

Occurrence of tropical affinity fish in Galician waters, north-west Spain

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Four new fish species have been recorded for the first time in the last few years in Galician waters: *Physiculus dalwigkii*, *Neoscopelus microchir*, *Gaidropsarus granti* and *Pisodonophis semicinctus*. The captures of *Physiculus dalwigkii*, *N. microchir* and *G. granti* represent a new northern limit for their distribution in the north-east Atlantic, increasing their geographical range of distribution considerably while the capture of *Pisodonophis semicinctus* is the second record for the Atlantic European waters.

INTRODUCTION

There is the idea or hypothesis of an expansive movement of the species with a marked latitudinal component from the equator toward the poles, related to a gradual displacement of the thermal gradient and the colonization of the new environment (Lloris, 1986). Presence of indicator species of ecological changes was found in the North Atlantic to high latitudes. Quéro et al. (1996a) recorded many tropical and subtropical fish unknown before 1950 in the European Atlantic to the north of Portugal. These range from highly mobile pelagic fish species to shallow and deep water species and include other taxa of marine organisms. In this paper we report new observations on the tropical affinity fish in Galician waters (north-west Spain) and discuss their anomalous presence.

MATERIALS AND METHODS

The specimens of *Physiculus dalwigkii* (Kaup, 1758), *Neoscopelus microchir* (Matsubara, 1943) and *Gaidropsarus granti* (Regan, 1903) were caught by bottom trawl during an exploratory fishery survey carried out in 1999 by the Instituto Español de Oceanografía in the Galician Bank (north-west Spain). The Galician Bank is a deep platform sited off the continental shelf, at about 42°32'N–11°30'W (Division IXb of CIEM) with depths ranging from 300 to more than 800 metres.

The specimen of *Pisodonophis semicinctus* (Richardson, 1848) was caught by a local fisherman in A Guarda, south of Galicia, with an artisanal dredge named 'arrastrón' used to fish common prawn (*Palaemon serratus*) in a shallow area 200 m next to the port of A Guarda.

Once in the laboratory, measurements and meristic characters were recorded to the nearest mm. In the case of *Physiculus dalwigkii*, according to Paulin (1989), 'V-af' is the distance between a transverse line between the anterior edges of the ventral fin insertions and the anal fin origin and 'lo' is the diameter of the naked area of the dermal fossa. For *N. microchir*, photophores of the isthmus

series (Is) and the uppermost lateral series (Lo) were counted according to Maul (1976).

Specimens were preserved in formalin or ethanol and stored in the fish collection of the Instituto Español de Oceanografía in Vigo (IEOV), the Instituto de Ciencias del Mar de Barcelona (ICICMB) and the Asociación Naturalista Baixo Miño (ANABAM).

RESULTS

Physiculus dalwigkii Kaup, 1758
(Gadiformes: Moridae) (Figure 1)

Material examined. IEOV 01699, 235 mm SL, Galicia Bank, 18 June 1999, 42°44'N 11°39'W, 731–738 m depth.

Diagnosis. D₁: 7; D₂: 68; A: 73; P: 25; V: 5; gillrakers in first arch: 3 + 9. The following measurements are in millimetres and in brackets the percentage respect to standard length: total length: 260; standard length: 235; head length 59 (25.1); snout length: 16 (6.8); postorbital length: 27 (11.5); horizontal eye diameter: 16 (6.8); interorbital length: 11 (4.7); barbel length: 8 (3.4) predorsal₁ length: 70 (29.8); predorsal₂ length: 83 (35.3); dorsal₁ base length: 13 (5.5); dorsal₂ base length: 139 (59.1); preanal length: 80 (34.0); anal base length: 134 (57.0); pectoral length: 36 (15.3); ventral length: 30 (12.8); body depth: 47 (20.0) and body width: 32 (13.6); distance V-af: 39 (16.6); distance Lo: 8 (3.4).

Body elongated, compressed; snout broad, upper jaw slightly projecting; maxilla extending to vertical from centre of eye; brush like band of small teeth in a graded series in upper and lower jaw, absent in vomer and palatine; ventral fin with elongated and filamentous rays, the second is the longest; ventral light organ large, 20.5% in V-af, placed immediately to interventral line: distance from interventral line to anterior margin of light organ is 0% in V-af. The flesh colour was pinkish on body and fins; head and ventral region darker, greyish brown and bluish respectively; oral cavity pale.

Distribution. Eastern Atlantic: along the African coast from about 25°N to Madeira (Maul, 1952).

