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Research Article

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Occurrence of *Phycis phycis* (Linnaeus, 1766) on the Rocky Coast of the Ionian Sea near Vuno (Albania), with Notes on Spatial Distribution and Taxonomic Classification

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Abstract

This study provides new information on the occurrence of the forkbeard (*Phycis phycis* Linnaeus, 1766) along the rocky coast of the Ionian Sea, specifically near the village of Vuno (Albania). A single specimen was collected in February 2023 at a depth of 6–10 m in a rocky habitat characterized by caves and algae-covered substrates. Morphometric and meristic analyses were conducted, together with detailed anatomical examination of skeletal elements, particularly the premaxillary bone and vertebrae, in order to confirm species identification and distinguish the specimen from the closely related *P. blennoides*. Diagnostic features included the absence of an elongated first ray in the first dorsal fin (D1) and the presence of conical, needle-like teeth consistent with a predatory feeding mode. The findings support the taxonomic placement of the genus *Phycis* within the family Phycidae and highlight the need to update existing data on the ichthyofauna of the Albanian Ionian coast.

Keywords: *Phycis phycis*, morphometric traits, vertebral analysis, taxonomy, Gadiformes.

1. Introduction

In the last week of February 2023, a fisherman engaged in spearfishing using a

pneumatic speargun reported the capture of a fish species not previously recorded among the commonly exploited local catches. A single specimen was obtained and, at our request, was subsequently deposited at the Museum of Natural Sciences for analysis. According to the fisherman, the capture occurred at a depth of 6–10 m along the rocky coast of Vuno (Ionian Sea, Albania), in a habitat characterized by caves, hard substrate (non-sandy and non-muddy), and rocks covered with algae and vegetation. On the same day, other species were also recorded from the same area, including *Sarpa salpa*, *Sparus aurata*, *Diplodus sargus*, *Mugil cephalus*, and *Mullus surmuletus* (Figure 1).



Figure 1. (Phycis blennoides) and some of the species that were caught during underwater hunting off the coast of Vunoi (Ionian Sea).

2. Morphometric and meristic evaluations

2.1 *Methodological aspects*

The availability of only one specimen limited the scope of the analyses to:

- numerical data on morphometric and meristic traits, following standard protocols for Gadiformes (Hurlbut & Clay, 1998; Deli Antoni et al., 2015);
- percentage ratios between morphometric measurements and standard length (SL) (Arapi et al., 2022, manuscript submitted for publication);
- analysis of skeletal elements, including vertebrae and the premaxillary bone (Watt et al., 1997).

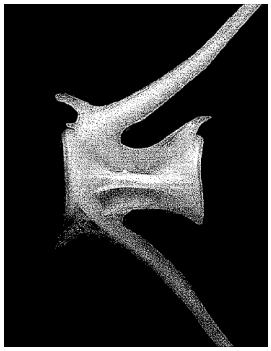


Figure 2a. Diagram of the morphology of a vertebra in fish of the genus Phycis (Watt, J. and colleagues, 1997).

In particular, the third evaluation, the basic schemes of which are shown in Figure 2 helped in differentiating the species of the genus Phycis and in identifying the specific species that was analyzed.

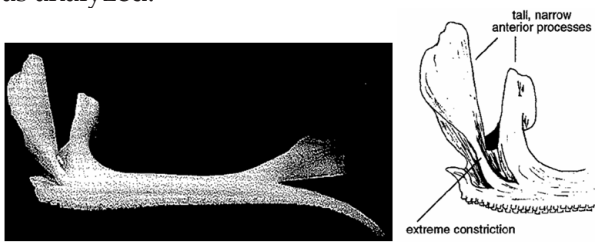


Figure 2b. Schematic lateral view of the premaxillary bone in fishes of the genus *Phycis*, showing details of the articular region (Watt et al., 1997).

Biometric processing of measurement data was not possible but will be carried out if other specimens of the respective species are provided.

2.2 Results of morphometric measurements



Figure 3. Individual of (Phycis phycis Linnaeus 1766); (Gadiformes,Phycidae) found on the near shore of the Ionian Sea, near the village of Vuno.

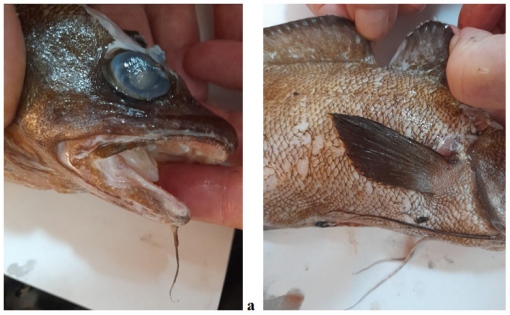


Figure 4. (a) Head region of *P. phycis*. The anterior edge of the lower jaw bears a "chin-like" extension. The mouth is of the superior type, with the upper jaw extending beyond the lower jaw. Multiple rows of conical, sharply pointed teeth in both jaws indicate a predatory feeding mode in the forkbeard. (b) Position and morphology of the dorsal fins (D), pectoral fins (P), and rudimentary pelvic fins (PELV). The pelvic fins terminate in a bifurcated "chin-like" shape. The dorsal fins lack strong rays, and the first dorsal fin (D1) does not possess an elongated first ray.

