**Tab E, No. 5**
**5/25/2017**

# Possessing Venting Tools and Descending Devices When Fishing for Reef Fish

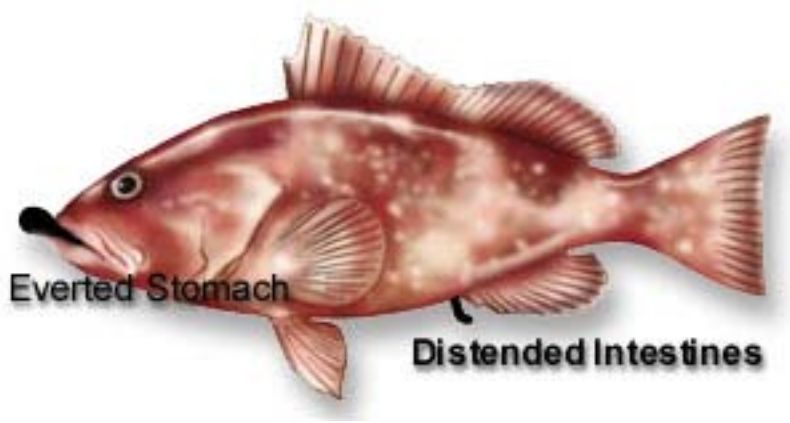


**Image from Florida Sea Grant**

## Options Paper for a Framework Action to the Fishery Management Plan for the Reef Fish Resources of the Gulf of Mexico

*This is a publication of the Gulf of Mexico Fishery Management Council Pursuant to National Oceanic and Atmospheric Administration Award No. NA15NMF4410011.*

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# ENVIRONMENTAL ASSESSMENT COVER SHEET

**Name of Action**

Framework Action for Possessing Venting Tools and Descending Devices When Fishing for Reef Fish

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**Type of Action**

( ) Administrative
(X) Draft

( ) Legislative
( ) Final

# ABBREVIATIONS USED IN THIS DOCUMENT

| | |
|---|---|
| Council | Gulf of Mexico Fishery Management Council |
| NMFS | National Marine Fisheries Service |
| NOAA | National Oceanic and Atmospheric Administration |

# TABLE OF CONTENTS

# LIST OF TABLES

# LIST OF FIGURES

# CHAPTER 1. INTRODUCTION

## 1.1 Background

National Standard 9 of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) states that conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch. One source of mortality is the effects of barotrauma caused by gasses escaping from ruptured swim bladders into the fish's abdominal cavity. A variety of tools are available to help increase survival of released reef fish, including venting tools, which release the gasses from the fish's abdominal cavity, and descender devices, which lower the fish to a depth at which the effects of barotrauma are reduced and the fish can swim away. Appendix A provides a summary of research into the effectiveness of venting tools and descender devices. Examples of venting tools and descender devices are shown in Appendix B and Appendix C, respectively.

When used appropriately, these devices can help improve the survival of released fish. However, the use of a venting tool or descending device may not be necessary in every situation. When used inappropriately, such tools do not contribute to the survival of reef fish, and may even cause increased stress and additional damage to vital organs (Wilde 2009; Eberts and Somers 2017). Even when these devices are used properly, survival can be affected by factors such as hook trauma, physical overexertion, barotraumas, temperature differentials, and handling time (Pulver 2017; Campbell et al. 2014).

Reef Fish Amendment 27/Shrimp Amendment 14 (GMFMC 2007), implemented in 2008, required reef fish fishermen to use non-stainless steel circle hooks when using natural baits, as well as venting tools and dehooking devices to reduce mortality of released fish. Because of the requirement to "use" venting tools, fishermen who complied with the rule would sometimes be forced to vent reef fish that were not in need of venting. This requirement also either precluded the use of alternative tools such as descender devices or subjected the fish to additional unnecessary handling stress. For this reason, the venting tool requirement was repealed in 2013 (GMFMC 2013).

In recent years, a number of devices have been developed to assist fishermen in returning reef fish to depth when releasing them. The use of descender devices is gaining in acceptance and popularity. At the same time, the use of venting tools, while no longer required, can still reduce discard mortality when used correctly and under the appropriate conditions.

