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# FIRST RECORD OF BROTULA BARBATA (OPHIDIIFORMES, BROTULIDAE) FROM THE CANARY ISLANDS: A NEW NORTHERN LIMIT IN THE *EASTERN ATLANTIC*

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**ABSTRACT:** The amphi-Atlantic species *Brotula barbata* (Bloch & Schneider, 1801) (Ophidiiformes, Brotulidae) is reported for the first time in the Canary Islands (northeastern Atlantic). This finding marks a new northern limit for its distribution in the eastern Atlantic. This study also contributes to the knowledge of the species' morphological characteristics.

**KEYWORDS:** Bearded brotula / tropical species / morphology / distribution / East Atlantic.

**RESUMEN:** La especie anfiatlántica *Brotula barbata* (Bloch & Schneider, 1801) (Ophidiiformes, Brotulidae) se cita por primera vez para Canarias. Este hallazgo establece un nuevo límite septentrional en su distribución en el Atlántico oriental. Este estudio también contribuye al conocimiento de las características morfológicas de la especie.

**PALABRAS CLAVE:** Brótula / especie tropical / morfología / distribución / Atlántico Este.

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## INTRODUCTION

Brotulidae Swainson, 1838 (bearded cusk-eels) is an ophidiiform family including one valid genus (*Brotula* Cuvier, 1829), with seven valid marine species distributed across the Indian, Pacific, and Atlantic Oceans (Eschmeyer & Fong, 2024; Fricke et al., 2024). The distribution and details of these species further highlight the genus's wide-ranging presence in tropical and subtropical waters (Fricke et al., 2024; Froese & Pauly, 2024):

• *Brotula barbata* (Bloch & Schneider, 1801) (Bearded brotula): Distribution: Western Atlantic: Florida (U.S.A.) south to Rio Grande do Sul (Brazil), including the Gulf of Mexico and the Caribbean Sea; Eastern Atlantic: Senegal south to Angola. Reef-associated; depth range ?–650 m.

• *Brotula clarkae* Hubbs, 1944 (Pacific bearded brotula): Distribution: Eastern Pacific: Pacific coast of southern Baja California Sur (Mexico) south to northern Peru, including the Gulf of California (Mexico). Benthopelagic; depth range ?–650 m.

• *Brotula flaviviridis* Greenfield, 2005 (Yellow green brotula): Distribution: Western Pacific: Fiji. Benthopelagic; depth range 7–14 m.

• *Brotula multibarbata* Temminck & Schlegel, 1846 (Goatsbeard brotula): Distribution: Red Sea; Indo-West Pacific: Eastern Cape and KwaZulu-Natal (South Africa), East Africa, Gulf of Aden, Persian Gulf, Seychelles, Madagascar and Mascarenes (La Réunion, Mauritius, Rodrigues) east to Hawaiian Islands and Pitcairn Group, north to southern Korea, southern Japan and Ogasawara Islands, south to Western Australia, New Caledonia, and Lord Howe Island. The Saint Helena Island (south-central Atlantic) population is probably based on a distinct species. Reef-associated; depth range 1–650 m.

• *Brotula ordwayi* Hildebrand & Barton, 1949 (Ordway's brotula): Distribution: Eastern Pacific: Pacific coast of southern Baja California Sur (Mexico) south to Peru, including Revillagigedo Islands (Mexico) and Galapagos Islands (Ecuador). Reef-associated; depth range unknown.

• *Brotula phenax* Prokofiev, 2007 (Imposter brotula): Distribution: Western Pacific: Vietnam. Benthopelagic; depth range unknown.

• *Brotula townsendi* Fowler, 1900 (Townsend's cusk eel): Distribution: Western and central Pacific Ocean: Marshall Islands east to Hawaiian Islands, south to Loyalty Islands (New Caledonia), Rotuma, and Tonga. Reef-associated; depth range unknown.