Table 1. Values of 22 morphometric traits (cm) and corresponding percentage ratios relative to standard length (SL) in *Phycis phycis* (Linnaeus, 1766) collected from the coast of Vuno (Ionian Sea, Albania).

Trait	Value (cm)	% to SL
Total length (TL)	39.9	109.92
Standard length (SL)	36.3	-
Total head length (HL or HEADL-L)	9.4	25.89
Head length between the edge of the upper jaw (UP-JAW) and the upper corner of the operculum (HEADL-M)	8.5	23.41
Head width (HW)	5.1	10.05
Facial length (SnL)	2.9	7.99
Caudal peduncle height (CPD)	3.4	9.37
Eye diameter (ED)	1.7	4.68
Dorsal fin base length (DBL 1)	2.8	7.71
Dorsal fin base length (DBL 2)	21.0	57.85
Pectoral fin base length (PBL)	1.6	4.41
Anal fin base length (ABL)	15.6	42.97
Pectoral fin length (PL)	5.3	14.60
Plump fin rudimentary length (PELVL)	9.6	26.45
Total caudal fin length (TCL)	6.3	17.36
Caudal fin height (HCL)	2.9	7.99
Upper jaw length (UPJAWL)	4.6	12.67
Pre-anal length (PREANAL L or PAL)	17.3	47.66
Pre-pelvic length including tail fin length (PPELVFL)	32.4	89.26
Pre-pectoral length including tail fin length (PPECTFL)	29.0	79.89
Length between the beginning of the base of the first dorsal fin and the tip of the tail fin (PFDORFL)	27.6	76.03
Length between the beginning of the base of the second dorsal fin and the tip of the tail fin (PSDORFL)	25.8	71.07

2.2 Values for some meristic traits

Table 2. Values for the number of constituent elements of some meristic traits Phycis phycis.

Trait	**V**alue
Number of strong rays on the first dorsal fin (D1)	0
Number of soft rays on the first dorsal fin	10
Long rays on first dorsal fin*	0

Number of strong rays on second dorsal fin (D2)	0
Number of soft rays on second dorsal fin	61
Number of soft rays on anal fin	62
No. of soft rays on reduced pelvic fin (PELV)	2
Number of soft rays on caudal fin (C)	27
Number of vellar spines on first, left, vellar arch	-
Number of scales on lateral line (LL)	-

* It is a very essential feature that distinguishes this species from the closely related species (Phycis blennoides (Brunnich), which has a rather elongated first ray of the first dorsal fin.

3. Anatomical evaluations of skeletal elements

a) Anatomical features of the premaxillary bone:



Figure 5. Elements of the jaw skeleton of *P. phycis* (Pisces: Phycidae). Left: *os mandibulae* (lower jaw); right: *os maxillae* (upper jaw).

A relatively regular arrangement of teeth in two rows can be observed on the lower jaw. All teeth are conical and terminate in sharp, needle-like points, a feature that indicates a predatory feeding mode. Although this species is commonly associated with marine habitats characterized by the presence of vegetation—an association reflected in its etymology (Greek *phykton*, meaning sea grass)—it is not herbivorous but rather a typical predator in terms of feeding behaviour. Given the importance of jaw structures in the taxonomy of bony fishes, the morphological features of the premaxillary bone were examined in detail. This bone constitutes the functional component of the upper jaw and is fully ossified in gadiform fishes. In the figures presented below, the anatomical characteristics of the premaxilla are illustrated using skeletal material obtained from the specimen of forkbeard collected off the coast of Vuno. Each figure includes two components: a comparative schematic of *Phycis* spp. derived from the literature (see relevant citation), and an original photograph produced within the framework of the present identification study.

