

Examining depredation of reef fish on descender devices across the Gulf of Mexico

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Abstract

Objective: We partnered with the charter-for-hire fishing fleet to document depredation rates of fish on descender devices across the U.S. Gulf of Mexico and identify the species responsible for depredation.

Methods: Two types of data were collected: (1) underwater video footage of fish descents on fish descender devices called SeaQualizers and (2) information about fishing sites and fish that were descended. All resulting video footage was then analyzed. Each recorded fish descent was assigned water clarity and vision field scores. The presence and, if applicable, the identity of the predators were logged. The fate of each descended fish was assigned.

Results: From March 2022 to March 2024, 987 fish descents were successfully recorded off Texas, Louisiana, Alabama, and Florida. Most of the descended fish—representing 20 species in total—were Red Snapper *Lutjanus campechanus* or Red Grouper *Epinephelus morio*. Based on all video footage recorded during the study, only three fish on descender devices were depredated, and all three were Red Snapper.

Conclusions: Our study suggests that depredation, though a significant occurrence among ascending fish (i.e., fish being caught), does not frequently impact reef fish on descender devices. The video footage indicated that depredation of fish returning to depth on descender devices is exceedingly rare. The overall depredation rate of fish on descender devices was 0.3%, and the depredation rate of fish on descender devices at sites where fish were depredated on ascent was 1.3%.

Keywords: depredation, descender device, human–wildlife conflict

Lay summary

Our study suggests that depredation, though a significant occurrence among ascending fish, does not frequently impact reef fish on descender devices. Thus, U.S. Gulf of Mexico anglers can use descender devices to mitigate barotrauma in the reef fish fishery without concern that fish will be commonly depredated on descent.

Introduction

Depredation, a human–wildlife conflict involving the partial or complete removal of a hooked species by a nontarget species, has been a topic of global concern among fishermen as well as fisheries scientists and managers for decades (Drymon et al., 2020; Gilman et al., 2008; Mitchell et al., 2023). In recent years, recreational fishermen in Australia and the United States have reported increases in depredation, prompting intensified calls for action and mitigation (Mitchell et al., 2023). Thus far, depredation research and fishermen's apprehension about depredation have both primarily involved depredation on ascent (i.e., depredation of fish being caught; Mitchell et al., 2023). However, anglers' concerns about depredation on descent (i.e., depredation of fish being released on fish descender devices, primarily for regulatory reasons) represent another important facet that can hinder adoption of best practices like using descender devices (Drymon et al., 2020; Runde et al., 2022).

In the southeastern United States, two studies have recorded fish descender releases using underwater cameras; they reported zero occurrences of depredation on descent for Red Snapper *Lutjanus campechanus* off Alabama ($n = 1,096$ descender releases; Drymon et al., 2020) and the same for reef fish off North Carolina ($n = 114$ descender releases; Runde et al., 2022). Using fishery-independent approaches with local foci, these studies provided valuable insight into depredation rates on fish descender releases. We sought to investigate the broader applicability of those conclusions to recreational fisheries at regional scales. To accomplish this, we partnered with the charter-for-hire fishing fleet to document depredation rates of fish on descender devices across the U.S. Gulf of Mexico and identify the species responsible for depredation.

Methods

Several skilled charter-for-hire captains were recruited, trained, and financially incentivized to collect data for the study during their typical charter fishing trips. Captains were selected proportionally from the eastern, central, and western U.S. Gulf of Mexico based on their willingness to participate in the project. Ultimately, the time and effort required of the captains and their deckhands were too substantial compared with the incentive value, thus yielding low participation. To remedy this, the project team also collected data on similar but separate charter fishing trips (i.e., the project team served as the fishermen on these trips), particularly in locations where data from captains were lacking.

Two types of data were collected: (1) underwater video footage of fish descents on fish descender devices called SeaQualizers and (2) fishing site and fish descent information, including location, the number of fish that were depredated on ascent per site (total numbers of fish caught per site were not recorded, thus preventing any rate calculations), surface predator identity and quantity, and the species released. Downward-facing GoFish Cams were used to record video footage, and the configuration was designed to prevent the loss of the GoFish Cam if the SeaQualizer was snagged or