***Gulf of Mexico Fishery Management Council***

- Responsible for conservation and management of fish stocks.
- Consists of 17 voting members: 11 members are appointed by the Secretary of Commerce, 1 voting member represents each of the five Gulf states, and the Regional Administrator for the National Marine Fisheries Service Southeast Region.
- Responsible for developing fishery management plans and recommending regulations to the National Marine Fisheries Service for implementation.

***National Marine Fisheries Service***

- Responsible for preventing overfishing while achieving optimum yield.
- Approves, disapproves, or partially approves Council recommendations.
- Implements regulations.

## 1.2 Purpose and Need

The purpose of this action is to suggest ways in which management can encourage the use of venting tools and descender devices while giving fishermen the flexibility to decide if and when they are appropriate to use.

The need is to reduce discard mortality to the extent practicable through the use of devices intended to increase survival of released fish, thereby minimizing bycatch or minimizing the mortality of such bycatch.

## 1.3 History of Management

In November 1999, the Council passed a motion to encourage red snapper fishermen to use circle hooks as a way to reduce release mortality. Council members felt that fishermen could be encouraged to use circle hooks through public information bulletins. However, the Council and the National Marine Fisheries Service (NMFS) only pursued limited public notice. An article encouraging fishermen to use circle hooks when fishing for red snapper and other reef fish was published in the October-December 1999 issue of *Gulf Fishery News* (Vol. 21, No. 5).[1] In 2003, NOAA Public Affairs published an article encouraging recreational fishermen to use circle hooks when fishing for highly migratory species.[2] Sea Grant programs have also published information on the use of circle hooks.[3]

[1] http://gulfcouncil.org/Beta/GMFMCWeb/newslet/nlet1199.pdf
[2] http://www.nmfs.noaa.gov/publications/circle_hooks_story_final.pdf
[3] http://nsgl.gso.uri.edu/flsgp/flsgpg08003.pdf

**Reef Fish Amendment 27/Shrimp Amendment 14**, implemented February 2008, required the use of non-stainless steel circle hooks when using natural baits and required the use of venting tools and dehooking devices. These requirements applied to both commercial and recreational reef fish fishermen.

An **April 2013 Framework Action**, implemented September 3, 2013, removed the requirement to have onboard and use venting tools when releasing reef fish.

A **June 2016 Framework Action**, implemented March 13, 2017, removed the requirement to use circle hooks when fishing with natural bait for the commercial harvest of yellowtail snapper south of Cape Sable, Florida, in the Gulf of Mexico.

In April 2017, the Council passed a motion instructing staff to develop an action to require either descending devices or venting tools on board vessels possessing reef fish to reduce discard mortality.

# CHAPTER 2. MANAGEMENT ALTERNATIVES

## 2.1 Action 1 – Possession of Venting Tools or Descending Devices

**Alternative 1**. No Action. Do not require or recommend that venting tools or descending devices be present on board vessels where reef fish are present.

**Alternative 2**. Establish a policy that the Council recommends vessels fishing for reef fish possess either descending devices or venting tools on board.

**Alternative 3**. Require that vessels where reef fish are on board possess

Option a. Venting tools
Option b. Descending devices
Option c. Either venting tools or descending devices
Option d. Both venting tools and descending devices

Descending devices should be rigged and ready for use while fishing is occurring.

**Alternative 4**. Develop an outreach program in conjunction with Sea Grant programs, to educate fishermen on the availability and correct use of venting tools and descending devices, including best handling techniques to minimize stress to the fish.

Note: **Alternative 4** can be adopted either by itself or in combination with **Alternative 2** or **3**.

**Discussion**:

Release mortality estimates for reef fish range from 5% (recreational fishing in nearshore waters) to 90% or higher (commercial longlining in deep waters). During the period when the use of venting tools was required, some stock assessments assumed a reduction in discard mortality for fish that were vented (Table 2.1.1).

