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Research Letters

Tidal pools as habitat for juveniles of the goliath grouper *Epinephelus itajara* (Lichtenstein 1822) in the Amazonian coastal zone, Brazil

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ABSTRACT

The goliath grouper *Epinephelus itajara* (Lichtenstein 1822) (Perciformes: Epinephelidae) occurs in marine and estuarine waters between Florida and south of Brazil in the Atlantic Ocean. *E. itajara* is a critically endangered species and the knowledge about its habitat use is essential for its conservation, since it can reveal nursery habitats that must be priority in management planning. Herein, we recorded the occurrence of ten juveniles specimens of *E. itajara* in tide pools in the Amazonian coastal zone.

Introduction

Epinephelus itajara (Lichtenstein 1822) (Perciformes: Epinephelidae) occurs in marine and estuarine environments between Florida and south of Brazil in the Atlantic Ocean and reaches 3 m of total length (Sadovy and Eklund, 1999; Frias-Torres, 2006). The species shows a slow growth pattern, late sexual maturity and high dependence of mangrove systems for reproduction and development (Sadovy and Eklund, 1999; Hostim-Silva et al., 2005; Frias-Torres, 2006), which contributed to the decline of its populations in global scenery (Gerhardinger 2006).

E. itajara was integrated on IUCN (International Union for Conservation of Nature) as Critically Endangered A2d (IUCN, 2015). Due to the importance of mangroves for *E. itajara* and other fish species, these environments had been broadly focused in conservation politics. Other coastal habitats had been neglected though. The littoral zone of the state of Pará (Brazil) has a broad mangrove area, beaches and rocky shores, and tide pools are present in beaches and rocky shores in the intertidal zone (Horn et al., 1999). Herein, we recorded the

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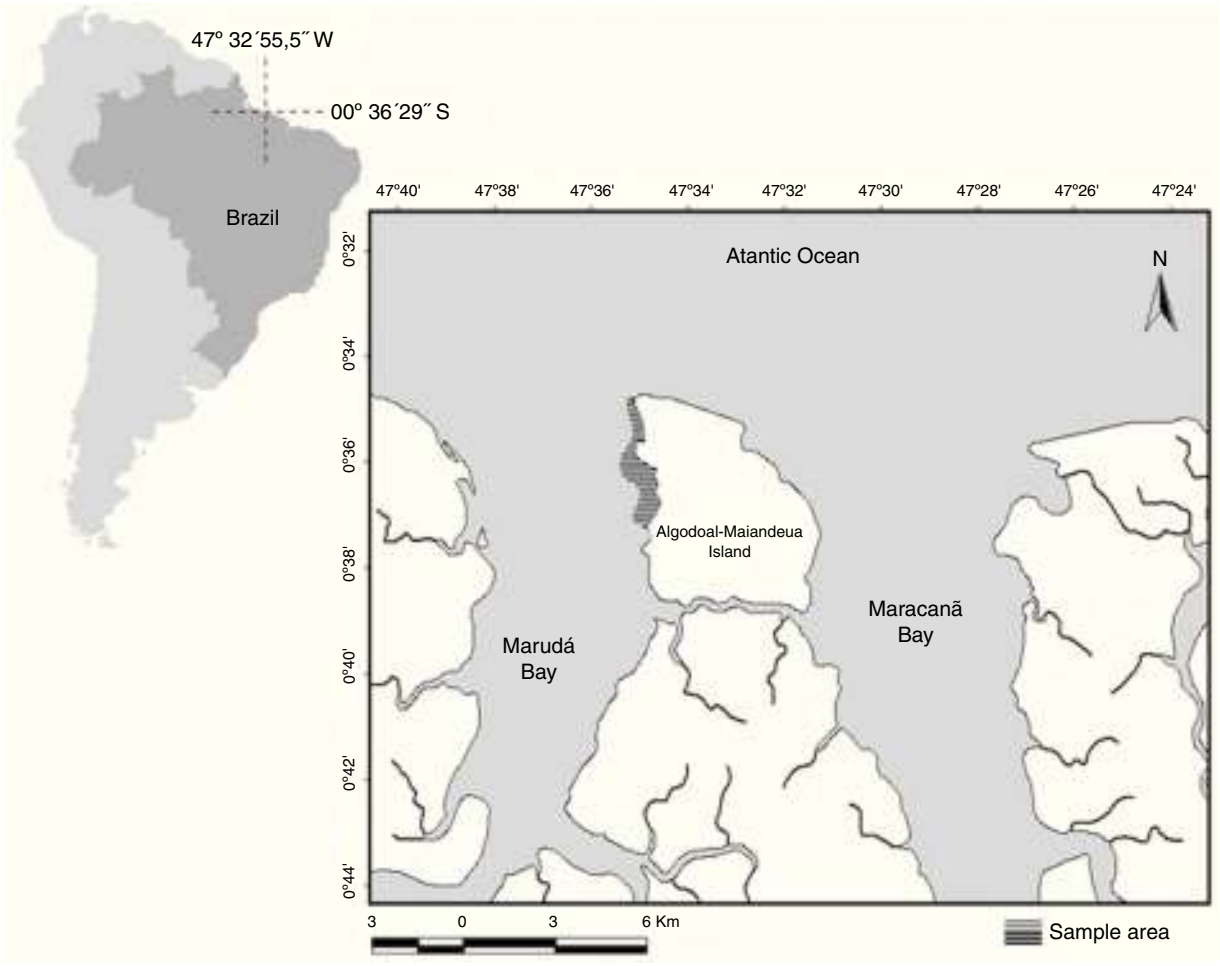

Fig. 1 – Algodoal-Maiandeua Island (Pará – Brazil), where individuals of *Epinephelus itajara* were sampled in tide pools in the Amazonian estuary.

presence of juveniles of the goliath grouper *E. itajara* in tide pools in the Maiandeua Island, Pará, Brazil.

