

FIRST RECORD OF *PHYSICULUS DALWIGKI* (ACTINOPTERYGII: GADIFORMES: MORIDAE) FROM THE TUNISIAN COAST (CENTRAL MEDITERRANEAN SEA)

Christian CAPAPÉ¹, Sihem RAFRAFI-NOUIRA², Youssouph DIATTA³,
and Christian REYNAUD*⁴

¹ *Laboratoire d'Ichtyologie, Université de Montpellier, Montpellier, France*

² *Unité de Recherches et Exploitation des Milieux aquatiques, Institut Supérieur de Pêche et d'Aquaculture de Bizerte, Université de Carthage, Menzel Jemil, Tunisia*

³ *Laboratoire de Biologie marine, Institut fondamental d'Afrique noire, (IFAN Ch. A. Diop), Université Cheikh Anta Diop de Dakar, Dakar, Senegal.*

⁴ *Laboratoire Interdisciplinaire de Recherche en Didactique, Education et Formation, Université de Montpellier, Montpellier, France*

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Abstract. A specimen of *Physiculus dalwigki* Kaup, 1758 measuring 218 mm in total length, 190 mm in standard length, and weighing 90 g was caught off the northern Tunisian coast. This capture constitutes the first record of this fish from the Tunisian coast. The specimen is described including morphological measurements, meristic counts, and color. Due to a lack of records, the real status of the species in the Tunisian waters still remains questionable. *Physiculus dalwigki* occurs only off northern Spain and south to the Strait of Gibraltar in the waters surrounding Madera and the Azores Islands, and in the Mediterranean Sea from Nice (southern France) to the Tunisian coast. Therefore, it appears that *P. dalwigki* is displaying a disjoint distribution with the exclusion of a large western region of the Mediterranean Sea.

Keywords: description, morphometric measurements, meristic counts, fragmented distribution, deep waters

INTRODUCTION

Physiculus dalwigki Kaup, 1758 is known along the eastern coast of the Atlantic Ocean from the Galician waters in north-west Spain (Bañón et al. 2002) to about 25°N (Blache et al. 1970, Cohen et al. 1990). However, it appears that captures of this species occurred rather from the waters surrounding Madeira Island (Maul 1952) and the Azores Islands (Barreiros and Azevedo 2019). *Physiculus dalwigki* was reported in the western Mediterranean, from Nice (southern coast of France), the Ligurian, Tyrrhenian, and Ionian coasts of Italy to Sicily (Tortonese 1970, Cohen 1986, Cohen et al. 1990, Iwamoto 2015).

Routine monitoring in Tunisian waters for a decade and concomitantly in the wake of local assistance of experienced fishermen, a specimen of *P. dalwigki* was captured during a commercial trawling survey off the northern Tunisian coast. The present paper provides a short description of the specimen, including morphometric

measurements, meristic counts, and in addition, some comments about the status of the species in the capture areas, inside and outside the Mediterranean Sea.

MATERIAL AND METHODS

On 30 September 2019, a specimen of *Physiculus dalwigki* was collected by trawl at a depth of 230 m, off Bizerte, northern Tunisian coast, at 37°33'04.72"N and 010°06'07.62"E. (Fig. 1), on a sandy-rocky bottom, together with labrid species, parrot sea perch, *Callanthias ruber* (Rafinesque, 1810), and *Phycis phycis* (Linnaeus, 1766). Morphometric measurements were recorded to the nearest millimeter and summarized in Table 1, together with weight in gram, while and meristic counts are given in Table 2. The standard length is abbreviated as SL and total length as TL. The number of gill rakers was counted on the first branchial arch, and the number of vertebrae was determined from an X-ray photograph.

* Correspondence: Dr Christian Reynaud, Laboratoire Interdisciplinaire de Recherche en Didactique, Education et Formation, Université de Montpellier, 2 place Marcel Godechot, B.P. 4152, 34092 Montpellier cedex 5, France, e-mail: (CR) christian.reynaud@umontpellier.fr, (CC) capape@univ-montp2.fr, (SRN) sihem.rafrafi@yahoo.fr, (YD) yousouphdiatta@hotmail.com, ORCID: (CR) 0000-0002-0044-4256, (CC) 0000-0002-6630-2728, (SRN) 0000-0002-8593-7876, (YD) 0000-0001-7482-4430.