**Table 2.1.1**. Release mortality rates used in recent reef fish stock assessments.

| Stock | Release Mortality Rate | Assessment |
|---|---|---|
| **Vermilion snapper** | 15% | SEDAR 45 |
| **Gray triggerfish** | 5% | SEDAR 43 |
| **Red grouper** | 11.6% recreational<br>19% vertical line<br>43.6% longline | SEDAR 42 |
| **Hogfish** | 10% hook & line<br>100% spear | SEDAR 37 |
| **Greater amberjack** | 10% with venting<br>22% without venting | SEDAR 33 |
| **Red snapper** | Depth-dependent<br>10%-11% recreational with venting<br>21%-22% recreational without venting<br>55%-88% commercial with venting<br>74%-95% commercial without venting | SEDAR 31 |

Venting tools and descending devices, when used properly, have been shown to increase survival of released fish in some, but not all, circumstances. Depth of capture, handling time, and the presence of predators are among the factors affecting survival of released fish. Venting tools and descending devices can be either commercially manufactured or home-made. There is no legal definition for these devices. For the purpose of this Framework Action, the following are suggested definitions.

Venting tool: A venting tool is a device capable of penetrating the abdomen of a fish in order to deflate the expanded air due to a ruptured air bladder from the body cavity of a fish retrieved from depth, with minimum damage. A venting tool must be a sharpened, hollow instrument, such as a hypodermic syringe with the plunger removed, or a 16–gauge needle fixed to a handle. A larger gauge needle is preferred in order to allow more air to escape rapidly. A device that is not hollow, such as a knife or ice pick, is not a venting tool, although it may be possible to use such a device to vent a fish in the absence of a venting tool.

Descending device: A descending device is an instrument that can return a fish to depth with minimum injury to the fish. The fish need not be returned to the bottom, but to a depth sufficient for the fish to be able to recover from the effects of barotrauma, generally 33 feet (1 atmosphere of pressure) or greater. The device can be a weighted hook, lip clamp, or box that will hold the fish while it is lowered to depth, and will either release the fish automatically, or release the fish by actions of the operator of the device, or will allow the fish to escape on its own. Since minimizing surface time is critical to increasing survival, descending devices should be rigged and ready for use while fishing is occurring.

**Alternative 1** maintains the status quo of the Gulf of Mexico Fishery Management Council (Council), which neither encourages nor requires that venting tools or descending devices be carried on board reef fish fishing vessels. Sea Grant and other organizations have promoted the use of venting tools. Many fishermen may still possess venting tools that were obtained on their own initiative or during the 2008-2013 period when the possession and use of such tools was required. Fishermen may also possess descending devices, although likely to a lesser extent given that commercially made descending devices are a more recent development.

**Alternative 2** establishes a policy that the Council recommends that vessels fishing for reef fish in federal waters of the Gulf possess either descending devices or venting tools on board, but does not require possession or use of such devices. To be effective, this alternative should be supplemented with further education for fishermen, such as with an outreach program as proposed in **Alternative 4**.

**Alternative 3** requires that vessels with reef fish on board in federal waters of the Gulf possess either venting tools or descending devices. The alternative does not require the use of the devices, but leaves such use to the discretion of the fisherman. The options in this alternative would apply the requirement to venting tools only (**Option a**); descending devices only (**Option b**); either venting tools or descending devises (**Option c**); or **Option d**: both venting tools and descending devices (**Option d**). Although **Option a** and **Option b** would require only one type of device, they would not preclude both types of devices from being on board.

Venting tools are relatively inexpensive ($9.00 to $17.00) and require little or no preparation to use. However, they may be subject to clogging, which can hinder or prevent gasses from escaping. In addition, these are not a one size fits all solution. Larger fish may need a larger needle in order to properly vent, so fishermen using these tools may want to have a variety of sizes on hand.

Many descending devices need to be rigged to a rod and reel to be used. If not pre-rigged, the time needed to rig the device may contribute to mortality of the fish. Therefore, this alternative requires that, if descending devices are required, they be rigged and ready for use while fishing for reef fish is occurring. This means that a rod and reel may need to be dedicated to the descending device, which will increase gear costs. Commercially available descending devices cost from $5.00 to $60.00.

Not all fish need to be vented or returned to depth using a descender device. This alternative only requires the possession of the devices if reef fish are aboard, and leaves the use of such a device to the discretion of the fisher. However, use of these devices will not increase survival of fish if the devices are not used when appropriate or are used improperly. Therefore, this alternative should be combined with an outreach program such as that contained in **Alternative 4**.