During the execution of the NASAS75 project (2009), focused on fish-trap fishing in Gran Canaria, the characterisation of fishery, and monitoring its impact on exploited populations, an unknown specimen in Canarian waters was captured and properly identified in the laboratory. After careful morphometric and meristic study by the authors, the primarily non-native specimen caught in Canary Islands waters turned to be *Brotula barbata* (Bloch & Schneider, 1801) (Brotulidae). The information and images necessary for this publication were partially lost on a damaged hard drive and have only now been recovered and properly processed for data treatment. This ichthyological note documents the first record of this species, genus, and family in Canarian waters, providing data on the specimen's morphology and comparisons with those from other populations in adjacent seas.

## MATERIAL AND METHODS

The habitat and bathymetric range of the seven *Brotula* species described in the Introduction section were taken from the global database FishBase (Froese & Pauly, 2024), as well as their English common names. Where unavailable, the common names were inferred from the etymology of their specific epithets (i.e., *flaviviridis* means yellow green, and *phenax* means imposter).

The material examined consisted of a specimen of *Brotula barbata* caught using artisanal fish traps in the northwest sector of Gran Canaria (**Fig. 1**), which was landed at the fishing port of Agaete. Fin rays and vertebral counts were obtained from radiographs, using X-ray equipment model Top 10 with an 80 KHz high-frequency generator. The specimen's tail was slightly damaged. Two additional specimens from the FishTrace project (unpublished data) were used for comparison. This material was collected by the first author in Senegal in 2004.

For each specimen, meristic and morphometric measurements (in mm) were taken according to Hubbs & Lagler (1958). The following abbreviations are used: TL – total length; SL – standard length; PD – predorsal length; PA – preanal length; HL – head length; PL – pectoral fin length; VL – ventral/pelvic fin length (maximum); BD – maximum body depth (at the level of the anus); S – snout length; E – eye diameter (horizontal); IOW – interorbital width; POL – postorbital length; UJL – upper jaw length.

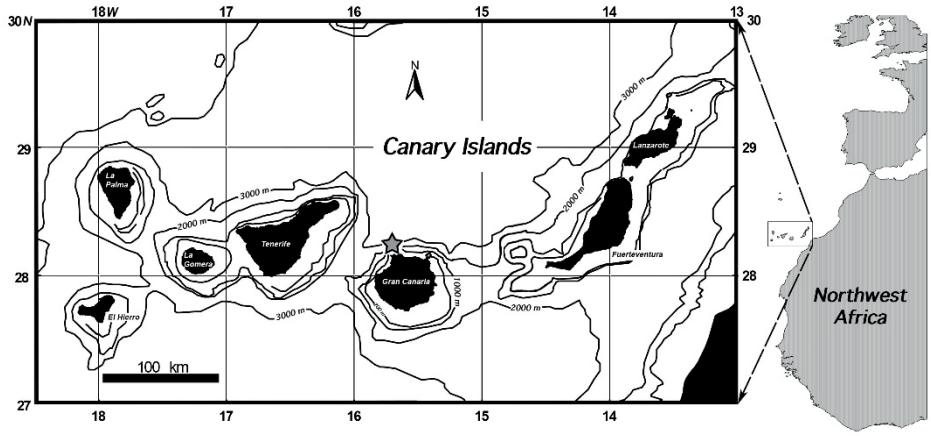


**Fig 1.** The Canary Islands. Collection location for *Brotula barbata* (Bloch & Schneider, 1801) (*).

Other counts and terminology follow Poll (1959) and Nielsen et al. (1999). These include: D – dorsal-fin rays; A – anal-fin rays; P – pectoral-fin rays; V – ventral/pelvic-fin rays; BR – branchiostegal rays; LGR – lower gill rakers (developed) on the first arch; UGR – upper gill rakers (tubercles) on the first arch; SLL – scales in lateral line; BS – barbels on the snout (right + left); BC – barbels on the chin (right + left); PV – precaudal vertebrae; CV – caudal vertebrae. Body proportions calculated, as per the aforementioned authors, include ratios such as S/E; HL/E; POL/S; E/IOW; and HL/IOW. This study follows the best practice approach to addressing unverified or unverifiable "first records", as proposed by Bello et al. (2014). In line with this, voucher specimens were deposited in the collections of the Tenerife Natural History Museum ('Museo de Ciencias Naturales de Tenerife', TFMC). Muscle tissue samples from the specimens were stored in alcohol at ICCM ('Iniciativa de Colecciones de Ciencias Marinas') at the University of Las Palmas de Gran Canaria.