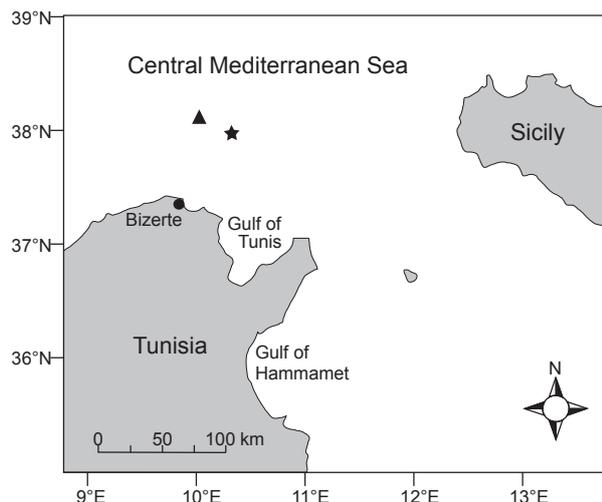


Fig. 1. Map of northern Tunisia, with black triangle indicating the Resgui Bank and black star indicating the capture site of the specimen of *Physiculus dalwigki* (Ref. ISPAB-Phy-dal-01)

Table 1
Absolute and relative values of selected morphometric measurements and total body weight of a specimen of *Physiculus dalwigki* collected off the northern Tunisian coast (ISPAB-Phy-dal 01)

Parameter	Value		
	[g]	[mm]	[%SL]
Total length		218.00	114.74
Standard length		190.00	100.00
Pre-anal length		53.00	27.89
Predorsal fin length		55.00	28.95
Prepectoral fin length		54.00	28.42
First dorsal fin length		11.59	6.10
Second dorsal fin length		118.36	62.29
Anal fin length		116.58	61.36
Pectoral fin length		7.36	3.87
Pelvic fin length		1.98	1.04
Head length		28.66	15.08
Eye diameter		12.14	6.39
Body depth		37.71	19.85
Preorbital length		11.41	6.01
Interorbital length		7.52	3.96
Length of upper jaw		20.48	10.78
Length of lower jaw		18.45	9.71
Length of right pelvic fin		28.32	14.91
Length of left pelvic fin		22.99	12.10
Total body weight	90		

SL = standard length.

The specimen was fixed in 10% buffered formaldehyde, preserved in 75% ethanol, and deposited in the Ichthyological Collection of the Institut Supérieur d'Acquaculture et de Pêche of Bizerte (ISPAB), Tunisia, under the catalog number ISPAB-Phy-dal-01.

Table 2
Meristic counts of a specimen of *Physiculus dalwigki* collected off the northern Tunisian coast (ISPAB-Phy-dal-01)

Parameter	Count
First dorsal fin rays	7
Second dorsal fin rays	62
Anal fin rays	69
Pectoral soft fin rays	23
Scales on lateral line	121
Rows between dorsal and lateral line	12
Gill rakers	12
Vertebrae	63

RESULTS AND DISCUSSION

The Tunisian specimen of *Physiculus dalwigki* (Fig. 2) was identified from the combination of main morphological characters as follows: elongated body slightly compressed with large head (4.3 times in SL) and tapering posteriorly, chin barbel present, oblique mouth, large eye, two dorsal fins, the first slightly higher than the second, anal fin not indented originated behind the origin of second dorsal fin, caudal fin rounded at distal end, pectoral fins extending beyond the origin of pelvic fin, filamentous ray of pelvic fin extending slightly beyond anal fin origin, light organ located between bases of pelvic fins, color pinkish tan, oral cavity pale.

General morphology, morphometric measurements, meristic counts and color are in total agreement with previous descriptions of *P. dalwigki* by Maul (1953), Tortonese (1970), Aguiar and Pereira (1982), Cohen (1986), Cohen et al. (1990), and Bañón et al. (2002). Therefore, the presently reported capture of *P. dalwigki* is the first well-documented record of the species from the Tunisian coast and the species should be included in the local ichthyofauna. This record of *P. dalwigki* extends southward the range of the species in the Mediterranean Sea.

According to Cohen (1986) and Cohen et al. (1990), *P. dalwigki* reaches 300 mm as maximum TL. The presently reported specimen measured 218 mm TL, 190 mm SL and its total body weight was 90 g, therefore it could be considered as medium sized, probably a juvenile specimen.

