



# Checklist of helminth parasites of Striped Red Mullet, *Mullus surmuletus* (Linnaeus, 1758) (Perciformes: Mullidae), caught in the Bay of Kristel, Algeria (western Mediterranean)

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**Abstract:** This investigation on the parasitic biodiversity of Striped Red Mullet, *Mullus surmuletus*, revealed the presence of 14 parasite species, including seven species of Digenea, four species of Nematoda, two species of Acanthocephala, and one Cestoda. *Opecoelides furcatus* and *Proctotrema bacilliovatum* are the most prevalent digenean species, present in 70% and 17% of the fish specimens analyzed, respectively. Concerning nematode species, *Hysterothylacium fabri*, *Ascarophis valentina* and *Cucullanus longicollis* have shown a prevalence of 66%, 17% and 8% respectively, among all specimens of *M. surmuletus* analyzed.

**Key words:** Mullidae, helminth parasites, Northwestern Africa, Mediterranean Sea

## INTRODUCTION

The parasite fauna of Striped Red Mullet, *Mullus surmuletus* (Linnaeus, 1758) (Perciformes: Mullidae), has aroused the interest of numerous parasitologists, mainly due to economic value of this species (Boudaoued-Krissat 1979). According to Le Pommelet *et al.* (1997) the system helminths–*Mullus* would undoubtedly be one of the richest and most diversified of the Mediterranean.

Although many authors have studied the helminth parasites of *M. surmuletus* (Bayoumi *et al.* 2004; Ferrer *et al.* 2005, 2007; Neifar *et al.* 2007; Ternengo *et al.* 2009) few studies have focused on Algerian coast. To better characterize the distribution of helminth parasites here, an epidemiological survey of helminths was carried out on 100 specimens of *M. surmuletus* from September 2009 to July 2010 in the Bay of Kristel on the west coast of Algeria.

## MATERIALS AND METHODS

The samples were collected from the Bay of Kristel on the coast of western Algeria. The coordinates of the sampling point were (35°43' N, 00°37' W) (Figure 1). One hundred fish were captured with trammel net. Their length ranged from 16 to 24 cm. The fish were dissected by making an incision along the ventral line from the anus to the buccal aperture, then the whole body cavity was carefully dissected, and

their walls scraped and rinsed several times in physiological saline water and thoroughly examined. Parasites were fixed and preserved in ethanol (70%). For light microscopy studies, Digenea and Cestoda were stained in carmin and mounted in Eukitt and Acanthocephala and Nematoda were clarified in Lactophenol (Ash and Orihel 1991). For identification of the parasites, papers of Anderson (1992) and Moravec (1994, 1998) were used for Nematoda, Gibson and Bray (2002) for Digenea, Khallil *et al.* (1994) for Cestoda, and Amin (1987) for Acanthocephala.

## RESULTS

A total of 1758 specimens of helminth parasites were recovered from the host species, representing 14 species and 12 genera, as listed below:

Phylum Nematoda Rudolphi, 1808  
Class Secernentea Von Linstow, 1905  
Order Ascaridida Skrjabin & Shultz, 1940  
Superfamily Ascaridoidea Railliet & Henry, 1915  
Family Anisakidae Railliet & Henry, 1912  
*Hysterothylacium* Ward & Magath, 1917

