

Evaluation of Fisheries Management and Conservation Measures Taken to Protect Grouper Spawning Aggregations in the Wider Caribbean: Case Studies of Bermuda, Belize and Cayman Islands

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ABSTRACT

In recent years, there has been a considerable increase in the human and financial resources devoted to the study of reef fish spawning aggregations in the wider Caribbean. The results from most studies suggest that spawning aggregations of commercially-important species such as groupers and snappers are highly vulnerable to directed fishing effort and that population abundance can be significantly reduced after only a few years of exploitation. High levels of fishing mortality at spawning aggregation sites can have important ecological effects on reef ecosystems as well as socio-economic impacts on fisheries.

Following studies which demonstrated serious degradation of spawning aggregations of Nassau grouper (*Epinephelus striatus*), several countries in the wider Caribbean have taken decisive steps to protect and conserve these aggregation sites. The fishery management measures which have been put in place in various countries in the past five years will be discussed with particular emphasis on Belize and the Cayman Islands.

KEY WORDS: Spawning aggregations, Resource management, Caribbean, Nassau grouper

La Evaluación de la Gerencia de la Pesquería y las Medidas de Conservación Tomado para Proteger Agregaciones de Desove de los Peces Arrecifales en el Caribe más Ancho

En años recientes, ha habido un aumento considerable en los recursos humanos y financieros dedicados al estudio de las agregaciones de desove de los peces arrecifales en el Caribe más ancho. Los resultados de la mayoría de los estudios sugieren que las agregaciones de desove de especies comercial-importantes tales como los meros y los pargos sean altamente vulnerables al esfuerzo de pesca dirigido y esa abundancia de la población se puede reducir perceptiblemente después solamente de algunos años de la explotación. Los altos niveles de la mortalidad de la pesca en los sitios de la agregación de desove pueden tener efectos ecológicos importantes en ecosistemas arrecifales así como impactos socioeconómicos en industrias pesqueras.

Seguindo estudia que demostraron la degradación seria de agregaciones de desove del mero de Nassau (*Epinephelus striatus*), varios países en el Caribe más ancho han tomado medidas decisivas para proteger y para conservar estos sitios de la agregación. Las medidas de la gerencia de la industria pesquera que se han puesto en lugar en varios países en los últimos cinco años serán discutidas con énfasis particular en Belice y las islas de Cayman.

PALABRAS CLAVES: Agregaciones de desove, gerencia de recurso, el Caribe, mero de Nassau

OVERVIEW

Most scientific studies of spawning aggregations which have been conducted in the wider Caribbean have focused on groupers. There is a growing body of evidence that spawning aggregations are highly vulnerable to overfishing and that, in general, fisheries management and conservation measures have not been implemented in a timely manner to stop the demise of these aggregations. In particular, the Nassau grouper (*Epinephelus striatus*), which has been prominent in the fisheries of the region, has been studied more than any other grouper species although several studies on the red hind (*E. guttatus*) have also been conducted.

Nassau grouper spawning aggregations appear to be particularly at risk and large declines have been documented. It has been estimated that at least one-third of all known Nassau spawning aggregations in the Caribbean

have disappeared due to overfishing. There is also growing recognition that spawning aggregations are critically important in the health of reef ecosystems and that fishing down the spawning biomass of high level trophic species e.g. groupers at aggregations may have cascading ecological effects.

An examination of three different case studies (Bermuda, Belize, Cayman Is.) of fisheries management and conservation of spawning aggregations from the wider Caribbean provides a perspective on the different mechanisms which have been used to achieve a measure of management success. The earliest fisheries management measure to conserve spawning aggregations was in Bermuda in 1974. This involved the seasonal closure (4 months) of two red hind aggregation sites. This management action was called for by commercial fishermen and the regulation was enacted by the Fisheries Department.

Following this measure, catches continued to decline but then stabilized in the longer term. The effectiveness of area closures often depends on enforcement of regulations to achieve high levels of compliance. Nassau grouper aggregations seaward of these red hind sites were not protected under the regulations and were heavily fished. As a result, Nassau grouper landings declined 95% from 1975 - 1981 and all known aggregations disappeared. There has been no demonstrable recovery to date. The seasonal closure of the red hind aggregation sites is still in effect 31 years later although there have been some modifications of boundaries and the size of the protected areas.

In recent years, there have been significant examples of management/ conservation action in both Belize and the Cayman Islands. In Belize, Nassau grouper spawning aggregations have been exploited for decades. Information from fishermen and others indicated that there had been marked declines at most sites. As a result of mounting concern about Nassau groupers, a National Spawning Aggregations Working Committee was formed which was made up of NGOs and the Belize Fisheries Department. An assessment was conducted of 11 known spawning aggregation sites in 2000 - 2001 and the results presented a bleak picture of the future of Nassau groupers. Following discussions with all main stakeholders including fishermen, the Belizean Government permanently closed these 11 aggregation sites in 2003. There was also a closed season for Nassau groupers imposed during spawning months. As most of these sites were multi-species aggregation sites with other groupers and snappers, the closure of these sites provided protection for all of these species during the period of highest catchability. Alternative economic activities have been provided to displaced commercial fishermen to help their transition from dependence on aggregation fishing. The two main alternatives which have been developed are those of a sport fishing guide and diving tourism.

