



Diversity of Nematodes from the greater forkbeard Phycis blennoides (Teleostei: Gadidae) in the Western Mediterranean Sea

Maya M. Hassani^a, Ahmed kerfouf^{b*}

^{a,b} *University of SidiBel Abbes, Faculty of Nature Sciences and life, Department of Environment, SidiBelAbbés, 22000, Algeria.*

^a*Email: mayahassani@live.com*

^b*Email:kerfoufahmed@yahoo.fr*

Abstract

The parasitological examination revealed the presence of 236 nematodes parasitizing the digestive tract of 110 greater forkbeard Phycis blennoides from the western Algerian coasts. Eight species belonging to five different families of nematodes were identified: *Anisakis simplex*, *Anisakis physeteris*, *Hysterothylacium aduncum*, *Hysterothylacium fabri*, *Hysterothylacium* sp, *Ascarophis collaris*, *Cucullanus cirratus* and *Capillaria gracilis*, these two latest species were recorded for the first time in western Mediterranean and *Phycis blennoides* represents a new host record.

Keywords: Gadidae; Parasitic worms; Northwest Africa; Mediterranean sea

1. Introduction

In the Mediterranean, the greater forkbeard, *Phycis blennoides* [3] stocks have been subjects of increasing commercial interest in recent years, this interest helped to attract attention to a number of its life history aspects: its feeding habit, biology and growth that have been studied by [1,2,3] respectively.

* Corresponding author.

E-mail address: kerfoufahmed@yahoo.fr.

Nevertheless, to our knowledge number of gaps remain concerning the parasites of this gadidae and especially nematodes, that are the most frequent and the most important parasites of fishes throughout the world, the present data on these parasites remains still incomplete [4].

Only a few researchers have published their work on nematode parasites of greater forkbeard in the Mediterranean Sea, and these include [5] and [6] who centered on Anisakidae nematodes from *P. blennoides* due to their pathological effects on host and human health. Thus the results of this study will contribute to this existing knowledge, identify the more common parasites in *P. blennoides* and comment briefly on its.

2. Material and methods

In total, 110 greater forkbeard *P. blennoides* caught in Oran Bay ($35^{\circ}43' N - 0^{\circ}37' W$) (Figure 1), western Algerian coasts, were acquired from fishermen, between October 2011 and March 2014. Specimens were transported in plastic containers to the laboratory where individual body weight and size (total length), sex, and maturity stage were recorded. The range of fish size (total length) was between 25 and 45 cm.

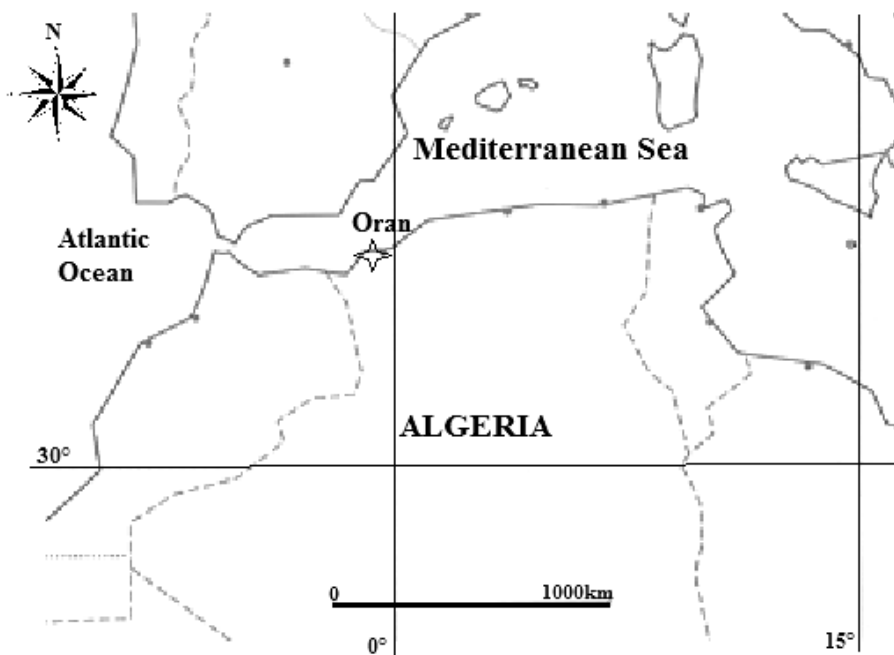


Figure1. Map showing the studied area.

