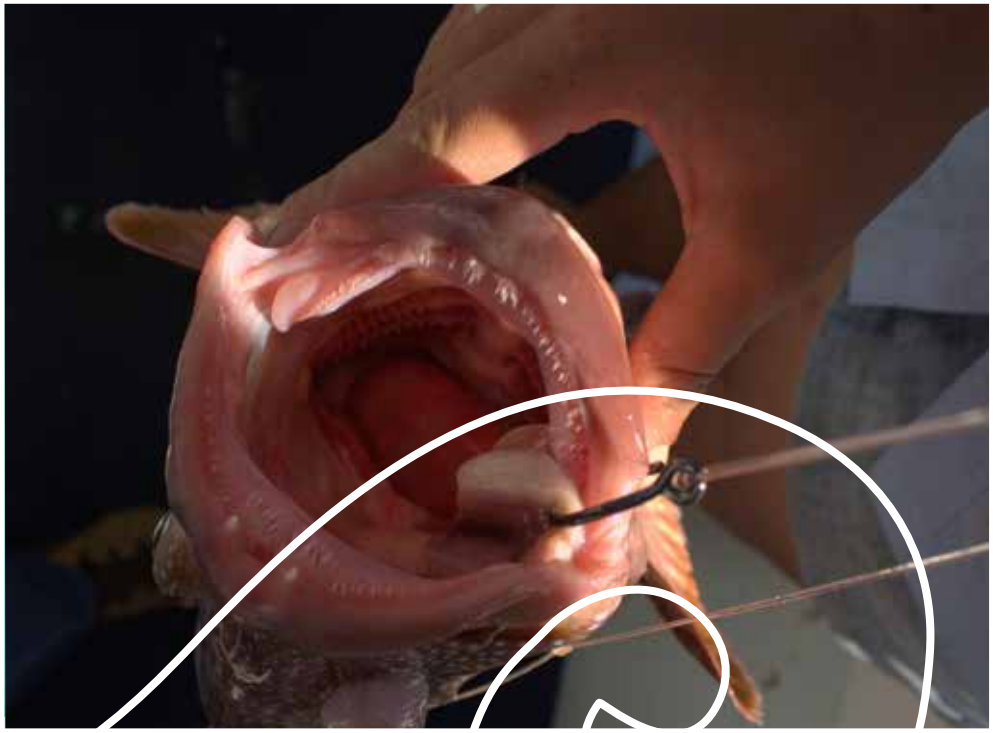

Awareness, Knowledge and Perceptions

of Barotrauma and Barotrauma Mitigation

A Survey of Florida Anglers

J. Hazell, L. Krimsky, B. Fluech, B. Staugler, C. Adams, J. Stevely, R. Botta

Sea Grant Florida

Suggested citation
Hazell, J., Krimsky, L., Fluech, B., Staugler, B., Adams, C., Stevely, J., & Botta, R., (2016). *Awareness, Knowledge and Perceptions of Barotrauma and Barotrauma Mitigation: A Survey of Florida Anglers.* Gainesville, Fla.: Florida Sea Grant College Program.

This publication was supported by the National Sea Grant College Program of the U.S. Department of Commerce's National Oceanic and Atmospheric Administration (NOAA) under NOAA Grant No. NA 14OAR4170108. The views expressed are those of the authors and do not necessarily reflect the views of these organizations.

The full text of this publication is available online by visiting Florida Sea Grant at www.flseagrant.org.

Florida Sea Grant
University of Florida
PO Box 110409
Gainesville, FL, 32611-0409
(352) 392-2801
www.flseagrant.org

TP 224
June 2016

Awareness, Knowledge and Perceptions of Barotrauma and Barotrauma Mitigation

A Survey of Florida Anglers

Joy Hazell[1]
Florida Sea Grant Agent

Lisa Krimsky[2]
Florida Sea Grant Agent

Bryan Fluech[3]
Florida Sea Grant Agent (former)

Betty Staugler[4]
Florida Sea Grant Agent

Chuck Adams[5]
Florida Sea Grant Marine Economics Specialist

John Stevely[6]
Florida Sea Grant Agent Emeritus

Robert Botta[7]
Project Assistant

June 2016
TP 224

[1]UF/IFAS Extension, Lee County, jhazell@leegov.com; [2]UF/IFAS Extension, Miami-Dade County, lkrimsky@ufl.edu; [3]Georgia Sea Grant, fluech@uga.edu; [4]UF/IFAS Extension, Charlotte County, staugler@ufl.edu; [5]Department of Food and Resource Economics, UF/IFAS Extension, cmadams@ufl.edu; [6]UF/IFAS Extension, Manatee County (retired), jsmarine@ufl.edu; [7]Rosenstiel School of Marine and Atmospheric Science, University of Miami, r.botta822@gmail.com.

Contents

Introduction 1

Methods 1

Survey Findings 3

Depth Zone Fished

1. Of the total number of saltwater fishing trips you take on a vessel in an average year, what percentage are spent primarily in the following depth zones? 3

Familiarity with Floaters

2. While releasing reef fish (for example, snapper, grouper, etc.) caught from deep water have you ever noticed that some were physically unable to return to the bottom on their own? 3
3. True or False. The following symptoms are visible signs associated with floaters 3
4. What is the organ that may protrude out of a floater's mouth? 4
5. Do you use any gear or other methods to help return floaters to depth? 4
6. Please indicate the reason(s) why you said no to helping floaters return to depth 4

Use of a Venting Tool

7. Do you use a venting tool to help floaters return to depth? 4
8. Please indicate the reason(s) you do not use a venting tool 4
9. Please select on the following graphic where you typically vent your fish 5
10. Please select the option below that most accurately describes how you insert a venting tool needle into a fish 5
11. How confident are you that you're properly venting fish? 6
12. How confident are you that venting helps fish to survive? 6
13. Do you feel you need more information/training on the proper use of venting tools 6

