



The parasitic fauna of *Pagellus acarne* (Risso, 1827) (Teleostei: Sparidae) of Béni Saf 's Bight in the West Coast of Algeria.

Mejda Boukhari Benamara¹, Maya Meriem Hassani², Affef Baaloudj^{3,*},
Ahmed Kerfouf¹

¹Laboratory of eco-development of space, University Djillali Liabes, Sidi Bel Abbès, Algeria.

²Department of biology, Sciences Faculty, Saida University, 20000, Algeria

³Biology, Water and Environment Laboratory (LBEE), University 8 May 1945, Guelma, Algeria.

*Corresponding Author: bafef@yahoo.fr

baaloudj.affef@univ-guelma.dz

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ABSTRACT

The present study investigates the parasitic biodiversity of the Axillary seabream *Pagellus acarne* (Risso, 1827), which were caught in western Algeria (western Mediterranean). The examination of 104 fishes landed in the port of Béni Saf, resulted in the identification of 440 individuals of parasites. Our study identified 5 species of Nematodes parasitizing the digestive system: *Anisakis physeteris*, *Hysterothylacium fabri*, *Hysterothylacium aduncum*, *Hysterothylacium* sp., *Cucullanus* sp., which belong to two large families: Anisakidae and Cucullanidae. The *Hysterothylacium fabri* species were well represented in our samples (63,46%). We have also identified Tetracanthida larvae of the *Scolec pleuronectis* with a prevalence of 23.07%. In addition to the presence of the *Anisakis physeteris* for the first time on the Algerian coast.

INTRODUCTION

About 40% of known species in the living world are parasites (Dobson *et al.*, 2008), including 16000 known parasitic Nematodes species of animals (including humans), and 8 % are invertebrate parasites (Anderson *et al.*, 2010). Parasites generally look bad because they are responsible for pathologies. According to Hudson *et al.* (2006), the diversity of parasites in the ecosystem is indicative of their overall health. Nematodes are considered one of the largest and most diverse groups of helminth parasites that infect marine, freshwater, and even brackish water fish (Klimpel *et al.*, 2011; Morsy *et al.*, 2013). Their infections cause great morbidity in humans and animals. Many cases of human anisakiasis, especially of the genera *Anisakis* and *Pseudoterranova*, occur due to the consumption of undercooked fish (Chaligiannis *et al.*, 2012; Guardone *et al.*, 2018).

However, there is no doubt that parasitic species, because of their "hidden" way of life, are the least known, whereas an extraordinarily large number of species remains discovered and described (Combes, 1995). In our study, we aim to draw up an inventory of nematodes species and other helminths within Sparidae species, the Axillary seabream *Pagellus acarne* (Risso, 1827), which were caught in the Béni Saf area in the Western Algerian coast. They are demersal fish with a great economic interest, due to their abundance and nutritional qualities, which live in coastal waters and occupy various trophic niches (Bargelloni *et al.*, 2005).

MATERIALS AND METHODS

The study area is a part of the West-Algerian coast, in the major fishing port of Algeria, that of Béni Saf (latitude: 35 ° 13'26 " North and longitude: 03 ° 23'16 " West), due to its significant fish production (Fig. 1). 104 individuals of fish were obtained fresh from the small trades, before they are unloaded in the port, and stored in ice and immediately returned to the laboratory for identification according to the nomenclature and criteria used by Fisher *et al.* (1987), then measured, weighed and photographed. Then they are dissected, and their digestive tracts and annexes are isolated in addition to their gonads. The parasite search is done with direct examination under the binocular microscope of various tissues, then rinsing fluids where these tissues were decanted. Parasites were preserved in (70%) of ethanol. Cestoda were fixed in Eukitt and stained in carmin, whereas Nematoda were clarified in Lactophenol (Ash and Orihel, 1991) for microscopy studies. Papers of Khalil (1994) was used for Cestoda and Petter *et al.* (1984), Petter and Maillard (1988), Petter and Radujkovic (1989), Anderson *et al.* (2010), were used for Nematoda for identifying the parasites. For assessment of parasitism, three parasitic indices were calculated: prevalence (noted P), mean intensity (MI), and abundance (A) as described by Bush *et al.* (1997).