## SYSTEMATIC ACCOUNT

This systematic account follows the classification of 'Eschmeyer's Catalog of Fishes' (Fricke et al., 2024, https://www.calacademy.org):

Class ACTINOPTERI
Order OPHIDIIFORMES
Family Brotulidae Swainson, 1838
Genus *Brotula* Cuvier, 1829
***Brotula barbata*** (Bloch & Schneider, 1801) (**Fig. 2**)

**Fig 2.** *Brotula barbata* (Bloch & Schneider, 1801) from the Canary Islands (TFMC/VP-1948, 451 mm TL, 419 mm SL).

• *Etymology*.- The generic name *Brotula* is the Spanish name for *B. barbata*, brotula. The specific Latin term *barbata* (meaning "bearded") refers to the six barbels on the snout and the six barbels on the chin.

• *Material examined*.- Voucher code and collection data: TFMC/VP-1948, 451 mm TL, 419 mm SL (Fig. 2), northwestern coast of Gran Canaria, off Agaete, 28°10'N 15°42'W, 80–90 m depth, bottom fish-trap, 12 Sep. 2009.

Additional material from Senegal (2004) for comparison.- Voucher codes and collection data: TFMC/VP-1235, 630 mm TL, 595 mm SL, and TFMC/VP-1278, 642 mm TL, 610 mm SL. FishTrace project.

• *Identification*.- The specimen examined closely matches the descriptions provided by Poll (1959), Nielsen & Nybelin (1963), and Nielsen & Robins (2002). The comparison between the Senegalese and Canarian specimens revealed no significant morphological differences.

• *Morphology data*.- Morphometric measurements, selected body proportions, meristics, and other distinguishing features of the Canary specimen of *B. barbata* are shown in Table 1, with comparisons to data from Poll (1959, used as the main reference), Nielsen (1981), Nielsen et al. (1999), and Nielsen & Robins (2002), as well as unpublished data from the FishTrace project.

The examined specimen aligns well with the literature in all respects (**Table 1**). However, some morphometric proportions—such as head length (HL) in %SL, pectoral fin length (PL) in %SL, ventral fin length (VL) in %SL, and body depth (BD) in %SL, as well as snout length (S), interorbital width (IOW), and postorbital length (POL) in %HL—fall slightly above or below the previously reported ranges. Regarding meristics, the specimen generally correspond to the literature, though minor differences were observed. This study slightly extends the reported range for upper gill rakers on the first arch (12–15 tubercles in the literature, 12–17 in this study), pectoral fin rays (25–28 in the literature, 24–28 in this study), and potentially for anal fin rays (86–90 in the literature, 83–90 in this study). For the Canarian specimen, 83 anal-fin rays were inferred. No data are available in the literature for scales on the lateral line (this study: 208–214), precaudal vertebrae (16), and caudal vertebrae (43 or 44). See Table 1.

