

Goliath Grouper (*Epinephelus itajara*) population trends in Florida, USA: Evaluating objective evidence of assumed recovery

Tendencias de la población del mero Goliath (*Epinephelus itajara*) en Florida, EE. UU: Evaluación de la evidencia objetiva de la supuesta recuperación

Tendances démographiques du mérou goliath (*Epinephelus itajara*) en Floride, aux États-Unis : évaluation des preuves objectives d'un rétablissement supposé

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EXTENDED ABSTRACT

Goliath Grouper (*Epinephelus itajara*) have been protected from harvest in Florida since 1990, following near extirpation of the species throughout its range due to severe overfishing and habitat degradation. Based largely on anecdotal reports of increases in incidental catch of the species, the Florida Fish and Wildlife Commission recently held a hearing to consider opening the fishery to limited take under the assumption that it has largely recovered. Because of no-take protections for the last 31 years, however, the state has limited data to objectively assess the population status of the species. To help fill this data gap, we constructed a time-series of Goliath Grouper densities over the last 3 decades using data from the Reef Environmental Education Foundation (REEF) Volunteer Fish Survey Project, a citizen science monitoring program ongoing since 1993. We developed a Bayesian state-space model that estimates underlying population trajectories based on the observations from REEF surveys (Greenberg et al, in prep). This model estimates the expected mean abundance for each year while conditioning on the various sources of heterogeneity in each survey; including drivers of survey effort, detection, variable abundance across sites and habitats, and the temporal clustering of opportunistic surveys. We applied the model with data collected from 17,983 roving diver REEF surveys conducted at 130 sites in Florida where Goliath Grouper have been encountered consistently between 1994 and 2020. We found that while the population appears to show strong growth over the first 20 years of the time series, in the last decade (since 2010) it has declined by ~50%. We further explored how trends differed across regions and sites throughout the coastal regions of Florida, highlighting areas with concentrated declines and recovery. The reasons for this decline are unclear, but likely involved a combination of both anthropogenic (incidental catch) and natural (red tide and cold snaps) stressors. Regardless of the causes, our findings indicate that any implemented level of take from a limited fishery are likely to exacerbate ongoing declines in this critically endangered species.

KEYWORDS: citizen science, endangered species, reef fish

LITERATURE CITED

Greenberg, DA, CV Pattengill-Semmens, BX Semmens. In prep. Validating citizen science natural history observations as a tool for assessing the status and trends of marine species.