *Clavellotis sargi* (Kurz 1877) on *Diplodus sargus* and *Diplodus vulgaris* from Tunisian coasts (Ben Hassine et al 1978), *Clavellotis strumosa* (Brian 1906) on the *Pagellus erythrinus* and *Lithognathus mormyrus* from Tunisian coasts (Benmansour et al 2001) *Clavellotis sebastidis* on *Sebastes oculatus* from Argentina (Castro & González 2005).

However there is no record in the literature for lernaeopodids that are parasitic on *Lithognathus mormyrus* in Turkey marine waters. The only lernaeopodids reported from Turkey waters *Clavellotis fallax* Heller 1868 on *Diplodus sargus sargus*, *Pagellus erythrinus*, *Sarpa salpa*, and *Spondyliosoma cantharus* from the Aegean Sea (Akmirza 2000). Additionally as lernaeopodids; *Lernaeopoda galei* Krøyer 1837 on *Mustelus mustelus* from the Aegean Sea (Karaytug et al 2004), *Neobrachiella impudica* Von Nordmann, 1832 on *Trigla lucerna* from the Sea of Marmara (Öktener & Trilles 2004a; *Eubrachiella exigua* Brian 1906 on *Pagellus erythrinus* from the Mediterranean Sea

(Öktener & Trilles 2004b), *Neobrachiella bispinosa* Von Nordmann, 1832 on *Trigla lucerna* from the Mediterranean Sea (Öktener & Trilles 2004b), and *also Clavellotis strumosa* Brian 1906 was recorded on *Pagellus erythrinus* from the Sea of Marmara (Öktener 2008). In the present study, *Clavellotis briani* (Benmansour et al 2001) (Copepoda, Lernaeopodidae) was reported for the first time and identified on striped seabream, *Lithognathus mormyrus* (Teleostei, Sparidae) in the Mersin Bay (Northeast Mediterranean Sea), Turkish water.

2. Material and Methods

The parasitological survey has been conducted to determine which parasitic copepods were present on teleost fish in Mersin Bay of Turkey since 2007. In 2011-2012 period striped seabream*, Lithognathus mormyrus* were caught monthly (May to April) by trammel nets in Mersin coast, located at 36.65°-36.8° N, 34.55°-34.8° E. After capture, the fish were placed on ice for approximately 1-1.5 hrs. Total length and weight were recorded, and the body surface, fins, and mouth of each fish were examined. Parasites were collected from the upper gill arches of the infested striped seabream and immediately preserved in 70% ethyl alcohol. Specimens were cleared in lactic acid for 2h prior to examination using a dissecting microscope (Olympus SZX16) and compound microscope (Olympus BX51). Parasites specimens were photographed with a digital camera. Three females were kept in the collection of Dr.Raul Castro Romero (University of Antofagasta, Chile) and five adult females are deposited in the collection of Parasitology Section of Fish Diseases Lab. Faculty of Fisheries, Mersin University. Identification of *Clavellotis briani* was performed according to Brian (1924), Ben Hassine et al (1978), Kabata (1979), Castro & Baeza (1984), Benkirane et al (1999), Benmansour et al (2001), and Boxshall (2013)'s reference literatures.

3. Results and Discussion

Clavellotis briani (Brian 1906) were found as a parasitic copepod from branchial arches of 8 individuals of fish (*Lithognathus mormyrus*) in the Northeast Mediterranean Sea, Mersin, Turkey (Figure 1). The mean intensity of infestation for the population, the mean intensity per fish, and the parasite load per infested fish were calculated 3.42%, 1 and 1 respectively (Table 1). The minimum and maximum total lengths were measured as 3.5-4.0 mm. According to literature, *Clavellotis briani* is widely distributed in the North Sea, Mediterranean Sea, Mauritania, Tunisia, Gulf of Lion in France, Kenitra in Morocco, and Dakar in Senegal (Brian 1906; Nuñes Ruivo 1954; Ben Hassine et al 1978; Benmansour & Ben Hassine 1997; Benkirane et al 1999).

Results of the present study indicated that lernaeopodids were only isolated in spring time from striped seabream (*Lithognathus mormyrus*). In the present parasite is belong to Copepoda (Edwards 1840) Class, Siphonostomatoida (Thorell 1859) Order, Lernaeopodidae (Olsson1869) Family, Clavellinae (Dana 1853) Subfamily, Clavellotis (Castro & Baeza 1984) genus, and it is classified in species as a name of *Clavellotis briani* Benmansour et al (2001). Additionally, the synonym name is *Clavellotis briani* same as species name in systematically.