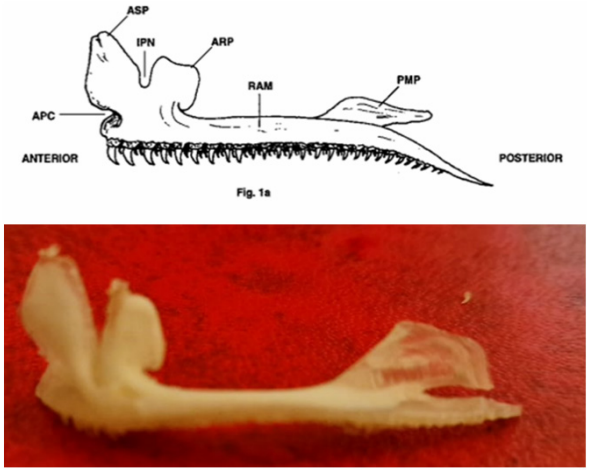


Figure 6. Frontal (buccal/oral) view of the premaxilla. ASP = ascending process; ARP = articular process; RAM = ramus; APC = anterior premaxillary sulcus; IPN = inter-processural planum; PMP = postmaxillary process. *Note.* Adapted from Watt and Pierce (1997) and Boyle (1997).

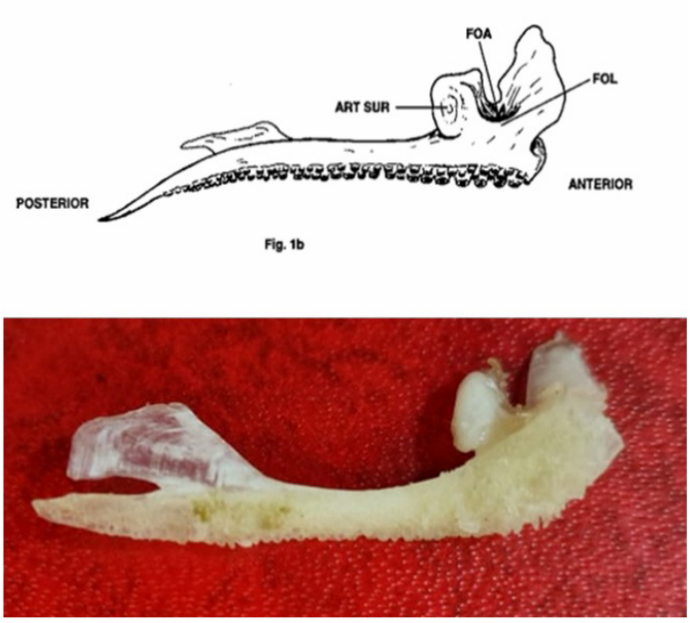


Figure 7. Internal (lingual) view of the *os premaxilla*. ART SUR = articular surface; FOA = fossa; FOL = lamellar fossa. *Note.* Adapted from Watt and colleagues (1997).



Figure 8. Ventral view of the premaxillary bone. The convex surface of the premaxilla bears several relatively regular rows of teeth. *Note.* Adapted from Watt and colleagues (1997).

b)Vertebreal Feautures

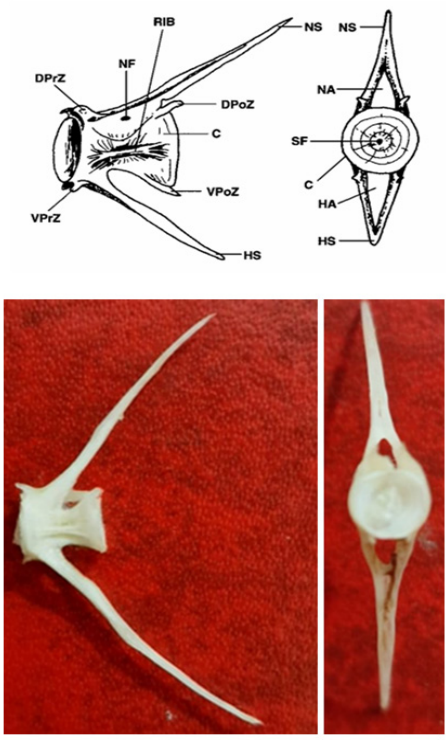


Figure 9. Upper panel: explanatory sketch of vertebral structure. Lower panel: original photograph of a vertebra of *Phycis phycis*. RIB = rib ("back"); NS = neural spine; HS = hemal spine; C = centrum (vertebral body); DPoZ = dorsal postzygapophysis; DPrZ = dorsal prezygapophysis; VPrZ = ventral prezygapophysis; VPoZ = ventral postzygapophysis; NF = neural foramen; HA = hemal arch; NA = neural arch; SF = spinal foramen. *Note.* Adapted from Watt and colleagues (1997).