The recognition that aggregation fishing is not sustainable in the longer term and that the fish can be more valuable economically if left on the reef has helped in the transition process. The key to this success story has been the involvement of all stakeholders and the political will to act based on sound information.

The Cayman Islands has also acted to protect its Nassau grouper population in recent years but the path it followed was somewhat different. There were five known Nassau grouper sites which were fished historically for decades. Declines in landings were first reported in the 1980s and research on Nassau groupers began by the Department of the Environment (DOE) in 1987. The first attempt to manage these aggregation sites was through seasonal closures in 1995. Although proposed by the Marine Conservation Board (MCB), this measure was not supported by the Government due to political lobbying by fishermen. Continued fishing of these aggregations led to

the disappearance or commercial extinction of three sites. The remaining two sites were still fished but catches continued to decline. The "rediscovery" of a Nassau grouper site at the west end of Little Cayman in 2001 led to heavy fishing again. Monitoring of this site began in 2002 with REEF's Grouper Moon Project conducted in conjunction with the Department of the Environment. A combination of fishery-dependent and fishery-independent sampling documented the severe impact of continued fishing by only 15 boats – almost 4,000 Nassau groupers were removed during only two spawning seasons. Based on the data obtained, a projection was made in 2003 that if fishing continued at the same level that the aggregation would be gone within two years. The MCB is empowered to make fisheries regulations but they must be ratified by Government. There was continued resistance by fishermen and appeals were made to politicians to leave the site open. Meetings were held with fishermen and other stakeholders to explain the situation and the need for a site closure. The DOE solicited support for closure from outside organizations including SCRFA (Society for the Conservation of Reef Fish Aggregations). Ultimately, the MCB acted unilaterally and effected an eight year closure of all Nassau grouper sites. This was implemented in December 2003. An active monitoring program has continued at the site since the closure to provide the data necessary to extend the closure permanently.

In conclusion, it is possible to achieve protection/ closure of spawning aggregation sites by different means but mechanisms involving all stakeholders have the greatest probability of long term success. In addition, post-closure enforcement costs will most likely be higher if there is not broad acceptance of the measure by fishermen because disaffected fishermen will be more inclined to poach. Socio-economic factors are very important in determining success – is aggregation fishing at subsistence level or is it to generate income ?

Are there acceptable economic alternatives to aggregation fishing if sites are closed? The principal users of the resource must be provided with information concerning the proposed management measure and should be encouraged to be a part of the management process.

Nassau grouper spawning aggregation sites can be easy to target for fishing but difficult to protect and challenging to study. Most are located at the edges of coastal platforms, adjacent to the open ocean, limiting access for shore-based fishery officers with weak enforcement capability. The Cayman Island aggregation site protection profiled by Waterhouse et al. (12), when considered in a wider context of multiple conservation and management efforts for this threatened species elsewhere, lays out a science-based blueprint for success. Rapid decline of Nassau grouper spawning aggregations in Belize: Fishery management and conservation needs. Fisheries (Bethesda, Md.) 26, 23-30 (2001). Luckherst, Brian E. Evaluation of fisheries management and conservation measures taken to protect grouper spawning aggregations in the wider Caribbean: Case studies of Bermuda, Belize and Cayman Islands. Proceedings of the Gulf and Caribbean Fisheries Institute 58 (2007): 281-282. Marshall, Dustin J., Selina S. Heppell, Stephan B Munch, and Robert R. Warner. The relationship between maternal phenotype and offspring quality: Do older mothers really produce the best offspring? The Caribbean's Cayman Islands are known for their stunning coral reef ecosystems. Home to a large diversity of marine life, these reefs function as a source of both food and tourism for residents of the three islands. But for some of the reef's fish, local pressure has led to significant population declines. Together, the project works to protect and conserve the Islands' Nassau grouper. A researcher swims in the midst of a Nassau grouper aggregation as part of an ongoing effort to track the critically endangered species numbers. Paul Humann, Grouper Moon Project. For nearly two decades, one of the Project's primary goals has been to develop a way to accurately monitor grouper spawning aggregations. In the wider Caribbean region, Belize has been a leader in the implementation of MPAs, where they have been created by several different management authorities under separate pieces of legislation (Gibson et al. 2004). They may be designated as: 4). Elsewhere in the region studies of Caribbean spiny lobster in no-take zones have shown greater densities. (Lipcius et al. grouper spawning aggregations have decreased dramatically over the last 35 years as a result of fishing (Sala et al. Table 2. Activities explicitly allowed (✓) and prohibited (X) in various zones of Belize's MPAs.