Materials and methods

Specimens were sampled during an ichthyofaunistic survey in rocky tide pool in the Algodoal-Maiandeua Island, Pará, Brazil. The island is located at the mouth of an estuary in the Brazilian state of Pará, between the geographical coordinates 00°35′0″–00°38′29″ S and 47°31′54″–47°34′57″ W (Fig. 1). Surveys occurred in the rainy season (April of 2008, and February and March of 2011) and in the dry season (September and December of 2008, and September of 2011), and were carried out during the diurnal low tides. Specimens were sampled during sweeps of the tide pool with hand-nets and sieves, both with a 5 mm mesh. There was no time limit for each sweep and each tide pool was swept until no further specimens were sampled for at least 10 minutes (Fig. 2). Superficial temperature (°C), salinity and pH of the water in the tide pool were measured with an Oakton 3563-00 multiparameter.

Identification of the specimens followed the procedure established by Smith (1971) using the following measures: standard length, head length, pectoral fin length, pelvic fin length, body depth, lengths of first, third and ninth spines of dorsal fin, and the lengths of first, second and third spines of anal fin. After identification, specimens were deposited in the ichthyological collection of the Emilio Goeldi Museum (MPEG) in Belém, Pará. Some specimens were measured during fieldwork, being released after that. Measures were taken three times using a manual caliper with 0.1 mm of precision, and posteriorly a mean for each measure was calculated for each specimen. Six individuals were eviscerated and had their digestive tracts analyzed to identify their main preys.

Results and discussion

Ten specimens were sampled in 94 tide pool in Algodoal-Maiandeua Island during 2008 and 2011. In 2008, a total of 1297 individuals of different species were sampled in 60 tide pool, and 4 individuals were identified as *E. itajara* (proportional abundance = 0.31%) in 3 tide pool (frequency = 5%). In 2011, 1306 individuals of different species were sampled in 34 tide pool, and 6 of them were identified as *E. itajara* (proportional abundance = 0.46%) in 4 tide pool (frequency = 11.8%). No

Fig. 2 – Habitat where samplings were carried out in Maiandeua Island (Pará – Brazil). (A) Rockyshore; (B) tide pool; (C) specimen of *Epinephelus itajara*.

specimens were captured in the rainy season of 2011. Total length was between 31.78 mm and 89.80 mm (mean ± standard deviation = 58.56 ± 23.79 mm). Of these, seven specimens were measured according Smith (1971), and both morphometric and meristic data confirmed the diagnosis. The superficial temperature ranged from 30 to 38 °C (34.8 ± 2.43), pH from 7.4 to 8.9 (8.1 ± 0.46) and salinity from 9 to 36 (25.14 ± 8.53).

Species can use different habitats across a landscape depending on their ontogenetic development, and this knowledge is essential to understand their ecological roles along their life cycle (Norcross and Shaw, 1984). Juveniles of the dusky grouper *Epinephelus marginatus* (Lowe 1834) utilize shallower habitats with cavities that allow cryptic habit (Harmelin and Harmelin-Vivien, 1999), and Azevedo et al. (1995) recorded the occurrence of a high concentration of juveniles of *E. marginatus* in tide pool at Lajes do Pico (Azores, Portugal). According to Koenig et al. (2007), juveniles of *E. itajara* usually occur in mangroves and coral reefs. Even so, we recorded juveniles of the goliath grouper in rocky tide pools, which could be related to the presence of shelter and high prey availability for juveniles (Horn et al., 1999).

In tide pools, the shelter is offered by abundant rocky crevices, while in mangroves and coral reefs it is offered by the roots of submerged trees and coral crevices, respectively. Those rocky tide pools are not abundant in the coast of Pará and have its boundary in the Pará platform, while the remaining littoral area (Bragança-Viseu basin) is composed by greater extensions of mangroves without rocky outcrops (Franzinelli, 1992; Souza-Filho, 2000). In the Pará platform, mangroves occupy smaller areas than other areas of the Pará coast (Souza-Filho, 2005), which enhances the importance of alternative habitats for species that are usually associated with mangroves.

Six individuals had their diet analyzed and all digestive tracts were replete with the Anomura crustacean *Petrolisthes armatus* (Gibbes, 1850). *P. armatus* is broadly distributed in rocky shores of the Amazonian coastal zone through the year (Oliveira et al., 2013; Morais and Lee, 2014). Sadovy and Eklund (1999) considered *E. itajara* as carcinophagous, feeding mainly on lobsters, which is absent in our study area and may lead the species to opportunistically feed on *P. armatus*.

Ecological aspects and management strategies for groupers have been studied and applied in Southern and Northern coastal zones from Brazil since 2002, due to extensive work of the Project "Meros do Brasil". Only recently the Project "Meros do Brasil" have been acting in the North coastal zone from Brazil, reflecting the disparity in the quantities of information about these species biology in North littoral (www.merosdobrasil.org). This way, tide pools can be important for the endangered species *E. itajara*, requiring additional studies to investigate the relationships among its juveniles and tide pool in intertidal zones that could generate essential data to the management of goliath grouper stocks.

Conflicts of interest

The authors declare no conflicts of interest.

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