

# Occurrence of *Grammicolepis brachiusculus* Poey, 1873 (Pisces: Grammicolepididae) in the Azores Archipelago

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Three specimens of *Grammicolepis brachiusculus* were caught by the commercial bottom hand and longline fisheries off Terceira and Faial Islands, Azores Archipelago. This is the first record of the species for the region, and one of few ever caught in the NE Atlantic.

Key words: Grammicolepididae, deepscale dory, first record, distribution range, NE Atlantic

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## INTRODUCTION

Three grammicolepidid fish species occur in scattered parts of the Pacific, southern Indian and Atlantic Oceans (Nelson 2006; Froese & Pauly 2011). *Grammicolepis brachiusculus* Poey, 1873, the deepscale dory or thorny tinselfish, is thought to be the only member of this family to occur in the NE Atlantic (Quéro 1986). *G. brachiusculus* is probably a rare species in this area as only a few specimens have been previously recorded (Maurin 1968; Quéro 1970, 1973, 1979, 1986; Scherbachev 1985; Uiblein et al. 1999; González et al. 2000; Quéro et al. 2001; Vasconcelos et al. 2003; Iglesias 2011). Furthermore, the tropical nature of the species' distribution range relevates the recent occurrences in such northerly waters in the context of climate changes (Quéro 1998; Brander et al. 2003).

This paper reports the occurrence of another three specimens of *G. brachiusculus*, representing

the first record of the species for the Azores Archipelago (central Northeast Atlantic).

## MATERIAL AND METHODS

Two specimens were collected by bottom hand-lines at ca. 30 km off the south-eastern coast of Terceira Island and a third individual was caught by bottom long-line at Princess Alice Bank, Azores Archipelago. Specimens A and B (Fig. 1) were collected on 21 June 2009 and 28 July 2009, at depths of 205 and 280 m, respectively. Specimen C was caught between 31 October and 7 November 2008 at about 360 m deep.

Specimens were measured with an ichthyometer and a digital calliper, weighed on a digital balance, photographed and preserved frozen at the Laboratory of Veterinary Anatomy of the Department of Environmental and Agrarian Sciences (specimens A and B) and in ethanol

(specimen C) at the reference collection of the Department of Oceanography and Fisheries, both from the University of the Azores. Specimens

were given the provisional numbers: GRABRA-UAç-DCA-1/09; GRABRA-UAç-DCA-2/09, and DOP-7439.



Fig. 1. Specimens of *Grammicolepis brachiusculus* from the Azores Archipelago, caught off Terceira Island in June and July 2009 (top photo, specimen A bottom fish, specimen B top fish) and the Princess Alice Bank in October – November, 2008 (bottom photo, specimen C).

## RESULTS AND DISCUSSION

Biometrics and meristics from the three specimens are presented in Table 1. Colour pattern, body morphometric proportions (i.e. head

length, body depth, ocular diameter, etc. in standard length) and meristic counts are similar to those previously described for this species (i.e. Quéro 1979; Karrer & Heemstra 1986; González et al. 2000; Vasconcelos et al. 2003), clearly

supporting the valid identification of the three specimens caught in the Azores. Noticeably, the orbital and eye diameters are relatively larger in specimen B than the other two specimens, as well

as reported by other authors. We believe that these differences may be attributable to the preservation status when the specimens were observed.

Table 1. Morphometric, mass and meristic parameters of the three specimens of *Grammicolepis brachiusculus* caught in the Azores in 2008 and 2009.

<b>Morphometry (mm)</b>	<b>Specimen A</b>	<b>Specimen B</b>	<b>Specimen C</b>
Total length	503	392	441
Standard length	347	305	311
Head length	77.6	78.4	81
Pre-orbital length	24.6	25.1	23.5
Inter-orbital distance	30.5	28.9	30.2
Orbital diameter	38.4	43.1	37.4
Eye diameter	44.1	53.1	31.6
Pre-dorsal length	116.9	101.8	98.4
Pre-pectoral length	77.4	77.7	79.1
Pre-pelvic length	76.1	77	81.4
Pre-anal length	128	121.7	117.2
Dorsal fin base length	182	157.9	156.5
Anal fin base length	176.2	153.9	154.5
Pectoral fin length (PFL)	34.7	29.4	30.1
Pelvic fin length	41	34.2	37.2
Caudal peduncle length	72.1	61.2	68.5
Caudal peduncle depth	23.5	19.6	29.5
Body maximum depth	166.1	141.8	151.9
Body maximum width	34	34.1	27
<b>Mass</b>			
Total mass (g)	1425	1213	479.2
<b>Meristics</b>			
Dorsal fin rays	V + 33	V + 33	V + 33
Anal fin rays	II + 34	II + 33	II + 34
Pectoral fin rays	15	15	15
Pelvic fin rays	I + 6	I + 6	I + 6
Caudal fin rays	13 + 2	13 + 2	13 + 2
Scales on lateral line	119	118	120
Gill rakers	15	15	14

The occurrence of *G. brachiusculus* in the Azores, together with recent new findings of this species in the northeast African margin, Meteor Seamount, Canary Islands, southern Portugal, Bay of Biscay and west Scottish slope (Table 2), indicate that this primarily tropical species is extending its distribution northward from its native geographical range (i.e. tropical eastern Atlantic; Karrer 1990) to the NE Atlantic.