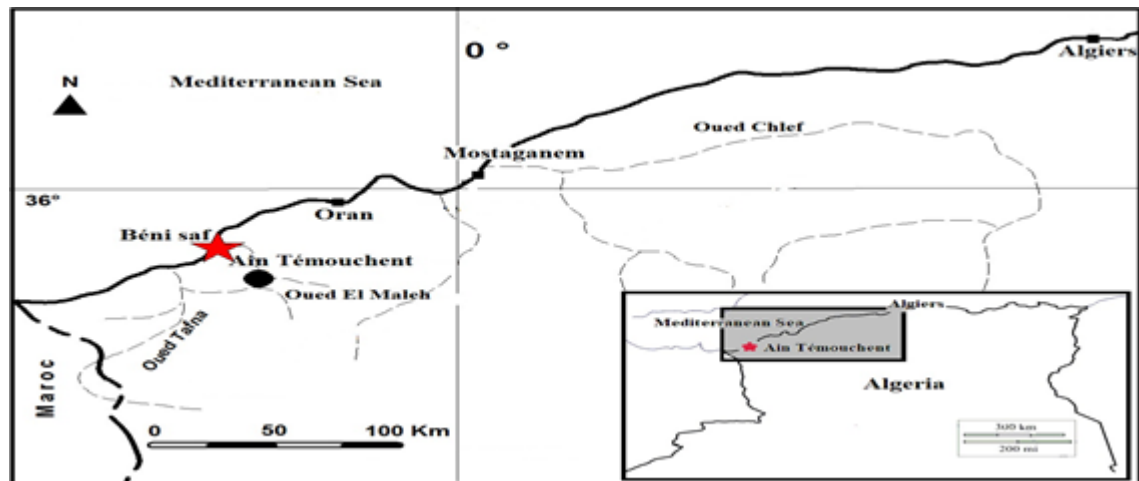


Fig. 1. A map showing the study area Beni Saf West Algerian Coast (signed with red star).

RESULTS AND DISCUSSION

The samples examination of Axillary seabream helped to collect of 6 the endoparasites species, represented by 5 species of Nematodes, and one species of Cestode, in the different organs of the examined fish: abdominal cavity, intestine, stomach, cecum, esophagus, liver, and gonads. These parasite species and their sites of infection in the host fish and their infection rate are shown in Table 1.

Table 1. Parasitological indices of the present parasites and their sites of infection in the host fish and their infection rate in the present and previous studies.

Prevalence (P), abundance (Ab), and mean intensity (MI) of Nematoda in sparid fishes from the western Mediterranean coast of Algeria for the stomach (A), caecum (B), intestine(C), gonads (D), rectum(E), liver (F), general cavity(G), esophagus(H), digestive tract (I) sites.

Species	Attachement Sites	P %	MI	Ab	Other Sparidae hosts	References	Study area
<i>Nematoda</i>							
<i>Anisakidae</i>							
<i>Anisakis physeteris</i> (Baylis, 1923)	ABH	5,76	01	0,05	<i>Pagellus acarne</i>	- Presente study	[1]
					<i>Pagellus bogaraveo</i>	- Hermida & al., 2012	[2]
<i>Hystérothylacium aduncum</i> (Rudolphi, 1802)	ABCGH	9,61	1,8	0,17	<i>Pagellus acarne</i>	- Presente study	[1]
					<i>Pagellus erythrinus</i>	- Saadi & al., 2019	[3]
					<i>Pagellus bogaraveo</i>	- Mladineo, 2006	[4]
						- Lablack, 2014	[6]
					<i>Pagrus pagrus</i>	- Morsy & al., 2013	[5]
						- Lablack, 2014	[6]
					<i>Boops boops</i>	- Sey, 1970	[7]
	- Papoutsoglou, 1976						
	- Petter & Radujkovic, 1989						
	- Radujkovic et Raibaut, 1989						
	- Pérez -del -olmo et al., 2004						
	- Renaud & al., 1980	[6]					
	- Cook & al., 1981						
	- Petter & al., 1984						
	- Petter et Maillard, 1988a, 1988b						
	- Pérez -del -olmo et al., 2004						
	- Merzoug & al., 2012						
	- Ichalal et al., 2015	[3]					
	- Benhamou & al., 2017	[8]					
	<i>Sparus aurata</i>						
	- Keser & al., 2007	[7]					

