

Co-Producing a Shared Characterization of Depredation in the Gulf of Mexico Reef Fish Fishery

Coproducción de una Caracterización Compartida de la Depredación en la Pesquería de Peces de Arrecife del Golfo de México

Co-production d'une Caractérisation Partagée de la Déprédation dans la Pêche de Poissons de Récif du golfe du Mexique

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EXTENDED ABSTRACT

Depredation, defined as the partial or complete removal of a hooked fish by a non-target species (Gilman et al. 2008), has become a significant concern worldwide and has escalated in frequency in the Gulf of Mexico (GoM). Increasing shark depredation interactions mirror the increase in the number of fishermen on the water and the recovery of shark populations following decades of overfishing (Carlson et al. 2019). Depredation results in substantial economic losses for both the recreational and commercial fishing sectors (Mitchell et al. 2018) and can also negatively impact the accuracy of fisheries assessments and the effectiveness of fisheries management efforts.

Although stakeholders have urged fishery managers to address these increasingly pervasive interactions, a comprehensive understanding of the nature, magnitude, and extent of depredation is currently lacking in the GoM. Therefore, we worked to co-produce a shared characterization of the impacts of depredation in the GoM reef fish fishery as a necessary precursor to quantifying depredation and developing effective solutions. To accomplish this, we employed a three-phase approach. First, we gathered, analyzed, and interpreted data from the National Marine Fisheries Service (NMFS) Southeast Fisheries Science Center (SEFSC) Reef Fish Observer Program to characterize depredation in the GoM commercial reef fish fishery (Duffin et al., in prep.). Next, we designed and implemented a comprehensive depredation-focused electronic survey of approximately 1,000 GoM recreational fishermen. Data synthesis from phase 1 and survey responses from phase 2 laid the groundwork for the third phase of this project: the development of a collaborative mental modeling workshop. This workshop served to: 1) allow stakeholders to develop, assess, discuss, and refine regional GoM reef fish depredation community models; 2) facilitate in-person discussion and reciprocal learning among researchers, resource managers, and stakeholders about GoM reef fish depredation; and 3) identify knowledge gaps concerning GoM reef fish depredation.

First, the reef fish depredation data syntheses were presented to workshop stakeholders. Then, stakeholders were divided into breakout groups to develop regional depredation community models. Four core model concepts (depredation, angler satisfaction, reef fish populations, and fisheries management effectiveness) identified from the survey were presented to stakeholders during breakout groups. Twenty additional concepts (also identified from the survey) were also presented to encourage discussion and to identify which components were most important to characterizing GoM reef fish depredation. Stakeholders were able to select presented components and/or suggest components of their own to incorporate into regional community models. Stakeholders were also asked to assign categorical weights to the causal links drawn between components, which were assigned positive or negative weights according to the type of influence one component had on another. These concepts and ideas were then incorporated into final community models through moderated group discussion (Figure 1).

Most stakeholders agreed that reef fish depredation in the GoM started increasing significantly in 2017, and they proposed several contributing factors for this increase, ranging from changes in fisheries management and socio-economic dynamics to environmental and ecological alterations. While most stakeholders agreed that depredation is increasing, there was division among stakeholders on whether GoM shark populations have significantly increased or decreased in recent years, and whether fisheries management efforts are responsible for the rise in depredation interactions. Because these two concepts were identified to be of high importance among breakout group discussions, they were selected for use in scenario analyses to determine how regional community models would be altered by changes in shark populations and fisheries management effectiveness. Changes in these two concepts resulted in a range of different outcomes for each region.

