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First record of scamp, *Mycteroperca phenax*, in the north-eastern Atlantic

T. Morato*‡, P. Afonso* and J.L. Carlin†

*Departamento de Oceanografia e Pescas, Universidade dos Açores, PT 9901-862 Horta, Azores, Portugal. †Department of Biology, Whitman College, Walla Walla, Washington, USA. ‡Corresponding author, e-mail: telmo@notes.horta.uac.pt

An adult specimen of *Mycteroperca* sp. previously unrecorded was collected from the Azores Islands. Based on comparison of morphological characters and the cytochrome *b* mitochondrial gene, the specimen was identified as the western Atlantic species *M. phenax*, a species previously unrecorded from the central or eastern Atlantic Ocean.

The Azores archipelago, located from 36°55′N 25°01W to 39°43′N 31°15′W, are the most isolated islands in the North Atlantic, approximately 1000 nautical miles from the nearest continent. Despite major oceanographic current flow from west to east, the Azorean marine ichthyofauna fauna has stronger biogeographic affinities with the eastern Atlantic than the west mainly with the archipelagos of Madeira and the Canaries, and to a lesser extent with continental coasts of north-west Africa, southern Europe, and the Mediterranean (Santos et al., 1995).

Mycteroperca Gill, 1863 (Serranidae: Epinephelinae) is a wide-ranging genus with 15 currently recognized species: two in the eastern Atlantic, eight in the western Atlantic and five in the eastern Pacific (Heemstra & Randall, 1993). In the Azores and the eastern Atlantic the genus is represented by only one species in each of those areas; the island grouper *Mycteroperca fusca* Lowe, 1836 and mottled grouper *M. rubra* Bloch, 1793, respectively (Heemstra & Randall, 1993). In this paper we report the occurrence of an unknown *Mycteroperca* species in the north-eastern Atlantic.

On 10 August 2000, an unknown *Mycteroperca* specimen was observed during a SCUBA dive at 'Baixa da Barca', a small reef between the Azorean islands of Faial and Pico. The specimen was collected, preserved and deposited in the Ichthyological Collection of the Department of Oceanography and Fisheries, University of the Azores, in Horta. Morphometric and meristic data were recorded following Heemstra & Randall (1993).

In addition to the morphometric data, the taxonomic identification of the fish was verified by molecular techniques. Approximately 750 base pair (bp) fragments of the mitochondrial cytochrome *b* gene from the Azorean specimen were compared with available specimens of other Atlantic *Mycteroperca* as well as with *Epinephelus marginatus* Lowe, 1834, the single other Epinepheline species occurring in the Azores. Mitochondrial DNA was isolated, amplified, and sequenced from gill and muscle samples as described in Carlin et al. (in press). Genetic distances were calculated using PAUP*4.0β10 (Swofford, 2000).

The solitary specimen was found at the top of the reef at about 25 m depth at about 4 m above the substratum, swimming in circles and approaching the divers very closely. This behaviour pattern was different from the common behaviour of *M. fusca* (personal observation). Morphometric and meristic characteristics were: 59.9 cm total length, 55.9 cm fork length, 44.4 cm standard length (SL), 17.4 cm head length (contained 2.55 times in SL), 18.6 cm maximum body depth (contained 2.39 times in SL), 19.3 mm eye diameter, 49.7 mm snout length, 85.6 mm upper jaw length, 57.3 mm caudal peduncle depth, 65.0 mm pectoral fin length, 81.2 mm pelvic fin length, 46.7 mm caudal peduncle length; 28 dorsal fin rays (XI+17), 15 anal fin rays (III+12), 16 pectoral fin rays (16); 28 gill rakers on the first gill arch, 10 in the upper limb (including four rudimentary) and 18 in the lower limb (including three rudimentary); and weighted 3250 g total weight. The pre-operculum had a distinct notch over the serrated lobe at angle. The caudal fin was concave and the anal fin anterior margin was deeply pointed. Both fins showed deeply exserted and irregular rays, in the caudal closer to the ends. When alive, the fish had distinct, large 'leopard-like' blotches on the sides, and the anterior ends of the upper jaw had a distinctive yellowish stripe. When dead, the colour pattern was mottled brown, due to small dark brown scale spots on a lighter brown background. This pattern was lighter ventrally and darker dorsally.

A total of 665 bp of the cytochrome *b* mitochondrial gene was successfully sequenced and aligned from the 15 specimens examined, resulting in 11 haplotypes. The alignment contained 152 variable sites (101 parsimony-informative) and no indels or stop codons. Pairwise comparisons among sequences revealed no nucleotide differences between the unidentified Azorean specimen and two specimens of *M. phenax* collected from the Florida Keys (Caribbean Sea) and northern Gulf of Mexico (Table 1).