**Alternative 4** calls for the Council, in conjunction with Sea Grant programs, to develop an outreach program to educate fishermen on the availability and correct use of venting tools and descending devices. The Council could develop such a program on its own or in conjunction with NMFS or some other entity. However, Sea Grant already has an outreach program for venting tools, although the level of outreach may vary from state to state. Many fishermen may possess the venting tools but may not use them or use them improperly. For example, a common mistake by many fishermen when using venting tools is to puncture the inverted stomach that is protruding from the fish's mouth. This does not relieve the air trapped in the body cavity and may do more harm than good. An outreach program can inform fishermen not only of the need for venting tools and descending devices, but also of the proper way to use them. **Alternative 4** can be selected in combination with **Alternative 2** or **Alternative 3**, or as a stand-alone alternative.

# CHAPTER 3. REFERENCES

Campbell, M.D., W.B. Driggers, B. Sauls, and J.F. Walter. 2014. Release mortality in the red snapper fishery: a meta-analysis of three decades of research. Fishery Bulletin. 112:283-296.

Eberts, R.L. and C.M. Somers. 2017. Venting and descending provide equivocal benefits for catch-and-release survival: study design influences effectiveness more than barotrauma relief method, North American Journal of Fisheries Management, 37:3, 612-623.

GMFMC. 2007. Final amendment 27 to the reef fish fishery management plan and amendment 14 to the shrimp fishery management plan including supplemental environmental impact statement, regulatory impact review, and regulatory flexibility act analysis. Gulf of Mexico Fishery Management Council. Tampa, Florida. 490 pp with appendices. http://www.gulfcouncil.org/Beta/GMFMCWeb/downloads/Final%20RF%20Amend%2027-%20Shrimp%20Amend%2014.pdf

GMFMC. 2013. Framework action to set the annual catch limit and bag limit for vermilion snapper, set annual catch limit for yellowtail snapper, and modify the venting tool requirement. Gulf of Mexico Fishery Management Council, Tampa, Florida. 171 p. http://gulfcouncil.org/docs/amendments/2013%20Vermilion-Yellowtail-Venting%20Tool%20Framework%20Action.pdf

Pulver, J. R. 2017. Sink or swim? Factors affecting immediate discard mortality for the Gulf of Mexico commercial reef fish fishery. Fisheries Research, 188:166-172.

Wilde, G.R. 2009. Does venting promote survival of released fish? American Fisheries Society, Fisheries 34(1):20-28

# APPENDIX A – SUMMARY OF VENTING TOOL AND DESCENDING DEVICE RESEARCH

In 1996, the Sustainable Fisheries Act added National Standard 9 to the list of national standards for fishery conservation and management. This standard stated, "Conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch."

In response to National Standard 9, Reef Fish Amendment 27, implemented in June 2008, required the use of non-stainless steel circle hooks when using natural baits to fish for Gulf of Mexico reef fish, and required the use of venting tools and dehooking devices when participating in the reef fish (commercial and recreational) fishery. At that time, available information suggested that venting increases survival in red snapper caught in deep water (K. Burns and C. Porch, affiliations, pers. comm). However, subsequent reports have questioned the effectiveness of venting (Wilde 2009). In addition, new methods and devices have been developed that help a fish return to depth to recompress, rather than vent, the fish. Also, some fish caught in shallower waters may not need to be vented. In such cases, attempts at venting the fish may cause more harm than good, particularly if done improperly (Wilde 2009; Pulver 2017; Eberts and Somers 2017).

The intent of the requirements was implemented under Amendment 27 (GMFMC 2007) to use venting tools, non-stainless steel circle hooks when using natural baits, and dehooking tools when fishing for reef fish was to reduce release mortality. At the time, the available scientific information generally supported the use of venting as a way to improve survival of released fish. Preliminary data from a 15-year study conducted at Mote Marine Lab (K. Burns and C. Porch, affiliations, pers. comm) suggested that venting increases survival in red snapper caught in deep water. This study was in contrast to earlier studies by Render and Wilson (1993) and Gitschlag and Renaud (1994), who found no increase in survival from venting. Collins et al. (1999) compared survival of vented and unvented black sea bass and vermilion snapper. Deflation of the swim bladder provided very significant reductions in mortality of black sea bass, and benefits of deflation increased with capture depth. Deflation for vermilion snapper was also beneficial, but to a lesser extent.