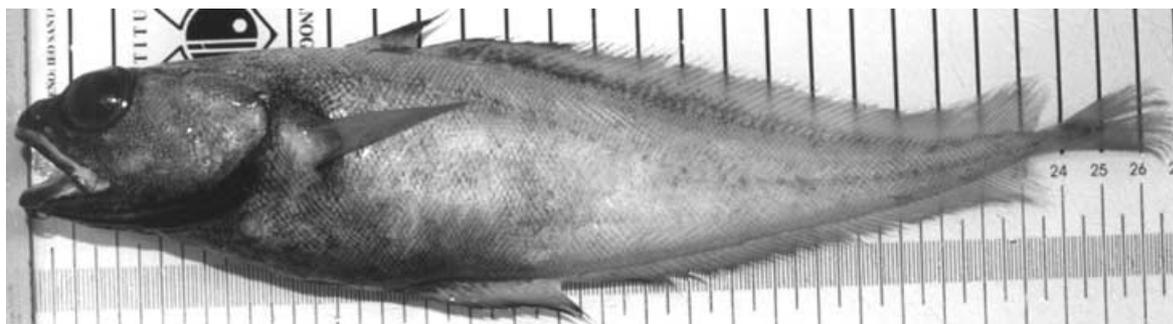


Figure 1. Specimen of *Physiculus dalwigkii* (Gadiformes: Moridae), trawled in Galician Bank.



Figure 2. Picture of one specimen of *Neoscopelus microchir* (Myctophiformes: Neoscopelidae) caught in Galician Bank.

Neoscopelus microchir Matsuura 1943
(Myctophiformes: Neoscopelidae) (Figure 2)

Material examined. 32 specimens between 150 and 259 mm SL (IIPB 7/2001 to IIPB 38/2001), 10 April 1999, 42°40'N 11°42'W, 764 m.

Diagnosis. The number of specimens measured in parentheses follows the counts. Dorsal rays: 13 (31), 14 (1); anal rays: 10 (4), 11 (28); pectoral rays: 16 (4), 17 (27), 18 (1); ventral rays: 9 (32); gill rakers: 3+1+10 (30); 3+1+11 (2); branchiostegal rays: 9 (32); photophores Lo: 20(2), 21 (5), 22 (11), 23 (1), 24 (1); photophores Is: 8 (7), 9 (25).

The range in per cent of standard length is followed by the mean in parentheses: head length 29.7–34.5 (31.9); preorbital length: 6.0–9.4 (7.6); postorbital length: 14.3–18.1 (16.4); eye diameter: 6.7–8.8 (7.9); interorbital length: 6.6–8.6 (7.6); predorsal length: 41.4–48.0 (43.4); dorsal base length: 13.5–18.3 (16.3); preanal length: 73.1–79.0 (76.0); anal base length: 8.0–11.0 (9.8); preventral length: 41.8–47.5 (45.3); preadipose length 78.3–84.8 (81.1); pectoral length: 26.7–34.9 (31.7); ventral length: 12.4–18.3 (15.9); maxilar length: 14.0–19.6 (16.8); body depth: 18.9–28.1 (24.3) and body width: 10.6–14.9 (13.3).

Body fusiform, compressed; conical head with large nostrils; large eyes separated by a wide interorbital space; mouth oblique, lower jaw slightly projecting; maxillary extending to or beyond hind border of orbit; premaxillae, dentary, vomer and palatines with small teeth; maxilla toothless; adipose fin present; a single, short, flat spine above pectoral fin base; photophores present in tongue and body, the uppermost lateral serie reaching to about end of anal fin. Colour on body brownish-reddish, belly bluish; fins reddish; mouth, preopercle and opercle silvery white.

Distribution. Between about 23°N and northern boundary limit; Madeira; western tropical Atlantic; western Indian Ocean and tropical western Pacific (Hulley, 1990).

Gaidropsarus granti Regan, 1903
(Gadiformes: Lotidae) (Figure 3)

Material examined. IEOV 01699, 235 mm SL, Galicia Bank, 17 June 1999, 42°43'N 11°54'W, 823 m depth.

