

April 26, 2021

To: Caribbean Fishery Management Council

From: Dr. Michelle Schärer

RE: Update to the timing of red hind spawning aggregations in Puerto Rico

The establishment of three seasonal marine protected areas (MPA) known as Abrir la Sierra, Bajo de Sico and Tourmaline (ABT; Figure 1) and the closed season in the EEZ off western Puerto Rico for red hind were based on pioneering research conducted at the Puerto Rico Fisheries Research Laboratory since the 1990's by Colin, Shapiro, García-Moliner, McGehee, Roman, Sadovy, Rosario, Figuerola, Torres-Ruiz, etc. Since then, assessments by Figuerola and Torres (2000) and Marshak and Appeldoorn (2008) did not detect significant changes in the red hind stocks off western Puerto Rico years after these closures and concluded they are still undergoing growth and recruitment overfishing as previously stated by Sadovy et al. (1992). Recent research directed towards fish spawning aggregations (FSA) on the western Puerto Rican platform provide information to potentially update the protection of the spawning stock of some groupers, mainly red hind (*Epinephelus guttatus*).

One of the assumptions inherent in the expectation of these closed areas/seasons is that reproductive events are contained within the extent of the closure are sufficient to re-build stocks and seek a sustainable fishery. When the FSA is completely contained within the closed season (Dec. 1 to Feb. 28) the spawners are all protected. However, there is evidence that red hind remained aggregated and potentially vulnerable to fishing at FSA sites off western Puerto Rico after February 28 on at least three of the past 10 years (2013, 2015 and 2019). Apparent shifts in the timing of red hind spawning aggregations in this area may indicate that a proportion of the spawning stock is significantly vulnerable to fishing once the season opens, when they are still aggregated. Under this scenario the reproductive output of red hind would be reduced if fish that haven't yet spawned are legally caught. In addition, overfishing of FSAs is known to affect the age at sexual maturity and change sex ratios of protogynous species (Coleman et al. 1996) creating a possible sperm limitation for red hind in subsequent year's FSAs. Preliminary results of research in the US Caribbean evidenced younger and smaller fish, lower fecundity and skewed sex-ratios of red hind off west Puerto Rico FSAs compared to St. Thomas red hind MCD in the USVI (Nemeth et al. in prep.). Changes in the phenology of red hind reproduction has also been observed recently in Bermuda, although earlier than expected (Taylor et al. 2020) suggesting changes in temperature regimes may be producing these shifts in the timing and duration of FSAs.

Previous requests to the CFMC to review the red hind closed seasons and requests for emergency rules to extend the date of the end of the closed season in MPAs and EEZ off west Puerto Rico on years when there was a prediction of extended FSA (see Appendix 1) were based on the precautionary principle, recognizing the vulnerability of red hind spawning stocks to directed fishing after March 1 (and a similar trend was documented for Nassau grouper at Bajo de Sico due to aggregations occurring in April of some years). A technical manuscript that supports these observations for red hind will provide an opportunity to peer review the latest science-based information that could be incorporated into the Puerto Rico Island-Based FMP. Projects that supported the monitoring of multi-species FSA sites in the US Caribbean for red hind ended in 2021, although we are happy to announce Section 6 funding for Nassau grouper in collaboration with

the Puerto Rico DNER expected to start in 2022. For now, the red hind monitoring of FSA will require directed funding if it is the interest of the CFMC to continue standardized long-term monitoring in the EEZ that could better predict how groupers are responding to shifts in temperature regimes and how management actions could be adapted to rebuild the red hind spawning stocks.