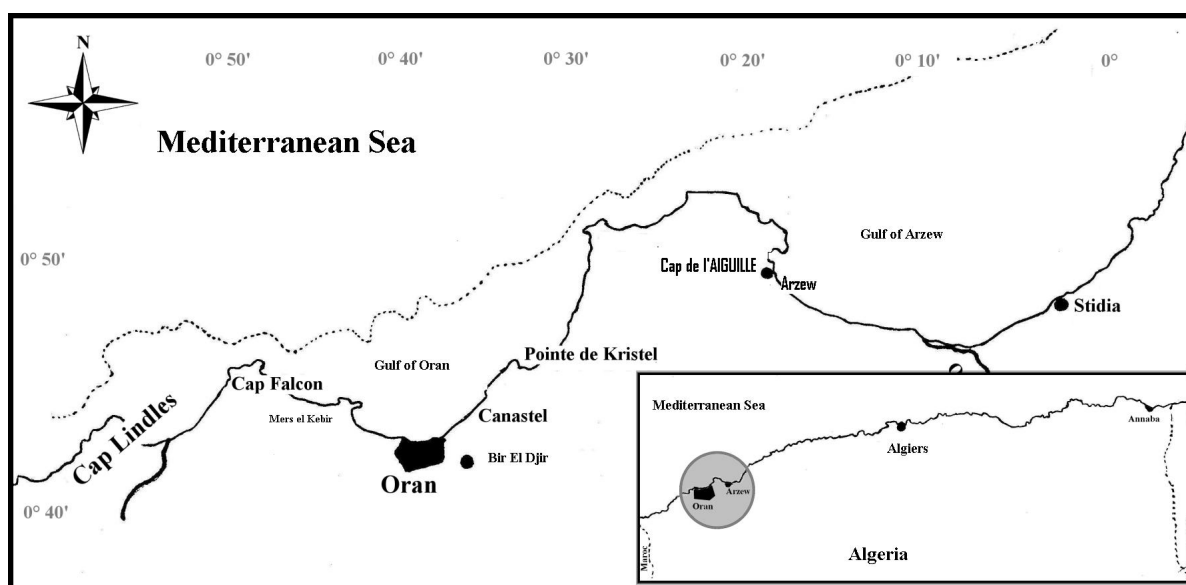
***Hysterothylacium fabri*** (Rudolphi, 1819), fourth stage larvae  
Prevalence: 66%; abundance: 1.59

***Hysterothylacium* sp.**, third stage larvae  
Prevalence: 3%; abundance: 0.04

Superfamily Seuratoidea Hall, 1916  
Family Cucullanidae Cobbold, 1864  
Genus *Cucullanus* Müller, 1777

***Cucullanus longicollis*** (Stossich, 1899)  
Prevalence: 8%; abundance: 0.13

Subclass Adenophora Linstow, 1905  
Order Spirurida Chitwood, 1933  
Superfamily Habronematoidea Chitwood & Wehr, 1932  
Family Cystidicolidae Skrjabin, 1946  
Genus *Ascarophis* Van Beneden, 1870