| *Brotula barbata* (Bloch & Schneider, 1801) (Ophidiiformes, Brotulidae) | TFMC/VP-1948 1 specimen ca. 451 mm TL Canary Islands this study | | | TFMC/VP-1235 1 specimen 630 mm TL Senegal FishTrace project | | | TFMC/VP-1278 1 specimen 642 mm TL Senegal FishTrace project | | | Poll (1959), main ref. Nielsen (1981) Nielsen et al. (1999) Nielsen & Robins (2002) (diagnostic characters) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Morphometrics and body proportions* | mm | in %SL | in %HL | mm | in %SL | in %HL | mm | in %SL | in %HL | in %SL | in %HL |
| Standard length, SL | 419 | - | - | 595 | - | - | 610 | - | - | - | - |
| Predorsal length, PD | 91.3 | 21.8 | - | 140.4 | 23.6 | - | 170.2 | 27.9 | - | no data | - |
| Preanal length, PA | 195.7 | 46.7 | - | 299.0 | 50.3 | - | 305.0 | 50.0 | - | no data | - |
| Head length, HL | 87.8 | 21.0 | - | 147.5 | 24.8 | - | 140.1 | 23.0 | - | 23.3–26.3 | - |
| Pectoral fin length, PL | 54.3 | 13.0 | - | 83.9 | 14.1 | - | 83.8 | 13.7 | - | 16.5–21.3 | - |
| Ventral fin length, VL | 47.4 | 11.3 | - | 80.5 | 13.5 | - | 74.6 | 12.2 | - | 13.1–16.9 | - |
| Maximum body depth, BD | 92.3 | 22.0 | - | 152.0 | 25.5 | - | 154.0 | 25.2 | - | 16.9–20.4 | - |
| Snout length, S | 21.4 | - | 24.4 | 39.9 | - | 27.1 | 37.4 | - | 26.7 | - | 30.2–34.1 |
| Eye diameter, E | 17.3 | - | 19.7 | 27.2 | - | 18.4 | 25.9 | - | 18.5 | - | 17.1–22.2 |
| Interorbital width, IOW | 10.5 | - | 12.0 | 23.1 | - | 15.7 | 22.8 | - | 16.3 | - | 13.1–13.8 |
| Postorbital length, POL | 48.7 | - | 55.5 | 77.9 | - | 52.8 | 72.9 | - | 52.1 | - | 38.5–47.6 |
| Upper jaw length, UJL | 41.5 | - | 47.3 | 68.9 | - | 46.7 | 67.9 | - | 48.5 | - | 47.1–50.6 |
| S/E | 1.24 | | | 1.47 | | | 1.44 | | | 1.00–1.35 | |
| HL/E | 5.1 | | | 5.4 | | | 5.4 | | | 4.5–5.7 | |
| POL/S | 2.3 | | | 2.0 | | | 2.0 | | | 2.1–2.6 | |
| E/IOW | 1.65 | | | 1.18 | | | 1.14 | | | 1.25–1.70 | |
| HL/IOW | 8.36 | | | 6.39 | | | 6.14 | | | 7.25–7.65 | |
| *Meristics* | | | | | | | | | | | |
| Dorsal-fin rays, D | ca. 109 | | | 109 | | | 115 | | | 109–117 | |
| Anal-fin rays, A | ca. 83 | | | 86 | | | 90 | | | 86–90 | |
| Pectoral-fin rays, P | 27 | | | 24 | | | 25 | | | 25–28 | |
| Ventral/pelvic-fin rays, V | 2 | | | 2 | | | 2 | | | 2 | |
| Branchiostegal rays, BR | 8 | | | 8 | | | 8 | | | 8 | |
| Lower gill rakers (1st arch), LGR | 3 | | | 3 | | | 3 | | | 3–5 | |
| Upper gill rakers (1st arch), UGR | 14 | | | 17 | | | 17 | | | 12–15 | |
| Scales in lateral line, SLL | unreadable | | | 214 | | | 208 | | | no data | |
| Barbels on snout, BS | 6 | | | 6 | | | 6 | | | 6 | |
| Barbels on chin, BC | 6 | | | 6 | | | 6 | | | 6 | |
| Precaudal vertebrae, PV | 16 | | | not taken | | | not taken | | | no data | |
| Caudal vertebrae, CV | 43–44 (tail damaged) | | | not taken | | | not taken | | | no data | |

**Table 1.** Selected counts, morphometrics and body proportions of *Brotula barbata* (Bloch & Schneider, 1801).

The number and shape of gill rakers are often of taxonomic significance among brotulids (Nielsen & Nybelin, 1963). Based on the cited literature, *B. barbata* possesses three well-developed lower gill rakers on the first arch. All specimens examined here also displayed this feature.