Diagnosis. Second dorsal fin rays: 56; anal fin rays: 51; pectoral fin rays: 21; ventral fin rays: 7; gillrakers in first

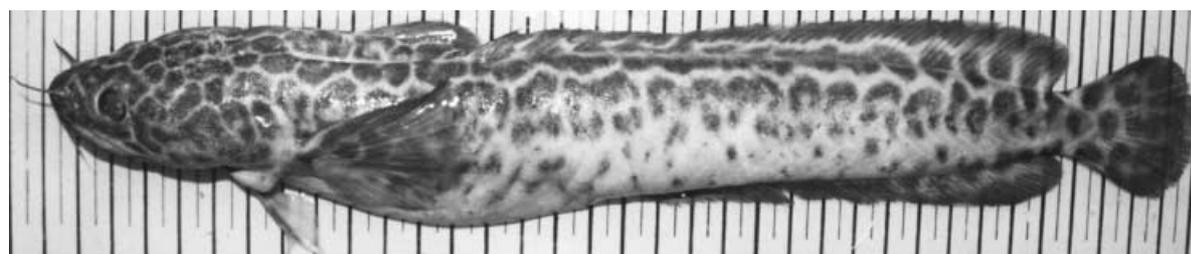


Figure 3. Specimen of *Gaidropsarus granti* (Gadiformes: Lotidae) trawled in Galician Bank.

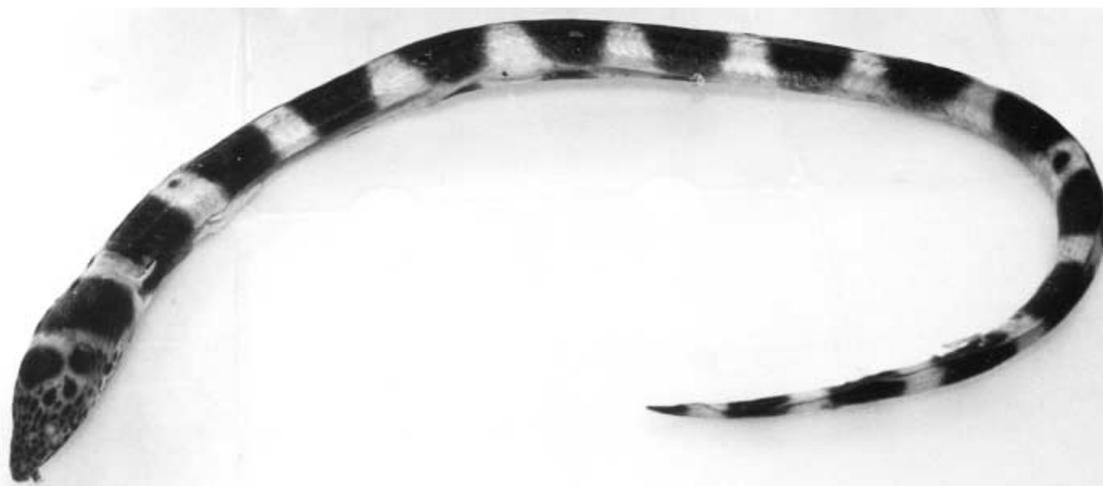


Figure 4. Picture of *Pisodonophis semicinctus* (Anguilliformes: Ophichthidae) caught in the port of A Guarda (south Galicia).

arch: 9+1. The following measurements are in millimetres and in brackets the percentage with respect to the standard length: total length: 338; standard length: 298; head length 74 (24.8); snout length: 20 (6.7); postorbital length: 44 (14.8); horizontal eye diameter: 11 (3.7); interorbital length: 13 (4.4); predorsal₂ length: 112 (37.6); first dorsal₁ ray length: 11 (3.7); dorsal₁ base length: 32 (10.7); dorsal₂ base length: 162 (54.4); preanal length: 145 (48.7); anal base length: 130 (43.6); pectoral length: 46 (15.4); ventral length: 56 (18.8); body depth: 41 (13.8) and body width: 38 (12.7).

Body elongated and compressed; head depressed; two nasal and one head barbel; upper jaw slightly projecting; first dorsal with a single short ray followed by a row of short filiform rays; ventral fins with two elongated rays, the second is the longest.

Colour when fresh: head with numerous irregular brown creamy blotches separated by a whitish line of demarcation between them; body with a whitish longitudinal sinuous band from the end of head to caudal peduncle with brown creamy blotches above this and fading out below; ventral part whitish; dorsal, anal, pectoral and caudal fins with brown creamy blotches and spots; all these marginal fins pinkish; along the second dorsal fin a fine whitish undulated longitudinal band.

Distribution. Eastern Atlantic: Canary Islands and the Azores and eastern Mediterranean (Zachariou-Mamalinga, 1999).

Pisodonophis semicinctus Richardson 1848
(Anguilliformes: Ophichthidae) (Figure 4)

Material examined. ANABAM 20701, 716 mm TL, 20 July 2001, shallow area 200 m next to port of A Guarda (south Galicia).

