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Research Letters

Landings of goliath grouper, *Epinephelus itajara*, in Brazil: despite prohibited over ten years, fishing continues



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ABSTRACT

The goliath grouper *Epinephelus itajara*, a threatened fish has been protected from fishing in Brazil since 2002. However, poaching records have raised questions about the extent of compliance to the fishing moratorium. We compiled data of commercial landings figuring in official reports as well as episodes of apprehensions of illegal catches by environmental police. According to reports, national catches declined seventy percent after the moratorium establishment, with an average of 393 tons per year of poaching between 2003 and 2011. Although poachers are occasionally caught during environmental police raids along Brazilian coast, in Pará State catches are reported to continue and poachers have targeted aggregations. Data from those episodes do not reflect the real number of poaching, which is believed to be much higher, once fisher process fishes before landings to confuse the supervision and weak enforcement efforts. As management strategies, we recommend the continuity of the fishing moratorium, besides increase in surveillance and enforcement. The choice of priority areas for concentration of goliath grouper conservation efforts may be an effective approach.

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Introduction

Groupers (Epinephelinae) represent typically apex-predators and one of the most important components of artisanal catches worldwide (Craig et al., 2011). On the other hand, groupers are among those species most vulnerable to fishing pressure because of life history traits such as longevity, late gonadal maturation and aggregation spawning (Sadovy de Mitcheson et al., 2012). The goliath grouper *Epinephelus itajara*, is the largest grouper (2.5 m length and > 400 kg) (Bullock et al., 1992) in the Atlantic Ocean and is widely distributed throughout the south-eastern United States to southern Brazil (Craig et al., 2011). The species is often a target of recreational, small-scale commercial and subsistence fisheries (Sadovy and Eklund, 1999). Decreasing population abundances due to fishing pressure and other anthropogenic stressors (e.g. habitat loss) have been reported (Rhodes and Graham, 2009). Consequently, the species is classified globally as Critically Endangered by the International Union for Conservation of Nature (Craig, 2011). In the USA, intensive exploitation of goliath grouper led to an economic extinction in the late 1980s, resulting in the protection of the species since 1990 (Koenig et al., 2011).

In Brazil, the decrease of goliath grouper catches led managers to establish a precautionary five-year moratorium on fishing of the species in 2002. Since then, the moratorium was renewed twice (2007 and 2012) once the species did not show signs of a population recovery. Currently, in Brazil goliath grouper catches are verified in incidental events, usually as a non-target species. Despite a ban on the fishing of goliath grouper in Brazilian waters, poaching, incidental catches and commercialization have been recorded along the coast (author's personal observation). This is in part due to the lack of awareness of the moratorium and incipient surveillance.

Goliath grouper catches in Brazil since 1995 are presented in this study, using commercial landings and illegal fishing apprehensions data. We aimed to: (1) to determine the landings frequency (weight and retail price) prior to the moratorium establishment, and (2) verify whether there has been a reduction in catches after the moratorium establishment.

Materials and methods

Landings data

We accessed records of annual goliath grouper landings from State and Federal Brazilian fisheries agencies between 1995 and 2011 (Fig. 1). To verify the economic importance and frequency of goliath grouper landings, we compiled data for the price of commercialization, total value of landings and representativeness on total income by State. Catches were assigned either as artisanal or industrial, whenever applicable.

Poaching apprehensions data

Records resulting from goliath grouper poaching apprehensions by environmental agencies were obtained by

compiling information available on the web media and reported to authors by surveillance agencies. To collect information available on the web, we conduct a search using the Portuguese words “*apreensão + mero*” (apprehension + goliath grouper) and “*fiscalização + mero*” (surveillance + goliath grouper) through Google search tool. The accuracy of poaching apprehension reports (number of fishes and weight) was later confirmed by contacting the surveillance agency involved.

Results

Landings data considered only two states from 1995 and 1998, while eight states provided information to 1999 and 2000. A national level agency reported landings from 2001 and 2011 (see Fig. 1). Between 2001 and 2011, we record 12,334 tons (t) of goliath grouper landings in Brazil (Fig. 2A). The peak occurred between 1998 and 2000, with 3,905 t in the Pará State, exceeding annual landings nationwide among 2001 and 2007. After the establishment of the fishing moratorium, the average national landings decreased from $1,099 \pm 202$ t (\pm SE) to 393 ± 60 t. This result was also influenced by reductions in the amount of catches in Pará (987 ± 174 t before to 173 ± 76 t after the moratorium). Landings in Bahia (217 ± 109 t before to 209.5 ± 43 t after) and Sergipe States (9.5 ± 3 before versus 10.4 ± 3 after moratorium) were virtually unaffected by the moratorium. We verified an increase to Maranhão State, where no landings were reported before, to 24.6 ± 8 from 2002 on, and Amapá State (4.0 ± 1 t before to 34.4 ± 8 t after moratorium establishment) (Fig. 2B–F).

The reported frequency of goliath grouper in total landings in each state remained below 1% of the total weight, with an overall average of 0.25% caught exclusively by the artisanal fleet, except in Amapá and Santa Catarina States, which presented 39% and 83% caught by industrial fishing (Table 1). Higher average prices of commercialization (price per kg) were observed after the moratorium establishment (Table 2). Paraíba (US\$ 3.54) and Bahia States had the highest mean values, while Amapá (US\$ 0.74) had the lowest. National average price before moratorium jumped from US\$ 0.98 to US\$ 1.65. However, prices before moratorium establishment were represented only by Ceará, Paraíba and Sergipe States. Landings with prices available (923.5 t) accounted to a revenue of US\$ 2,253,333, representing 0.23% of the total revenue of first commercialized fish.

Illegal catches were confiscated during enforcement raids (22.4 tons, approximately 314 specimens) occurred in ten states between 2004 and 2013 (Fig. 2G). Raids were led by the Brazilian Institute for Environment and Renewable Natural Resources ($n=11$), the Chico Mendes Institute for Biodiversity Conservation (ICMBio; $n=6$), by state inspection agencies ($n=6$) and by the Federal Police ($n=2$). Higher frequencies occurred in Pará (34% of cases and 86% of specimens), in which six events were characterized by catches larger than 15 large fishes. From total of confiscated fish, 90% had between 50 and 100 kg, caught by bottom longline, spearfishing and line and hook gears.

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