4. Conclusion

Since the main objectives of the present assessment were to determine the species identity of a fish specimen caught on the Ionian coast of Vuno (Himara, Albania), to clarify the taxonomic position of fish of the genus *Phycis*, to supplement species identification protocols for fishes of the order Gadiformes with specific meristic, morphometric, and anatomical characters, and to clarify information on the distribution of *Phycis phycis* along the Albanian coast, it is important to highlight the following points:

- Fish of the genus *Phycis*, including *Phycis phycis*, are commonly referred to as "phycid cods." They are classified within the order Gadiformes but not within the family Gadidae, as they constitute a distinct taxonomic group, the family Phycidae (Froese & Pauly, 2018, 2021).
- In methodological protocols for the identification of Phycidae species and their differentiation from members of Gadidae, standard morphometric schemes for Gadiformes can be applied. However, for Phycidae identification, in addition to conventional morphometric and meristic characters, skeletal analyses should also be included. Particular attention should be given to anatomical variations in the premaxillary bone and vertebrae from the abdominal and caudal regions. The presence or absence of the first elongated ray in the first dorsal fin (D1) should also be evaluated.
- Based on morpho-anatomical criteria, including measurable (morphometric) traits, countable (meristic) characters, and structural features of skeletal elements (especially the premaxillary bone and abdominal vertebrae), the examined specimen collected from the Ionian coast of Vuno was identified as *Phycis phycis* (Linnaeus, 1766; Gadiformes, Phycidae). This species exhibits morphological differences compared to the closely related *P. blennoides*, with which it appears to have a sympatric distribution in marine regions such as the Ionian Sea, although occupying habitats with distinct geomorphological characteristics.
- According to information provided by the fisherman who captured the specimen, the fish was observed swimming among rocky substrates in a relatively shallow coastal zone (6–10 m depth), particularly in areas with rock surfaces covered by macrophytes and red algae. This behavior indicates a lithophilous ecological preference for rocky habitats and avoidance of sandy and muddy substrates. This interpretation is also supported by vernacular names such as Spanish *brótola de roca* ("rock forkbeard") and French *phycis de roche* ("rock phycis"). In contrast, the related species *Phycis blennoides* is typically associated with soft-bottom habitats (sandy or muddy substrates) (Cohen & Inada, 1990). It has also been documented that its bathymetric distribution in the eastern Ionian Sea ranges from 300 to 1,047 m (Mytilineou et al., 2005).
- Based on the results of the present analyses and the supporting literature, it is considered necessary to clarify certain data presented in *Ichtiofauna e Shqipërisë* (Rakaj, 1995), particularly regarding the two species of the genus *Phycis*.

References

Arapi, D., Sadikaj, R., Spaho, V., Mustafa, E., & Spaho, E. (2022). Information on the presence of Indian scad (*Decapterus russelli* Rüppell, 1830; Pisces, Carangidae), a non-native species, in the Butrint Lagoon (Saranda, Albania) [Manuscript submitted for publication].

Cohen, D. M., Inada, T., Iwamoto, T., & Scialabba, N. (1990). *FAO species catalogue (Vol. 10): Gadiform fishes of the world (Order Gadiformes): An annotated and illustrated catalogue of cods, hakes, grenadiers and other gadiform fishes known to date* (FAO Fisheries Synopsis No. 125(10), 442 pp.). FAO.

Deli Antoni, M. Y., Delpiani, S. M., Steward, A. L., González-Castro, M., & Díaz de Astarloa, J. M. (2015). *Merluccius tasmanicus* Matallanas & Lloris, 2006 is a junior synonym of *M. australis* (Hutton, 1872) (Gadiformes: Merlucciidae) based on morphological and molecular data. *Zootaxa, 3956*(1), 29–55. https://doi.org/10.11646/zootaxa.3956.1.2

Froese, R., & Pauly, D. (2018). *Phycis phycis* (Linnaeus, 1766). In O. Bánki et al. (Eds.), *Catalogue of Life Checklist* (Feb 2018). https://doi.org/10.48580/dfpk-37v

Froese, R., & Pauly, D. (Eds.). (2021). *FishBase*. Version 08/2021. https://www.fishbase.org

Hurlbut, T., & Clay, D. (1998). Morphometric and meristic differences between shallow- and deep-water populations of white hake (*Urophycis tenuis*) in the southern Gulf of St. Lawrence. *Canadian Journal of Fisheries and Aquatic Sciences, 55*(10), 2274–2282. https://doi.org/10.1139/f98-106

Musick, J. A. (1973). Meristic and morphometric comparison of hakes, *Urophycis chuss* and *Urophycis tenuis* (Pisces, Gadidae). *VIMS Articles*, 647.

Mytilineou, C., Politou, C.-Y., Papaconstantinou, C., Kavadas, S., D'Onghia, G., & Sion, L. (2005). Deep-water fish fauna in the eastern Ionian Sea. *Belgian Journal of Zoology, 135*(2), 229–233.

Rakaj, N. (1995). *Ichthyofauna of Albania*. Libri Universitari.

Watt, J., Pierce, G. J., & Boyle, P. R. (1997). *Guide to the identification of North Sea fish, using premaxillae and vertebrae*. ICES Cooperative Research Report No. 220.