Additional studies appeared to question the usefulness of venting. Rummer (2007) noted that excessive handling and use of landing nets when fish are retrieved and released can cause physical injury and physiological stress, yet venting requires handling a fish long enough to vent. Rummer (2007) noted that ongoing studies by other researchers showed that, while venting prevents immediate (within 24 hours) mortality in juvenile red snapper, vented fish display loss of equilibrium and righting response and are therefore susceptible to predation. Wilde (2009) reviewed the results of 17 studies that evaluated venting in 21 fish species and 1 composite group. Overall, he found that, while venting was slightly beneficial to fish captured from shallow waters, it appeared to be increasingly harmful for fish captured from progressively deeper waters. Based on his findings, Wilde suggested that venting fish should not only be

discouraged by fishery management agencies, but should be prohibited, rather than required, by regulation.

Since the review by Wilde (2009), additional research has been conducted on the effects of venting and of barotrauma on fish, and new methods and devices have been developed that help a fish return to depth to recompress, rather than vent, the fish. In April 2012, FishSmart held a workshop[4] in St. Petersburg, Florida to review the current state of knowledge of barotrauma effects, venting and devices for returning fish to depth (rapid descent devices), and other factors affecting released fish survival, and to develop information that could help anglers improve the survival of fish that they catch and release (Loftus and Radonski 2012). A complete summary of the FishSmart workshop is available at http://www.FishSmart.org. Relevant information from the workshop is summarized below.

At the FishSmart workshop, several presentations were made reviewing the effects of barotrauma, the effectiveness of venting and rapid descent devices, and other methods for improving survival of fish. Theberge (2012) compared the usefulness of venting tools to rapid descent devices. He noted that venting tools are inexpensive and can be used quickly to vent a large number of fish. However, they subject the fish to possible infection, and could be harmful if used incorrectly or if they punctured internal organs. Rapid descent devices have no risk of causing infection or internal organ damage, but require a dedicated rod and reel, take longer to use, and can be more difficult to use in rough weather. Theberge (2012) noted that different species had different swim bladder structures and different responses to handling stress, which affected the choice of release methods. Burns (2012) also noted that different species have different physiologies, which, along with depth and other factors, impacts their response to barotrauma. For example, red grouper are very susceptible to barotrauma but have a low hook mortality, whereas red snapper are the opposite. Rudershausen et al. (2012) evaluated factors affecting survival of black sea bass caught in 95 to 110 feet. They found that swim down behavior appeared to be a reliable proxy for survival of black seas bass. Using tagging as a form of venting, swim-down survival was not significantly different for vented versus unvented fish, but a higher percentage of tagged fish than untagged fish swam down. Fluech et al. (2012) evaluated several different types of fish descender devices. They concluded that, at a minimum, improved catch and release practices (including venting and recompression) do some fish some good. However, no one device or method was the best for all situations, and they recommended that fishermen have a variety of release tools on board. Stunz (2012) used both field and laboratory studies to evaluate venting vs. non-venting. He found that, in addition to depth, there was a clear seasonal effect on mortality with higher temperature leading to higher discard mortality. As a result, he recommended venting, especially in the summer, but cautioned that additional research was needed.

The FishSmart workshop participants concluded that, in some circumstances venting may be an appropriate action, while in other circumstances the use of descent devices may provide a greater

[4] FishSmart regional workshop on improving survival of angler caught and released fish with a focus on Gulf of Mexico and South Atlantic recreational fisheries. April 11-13 2012, St. Petersburg, Florida. http://www.fishsmart.org/GulfSA%20Workshop.htm

likelihood for survival. In yet other circumstances, the best approach may be to use neither venting tools nor descent devices, but to simply release the fish with as little handling and surface time as possible. One workshop recommendation directed specifically at the Gulf Council was that the regulation requiring reef fish vessels to possess and use venting tools be changed to require the use of venting tools when needed (rather than at all times).