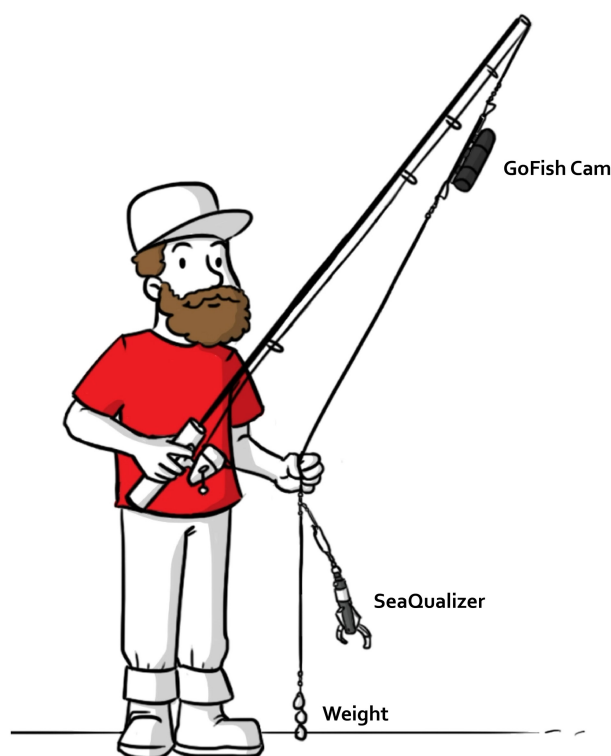


Figure 1 Illustration showing the gear configuration used to record fish descender releases throughout the study.

taken (Figure 1). The top of the GoFish Cam was attached to the mainline, and a snap swivel connected the bottom of the GoFish Cam to the rigging, which included the SeaQualizer and weight. The rigging monofilament always had lighter test than the mainline to ensure that the GoFish Cam would remain attached to the mainline.

All resulting video footage was then analyzed by two viewers. First, each recorded fish descent was assigned water clarity and vision field scores of good, fair, or poor. Descents with poor water clarity (e.g., released in deep, dark water) or a poor field of vision (i.e., released outside of the GoFish Cam's field of vision) were removed from further analysis due to an inability to adequately review the footage. If the viewers did not agree on whether a video should be removed due to poor water clarity or vision field scores, they consulted with each other to reach an agreement. Next, the presence and, if applicable, the identity of predators were logged. Finally, the fate of each descended fish was assigned (depredated, premature release from the descender device, or successful release from the descender device).

Results

From March 2022 to March 2024, 987 fish descents were successfully recorded on 119 trips off Texas, Louisiana, Alabama, and Florida (Figure 2), with a median of 5 fish descents recorded per trip (range = 1–67 descents). An additional 125 descents were excluded from further analysis due to poor water quality ($n = 50$) and/or a poor field of vision ($n = 85$). Fishing locations included waters offshore of Corpus Christi and Galveston, Texas ($n = 397$); Venice, Louisiana ($n = 98$);