Figure 1- *Clavellotis briani* (Brian 1906), female specimen (Scale: 1mm)

Şekil 1- Clavellotis briani (Brian 1906), dişi örnek (Scale: 1mm)

In Tunisia, Benmansour et al (2001) reported 18.2% infestation prevalence for *Clavellotis briani*

Table 1- The status of examined fishes (W: live weight, TL: total length)

Çizelge 1- İncelenen balıkların durumu (W: canlı ağırlık, TL: toplam boy)

Months	*Number of examined fish*	*W (g)*	*TL (cm)*	*Number of parasitized fish*	*Prevalence (%)*
May	11	122.33±13.37	19.89±0.90	4	36.36
June	22	68.74±2.49	17.47±0.28	NA*	NA
July	18	70.22±2.10	17.71±0.17	NA	NA
August	16	74.57±3.87	17.22±0.29	NA	NA
September	25	71.94±6.40	17.37±0.41	NA	NA
October	25	64.99±3.48	17.08±0.28	NA	NA
November	25	75.78±2.69	17.38±0.20	NA	NA
December	25	62.04±1.23	16.37±0.14	NA	NA
January	4	90.69±15.77	18.05±1.14	NA	NA
February	13	87.39±3.67	18.61±0.22	NA	NA
March	25	96.90±4.91	18.5±0.42	NA	NA
April	25	63.74± 4.02	15.40±0.29	4	10
Total	234	-	-	8	-
Mean±SD	19.42±7.17	79.11±17.54	17.61±1.19	2.92±2.78	3.42

*, NA, not available

on striped seabream. Other species of the genus *Clavellotis* have earlier been recorded by several other authors as well. Ben Hassine et al (1978) reported 4.5% infestation prevalence for *Clavellotis strumosa* on striped seabream. Ben Hassine et al (1978) determined 9% infestation prevalence for *Clavellotis sargi* on *Diplodus sargus*. Radujkovic & Raibaut (1989) reported a 19% infestation prevalence for *Clavellotis sargi* (Kurz, 1877) on *Diplodus annularis* in Montenegro, 1% on *Diplodus vulgaris*, 5.4% on *Diplodus annularis*, 27.7% prevalence on *Pagrus pagrus*, 6% on *Sarpa salpa*, and 0.9% *Pagellus erythrinus*. Öktener et al (2008) reported 6% infestation prevalence for *Clavellotis strumosa* on *Pagellus erythrinus*. Thus, the prevalence levels recorded in the present study are within the range reported in other studies. Additionally, the parasite infection showed monthly variations with the only occurred in spring season.

The other lernaeopodids were previously reported from Turkish waters as *Clavellotis fallax* Heller, 1868 on *Diplodus sargus sargus*, *Pagellus erythrinus*, *Sarpa salpa*, and *Spondyliosoma cantharus* from the Aegean Sea (Akmirza 2000); *Lernaeopoda galei* Krøyer, 1837 on *Mustelus mustelus* from the Aegean Sea (Karaytug et al 2004); *Neobrachiella impudica* Von Nordmann, 1832 on *Trigla lucerna* from the Sea of Marmara (Öktener & Trilles 2004a); *Eubrachiella exigua* Brian, 1906 on *Pagellus erythrinus* from the Mediterranean (Öktener & Trilles 2004b); *Neobrachiella bispinosa* Von Nordmann, 1832 on *Trigla lucerna* from the Mediterranean (Öktener & Trilles 2004b) and *Clavellotis strumosa* (Brian 1906) on *Pagellus erythrinus* from the Sea of Marmara (Öktener et al 2008).

Parasites affect fish health through mechanical, physical and also reproductive damage. These harmful changes can decrease growth, fecundity and survival, and result in many alterations of the infested host (Bush et al 2001). The economic effects of parasitisation of fishes by copepods include reduced marketability. Farmed fish with unsightly lesions have reduced value (Boxhall & Defaye 1993). In this study we were found another lernaeopodids on striped seabream, *Lithognathus mormyrus* from Mersin Bay (Northeast Mediterranean Sea). As it's known that heavily parasitized fishes with lernaeopodid copepods shows haemorrhagic pathology. In that point, Scholz (1999) stated that

despite considerable progress in fish parasitology in the last decades, major gaps still exist in the knowledge of taxonomy, biology, epizootiology and control of fish parasites.

4. Conclusions

Future studies should focus on collecting biological information to examine control procedures to reduce the *Clavellotis briani* infestations. It would be a very important attempt to address what we could do to maintain our natural environments, to create sustainable natural fish stocks and aquaculture development in near future. Because the Mersin Bay is identified as a key site for cage aquaculture by the Turkish Ministry of Aquaculture and Rural Affairs, findings of the current study would serve a vital role for future aquacultural efforts in the area. In a global perspective, data provided herein might be considered significant to address maintenance of natural environments and thus create sustainable natural fish stocks and aquaculture development in near future. In conclusion, *Clavellotis briani* has not previously been reported from Turkey. The present record represents a northward extension of the known ranges of both the host and the parasite.

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