The whole gastro-intestinal tract was removed immediately after capture and all portions (stomach, pyloric caeca and intestine) were opened by a longitudinal incision. Removal of contents was obtained by successive washes with a wash bottle in a Petri dish; the food material collected was examined under a dissecting microscope Zeiss Stemi 2000. Only helminthes infesting this tract were

examined, worms were collected alive and subsequently rinsed in saline solution (9% NaCl), fixed in alcohol 70%, and stored in the same solution. For light microscopy, worms were cleared in lactophenol and examined under a microscope (Zeiss) and identification of nematodes was done according to specialists criteria related to parasitic nematodes of fishes: [7] and [8].

3. Results

In total, 236 specimens of nematodes were registered during this study. All fishes were parasitized by at least one species of parasites. *Hysterothylacium aduncum* Rudolphi, 1802 was the most prevalent species (45.45%) followed by *Cucullanus cirratus* Muller, 1777 (20.20 %). The species with the lowest prevalence were *Hysterothylacium sp* (0.09%) and *Ascarophis collaris* Petter, 1970 (0.09%). The list of species of nematodes and information on levels of parasitism are presented in Table 1.

Table1. List of species of nematodes collected from digestive tract of *P. blennoides* fished in Oran bay.

Nematode species	Number of fish infested	Number of parasites collected	Prevalence %	Abundance	Mean intensity
<i>Hysterothylacium aduncum</i>	50	121	45.45	1.1	2.42
<i>Hysterothylacium fabri</i> (Larvae)	07	18	6.36	0.16	2.5
<i>Hysterothylacium sp</i>	01	01	0.9	0.09	1
<i>Anisakis simplex</i> (Larvae)	05	08	4.54	0.072	1.6
<i>Anisakis physeteris</i> (Larvae)	10	22	9.09	0.2	2.2
<i>Cucullanus cirratus</i>	23	35	20.9	0.31	1.59
<i>Capillaria gracilis</i>	20	30	18.18	0.27	1.5
<i>Ascarophis collaris</i>	01	01	0.9	0.09	1

4. Discussion

High nematode parasite richness in this study, may be associated to the diet of greater forkbeard that feeds wide variety of preys (animals) especially benthic organisms, its principal prey being decapods buried in the mud of the seabed, although, as the specimens grow, they also tend to prey on small

fish. However, decapods continue to constitute the main part of the diet, by weight [11] and serve as intermediate hosts of most nematodes recorded below.

Class: Nematodes Rudolphi, 1808

Subclass: Secernentea

Order : Ascaridida Skrjabin & Shultz, 1940

Superfamily : *Ascaridoidea* Railliet & Henry, 1915

Family : Anisakidae Railliet & Henry, 1912

Genus : *Hysterothylacium* Ward & Magath, 1917

Hysterothylacium aduncum Rudolphi, 1802: Adult nematodes were isolated from the stomach lumen, pyloric caeca and intestine, this nematode has a circumpolar distribution in the Northern Hemisphere, and is found mainly in marine teleosts in temperate and cold waters [9],[10] confirmed its presence in a great number of fish species from the Mediterranean Sea. In Algeria its third stage larvae L3 has been reported from *Sardina pilchardus* [24].

Hysterothylacium fabri Rudolphi, 1802: Its definitive host is *Zeus faber* L, (Teleostei, Zeidae); nevertheless its third stage larvae are frequently encountered in Mediterranean fish [11],[12] reported its presence from 11 mediterranean fish species as L3 and L4 larval stage.

Hysterothylacium sp: Only one specimen was found in the intestine of *Phycis blennoides*, this nematode was found for the first time in Montenegro by [13] from this same host and it has never been reported since.