The Galician waters, constitute the northernmost extension of *Physiculus dalwigki* range from the eastern Atlantic, and following Bañón et al. (2002), such occurrence suggests a possible dispersion of the species to northern areas using islands and seamounts as intermediate. Additionally, the global warming of marine waters allows finding fish species in habitats where they were previously unknown (Bañón et al. 2002, Quéro et al. 2003). However, a single specimen of *P. dalwigki* was recorded in the area (Bañón et al. 2002, 2010, Bañón, personal communication, 2020), suggesting that a successful establishment of the species in the area remains

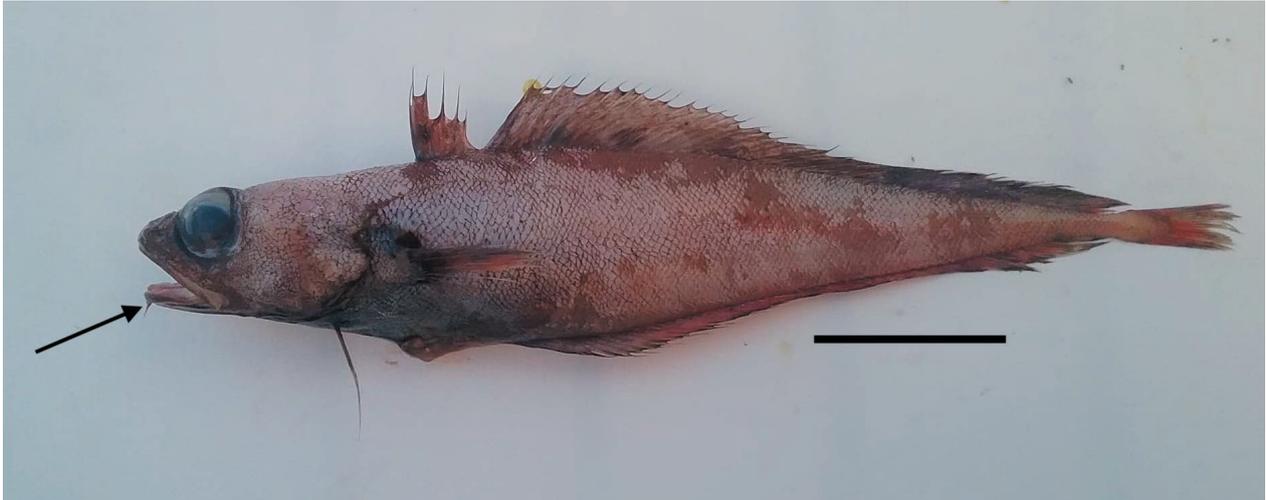


Fig. 2. Specimen of *Physiculus dalwigki* (Ref. ISPAB-Phy-dal-01) captured in the northern Tunisian waters, with an arrow indicating the chin barbel; scale bar = 40 mm

doubtful. Iwamoto (2015) noted the occurrence of the species in areas where it was previously unknown such as Portugal (Cohen 1986), Morocco (Lloris and Rucabado 1998), and Mauritania (Maigret and Ly 1986).

Conversely, a routine monitoring regularly conducted throughout the entire coast of Senegal allow to collect several fish species (Diatta et al. 2014), some of them being rare (Diatta et al. 2019) or unknown to date (Capapé et al. 2019) but no specimen of *P. dalwigki* was found in the same area. Southward, the species was not reported from Guinea-Bissau (Sanchez 1991), and therefore its occurrence at latitudes higher than 25°N, remains questionable, even if such hypothesis cannot be totally ruled out.

Physiculus dalwigki only occurs in the Mediterranean Sea, from Nice (southern France) to the Tunisian coast, and in the eastern Atlantic, off northern Spain and south the Strait of Gibraltar in the waters surrounding Madera and Azores Islands. Therefore, it appears that *P. dalwigki* is displaying a disjoint distribution with the exclusion of a large western region of the Mediterranean Sea. A similar pattern was observed by Ben Amor et al. (2019) for *Taeniurops grabata* (Geoffroy Saint-Hilaire, 1817), known in the eastern Mediterranean Basin, but totally unknown in the western basin, including the Maghreb shore. The Tunisian coast could be also considered as the north-western most expansion of its range in this sea. However, *T. grabata* is recorded off west African coast from Mauritania to Angola, around the Azores and Cape Verde Islands (Capapé and Desoutter 1990, Ben Amor et al. 2019). Following Lucrezi and Schlacher (2014), such spatial discontinuities are probably due to the fact that the Mediterranean Sea was invaded during a warm interglacial period in the Quaternary, and some species disappeared from the western Basin due to the intra-glacial cold climatic conditions. Global warming of sea waters throughout the world and especially in the entire Mediterranean Sea (Francour et al. 1994) could enhance the emergence of species previously unknown.

However, Bañón et al. (2002) suggested that the distribution of *P. dalwigki* is not really fragmented and its non-occurrence could be also due to a lack of sampling effort, the species inhabit deep bottoms generally less exploited that shallow coastal waters by commercial fishing boats. Additionally, following our own observations, the species is not targeted by fishermen due to its poor economical value, and probably specimens are discarded at sea soon after being captured.

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