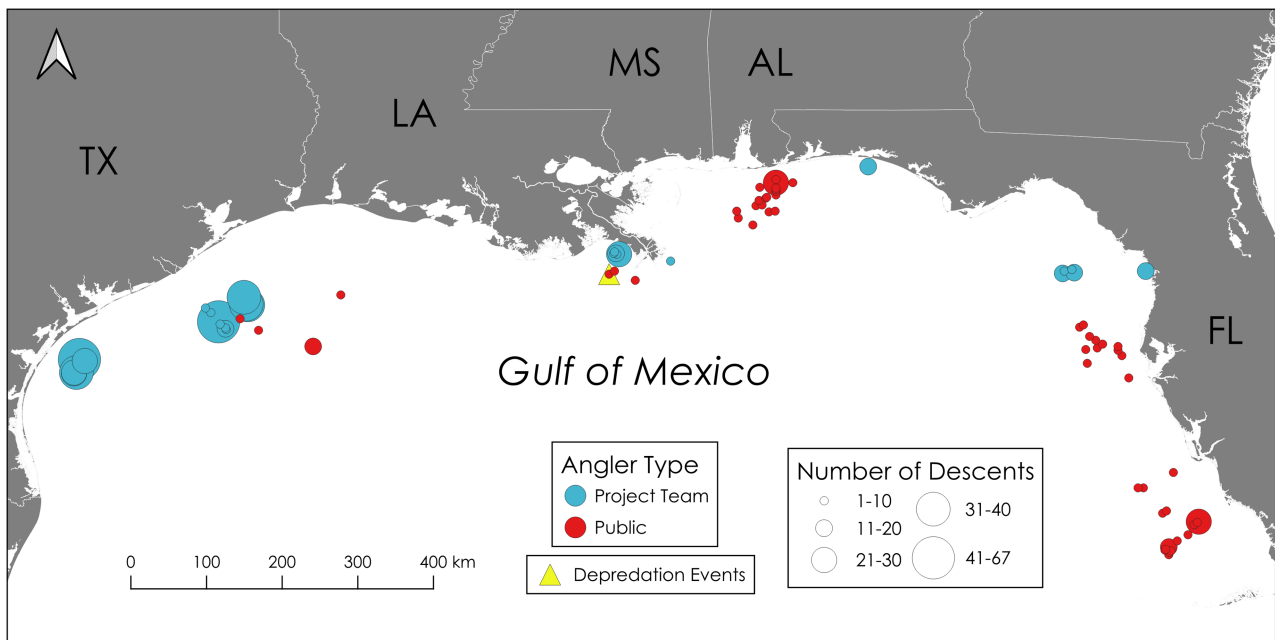


Figure 2 Map of all fish descender releases ($n = 987$) that were successfully recorded off Texas, Louisiana, Alabama, and Florida from March 2022 to March 2024. The color of each circle signifies whether members of the project team or members of the public were fishing. The size of each circle corresponds to the number of recorded descender releases at that particular location. The yellow triangle represents the approximate location of the three recorded depredation events on fish descender releases.

Dauphin Island and Orange Beach, Alabama ($n = 199$); and Destin, Crystal River, Tampa, Fort Myers, and Marco Island, Florida ($n = 293$). Approximately half of the descents ($n = 441$) were recorded by the charter-for-hire captains, and the remainder ($n = 546$) were recorded by the project team fishing with charter-for-hire captains. Most of the descended fish—representing 20 species in total—were Red Snapper ($n = 684$ [69% of descents]) or Red Grouper *Epinephelus morio* ($n = 197$ [20% of descents]). The remainder included mostly reef fish, such as other snappers and groupers, jacks, and triggerfish (Supplementary Table 1).

A total of 157 descents (16%) occurred at fishing sites where at least 1 fish and up to 10 fish were depredated on ascent. For 114 (12%) of all descents, predators were present at the surface. These included sharks ($n = 17$) and dolphins ($n = 97$). Altogether, 14 descents (1%) occurred at sites where fish were depredated on ascent and predators were present at the surface; 257 descents (26%) occurred at sites where fish were depredated on ascent or predators were present at the surface. For 44 (4%) of all descents, predators were apparent in the video footage (Figure 3; Supplementary Video 1). These included sharks ($n = 34$), dolphins ($n = 7$), and Atlantic Goliath Grouper ($n = 3$). Based on all video footage recorded during the study, only three fish on descender devices were depredated. All three events occurred off the coast of Venice, Louisiana, and involved a shark depredating a descending Red Snapper (Figure 3; Supplementary Video 1). In two of those cases (June 15, 2022, and the first of two on March 14, 2024), the depredator was a Blacktip Shark. In the third case (the second of two on March 14, 2024), we were unable to identify the shark to species. The two depredation events on March 14, 2024, occurred less than 30 min apart at the same

location. For all three depredation events, no predators were seen at the surface. For the depredation event on June 15, 2022, no depredation occurred on ascending fish at that fishing site. However, for the depredation events on March 14, 2024, one fish was depredated on ascent at that fishing site. In total, the overall depredation rate of fish on descender devices was 0.3%, and the depredation rate of fish on descender devices at sites where fish were depredated on ascent was 1.3%.

Discussion

Our study suggests that depredation, although a significant occurrence among ascending fish (i.e., fish being caught), does not frequently impact reef fish on descender devices. The video footage indicated that depredation of fish returning to depth on descender devices is exceedingly rare. Although this small chance of a fish being depredated on descent could be deemed significant considering that millions of reef fish are caught and released each year (National Marine Fisheries Service, 2026), the risk of depredation on descent is offset by the reduction in postrelease mortality associated with the use of descender devices (Bohaboy et al., 2020; Curtis et al., 2015; Runde et al., 2022). These findings contribute to the growing body of global depredation research (Mitchell et al., 2023), particularly given the study's regional scale and fishery-dependent approach. Furthermore, they echo the results of previous studies examining depredation rates on fish descender releases in the southeastern United States (Drymon et al., 2020; Runde et al., 2022). Thus, U.S. Gulf of Mexico anglers can use descender devices to mitigate barotrauma in the reef fish