In June 2012, the SSC reviewed a summary of the FishSmart workshop, as well as presentations on research into release mortality and barotrauma effects (GMFMC 2012). The SSC also reviewed the paper by Wilde (2009) that questioned the effectiveness of venting. The SSC concluded that, in the time since the Wilde paper was published, new information had been published, including the studies presented to the SSC and at the FishSmart workshop, that supported the use of venting and descent devices. The use of descent devices may be preferable to venting in some situations, but is time consuming and requires additional gear. On the other hand, the SSC felt that there is evidence that not only fishermen but also some researchers are using improper methods to vent fish. In addition, there are situations when neither venting nor decent devices are needed. The SSC felt that fishermen should have the option of deciding the most appropriate way to release fish. As a result, the SSC made three recommendations to the Council.

1) The SSC recommended that the Council give fishermen the option of venting "as necessary" and/or be allowed to use descent devices to minimize barotrauma mortality.

2) The SSC also felt that there is a clear need for outreach and education, and recommended that the Council cooperate, as appropriate, with the Gulf states, interstate commissions, and Sea Grant to increase outreach and education efforts dedicated to reducing release mortality, and eliminate inconsistencies in current public relations materials.

3) The SSC recommended that the Council encourage continued research on means of reducing mortality of released fish, given the importance of reducing discard mortality, and given the rapid development of new technology in this area.

Based on the above information, the Council in 2013 removed the requirement to have onboard and use venting tools when releasing reef fish (GMFMC 2013). Since then, additional studies have been published on the effectiveness of venting or descending devices. The following is from a summary prepared by the South Atlantic Fishery Management Council[5].

Two recent red snapper discard mortality papers reported on the potential for using descending devices and venting to improve survivorship of released red snapper (Curtis et al. 2015, Drumhiller et al. 2014). Surface released fish (non-vented and not descended) were three times as likely to suffer mortality compared to descended fish and 1.9 times as likely to suffer mortality compared to vented fish (Curtis et al. 2015). The researchers also noted an effect of season on discard mortality. Rapid recompression (descending device simulation) reduced

[5] Red Snapper Discard Mortality Review.
http://safmc.net/download/Briefing%20Book%20March%202017/TAB%2007%20Snapper%20Grouper%20Committee/A04b_LitRev_RedSnapperDiscardMortality.pdf

discard mortality for fish with simulated capture from 30 and 60 meters (98 and 197 feet; Drumhiller et al. 2014). The mortality for fish released at 30 meters decreased from 33% to 0% and for fish released at 60 meters decreased from 83% to 17%.

Diamond et al. 2011 indicated that recompression and venting did not significantly improve discard mortality rates, although the study noted some issues with tag recovery and acoustic reception.

Campbell et al. (2014) and Pulver (2017) indicated that venting reduced the immediate discard mortality, but venting also increased the delayed discard mortality rates in Campbell et al. (2014). The researchers indicated that descending devices might be the best option and venting might be a good second option to help the fish resubmerge, although descending devices were not included in their analysis.

## REFERENCES


Burns, K. 2012. Gulf of Mexico overview: barotrauma - predation - circle hooks. PowerPoint presentation at the Gulf of Mexico South Atlantic FishSmart workshop on survival of released fish. Available at: http://www.fishsmart.org/sites/g/files/g1490811/f/201404/FS_GULF_12_BurnsGOMCharacterization.pdf

Campbell, M.D., W.B. Driggers, B. Sauls, and J.F. Walter. 2014. Release mortality in the red snapper fishery: a meta-analysis of three decades of research. Fishery Bulletin. 112:283-296.

Collins, M. R., J. C. McGovern, G.R. Sedberry, J. S. Meister, and R. Pardieck. 1999. Swim bladder deflation in black sea bass and vermilion snapper: Potential for increasing post release survival. North American Journal of Fisheries Management 19:828-832.

Curtis, J.M., M.W. Johnson, S.L. Diamond, and G.W. Stunz. 2015. Quantifying delayed mortality from barotrauma impairment in discarded red snapper using acoustic telemetry. Marine and Coastal Fisheries. 7: 434-449.

Diamond, S. L., T. Hedrick-Hopper, G. Stunz, M. Johnson, and J. Curtis. 2011. Reducing discard mortality of red snapper in the recreational fisheries using descender hooks and rapid recompression. Final report, grant no. NA07NMF4540078, 52 p. [Available from http://www.sefsc.noaa.gov/P_QryLDS/download/CR262_Diamond_2011.pdf?id=LDS.]