Some stakeholders agreed with current shark population assessments, which do not show significant increases in shark

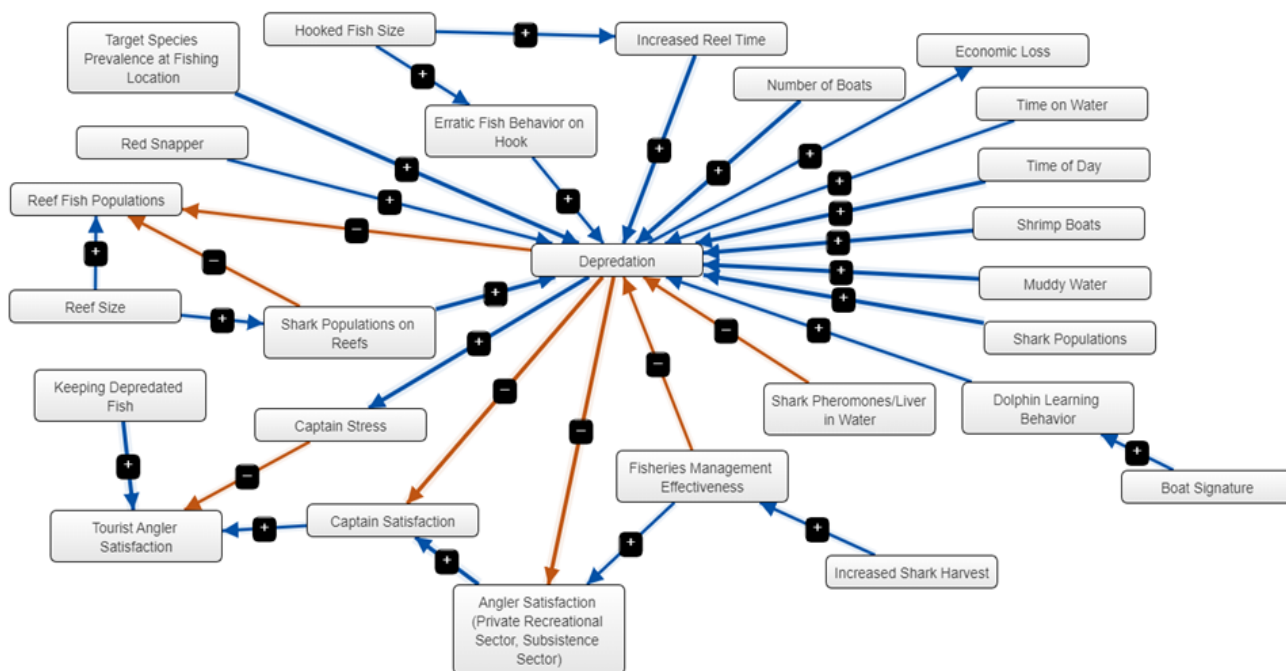


Figure 1. Community model showing concepts important to understanding Gulf of Mexico reef fish depredation with causal links illustrated with blue (positive) or red (negative) categorical weights.

populations, and attributed increased shark depredation interactions to more anglers on the water, fewer shrimp boats on the water, and smaller fish populations than in the past. Other stakeholders insisted the rise in depredation interactions was the result of fisheries management efforts and regulatory changes to protect sharks that have now resulted in the recovery and increase of many shark populations. However, there was no consensus on which shark species are predominantly responsible.

Proposed solutions to increased GoM reef fish depredation were divided and mirrored stakeholder opinion on shark population status. For example, stakeholders who felt that shark populations have increased and recovered identified the implementation of a directed and expanded shark fishery as a viable solution to decrease the negative impacts of depredation. However, stakeholders also recognized two primary barriers to implementing an effective shark fishery: 1) a polarized public opinion on shark harvest, and 2) a lack of infrastructure and demand that would support a market for sustainable shark products. Many stakeholders recognized that changing public perception and overcoming infrastructure barriers may not be feasible; thus, some felt developing effective shark deterrents may represent a better solution to depredation.

Depredation is a complex socio-ecological issue that requires a multi-faceted approach to solutions. Community models developed from this collaborative workshop incorporated a wealth of local ecological knowledge that enabled us to further characterize GoM reef fish depreda-

tion and identify knowledge gaps that can be addressed through future research while fostering the co-production of knowledge between stakeholders and fishery managers. These efforts represent a critical first step to quantify the nature and extent of depredation in the GoM reef fish fishery.

KEYWORDS: Juvenile recruitment, fisheries management, larval ecology

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