Quéro (1998) refers to various species, previously unreported for the European slopes before 1950, which are now well established to latitudes that exceed 55°N. Among them, and

along with *G. brachiusculus*, he refers to other zeiform fishes, namely *Cytopsis roseus* and *Zenopsis conchifer*, two species that were also recently recorded for the first time in the Azores (Santos et al. 1997; Porteiro et al. 2010). The northerly extension of the distribution ranges of these zeiform fishes along the NE Atlantic margins has also been reported by Quigley & Flannery (1995a, b) and Swaby & Potts (1999). Retzer (1990), Moore & DeWitt (2002) and Moore et al. (2003) also found the same species extending their distribution range along the NW Atlantic.

Table 2. Summary of the occurrences of *Grammicolepis brachiusculus* in the Northeast Atlantic. Gear: BT - bottom trawl; BL - bottom lines; DGN - Drift gill net.

Location	no. spec	Depth (m)	Size (SL; mm)	Year	Gear	References	Comments
Northwest Africa (26° 08' N 014° 3' W)	1	563 - 642	280	1962	BT	Maurin 1968; Quéro 1979; Maurin & Quéro 1981	Maurin (1968) and Maurin & Quéro (1981), give the location 26°12'N 015°08'W for this fish.
SW Bay of Biscay (43° 50' N 008° 40' W)	1	600	400	1966	BT	Quéro 1970; 1973; 1979	MNHN 1993-0097
Unnamed seamount (30° 48' N; 028° 31' W; Jer seamount)	3	460 - 800	350 - 400		BT	Shcherbachev et al. 1985	
Canaries (27° 35' N 017° 59' W)	2	680	418; 424	1996	BL	Gonzalez et al. 2000	
Grand Meteor Seamount (29° 56' N 028° 20' W)	1	426	370	1998	BT	Ublein et al. 1999; Fock et al. 2002	
West Scotland (55° 00' N 014° 00' W)	1	700	370	2000	BT	Quéro et al. 2001	Location data at the Muséum National d'Histoire Naturelle (MNHN 2001-1102): 48° 20'N 9° 20'W
Southern Portugal (36° 50' N 007° 45' W)	1	300	441	2002	DGN	Vasconcelos et al. 2003	
West Scotland (57°16' N 009°26' W)	1	600	429	2004	BT	Iglésias 2011	MNHN 2004-0835

The boreal expansions in distribution ranges of tropical-subtropical species along the NE Atlantic margins have been interpreted as a consequence of ocean warming (Quéro 1998; Stebbing et al. 2002; Brander et al. 2003), but clear empirical evidence of this correlation is still lacking.

The migration pathways used by the zeiform species to expand northerly along the continental margins is facilitated by the continuity of the realm and therefore the spread rate should match the rate of temperature increase in this particular region (Swaby & Potts 1999; Stebbing et al.

2002). However, the pathways used by these species to reach remote oceanic areas, such as the seamounts south of the Azores (Shcherbachev et al. 1985; Ublein et al. 1999; Fock et al. 2002) and the Azores Archipelago, is not straightforward for fishes considered to be demersal (Karrer 1990). Most probably, as suggested by Quéro (1986), adults *G. brachiusculus* can also live and disperse in the upper midwater environment which would explain its ability to reach such oceanic regions.

This pelagic behaviour may also be common to the other zeiforms considered, but even so, it remains unclear if these immigrant fishes arrive in the region as larvae, juveniles or adults. All of these zeiform fishes were caught in the Azores as adults, but it is acceptable to consider that they arrived as larvae or juveniles and grew to adults while in the region. In any case, one can anticipate new records of this apparently rare species to succeed in the region, including in Madeira Islands, which currently represent a gap in its NE Atlantic distribution.

Under this scenario, we can speculate that the southern Macaronesian archipelagos and/or the seamounts south of the Azores function as stepping-stone habitats for this species to colonise the remote waters of the Azorean Archipelago. If so, the colonisation event should be a more stochastic process than the spread along continental margins and, presumably, a more irregular pace of extension should be expected. These fishes should inevitably cross the Azores Current, recognised as the Subtropical Convergence (Juliano & Alves 2007) that runs at about 35°N (Klein & Siedler 1989) and separates these two regions within the North Atlantic Subtropical Gyral (East) Province (Longhurst 2007). Anticyclone eddies detached from the main jet and moving north-westward (Alves & de Verdière 1999) may transport these organisms from south of the Azores seamounts to the Azores region. The role of these oceanic hydrological structures in the dispersion of pelagic fauna needs to be investigated.

Our findings seem to corroborate Quéro's (1998) conclusion that zeiform fishes are more pelagic than previously anticipated and, potentially, good indicator species of climatic changes for the North Atlantic basin.

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