<i>Hystérothylacium fabri</i> (Rudolpi, 1819)	ABCDFGH	63,46	4,84	3,07	<i>Pagellus acarne</i>	- Presente study [1] - Hadjou & al., 2017 [9]
					<i>Pagellus erythrinus</i>	- Ternengo & al., 2009 [10] - Saadi & al., 2019 [3]
					<i>Diplodus vulgaris</i>	- Ternengo & al., 2009 [10]
					<i>Diplodus sargus sargus</i>	- Isbert & al., 2018 [11]
					<i>Boops boops</i>	- Petter & al., 1984 [7] - Petter & Radujkovic, 1989 - Radujkovic et Raibaut, 1989 - Akmirza, 1998 - Merzoug & al., 2012 [6] - Benhamou & al., 2017 [8]
					<i>Pagellus bogaraveo</i> <i>Pagrus pagrus</i>	- Lablack, 2014 [6] - Lablack, 2014 [6]
<i>Hystérothylacium sp.</i> (Ward & Magath, 1917)	CDEFG	23,07	1,25	0,28	<i>Pagellus acarne</i>	- Presente study [1] - Hadjou & al., 2017 [9] - Azbaid & al., 2016 [12]
					<i>Pagellus erythrinus</i>	- Gasmi & al., 2017 [13] - Saadi & al., 2019 [3]
					<i>Pagellus bogaraveo</i>	- Costa & al., 2004 [2] - Hermida & al., 2012 [2] - Lablack, 2014 [6]
					<i>Pagrus pagrus</i>	- Eiras & Rego, 1987 [14] - Vicente & al., 1985, 1999 - Paraguassù & al., 2000 - Luque & Poulin, 2004 [14] - Saad & Luque, 2009 [6] - Lablack, 2014 [6]
					<i>Boops boops</i>	- Huang, 1988 [15]
Cucullanidae						
<i>Cucullanus sp.</i>	ABCG	19,23	1,2	0,23	<i>Pagellus acarne</i>	-Presente study [1] - Cuyàs, 2015 [16] - Hadjou, 2017 [9]
Cestoda						
<i>Scolex pleuronectis</i> (Müller, 1788)	ACE	23,07	1,75	0,40	<i>Pagellus acarne</i>	-Presente study [1] - Hadjou, 2019 [9]
					<i>Pagellus bogaraveo</i>	- Lablack, 2014 [6]
					<i>Pagellus erythrinus</i>	- Radujkovic & al., 2014 [17]
					<i>Pagrus pagrus</i>	- Paraguassù & al., 2002 [14] - Luque & Poulin, 2004 [6] - Lablack, 2014 [6]
					<i>Diplodus vulgaris</i>	- Ternengo & al., 2009 [4] - Radujkovic & al., 2014 [17]

<i>Diplodus annularis</i>	- Radujkovic & al., 2014	[4]
<i>Boops boops</i>	- Pérez -del -olmo & al., 2007	[4]
	- Marzoug & al., 2012	[6]
	- Radujkovic & al., 2014	[17]
	- Benhamou & al., 2017	[8]

[1] Presente study, [2] Northeast Atlantic (Portugal), [3] Mediterranean (the East coast of Algeria), [4] Mediterranean sea, [5] Sea red (Egypt), [6] Western Mediterranean, [7] Eastern Mediterranean, [8] Mediterranean (Boudzejar, Alger, Skikda), [9] Mediterranean (Gulf of Bejaia), [10] Mediterranean (Corsica Island), [11] Mediterranean (North west), [12] Atlantic (Moroco), [13] Mediterranean (El Kala coast), [14] Brazil, [15] France, [16] Atlantic (Spain), [17] Mediterranean (Adriatic Sea).