Genus: *Anisakis* Dujardin, 1845

Anisakis simplex (Rudolphi, 1809): commonly called herring worms or whale worms, is the most important from a public health point of view. The Anisakidosis is the disease condition in humans caused by infestation by third stage larvae (L3) [14]. Adult *Anisakis* are parasites in the stomach and intestine of whales primarily, though occasionally seals, while larvae have been detected worldwide in a large variety of fish species, approximately 200 [15], the present worms, were identified as third-stage larvae.

Anisakis physeteris Baylis, 1923: host specific for the sperm whale *Physeter macrocephalus*, larvae can be expected to have an extensive range of distribution in the world oceans, however, no adults have been recorded in other cetacean hosts [16].

All Anisakidae above are reported for the first time from Algerian coasts (western Mediterranean), except for *Hysterothylacium fabri*.

Superfamily: Seuratoidea Hall, 1916

Family: Cucullanidae Cobbold, 1864

Genus: *Cucullanus* Muller, 1777

Cucullanus cirratus Muller, 1777: Is a common parasite of Atlantic cod *Gadus morhua*, and other gadidae, and the type species of the genus *Cucullanus* [17], in Mediterranean it can easily be confused with *Cucullanus longicollis* (endemic Mediterranean species) a Mullidae specialist nematode [18].

Subclass: Adenophora Linstow, 1905

Order: Enoplida Filipjev, 1929

Superfamily: Trichuroidea Railliet, 1916

Family: Capillariidae Railliet, 1915

Genus: *Capillaria* Zeder, 1800

Capillaria gracilis Bellingham, 1840: Is mainly a parasite of the rectum of gadoid fish, although it may occur in other fish superfamilies. All specimens collected in this study were in the adult stage.

C. cirratus and *C. gracilis* are gadoid specialist nematodes, these species are common in the North Atlantic and adjacent seas [19] have no records from Mediterranean [20], [21] Thus, our study represents the first report on the occurrence of these species in the western Mediterranean Sea.

Order: Spirurida Chitwood, 1933

Superfamily: Habronematoidea Chitwood and Wehr, 1932

Family: Cystidicolidae Skrjabin, 1946

Genus: *Ascarophis* Van Beneden, 1870

Ascarophis collaris Petter, 1970: Was found for the first time in Spain by [22] from *Phycis blennoides*, it has never been reported since. Only three species representing the genus *Ascarophis* are present in Mediterranean, *Ascarophis capelanus*, *Ascarophis valentina* and *Ascarophis mullusi* [23] the last two species were recorded

from *Mullus surmuletus* and *Mullus barbatus*. Therefore, our study represent the first record of *Ascarophis collaris*, a long forgotten Cystidicolidae nematode species from the Algerian western coast.

Acknowledgements

The authors would like to express their gratitude to the team of biology laboratory of Saida University, for their help in treating the specimens.

References

- [1] Macpherson E.1978, Régimenalimentario de *Phycis blennoides* (Brunich) y *Antonogadus megalokynodon* (Kolombatovic) (Pisces:Gadidae) en el Mediterraneo occidental. Investig. Pesq. 42:455-466.
- [2] Petrakis G., Papaconstantinou C. 1992. Some aspects of biology and population dynamics of the forkbeard (*Phycisblennoides*) from the North Aegean Sea. Proceedings of The International Congress of Mer Méditerranée. Pp 304-305.
- [3] Casas J.M., Pineiro C. 2000. Growth and age estimation of greater forkbeard *Phycis blennoides*(Brunnich, 1768) in the north and northwest of the Iberian Peninsula (ICES Division VIIIc and IXa). Fish Res 47:19-25.
- [4] Moravec F. 2007. Nematode parasites of fishes: recent advances and problems of their research. Par.assitologia. 49(3):155-60.
- [5] Valero A., Paniagua M.I., Hierro I., Diaz V., Valderrama M.J., Benitez R., Adroher F.J. 2005. Anisakid parasites of two forkbeards (*Phycis blennoides* and *Phycis phycis*) from the Mediterranean coasts of Andalusia (Southern Spain). Parasitol. Int.55(5):1-5.
- [6] Farjallah S., Ben slimane B., Blel H., Amor N., 2006. Anisakid parasites of two forkbeards (*Phycisblennoides* and *Phycisphycis*) from the eastern Mediterranean coasts in Tunisia, Parasitol. Resea. 100(1): 11-17.
- [7] Anderson R.C. 1992. Nematode parasites of vertebrates: their development and transmission. CAB international. Walligford, UK., 340 pp.
- [8] Moravec F .1994. Parasitic nematodes of freshwater fishes of Europe. Kluwer, Dordrecht, 473pp.
- [9] Berland B. 1991. *Hysterothylacium aduncum* (Nematoda) in fish. ICES Identification leaflets for diseases and parasites of fish and shell fish, Leaflet No. 44. 4 p.
- [10] Petter A.J., Maillard C. 1988. Larves d'Ascarides parasites de poissons en Méditerranée occidentale. Bull. Mus. Hist. Nat. Paris. 4(10):347-369.