Drumhiller, K.L., M.W. Johnson, S.L. Diamond, M.M. Reese Robillard, and G.W. Stunz. 2014. Venting or rapid recompression increase survival and improve recovery of red snapper with barotrauma. Marine and Coastal Fisheries. 6: 190-199.

Eberts, R.L. and C.M. Somers. 2017. Venting and descending provide equivocal benefits for catch-and-release survival: study design influences effectiveness more than barotrauma relief method, North American Journal of Fisheries Management, 37:3, 612-623.

Fluech, B., J.Stevely, and B. Staugler. 2012. Practical evaluation of fish recompression tools. PowerPoint presentation at the Gulf of Mexico South Atlantic FishSmart workshop on survival of released fish. Available at:
http://www.fishsmart.org/sites/g/files/g1490811/f/201404/FS_GULF_12_Stevelyoutreach.pdf

Gitschlag, G. R. and M. L. Renaud. 1994. Field experiments on survival rates of caged and released red snapper. North American Journal of Fisheries Management 14: 131-136.

GMFMC. 2007. Final amendment 27 to the reef fish fishery management plan and amendment 14 to the shrimp fishery management plan including supplemental environmental impact statement, regulatory impact review, and regulatory flexibility act analysis. Gulf of Mexico Fishery Management Council. Tampa, Florida. 490 pp with appendices.
http://www.gulfcouncil.org/Beta/GMFMCWeb/downloads/Final%20RF%20Amend%2027-%20Shrimp%20Amend%2014.pdf

GMFMC. 2012. Standing and Special Reef Fish SSC Meeting Summary – June 7-8, 2012. Gulf of Mexico Fishery Management Council, Tampa, Florida. 13 p.
http://gulfcouncil.org/docs/SSC%20Reports/Reef_Fish_SSC-June_2012.pdf

GMFMC. 2013a Framework action to set the annual catch limit and bag limit for vermilion snapper, set annual catch limit for yellowtail snapper, and modify the venting tool requirement. Gulf of Mexico Fishery Management Council, Tampa, Florida. 171 p.
http://gulfcouncil.org/docs/amendments/2013%20Vermilion-Yellowtail-Venting%20Tool%20Framework%20Action.pdf

Loftus, A.J. and G.C. Radonski. 2012. FishSmart Gulf of Mexico/South Atlantic workshop on improving the survival of released fish focusing on barotrauma. 32 pp. Available at:
http://www.fishsmart.org/sites/g/files/g1490811/f/201404/FS_GULF_12_Full_Report.pdf

Pulver, J. R. 2017. Sink or swim? Factors affecting immediate discard mortality for the Gulf of Mexico commercial reef fish fishery. Fisheries Research, 188:166-172.

Render, J. H., and C. A. Wilson. 1993. Hook-and-line mortality of caught and released red snapper around oil and gas platform structural habitat. Bulletin of Marine Science 55:1106-1111.

Rudershausen, P.J., J.A. Buckel, and T. Burgess. 2012. Estimating discard mortality of black sea bass (Centropristis striata) using a tag-return approach. PowerPoint presentation at the Gulf of Mexico South Atlantic FishSmart workshop on survival of released fish. Available at:
http://www.fishsmart.org/sites/g/files/g1490811/f/201404/FS_GULF_12_BuckelSAresearch.pdf

Rummer, J.L. 2007. Factors affecting catch and release (CAR) mortality in fish: insight into CAR mortality in red snapper and the influence of catastrophic decompression. American Fisheries Society Symposium 60:113–132.
Also: Gulf of Mexico Fishery Management Council SEDAR 31-RD29. Available at:

http://www.sefsc.noaa.gov/sedar/download/SEDAR31-RD29-%20Factors%20affecting%20CAR%20mortality%20in%20RS.pdf?id=DOCUMENT

Stunz, G. 2012. Minimizing discard mortality in the red snapper fishery in the Gulf of Mexico. PowerPoint presentation at the Gulf of Mexico South Atlantic FishSmart workshop on survival of released fish. Available at: http://www.fishsmart.org/sites/g/files/g1490811/f/201404/FS_GULF_12_StunzGOMandmarinemammals.pdf