• *Remarks*.- *Brotula barbata* is a subtropical, reef-associated species, found in benthopelagic zones from shallow waters down to 650 m (Nielsen, 1981, 1990; Nielsen et al., 1999; Wirtz et al., 2013), with a typical depth range of 50–300 m (Nielsen & Nybelin, 1963; Sanches, 1991), primarily inhabiting the continental shelf (Nielsen, 1990) on sandy or muddy bottoms (Schneider, 1990). There is currently no available data on its feeding habits. The maximum recorded length is 94 cm TL, though the species is more commonly found up to 50 cm TL (Froese & Pauly, 2024).

This amphi-Atlantic species ranges between 30°N and 14°S, and 98°W to 15°E (Nielsen et al., 1999). In the Western Atlantic, it occurs off the continental coast from Florida, U.S.A., through the Gulf of Mexico to northern South America, including several Caribbean islands. The species' first Eastern Atlantic record was published by Regan (1915) from Lagos, Nigeria. Since then, *B. barbata* has been reported frequently off West Africa, with several hundred specimens collected, as noted by Poll (1959). In the Eastern Atlantic, it is found from southern Mauritania and Senegal to Namibia (Ly & N'Diaye, 1993; Bianchi et al., 1999; Nielsen et al., 1999; Nielsen & Robins, 2002; Froese & Pauly, 2024), including Cabo Verde (Wirtz et al., 2013).

## DISCUSION

The discovery of this specimen of *Brotula barbata* marks the first recorded occurrence of the family Brotulidae Swainson, 1839, the circumtropical genus *Brotula* Cuvier, 1829, and this subtropical species in the Canary Islands.

The Canary Islands now represent the northernmost limit (28°10'N) of *B. barbata*'s distribution in the Eastern Atlantic Ocean, extending its range northward by 680 nautical miles (approximately 1,260 kilometers). It is evident that this colonization did not arise from a previously existing population but rather from a new seeding event. This is because the species is easily identifiable and distinguishable, which would have likely resulted in at least some anecdotal reports, as it would not have gone unnoticed by experienced ichthyologists.

A question arises as to how *B. barbata* managed to reach the oceanic island of Gran Canaria, particularly its northwestern coast, which is located about 265 km from the African continent. The dispersal of *B. barbata* likely occurs during its larval phase, but there is a biogeographical challenge: the larvae would need to traverse the Banc d'Arguin, Mauritania (e.g., Spalding et al., 2007). This area is

where the Canary Current, flowing south and cooling, meets the Guinea Current, flowing north and warming. The influence of these currents on regional faunal distributions remains uncertain (Fransen, 2002). However, Mittelstaedt (1983) suggested that the occasional displacement of African waters due to specific wind conditions, particularly during winter, could be a natural means by which tropical African larvae reach the Canary Islands.

The Canary Islands are influenced by the subtropical gyre of the Eastern Central Atlantic, which facilitates the transport of marine organism larvae to the archipelago from the Northwest African coast (e.g., Barton et al., 1998). A mesoscale distribution of larval fish communities has been described in the upwelling filaments extending from the African coast to the Canary Islands (Rodríguez et al., 2004; Bécognée et al., 2009). These studies have shown that short-lived larvae from Africa reach the Canary Islands via currents or upwelling filaments, with a quasi-permanent flow of such organisms recorded. *Brotula barbata* is oviparous, with oval pelagic eggs floating in a gelatinous mass (Breder & Rosen, 1966), and while juveniles are commonly found on reefs, smaller silvery specimens have been taken far out to sea in the epipelagic zone (Nielsen et al., 1999).

A second scenario explaining the occurrence of *B. barbata* in the Canary Islands involves human-mediated introduction. One possibility is the transport of fish larvae through ship ballast water (e.g., Lockett & Gomon, 2001; Galil et al., 2011). Another could be the transport of juvenile, subadult, or adult fish on oil platforms (e.g., Friedlander et al., 2014).

In any case, given that *B. barbata* inhabits Florida, U.S.A., its presence in the Canary Islands, which are located at a similar latitude, should not be considered a result of tropicalization in the region due to ocean warming. A more plausible hypothesis, at least initially, would be the natural expansion of the species from adjacent areas, probably from Western Sahara. However, since no other sightings of the species have been reported in the Canary Islands between 2009 and 2024, the theory of an anthropogenic origin also gains credibility.

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