- [11] Hristovski N.D., Jardas I.1983. A contribution of the helminthes fauna of fishes from the coastal waters of the Mid insular Area of the Adriatic Sea. Acta Adriat. 24: 179-191.
- [12] Petter A.J., Maillard C. 1988. Larves d'Ascarides parasites de poissons en Méditerranée occidentale. Bull. Mus. Hist. Nat. Paris. 4(10):347-369.
- [13] Petter A.J., Radujkovic B.M .1989. Parasites de poissons marins du Monténégro: (Nématodes). Acta Adriat. 30(12):195-236.
- [14] Smith J.W., Wootten R.1978. *Anisakis* and anisakiasis. Adv. Parasitol.16:93-163.
- [15] Chen Q., Zhang H., Song H.Q., Yu H.Q., Lind R.Q., Zhu, X.Q. 2008. Prevalence of Anisakid Larvae in Maricultured Sea fish Sold in Guangzhou, China. J. Animal. Vet. Advance. 7(9): 1078 -1080.
- [16] Mattiucci S., Paggi L., Nascetti G., Abollo E., Webbs C., Pascual S., Cianchi R., Bullini L .2001. Genetic divergence and reproductive isolation between *Anisakis brevis piculata* and *Anisakis physeteris* (Nematoda: Anisakidae). Internat. J. for. Parasitol, 31: 9-14.
- [17] Valovaya M. A. 1979. Biology of *Cucullanus cirratus* Muller, 1977(Nematoda, Cucullanidae). [In Russian.] Parazitologiya. 13: 540-544.
- [18] Ternengo S., Levron C., Mouillot D., Marchand B. 2009. Site influence in parasite distribution from fishes of the Bonifacio Strait Marine Reserve (Corsica Island, Mediterranean Sea). Parasitol. Resea.104:1279-1287.
- [19] Koie M. 2000. Life cycle and seasonal dynamics of *Cucullanus cirratus* (Nematoda, Ascaridida, Cucullanidae) O.F Muller, 1777 in Atlantic cod *Gadusmorhua* (L.). J. Parasitol. 78:182-190.
- [20] Klimpel S., Kleinertz S., Palm H.W. 2008. Distribution of parasites from red mullets (*Mullus surmuletus*L., Mullidae) in the North Sea and the Mediterranean Sea. Bul. Fish. Biol. 10:25-38.
- [21] Perdiguero-Alonso D., Monteo E.F., Antonio R., Kostadinova K. 2008. Composition and structure of the parasite faunas of cod, *Gadusmorhua* L. (Teleostei: Gadidae), in the North East Atlantic. Parasit. Vect. 1(23): 1-18.
- [22] Petter J.1970. Une espèce nouvelle d'ascarophis (nematoda, cystidicolinae) parasite de *Phycis blennoides* (Brunnich) gadidé Rev.Traun.Inst.Pêches.marit.3 4(2) :221-224.
- [23] Nikolaeva V.M., Naidenova N. 1964. Nématodes de poissons pélagiques et bathypélagiques des mers du bassin méditerranéen. Tr. Sevastop. Biol. Stan. 17:125-158.
- [24] Marzoug D., Boutiba Z., Kostadinova A., Pérez-del-Olmo A. 2012. Effects of fishing on parasitism in a sparid fish: Contrasts between two areas of the Western Mediterranean. Parasitol. Internat.61:414-420.