Phylum Nematoda (Rudolphi, 1808)
 Class :Secernentea (Von Linstow, 1905)
 Order :Ascaridida (Skrjabin& Shultz, 1940)
 Superfamily :Ascaridoidea (Railliet& Henry, 1915)
 Family : Anisakidae (Railliet& Henry, 1912)
 Genus : Anisakis (Ward et Magath, 1917).
 Species : *Anisakis physeteris* (Baylis, 1923).
 Prevalence: 5,76 %; mean intensity:01; abundance: 0,05
 Genus : Hysterothylacium (Ward &Magath, 1917)
 Species :*Hysterothylacium aduncum* (Rudolphi, 1819).
 Prevalence: 9,61 %; mean intensity:1,8 ; abundance: 0,17
 Species : *Hysterothylacium fabri* (Rudolphi, 1819),
 Prevalence: 63, 46 %; mean intensity 4.84 ; abundance: 3.07
 Species :*Hysterothylacium* sp. (Ward et Magath, 1917).
 Prevalence: 23,07 %; mean intensity:1,25 ; abundance: 0,28
 Superfamily : Seuratoidea Hall, 1916
 Family : Cucullanidae(Cobbold, 1864)
 Subfamily : CucullaninaeCobbold, 1864
 Genus : Cucullanus (Müller, 1777)
 Species : *Cucullanus* sp.
 Prevalence:19,23%; mean intensity : 1,2, abundance: 0,23
 Class : Cestoda
 Subclass : Eucestoda (Southwell, 1930)
 Order : Tetrphyllidea (Carus, 1863)
 Family : Tetrphyllidea incertaesedis
 Genus : Scolex
 Species : *Scolex pleuronectis* (Müller, 1788)
 Prevalence : 23,07 % , mean intensity : 1,75 , abundance : 0,40

The examination of this Sparidae species contributes to the study of the parasitology of *Pagellus acarne*. Five species of Nematodes have been identified based on their morpho-anatomical criteria. These species belong to two distinct families: Anisakidae and Cucullanidae, and they are *Anisakis physeteris*, *Hysterothylacium aduncum*,

Hysterothylacium fabri, *Hysterothylacium* sp., *Cucullanus* sp. (Fig. 2). These parasites infest the viscera and are attached to the digestive tract, intestines, stomach, cecum, liver, and gonads in two encapsulated or elongated forms. These obtained results are consistent with those already reported in various localities of the Mediterranean basin.

Indeed, several researchers have reported the presence of Nematodes in Teleost fish (Ramdane, 2010; Saadi, 2013; Lablack, 2014; Ichalal *et al.*, 2015; Azbaid *et al.*, 2016; Hadjou *et al.*, 2017; Hassani *et al.*, 2014, 2015; 2020). The genus *Hysterothylacium* is the most frequent in *P. acarne*, and many authors (Rudolphi, 1819; Molin, 1858; Stossich, 1896; Petter and Radujkovic, 1989, Radujkovic and Raibaut, 1989, Akmirza, 1998, Ternengo *et al.*, 2009, Benhamou *et al.*, 2017, Isbert *et al.*, 2018), have demonstrated its frequency in teleost fish.

Some authors have reported the presence of mesoparasites like Axillary seabream Bartoli *et al.* (1989), Petter and Cabaret (1995) in the North Atlantic and the North Sea of Europe, Bray and Cribb (1997) in the Atlantic Ocean, Salati *et al.* (2013) in Sardinia, Akmirza (2013) in Turkey. and Cuyàs (2015), in Spain.