Therberge, S. 2012. Framing the issue in the Gulf of Mexico and SE Atlantic: developing practical, effective methods for reducing barotrauma mortality in fish. PowerPoint presentation at the Gulf of Mexico & South Atlantic FishSmart workshop on survival of released fish.
Wilde, G.R. 2009. Does venting promote survival of released fish? American Fisheries Society, Fisheries 34(1):20-28

Wilde, G.R. 2009. Does venting promote survival of released fish? American Fisheries Society, Fisheries 34(1):20-28

# APPENDIX B – VENTING TOOLS

Venting tools can be either commercially made or home-made. This simplest version is a large gauge (e.g., 16 gauge) hypodermic needle with the plunger removed. A venting tool of this type was developed by Florida Sea Grant and Mote Marine Lab and was sold in retail outlets as the Florida Sea Grant Novak Venting Tool Kit (Figure A.1). It has been discontinued but may still be available from some vendors.

Commercially made venting tools are also available, such as the one shown in Figure A.2. These devices usually are designed to allow the needle to be retracted or folded into a protective sheath to prevent injury. Several brands became available after the Council required venting tools in Amendment 23. In several cases the companies are no longer in business, but venting tools are usually available at tackle shops or from online vendors.

Pros: inexpensive, no need to pre-rig
Cons: Hollow bore can clog, not a one size fits all solution, often used incorrectly
Cost: $9 to $17 plus weights

**Figure B.1**. Florida Sea Grant venting tool

**Figure B.2**. Commercial venting tool

# APPENDIX C – DESCENDING DEVICES

Weighted Hooks

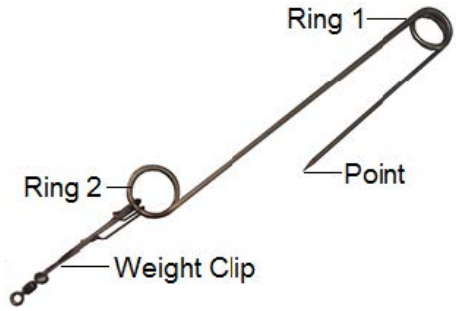


**Figure C.1.** Captain Roy's Fish Saver Device


**Figure C.2.** SFD™ (Shelton Fish Descender™)

**Figure C.3**. Weighted hook

Lip Clamp Devices

**Figure C.4**. Seaqualizer™

**Figure C.5**. RokLees EcoLeeser™

**Figure C.6**. Blacktip Catch & Release Recompression Tool

## C.1 Weighted hooks

Weighted hooks can be either commercially made or home-made. The weight can be an integral part of the hook or a separate attachment. Its function is to hold the hook upside-down and to provide weight to return the fish to depth. When the fish has reached the desired depth, an upward tug on the line releases the fish.

Pros: inexpensive
Cons: It can be difficult to keep the fish on the hook
Cost: $6 to $20 plus weights

**Figure C.7.** Inverted utility crate

## C.2 Lip Clamp Devices

These devices work in a way similar to weighted hooks, except that they are attached to the fish's lower lip using a clamp rather than a hook. A weight helps to return the fish to depth. Some devices are designed to release the fish when the device impacts the bottom. Others allow the fish to be released at a desired depth by jerking up on the line. One device, the Seaqualizer™, can be adjusted to automatically release the fish at a pre-determined depth.

Pros: Easy to use. Seaqualizer can be set to specific release depths
Cons: More expensive than other devices.
Cost: $55 to $60

**Figure C.8**. Recompression cage

## C.3 Box Type Devices

These devices are containers that are open on the bottom. The fish is place in the container and the container is lowered until the fish is able to swim out on its own. One such device is an upside-down milk crate with two four-pound weights attached (Figure B.7). Directions for building this device can be found on YouTube (http://www.youtube.com/watch?v=_bviQYGgKhw), or it can be purchased pre-made from West Marine. A device that is similar in function is referred to as a recompression cage (Figure B.8). It consists of a modified dungeness crab hoop "net" used on the U.S. west coast, but built with a smaller mesh net (2 inch, commercially available nets have a 4 Inch mesh). A smaller mesh is required as otherwise the fish gill plate can become entangled in the net. The rigging on the net is modified so that the net is lowered upside-down by attaching rope to the smaller hoop.

Pros: Less handling stress for fish

Cons: Bulky.
Cost: Inverted crate: $5 - $80 plus weights
Recompression cage: $27 plus netting material