**Figure 1.** Geographical location of the studied area.

***Ascarophis valentina*** (Ferrer , 2005)

Prevalence : 17% ; Abundance : 0.33

Class Trematoda Rudolphi, 1808

Subclass Digenea Carus, 1863

Superfamily Allocreadioidea Loos, 1902

Family Opecoelidae Ozaki, 1925

Subfamily Opecoelinae Ozaki, 1925

Genus *Opecoeloides* Odhner 1928

***Opecoeloides furcatus*** (Odhner, 1928)

Prevalence: 70%; Abundance:11.11

Genus *Poracanthium* Dollfus, 1948

***Poracanthium furcatum*** (Dollfus, 1948)

Prevalence: 15%; Abundance: 1.34

Superfamily Monorchioidea Odhner, 1911

Family Monorchidae Odhner, 1911

Subfamily Monorchinae Odhner, 1911

Genus *Proctotrema* Odhner, 1911

***Proctotrema bacilliovatum*** (Odhner, 1911)

Prevalence: 17% Abundance: 2.56

Genus *Lasiotocus* Loos, 1907

***Lasiotocus mulli*** (Stossich, 1883)

Prevalence: 4%; abundance: 0.04

Superfamily Hemiuroidea Loos, 1899

Family Deroginidae Nicoll, 1910

Subfamily Derogeninae Nicoll, 1910

Genus *Derogenes* Janiszewska, 1953

***Derogenes latus*** (Nicoll, 1910)

Prevalence: 8 %; abundance: 0.11

Superfamily Hemiuroidea Loos, 1899

Family Hemiuridae Loos, 1899

Subfamily Elytrophallinae Skrjabin & Guschanskaja, 1945

Genus *Lecithocladium* Lühe, 1901

***Lecithocladium excisum*** (Rudolphi, 1819)

Prevalence: 2%; abundance: 0.3

Family Cryptogominidae Ward, 1917

Subfamily Aphallinae Yamaguti, 1958

Genus *Aphallus* Poche, 1926

***Aphallus tubarium*** (Rudolphi, 1891), metacercarial stage

Prevalence: 9%; abundance: 0.18

Superfamily Bucephaloidea Poche, 1907

Family Bucephalidae Poche, 1907

Subfamily Prosorhynchinae Nicoll, 1914

Genus *Prosorhynchus* Odhner, 1905

***Prosorhynchus crucibulum*** (Odhner, 1905), metacercarial stage

Prevalence: 1%; abundance: 0.01

Class Cestoda

Order Trypanorhyncha Diesing, 1863

Family Tentaculariidae Poche, 1926

Genus *Nybelinia*, Poche, 1926

***Nybelinia lingualis*** Cuvier, 1817

Prevalence: 1%; abundance: 0.01

Phylum Acanthocephala

Class Palaeacanthocephala Meyer, 1931

Order Echinorhyncha Southwell & Macfie, 1925

Family Arhythmacanthidae

Subfamily Paracanthocephaloidinae Golvan, 1969

Genus *Euzetacanthus* Golvan & Houin, 1964

***Euzetacanthus simplex*** (Rudolphi, 1810)

Prevalence; 3%; abundance: 0.04

Genus *Breizacanthus* Golvan, 1969

***Breizacanthus ireanae*** (Golvan, 1969)

Prevalence; 1%; abundance: 0.02

## DISCUSSION

Our studies show high degree of infestation, which is however not uncommon in Striped Red Mullet populations of the Mediterranean Sea (Hristovski et al. 1989; Arculeo et al. 1997; Figus et al. 2004). The most prevalent parasites were the digeneans, among them *Opecoeloides furcatus*, *Poracanthium furcatum* and *Proctotrema bacilliovatum*, and the nematodes *Hysterothylacium fabri*, *Ascarophis valentina*, *Cucullanus longicollis* and *Hysterothylacium* sp. The present study reports the occurrence of *Ascarophis valentina* from the west coast of Algeria. Cestoda and Acanthocephala were rare.

The high diversity of digenean species in *M. surmuletus* was reported by Le Pommelet et al. (1997), who listed 18 species. However, many of these species have a restricted distribution in the western Mediterranean and the Adriatic Seas and were not recorded elsewhere.

Neiffar et al. (2007) found that *M. surmuletus* from Tunisia hosted significantly fewer parasite taxa than those from Spanish coasts (16 species in the Spanish Mediterranean vs. 9 in Tunisia). *Lasiotocus mulli*, *Lecithocladium excisum* and *Ascarophis valentina* were found only in Spain and, in contrast, no taxa were exclusive to Tunisian coasts.

Klimpel et al. (2008) demonstrated that the parasite fauna of mullets from the North Sea (North Atlantic) was richer than from mullets from the Mediterranean. *Opecoeloides furcatus* and *Ascarophis valentina* were isolated only from the Mediterranean Sea while *Capillaria gracilis* and *Anisakis simplex* were found only in the North Sea. These results suggest historical (post-Messinian history) and geographical reasons for the differences observed in the parasite fauna composition of the mullets from different localities. Ferrer et al. (2007) published similar results and identified these species with a similar high prevalence and abundances.

Parasite species from *M. surmuletus* and other teleost fishes were correlated to the sites located inside or outside the Bonifacio Strait Marine Reserve (Corsica Island) and their distribution seemed to be most influenced by host specificity than by the protected status of the site (Ternengo 2009).

Species composition herein resembles those in the western Mediterranean, suggesting that species composition and richness of parasite communities of *M. surmuletus* appear to vary significantly at a large geographical scale. Further studies with other sampling sites are needed to explore the role of the natural barriers (e.g., Strait of Gibraltar) to restrict metazoan parasite populations within and outside the Mediterranean Sea.

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## LITERATURE CITED

Amin, O.M. 1987. Key to the families and subfamilies of Acanthocephala, with the erection of a new class (Polyacanthocephala) and a new order (Polyacanthorhynchida). *Journal of Parasitology* 73(6): 1216–1219 (doi: 10.2307/3282307).

Anderson, R.C. 1992. *Nematode Parasites of Vertebrates: Their Development*

*and Transmission*. Wallingford: CABI publishing. 340 pp.