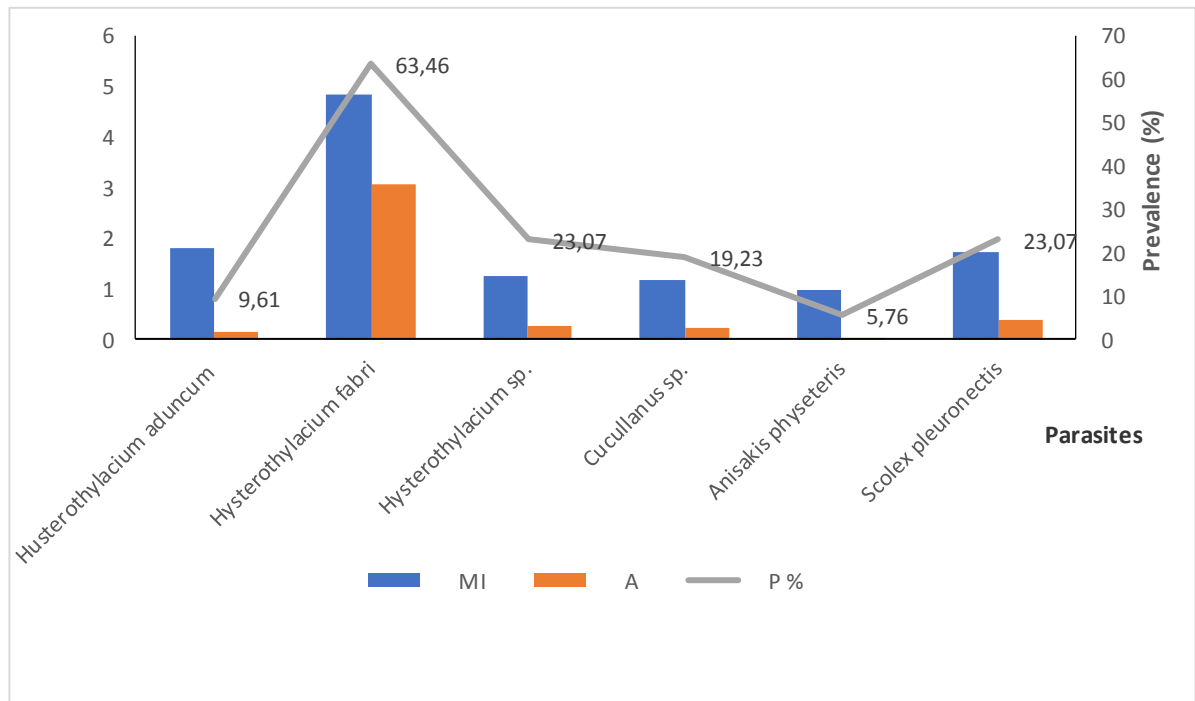


Fig. 2. Prevalence (%), abundance and mean intensity of *Pagellus acarne* parasites

The highest prevalence rate of parasitic communities is 63.46% and corresponds to the larvae of *Hysterothylacium fabri*. This nematode larva was present almost during all seasons. It was also valid for *Hysterothylacium* sp., with a prevalence of 23.07%. Besides, in the Atlantic Ocean, in Morocco, Azbaid *et al.* (2016) reported the presence of *Hysterothylacium* sp., with a maximum prevalence of (100%). This species has already

been reported in *Pagellus acarne* in the Atlantic ocean in Spain by Cuyàs (2015) and in the Mediterranean in Béjaia to the east of the Algerian coast by Hadjou *et al.* (2017).

Our study identified adult male and female specimens of *Cucullanus* sp., in two micro-habitats (intestine and stomach), with a prevalence of 19.23%. This species has also been recorded in the same host fish and the same place by Cuyàs (2015) and Hadjou *et al.* (2017).