Morphology and behaviour clearly indicated that this specimen was not either of the two known eastern Atlantic *Mycteroperca* species. Following the Heemstra & Randall (1993) key for the serranid subfamily Epinephelinae, the morphological characters indicated the specimen as a scamp, *M. phenax* Jordan & Swain, 1884. The colour patterns observed were similar to the brown phase (when dead) and 'cat's paw' pattern (when alive) in scamp as described by Gilmore & Jones (1992). However, the maximum body depth of this individual was found to be much greater (contained 2.39 times in SL) than that reported for other related species (between 3.0 and 3.4 times in SL). Most meristic characters were also consistent with the yellowmouth grouper, *M. interstitialis* Poey, 1860, but the number of gill rakers and the colour pattern seemed to rule out this hypothesis. The scamp is known only from the Atlantic coast of the US from North Carolina to Key West, the Gulf of Mexico and along the southern shores of the Caribbean Sea (Heemstra & Randall, 1993).

Table 1. *Differences between* Epinephelus marginatus, Mycteroperca *spp., and an Azorean Epinepheline specimen of uncertain taxonomic identity. Biogeographic subdivisions follow the regions and provinces of Briggs (1995). Genetic divergence from the Azorean sample is presented as absolute number of transitions (ti) and transversions (tv), and Hasegawa, Kishino and Yano genetic distance (*d*; Hasegawa et al., 1985).*

Specimen(s)	Collection Locality; Biogeographic Subdivision	Nucleotide differences		
		ti	tv	*d*
Epinephelus marginatus (N=3)	Horta harbour, Faial I., Azores; Lusitania Province	76	6	0.247
Mycteroperca bonaci[1]	Florida Keys, Florida, USA; Caribbean Province	53	5	0.132
Mycteroperca fusca (N=2)	Horta harbour, Faial I., Azores; Lusitania Province	58	6	0.152
Mycteroperca microlepis[2]	West coast of Florida, Gulf of Mexico; Carolina Region	49	1	0.109
Mycteroperca phenax	Pinnacles Reef, Gulf of Mexico; Carolina Region	0	0	0.000
Mycteroperca phenax	Florida Keys, Florida, USA; Caribbean Province	0	0	0.000
Mycteroperca rosacea[3]	San Carlos, Mexico; Gulf of Mexico; Carolina Region	42	7	0.134
Mycteroperca tigris[4]	Bahamas; West Indian Province	50	6	0.100
Mycteroperca tigris	Bahamas; West Indian Province	49	6	0.103
Mycteroperca venenosa[5]	Pinnacles Reef, Gulf of Mexico; Carolina Region	52	6	0.132
Mycteroperca venenosa	Bahamas; West Indian Province	53	6	0.135

Species authority: [1], Poey, 1860; [2], Goode & Bean, 1879; [3], Streets, 1877; [4], Valenciennes, 1833; [5], Linnaeus, 1758.

Results from the genetic analysis clearly indicate that our specimen was in fact a scamp. We acknowledge that our genetic comparisons did not include all congeneric taxa (7 out of 10 for the Atlantic) or genomes, but if the specimen is not a scamp (or at least a scamp hybrid), then the presence of completely identical haplotypes represents at least a Caribbean maternal allele in the temperate North Atlantic or a remarkable degree of homoplasy within the genus *Mycteroperca*. We note that mtDNA haplotype sharing between the eastern United States coast and mid- and western-Atlantic samples has been reported in other demersal fish: the wreckfish *Polyprion americanus* Bloch & Schneider, 1801 (Sedberry et al., 1996) and the rock hind *Epinephelus adscensionis* Osbeck, 1765 (Carlin et al., in press).

The presence of the *M. phenax* specimen in the Azores could result from human assisted transport. Several cases of human introduction of invertebrates have been recorded for the Azores, such as individuals attached to boat hulls, larvae in ballast water (Morton & Briton, 2000), or even release of species from aquaria (personal observation). If the specimen's presence in the Azores is via human transport, then the individual must have been introduced at a much smaller size and survived until it reached 3.25 kg (7 y old).

However, natural dispersal mechanisms could also explain the presence of one scamp (or more) in the Azores. A large adult or juvenile could have rafted below objects floating with the North Atlantic currents and settled in the Azores in a process similar to that reported for the juvenile wreckfish, *Polyprion americanus* (Sedberry et al., 1996). Drifting of juvenile or adult *Mycteroperca* has never been reported to our knowledge. Also the migration of adult scamp is unlikely to occur since this benthic species inhabits depths shallower than 100 metres, whereas depths between the American Atlantic coast and the Azores can be of several thousand metres. The transport and survival of the fish as egg and/or larvae could also be a plausible explanation. Of course the presence of a single scamp in the Azores does not necessarily imply the establishment of a previously unrecorded viable population in Mediterranean–Atlantic region. However, this occurrence may be a remarkable example of the importance of long distance dispersion in the potential colonization of isolated oceanic islands over evolutionary time.

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