Arculeo, M., N. Hristovski and S. Origgio. 1997. Helminth infestation of three fishes (*Serranus scriba*, *Mullus surmuletus*, *Scorpaena porcus*) from a coastal sea ground in the Gulf of Palermo (Tyrrhenian Sea). *Italian Journal of Zoology* 64(3): 283–286 (doi: 10.1080/11250009709356210).

Ash, L.R. and T.C. Orihel. 1991. *Parasites: A Guide to Laboratory Procedures and Identification*. Chicago: ASCP Press. 110 pp.

Bayoumi, E.M., S. Abdelmonem and K.A. Ammar. 2004. Ultra structural study of some helminth parasites infecting the Goatfish, *Mullus surmuletus* (Osteichthyes: Mullidae) from Syrt Coast, Libya. *Nature and Sciences* 6(2): 51–63.

Boudaoud-Krissat, K. 1979. *Contribution à l'Étude des Helminthes et des Crustacés Parasites des Poissons du Genre Mullus en Oranie*. Thèse de Magister, Université Es-Senia, Oran. 130 pp.

Ferrer, E., F.J. Aznar, J.A. Balbuena and F. Moravec. 2005. A new cystidicolid nematode from *Mullus surmuletus* (Perciformes: Mullidae) from the Western Mediterranean. *The Journal of Parasitology* 91(2): 335–344 (doi: 10.1645/GE-366R).

Ferrer, E., J.A. Raga and F.J. Aznar. 2007. Parasites as fish population tags and pseudoreplication problems: the case of striped red mullet *Mullus surmuletus* in the Spanish Mediterranean. *Journal of Helminthology* 8(1): 169–178 (doi: 10.1017/S0022149X07729553).

Figus, V., J. Culurgioni., M. Cortis., V. D'Amico and G. Canestrii. 2004. Digenetic trematodes of *Mullus surmuletus* (L., 1758) from Gulf of Cagliari, southern Sardinia. *Ittiopatologia* 1: 41–48

Gibson, D.I., A. Jones and R.A. Bray. 2002. *Keys to the Trematoda*. Volume I. Wallingford: CABI publishing/The Natural History Museum, UK. 521 pp.

Hristovski, N.D., M. Arculeo and S. Riggo. 1989. Helminth parasite fauna of *Mullus surmuletus* (Pisces, Mullidae) in the Bay of Palermo (Sicily/Italy). *Bilješke Notes* 75: 1–6.

Khalil, L.F., A. Jones and R.A. Bray. 1994. *Keys to the Cestode Parasites of Vertebrates*. Wallingford: CABI publishing. 751 pp.

Klimpel, S., S. Kleinertz and H.W. Palm. 2008. Distribution of parasites from red mullets (*Mullus surmuletus* L., Mullidae) in the North Sea and the Mediterranean Sea. *Bulletin of Fish Biology* 10(2): 25–38.

Le Pommelet, E., P. Bartoli and P. Silan. 1997. Biodiversité des digènes et autres helminthes intestinaux des Rougets: Synthèse pour *Mullus surmuletus* (Linné, 1758) et *M. barbatus* (L. 1758) dans le bassin méditerranéen. *Annales de Sciences Naturelles de Zoologie* 18(4): 177–181.

Moravec, F. 1994. *Parasitic Nematodes of Freshwater Fishes in Europe*. Wallingford: CABI Publishing. 473 pp.

Moravec, F. 1998. *Nematodes of Freshwater Fishes of the Neotropical Region*. Wallingford: CABI Publishing. 395 pp.

Neifar, L., E. Ferrer-Castello., M. Chaari, L. Boudaya, L.G. Alama-Bermejo, A.G. Raga and F.J. Aznar. 2007. Parasite fauna of Red Striped Mullet, *Mullus surmuletus*, in Tunisia and the Spanish Mediterranean: A geographical comparison. 7th International Symposium on Fish Parasites (Viterbo, Italy).

Ternengo, S., C. Levron, D. Mouillot and B. Marchand . 2009. Site influence in parasite distribution from fishes of the Bonifacio Strait Marine Reserve (Corsica Island, Mediterranean Sea). *Parasitology Research* 104(6): 1279–1287 (doi: 10.1007/s00436-008-1323-7).

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