Diagnosis. The following basic measurements are in millimetres and in brackets the percentage in respect to total length: total length 716, head length: 77 (10.7); pre-orbital length: 15 (2.1); horizontal eye diameter: 8 (1.1); postorbital length: 54 (7.5); predorsal length: 61 (8.5); preanal length: 290 (40.5); pectoral length: 24 (3.3);

height gill opening: 10 (1.4); body height: 22 (3.1); body width: 24 (3.3). Pectoral fin with ten rays, dorsal and anal fins rays very difficult to count after preservation.

Body elongated, eel-like, almost cylindrical. Head conical with a slightly prominent snout. Upper jaw projecting beyond the lower jaw; anterior nostril in the form of a tube directed downward; posterior nostril opening under the eye and covered by a flap. Teeth molariform multiseriate on jaws and vomer. Body naked, scaleless; dorsal and anal fins developed, not confluent. Caudal fin absent. Short pectoral fin behind a lunate gill opening. The colour when fresh was yellow-brownish with 16 saddle-like dark brown patches in body and other small-dispersed patches of the same colour in head; ventral part whitish.

Distribution. Eastern Atlantic, from France to Angola (Quéro et al., 1996b). Introduced in the Mediterranean (Dieuzeide & Roland, 1958).

DISCUSSION

The presence of this tropical species in Galician waters is unexpected, although the capture of this species has been more frequent in recent years. The first two species related to this phenomenon were probably the grey triggerfish *Balistes carolinensis* and the flatfish *Solea senegalensis*, previously unknown and now with a relevant biomass.

During recent years several tropical and subtropical fish have been recorded in the area: the tropical carangids *Caranx crysos* (Bañón & Casas, 1997) and *Pseudocaranx dentex* (Fernandez-Cordeiro & Bañón, 1997) or deep water fish as *Cyttopsis roseus*, *Neoscopelus macrolepidotus*, *Hoplostethus cadenati*, *Nettastoma melanura* and *Halosaurus ovenii* (Bañón et al., 1997).

Increased exploration of deep-sea fish resources in recent years has enhanced the discovery of new deep-water species northward of their known distribution area. This apparent extension of range could be due to an increasing fishing and sampling effort more than to a true expansion.

In the case of *Physiculus dalwigki*, this species is unknown in the continental slope of the European Atlantic waters

and all records were taken from islands and seamounts. This fact, as well as the fact that eggs and larvae are pelagic, suggests a possible dispersion of *P. dalwigki* to the North Atlantic waters using the islands and seamounts as intermediates, as Wilson & Kaufmann (1987) already pointed out for the transoceanic dispersal of species.

However, the wide range of distribution in depth of all these species, including from shallow water to deep-water species, might be related to a common factor, such as the increase of water temperature. In fact, an increase of the surface temperature during previous decades was found by Koutsikopoulos et al. (1998) in the Bay of Biscay.

The Galician region is crossed by two poleward currents that flow to the north: the shelf edge current (SEC) throughout the year along the continental slope, (Pingree, 1990) and the surface poleward current near the coast in winter (Frouin et al., 1990). Both poleward currents transport warm and saline water from lower latitudes towards the British Isles and could be an important means of dispersion for this warm affinities species.

Evidence of changes in current patterns in the North Atlantic, bringing more southerly water into the north-east Atlantic, is derived from the presence of the summer stocks of the copepod *Calanoides carinatus* reported from south-west of the British Isles (Stöhr et al., 1997), the large increase in the catches of the western stock of the horse mackerel *Trachurus trachurus* in the northern North Sea (Reid et al. 2001) or the records of tropical fish in Biscay Bay (Quéro et al., 1998).

In the Mediterranean Sea a similar phenomenon occurs. In their website (www.desertification.it), Andaloro & Rinaldi list most of these 120 alien fishes and point out the thermal change, over fishing and pollution high level as the probable causes of the change in the autochthonous ichthyofauna.

The fact that Atlantic species as *Pisodonophis semicinctus* and *Gaidropsarus granti*, were previously recorded in the Mediterranean Sea, where they were unknown, and now in Galician waters seems to indicate a gradual displacement of these species northwards, using the Gibraltar Strait as an escape valve in these transports to the north. Additionally, in the Mediterranean as well as in the European Atlantic Sea, this phenomenon has increased rapidly in the last ten years, indicating probably, at least in western Mediterranean, the same origin.

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