



Local ecological knowledge and Goliath grouper spawning aggregations in the South Atlantic Ocean: Goliath grouper spawning aggregations in Brazil

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Abstract

In this paper we report on the occurrence of Goliath grouper *Epinephelus itajara*, spawning aggregations in the South Atlantic Ocean (south Brazil), as indicated by surveys of fishermen's local ecological knowledge. Insights on Goliath grouper behaviour within aggregations and prospects for species conservation and research in Brazil are also provided.

Goliath groupers *Epinephelus itajara* (Lichtenstein 1822) occur throughout tropical and subtropical waters in the Atlantic Ocean (Fig. 1). This large grouper can attain a weight of more than 400 kg, and has an estimated lifespan of over 38 years, strong site fidelity, passive behaviour towards spearfishers, late sexual maturity (five years), and aggregates to spawn (Bullock et al. 1992; Sadovy and Eklund 1999). Though all of these life history traits represent serious conservation concerns, identifying and protecting spawning aggregations is considered one of the key targets for fish species conservation (Colin et al. 2003). Few Goliath grouper spawning sites have been mapped in the Northern Hemisphere, including the coast of Florida (still requiring spawning observation), Hobe Sound and Palm Beach, off Belize (extirpated), and Colombia (Sadovy and Eklund 1999; Frias Torres pers. observ.). Although Goliath grouper spawning aggregations have been reported by fishermen in the Gulf of California, no individuals have been observed or caught since 1995.

Here we provide the first evidence of *E. itajara* spawning aggregations in the South Atlantic. Preliminary outcomes of a current local ecological knowledge survey for Goliath grouper bioecological and conservation aspects (Gerhardinger et al. 2004), indicate that these large schools of fish (up to 60 individuals) aggregate for spawning purposes, as fish caught on these occasions had well developed gonads (in advanced maturity phases). These transient spawning aggregations are usually observed in December, although they were already

seen in January and February, and are always associated with a full moon, according to our informants in the State of Santa Catarina.

The following intriguing observation was made by the elderly informant (83 years old):

"...the male, he would stay taking care of the females, and when we dived the male would come after us to see what was going on. We already knew, the female would stay down there, quiet. There were always more females than males. The male had no eggs, the females had eggs, and when we caught them, we saw their large bellies with eggs, already knowing that it was a female, the male was thinner."

This interesting observation of how different sexes behave within a spawning aggregation indicates a female biased sex-ratio in these events. Unfortunately, only this particular fisherman had acquired such detailed knowledge of this subject. Although this is considered preliminary information (which gave rise to an interesting hypothesis for our Goliath grouper conventional ichthyologic studies), it builds on Hamilton's (2005) point about how the knowledge and experience of only one fisherman can reveal original and extremely detailed information on a given species.

Nowadays, a network of government and non-governmental institutions is consolidating a nationwide Goliath Grouper Conservation Campaign (<http://www.merosdobrasil.org>), which

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includes research, policy and environmental education issues (Hostim-Silva et al. 2005; Ferreira et al. 2006). Within the core of this partnership lies the conservation of the species as well as its essential habitats, such as mangroves, rocky and coral reefs.

By recognizing that conventional ichthyological science alone cannot satisfy the demand for ecological information on the vast Brazilian coast, and that fishermen possess intrinsic knowledge about their own local marine environment, ethnoecological methods will be utilized as a major component of this partnership. Because groupers have been targeted by Brazilian communities for generations, they are likely to be an integral part of fishermen's traditional knowledge.

In addition to the scientific study of fishermen's knowledge, we will also engage expert fishermen in our workshops and discussion forums, in a clear attempt to create a good atmosphere for constructive cooperation among scientific experts and holders of traditional ecological knowledge.

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Figure 1. An *Epinephelus itajara* aggregation in south Brazil. Eleven large-sized fish can be seen in the photo (by Marcelo Krause).