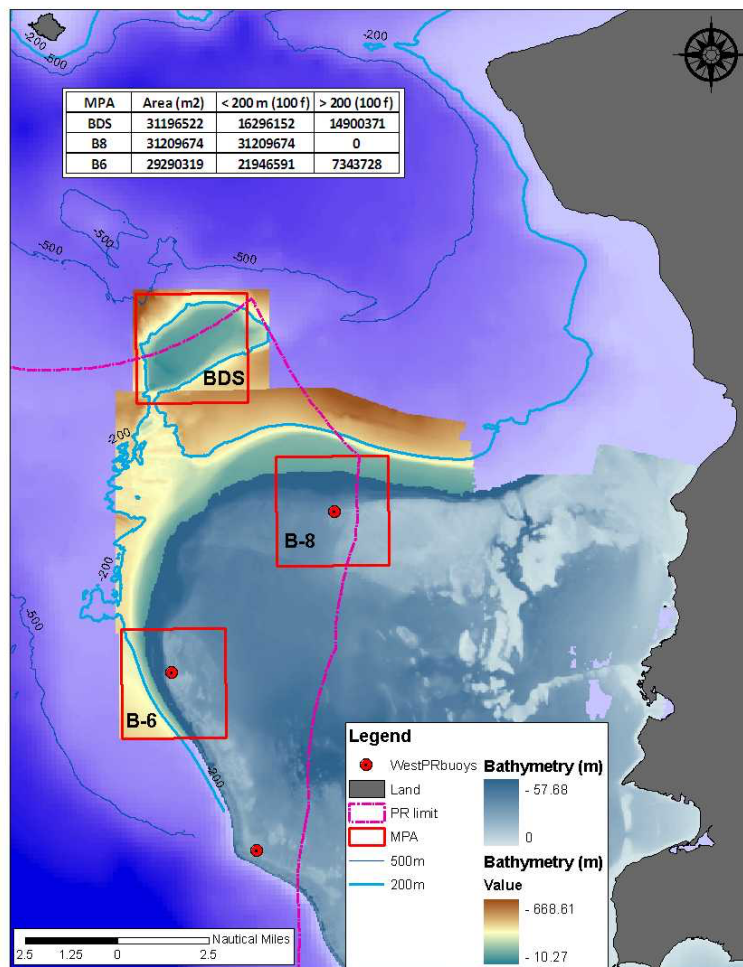


Figure 1. Seasonal MPAs and FSAs of red hind off western Puerto Rico.

Coleman FC, Koenig CC, Collins LA (1996) Reproductive styles of shallow-water groupers (Pisces: Serranidae) in the eastern Gulf of Mexico and the consequences of fishing spawning aggregations. *Environ Biol Fishes* 47:129–141.

Figuerola M and W Torres (2000) Reproduction of the coney (*Cephalopholis fulva*) and preliminary evaluation of the closure during the spawning aggregations of the Red hind (*Epinephelus guttatus*) in western Puerto Rico. Report to the CFMC, 28 pp.

Marshak AR, Appeldoorn RS (2008) Evaluation of Seasonal Closures of Red Hind, *Epinephelus guttatus*, Spawning Aggregations to Fishing off the West Coast of Puerto Rico Using Fishery-dependent and Independent Time Series Data. In: *Proceedings of the Sixtieth Annual Gulf and Caribbean Fisheries Institute*. pp 566–572

Sadovy YJ, Figuerola M, and A Roman (1992) Age and growth of red hind *Epinephelus guttatus* in Puerto Rico and St. Thomas. *Fish Bull* 90:516–528.

Taylor, J.C., M. Karnauskas, L. Cherubin, M. Schärer-Umpierre, W.L. Michaels, R. Caillouet, M. Campbell, D. Demer, B. Erisman, S. Fulton, S.A. Heppell, W. Heyman, K. Kingon, D. Morley, R. Nemeth, J. Pitt, T. Rowell, and B. Semmens. 2020. Emerging Science and Technology to Improve Monitoring and Assessments of Fish Spawning Aggregations. Report from the 2019 Gulf and Caribbean Fisheries Institute Workshop. NOAA Tech. Memo. NMFS-F/SPO-207, 74 p.

February 24, 2016

Mr. Carlos Farchette, Chair
Caribbean Fishery Management Council
270 Munoz Rivera Ave., Suite 401
San Juan, Puerto Rico 00918

Re: Recommendation for the extension of the closed season for red hind in Puerto Rico

Dear Chairman Mr. Farchette,

We have recently collected information on the spawning aggregations of red hind (*Epinephelus guttatus*) during research being conducted off western Puerto Rico that deserve an emergency action to extend the closed season for red hind in Puerto Rico. We request that the Caribbean Fishery Management Council extends the closed season to at least March 10, 2016 given our observations. The sustainability of this fishery requires that the fish that are aggregated to spawn be protected from fishing in the exclusive economic zone of the western Puerto Rico platform. A similar request has been made to the Puerto Rico Department of Natural and Environmental Resources to protect the aggregations in the local jurisdiction and prohibit the sale and possession of red hind until spawning has culminated.

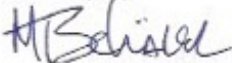
During dives conducted in the western Puerto Rico EEZ, during the peak of the last spawning event we observed that the duration of the reproductive season was extended during more days than was expected after the full moon. Since the next full moon will be at the end of the month (February 22) the next spawning aggregation event is expected to last until March, when the closed season for red hind that protects this critical event, has expired (December 1 to the last day of February). It is urgent to protect these grouper during this season, when they are extremely vulnerable to fishing. We do not expect another spawning peak until next year for this species.

Spawning aggregations are associations of limited time where one species of fish is found in high densities at a fixed location. It has been documented that fish converge from distant sites with the only purpose of reproducing. The spawning aggregations are especially vulnerable to fishing, because they occur in predictable locations and times, which means that they can be exploited and the result is a reduction in the population's size. Throughout the Caribbean, the spawning aggregations of Nassau grouper (*Epinephelus striatus*) have

been decimated by fishing on their aggregations and the species is now catalogued as endangered by the IUCN (Sadovy De Mitcheson et al. 2008).

We suggest this fisheries management measure as a one-time emergency since this is what is happening now in the areas of Puerto Rico that spawning aggregations of red hind are being surveyed. It is our belief that the future of this fishery deserves all the attention we can provide at a critical time with the best scientific information available. The immediate short-term impacts that this action could cause are undoubtedly much less than losing access to the red hind as part of our future fishery, as was evidenced in the case of the Nassau grouper in our waters, mainly due to the unregulated fishing of their spawning aggregations.

Cordially,



Michelle T. Schärer-Umpierre, PhD

- Cc: Miguel Rolón, CFMC
Richard Appeldoorn, SSC-CFMC
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María del Mar López, NOAA Fisheries
Richard Nemeth, UVI