Among the collected parasitic species, we reported *Anisakis physeteris* in *Pagellus acarne* for the first time in the Mediterranean region, with 5.76%. Sparids have already collected this species by Hermida *et al.* (2012) in the North Atlantic. *Scolex pleuronectis* larvae were identified with a prevalence of 23.07% and reported in Sparidae fish by several authors (Anato *et al.*, 1991; Akmirza, 1998, 2000, 2002; Paraguassù *et al.*, 2002; Luque and Poulin, 2004; Perez-Del-Olmo *et al.*, 2007, 2008; Ternengo *et al.*, 2009; Marzoug *et al.*, 2012; Radujkovic *et al.*, 2014, Benhamou *et al.*, 2017 and Isbert *et al.*, 2018; Hadjou, 2019).

Moreover, parasitism in *Pagellus acarne* is slightly high during the spring and at the beginning of the summer. According to Combes (1995), higher parasite loads may indicate that the host provides good habitat. So the parasite and host encounter is easy, and the compatibility between them is possible, which makes the host population appear to be superficially homogeneous. Sasal *et al.* (2007) and Poulin (2002) suggest that host fish that share the same biotope can develop an exchange of parasites between them. Thus, the study site, the season, the size of the host can influence the presence of certain parasitic species (Filippi, 2013).

Pagellus acarne feeds mainly on crustaceans, fish, and mollusks, which may explain the predominance of larval stages of anisakidae nematodes since the intermediate hosts of this life cycle are marine invertebrates (crustaceans or mollusks) (Anderson, 2000).

CONCLUSION

The analysis of our samples supported the inventory and description 6 endoparasitic species of *Pagellus acarne* with 440 individuals, belonging to nematodes and cestodes, and all analyzed specimens were infested. The highest number of parasites is that of *Hysterothylacium fabri* with a prevalence of 63.46%. The Axillary seabream *Pagellus acarne* is a new host for *Anisakis physeteris* in the Mediterranean.

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ARABIC SUMMARY

الحيوانات الطفيلية لسمكة (*Teleostei: Sparidae*) *Pagellus acarne* (Risso, 1827)

في خليج بني صاف للساحل الغربي الجزائري

مجدة بوخاري بن عمارة¹، مايا مريم حساتي²، عفاف بعلوج³، كرفوف احمد¹

¹مخبر التنمية البيئية للفضاء، جامعة الجبلالي ليايس، سيدي بلعباس، الجزائر.

²قسم البيولوجيا، كلية العلوم، جامعة سعيدة، 20000، الجزائر.

³مخبر البيولوجيا، الماء و البيئة، جامعة 8ماي 1945، قالمة، الجزائر.

لقد تطرقنا في عملنا هذا إلى دراسة التنوع الطفيلي الخاص بسمكة *Pagellus acarne*، هذا النوع من السمك تم اصطياده من غرب الجزائر (غرب البحر الأبيض المتوسط).

تم التعرف على الحيوانات الطفيلية من خلال فحص 104 سمكة من ميناء بني صاف، وقد تم جمع 440 عينة من الطفيليات. من خلال دراستنا هاته تمكنا من تحديد 5 أنواع من الديدان الخيطية الطفيلية الخاصة بالجهاز الهضمي وهي:

Anisakis physeteris, *Hysterothylacium fabri*, *Hysterothylacium aduncum*,
Hysterothylacium sp., *Cucullanus* sp.

المنتمية إلى عائلتين كبيرتين: *Anisakidae* و *Cucullanidae*.

النوع الأكثر تمثيلا وتواجدا هو: *Hysterothylacium fabri* بنسبة 63,46%. استطعنا أيضا تحديد يرقات *Tetraphyllidea* من *Scolex pleuronectis* بنسبة انتشار 23,07%، بالإضافة إلى ذلك يجدر الإشارة إلى وجود *Anisakis physeteris* في هذا النوع من السمك لأول مرة في الساحل الجزائري.

الكلمات المفتاحية: الطفيليات، *Pagellus acarne*، *Sparidae*، غرب الجزائر، البحر المتوسط