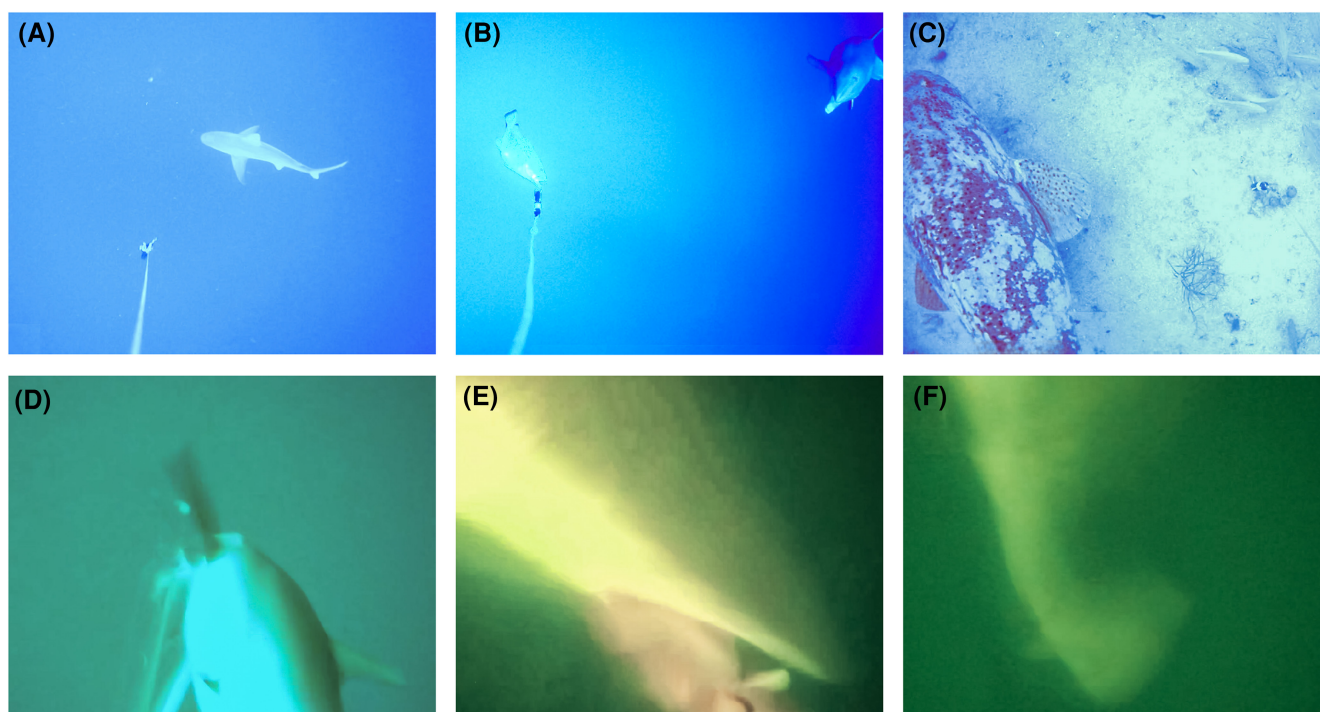


Figure 3 (A)–(C) Examples of predators (shark, dolphin, and Atlantic Goliath Grouper *Epinephelus itajara*) that were apparent in video footage of fish descender releases but did not depredate the fish while it was attached to the descender device or prey upon the fish immediately after it was released from the device and still in view of the camera. (D)–(F) Images of the three recorded depredation events on fish descender devices. In panel D, a Blacktip Shark *Carcharhinus limbatus* is facing down, away from the camera, with a Red Snapper in its jaws. In panel E, a Blacktip Shark is depredating a Red Snapper. In panel F, a blurred shark of unidentified species is facing down, away from the camera, with a Red Snapper in its jaws.

fishery without concern that the fish will be commonly depredated on descent.

Both of the depredation events recorded at the same location on March 14, 2024, involved sharks, but due to video limitations, it was impossible to determine if they were the same individual or two individuals of the same or different species. Given the infrequency of depredation on descent in this study, these two proximate events may be attributable to learned behavior, a capability that is well documented among sharks (Guttridge et al., 2009). Through associative learning and classical conditioning, sharks can mentally connect the presence of fishing vessels with the presence of food (Mitchell et al., 2018). Even if learned behavior did not play a role in the depredation events on March 14, 2024, the enhanced use of fish descender devices alongside escalating fishing effort (Mitchell et al., 2018) and the continued recovery of shark populations (Peterson et al., 2017) could concomitantly prompt sharks to learn to depredate fish from fish descender devices over time. Given these complex, intertwined anthropogenic and natural influences, additional studies should continue to investigate depredation rates of reef fish on descender devices, as these rates might eventually increase.

Notably, all three depredation events occurred off the coast of Venice, Louisiana, suggesting that location-specific factors could impact depredation rates on fish descender releases. For example, these might include abiotic factors, such as bottom structure or visibility; biotic factors, such as prey availability or predator abundance; and fishing practices, such as depth, target

species, fishing methods used (e.g., cut bait or chum), or types of fish descender devices used. The depredation rate in our study was so low that it was impossible to properly investigate or quantify the impacts of those types of factors. If depredation rates on fish descender releases do progressively increase, a more comprehensive understanding of these dynamics could inform future best practices guidelines and management decisions prioritizing the postrelease survival of reef fish.

Supplementary material

Supplementary material is available at [North American Journal of Fisheries Management](#) online.

Data availability

Data are available upon request.

Ethics statement

All research conducted meets the ethical guidelines and legal requirements of the United States.

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Conflicts of interest

None declared.

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