I. A device for greatly reducing fishing mortality of protected giant sea bass (*Stereolepis gigas*) and jewfish (*Epinephelus itajara*).

Michael L. Domeier, Ph.D.
Pfleger Institute of Environmental Research
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II. Abstract

California's giant sea bass and Florida's goliath grouper (formerly referred to as jewfish) are both very large protected species that are incidentally caught by recreational and commercial hook and line anglers. When brought to the surface the air in the swim bladder of these fishes expands greatly, making the fish so buoyant that it cannot swim back to the bottom when released. Good intentioned anglers often pierce the body wall and swim bladder to vent the excess air; although the fish swims away it usually dies from the injury. This final result of this project will be a device that returns the fish back to the bottom using detachable (and recoverable) weights, eliminating unintentional mortalities.

II. Executive Summary

A release device was designed and manufactured to allow commercial and recreational anglers a means of safely releasing large bottom fish with swimbladders. A prototype was built from which changes were made before a final product was produced. The final product was tested in the field on giant sea bass and goliath grouper. Fish captured and released with this device were shown to survive through the use of acoustic tagging and tracking. Twenty-five of these devices were manufactured for the distribution to commercial and party boats that routinely encounter these large protected species.

III. Purpose

This project responded directly to the Saltonstall-Kennedy priority A, Conservation Engineering, through the design, testing and deployment of a device specifically intended to dramatically reduce the incidental fishing mortality of two protected species. The two species of concern are the giant sea bass (*Stereolepis gigas*), found in the coastal waters of southern California, and the goliath grouper (*Epinephelus itajara*) found in the coastal waters of southern Florida. These two species are very similar in many respects; both reach a size in excess of 500 pounds, both have undergone serious population declines resulting in protected status, and both are incidentally caught by commercial and recreational anglers resulting in unnecessary mortalities.

Both giant sea bass and goliath grouper have a large swim bladder that expands as the fish are brought from depth to the surface (a result of decreasing pressure). Even when caught in moderate depths individuals become so buoyant that they are unable to swim back to the bottom when released; if left to float at the surface the fish will die. Good intentioned anglers will pierce the body wall and swim bladder of the affected fish with a knife or other sharp object, to release the air and allow the fish to sink back to the bottom. Laboratory work (Domeier, unpub.) has proven this method of "deflation" to

be fatal to the fish. If the fish does not immediately bleed to death it succumbs to systemic infection within two weeks. A special deflation device designed at the Pfleger Institute of Environmental Research has proven successful at safely deflating giant sea bass, but a percentage of the deflated individuals have been found to die of a fungal infection of the swim bladder one year after being deflated (Domeier, unpub.). Also, proper deflation requires the large fish to be brought onboard the vessel, stressing the animal and increasing the possibility of self-inflicted injury, and insertion of the deflation device must be done by a trained individual. Deflation may work for researchers bringing fish into the laboratory, but it clearly is not the solution for anglers attempting to release these protected species. We designed, manufactured, tested and distributed a new device that allows fishermen to return these species to the bottom without handling or puncture of the body wall, thereby greatly reducing incidental mortality.


FIGURE 1

II. Approach

Michael Domeier of the Pfleger Institute of Environmental Research designed the fish saving device and contracted Marv Tilco of Tilco Engineering to manufacture a prototype (Fig. 1). The idea behind the device was simple: attach a weight to the fish that will sink the fish to the bottom and then retrieve the weight via an attached rope. It was thought that the most reliable way to attach the weight was to incorporate it into a large hook that would penetrate the soft tissue of the jaw (lip gaff). The weighted gaff hook was designed such that the weight would hold the hook in place until it was retrieved by pulling on the rope. The weighted hook was mounted on a handle so that it could easily be placed on the fish, and then the hook was released from the handle so that it would sink freely to the bottom before being retrieved.


FIGURE 2

VI. Findings

The prototype was tested in the laboratory and alterations were made to the design before the device was tested in the field. Specifically, the rope was threaded through the handle of the prototype making the handle difficult to deal with once the weight was released and the rope was sliding through the handle. A single knot or kink in the rope could prevent the device from working properly. This was changed to a final design that did not have this feature, allowing the handle to be set aside once the weight was released. (Fig. 2). The final product also had a break-down handle for easy storage.

The device was used to release both giant sea bass in California and goliath grouper in Florida. Fish were released using both a 10 pound weight and a 20 pound weight (device designed so that weights were interchangeable). It was found that all but the largest fish could be released with the 10 pound weight; but very large fish (over 175 pounds) did require the heavier weight. By putting a diver in the water it became clear that it was not necessary for the weight to take the fish all the way to the bottom. In most cases the fish becomes active and swims off the hook after sinking just 10-15 feet, in some cases even less. This raises the possibility of constructing a simpler device that does not incorporate any weight, but instead uses a longer handle that is used to push the fish down. Although the weighted prototype worked very well, the weighted hook took practice to use it in a efficient and coordinated manner. A long un-weighted device might be simpler to use, but may not work for fish that are exhausted or very large.

Simply releasing fish is not sufficient to determine the long term effects of catch and release; to do this individual fish must be tracked for several days. Mortality that occurs as a result of catch and release has been shown to take place in the first few hours to days in striped marlin (Domeier and Dewar, in press) and in the first 2 weeks in giant sea bass (Domeier, unpub.). To track individual fish, both giant sea bass and goliath grouper were tagged with acoustic tags prior to release. This allowed for nearly continuous tracking of the individual fish once they were released with the new device. Two goliath grouper were tracked for up to 4 months, thirteen giant sea bass tracked for 4 months and 2 giant sea bass were tracked for over a year.

VII. Evaluation

All of the fish that were captured, tagged with an acoustic tag and released showed no ill effects from capture and release with the new device. Each acoustic tag transmits a signal that not only confirms the presence of the fish, but also relays the swimming depth of the fish. From changes in location and swimming depth we could positively confirm that each fish was alive. In fact, data collected for this study was of such quality that a separate paper that describes the habitat use and behavior of goliath grouper is being drafted for submission to a peer reviewed journal. Although mostly funded from other sources, the giant sea bass data will also be published.

The release device proved to be a great success and has already been of tremendous benefit to research projects. However, the primary purpose of this project was an effort to reduce accidental mortality of incidentally caught fish be recreational anglers and commercial fishermen. To this end, 20 of the devices were manufactured and distributed to sport fishing landings in California and Florida. In each case a meeting was arranged with the skipper of individual boats so that a hands-on demonstration could be conducted. These devices are currently on board these vessels and being used to release both giant sea bass and goliath grouper. An additional 4 devices remain at the Pfleger Institute of Environmental Research, ready to be distributed when the need arises, and one device will be retained for research projects.