

Barosafe: Increasing the Survivability of Bycatch that Experience Barotrauma in the Recreational Fisheries



Introduction

Groundfishing Charters like Eastman's Fishing Fleet target fish that are at depths greater than 250 feet. When these fish are caught and brought to the surface, the extreme difference in pressure can cause life threatening injuries. These injuries are known as **barotrauma** (Fig.4). In the ocean, for every 33 feet of depth, the hydrostatic pressure increases by 14.5 pounds per square inch (psi). If these fish are caught at 250 feet below sea level, their bodies are accustomed to a pressure of around 109.8 psi. When brought to the surface, where pressure is only about 15 psi, the air in the fish's organs (such as the swim bladder and eyes) expands and disrupts the internal anatomy.

Many fishing practices result in undesirable fish being caught. Some of the reasons why these fish can be considered undesirable include: sublegal size (juveniles), wrong species, wrong sex, etc. These fish are known as **bycatch**. If these fish are caught and retrieved from deeper water, many will experience severe barotrauma. When they are released at the surface, they may not be able to recover and will eventually die, defeating the purpose of throwing them back.

The **Barosafe** cage is a device created by Blue Water Concepts with input from a recreational charter boat captain from Eastman's Fishing Fleet, and UNH fisheries scientists. The cage (Fig. 1) is designed to rapidly transport distressed bycatch back to the original depth they were captured. This rapid, automated descent gives the fish a safe ride back to the bottom, and causes the air inside the fish to compress back to normal, thus greatly increasing their chances of survival.

Experimental Procedure

The device was tested in the Gulf of Maine, off the coast of Hampton Beach, on 4/29/16 and 5/25/16 by the members of the UNH Sustainable Fisheries and Aquaculture Club, Eastman's Fishing Fleet, NH Sea Grant Extension Specialists, as well as the design team from Blue Water Concepts (Fig. 2-3). The fish were caught by rod and reel that were dropped to the bottom of our randomized location. All fish, once at the surface, experienced barotrauma (Fig 4). The bycatch were put into the top Barosafe's tube shaped cage. No more than 3 fish were placed in the cage for each drop. The bycatch were only left out of the water for no more than 3 minutes at a time. The one button on the control pan would release the magnet that held the tube suspended and lower the device down to depth. On the way down, the bycatch would compress to normal. At depth, the cage's bottom would open and the bycatch would be released (Fig.5). The cage is then motorized to go back up to the surface, reattach to the magnet and be ready for the next decent. The process was GoPro'ed all the bottom and the fish were filmed compressing back to their livable state. The device took an average of about 1 to 2 minutes for the full descent and surface. CTD analyses were taken on both trips and showed just how much pressure change these fish were experiencing. The device was tested several times at randomized locations.

Results

Over the two testing days, the cage was tested multiple times. Out of about the 32 to 50 fish that were considered bycatch for Eastman's Fishing Fleet, only 2 were observed returned to the surface (deceased). This is a smaller ratio of deceased bycatch than the normal fishing day ratio without the Barosafe. CTD analysis showed that the fish were experiencing a change in pressure from about 60 to 70 dBars at depth of about 60 meters to about 0 dBars at the surface in a matter of minutes.

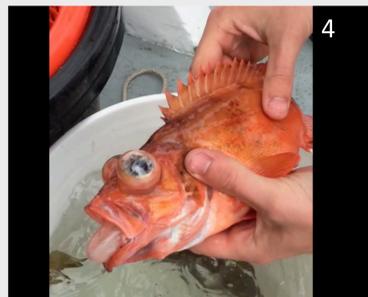


Fig. 4: Acadian Redfish suffering from severe barotrauma before release. Notice Bulging eyes and air bladder protruding from mouth.

Fig. 5: Same Redfish after release with the Barosafe. The fish appears normal and swims away under own power.

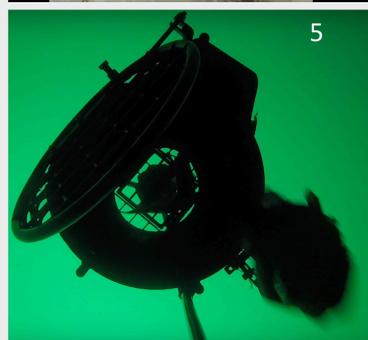


Fig. 1: Barosafe device on deck prior to deployment.



Fig. 2-3: Device being setup and loaded during first sea trial on 4/29/16.

Conclusion and Future Goals

The Barosafe device was a success as the videos showed fish compressing back to normal as they were being brought down to depth. GoPro videos did show the fish compressing back to their livable state and flutter swim out of the cage with depth

Goals:

- More research and trials need to be conducted to improve the effectiveness of the device as well as further development and improvements.
- Increase the public's interest in the device
- Explore funding to build a next generation of the Barosafe cage to be used on multiple vessels in New Hampshire's Recreational Fishing Fleets.

Acknowledgments

Poster Design: John Taylor and Jared O'Brien

Picture Credits: Rebecca Zeiber, N.H. Sea Grant // UNH Sustainable Fisheries and Aquaculture Club

For more information contact: Erik Chapman, Ph.D., NH Sea Grant, Erik.Chapman@unh.edu