Use of Descending/Recompression Gear

14. Do you use a descending/recompression gear to help floaters return to depth? 6
15. What is/are the reason(s) why you don't use fish descending/recompression gear? 6
16. What type(s) of fish descending gear devices do you use? 7
17. If you use fish descending/recompression gear, how confident are you that you're using the gear properly? 7
18. If you use fish descending/recompression gear, how confident are you that this gear helps fish to survive? 7
19. Do you feel you need more information/training on the proper use of descending/recompression gear? 7

Preferred Methods to Learn More

20. Top three preferred methods to learn about venting, fish descending/recompression gear 7
21. Top three preferred methods to learn about catch and release fishing practices 8

Awareness of the Term "Barotrauma"

22. Are you aware of the term barotrauma? 8

Florida Fishing Experiences and Avidity

23. How many years have you fished in Florida's coastal and/or marine waters? 9
24. Have you been fishing in Florida's coastal or marine waters in the past 3 years? 9
25. How many Florida saltwater fishing trips do you take in an average year? 10
26. When fishing in Florida waters, what percentage of your time is spent on the following coasts? 10
27. Of the total number of saltwater angling trips you take in an average year, what percentage of your trips are taken using the following modes? 10
28. What is your Florida County of residence? 10

Summary 10

References 12

INTRODUCTION

Saltwater recreational fishing is an important economic engine for many of Florida's coastal communities. The annual economic impact associated with saltwater recreational fishing, which sustains 110,000 jobs, is estimated to be $13 billion (National Oceanic and Atmospheric Administration, 2016). An important component of the saltwater recreational fishing effort in Florida targets reef fish, specifically snappers and groupers. Given the popularity and economic importance of reef fish, careful management of these fish stocks is imperative for the sustainability of the resource.

Fishery managers attempt to account for the recreational fishing mortality associated with a fish stock, including mortality associated with retention and release. Release, or discard, mortality occurs when fish that are to be returned to the water are injured during the process of being caught, handled improperly when landed, and/or released in an inappropriate manner. For reef fish, another unique source of release mortality exists, which is known as *barotrauma*. Barotrauma occurs when reef fish are brought up from depth and the resulting reduction in ambient barometric pressure causes gases within the fish to expand. These expanding gases can result in embolisms and rupture of gas-filled organs such as the swim bladder. Fish experiencing barotrauma may have difficulty returning to depth, as the expanded gas within the body creates excessive buoyancy. As a result, these fish are often referred to in the vernacular as "floaters" and are more susceptible to predators and exposure from the elements.

Anglers can mitigate the effects of barotrauma in two key ways. The first is by allowing the trapped, expanded gases to escape so that a fish can swim back down to depth upon release. This can be done using a hollow needle, or venting tool, that can be inserted into a fish's body to allow expanded gases to escape. In the absence of the expanded gases, the fish can overcome the excessive positive buoyancy and swim back down to depth without help. The second is by forcibly returning the fish to depth and to the ambient pressure from which it was removed. This can be done using a descending device or recompression tool, a weighted device that attaches to or encloses the fish and drops the fish back to depth where gases in the fish's body are recompressed, eliminating excessive positive buoyancy. Both of these barotrauma mitigation strategies help reef fish return to depth, thereby increasing their chance for survival.

The popularity of reef fishing, coupled with more stringent fisheries regulations have likely contributed to an increase in the numbers of reef fish being released by anglers. As the numbers of released fish increases, the aggregate release mortality will also likely increase. The management paradox is that this is counter-intuitive to the fisheries management goals of implementing bag limits, size limits and seasonal closures. A strategy for reducing this discard mortality is to educate saltwater anglers about barotrauma and provide them with the necessary skills to mitigate its impact when fish are released.

As part of its catch and release outreach program, Florida Sea Grant conducted this survey to measure Florida saltwater anglers' awareness, knowledge and perceptions of barotrauma. Initial field trials with volunteer anglers suggested additional insights into angler perceptions and preferences for using venting and recompression techniques would help the development of more effective outreach programs and strategies (Stevely et al., 2014). The survey was designed to provide insight into the level of understanding Florida anglers have regarding the concept of barotrauma, their recognition of it, their experience and confidence in using existing barotrauma mitigation tools, and their preferred methods of learning about barotrauma. Information about basic fishing patterns and experience was also solicited. The findings of the survey will also be useful to state and federal fisheries managers as they seek to develop management strategies that will better ensure the sustainable use of reef fish stocks, as well as all other fish stocks targeted by the economically important saltwater recreational fishing industry.

METHODS

Survey Implementation

The survey was administered via email to a sample of the 2013 Florida Saltwater Angler license holders file, a list maintained by the Florida Fish and Wildlife Conservation Commission. The parent file contained approximately 500,000 valid email addresses. An email message was sent to 10,000 randomly selected email addresses every two weeks. The email message provided a salutation that described the purpose of and motivation for the survey (though the salutation specifically avoided the use of the word barotrauma) and a link to the survey. A reminder email was sent to each original recipient one week after the initial wave of messages was sent. A total of five waves of email messages (50,000) were sent out, with the initial wave being sent on July 14, 2014. The survey was conducted using the University of Florida QUALTRICS system. Survey protocol and questions were approved by the University of Florida Institutional Review Board for Social and Behavioral Research. The survey was field-tested for content clarity, validity and readability. All recommendations were considered and the survey was revised based on field-test feedback. The survey was conducted with assistance from the UF Fisheries and Aquatic Sciences Program.

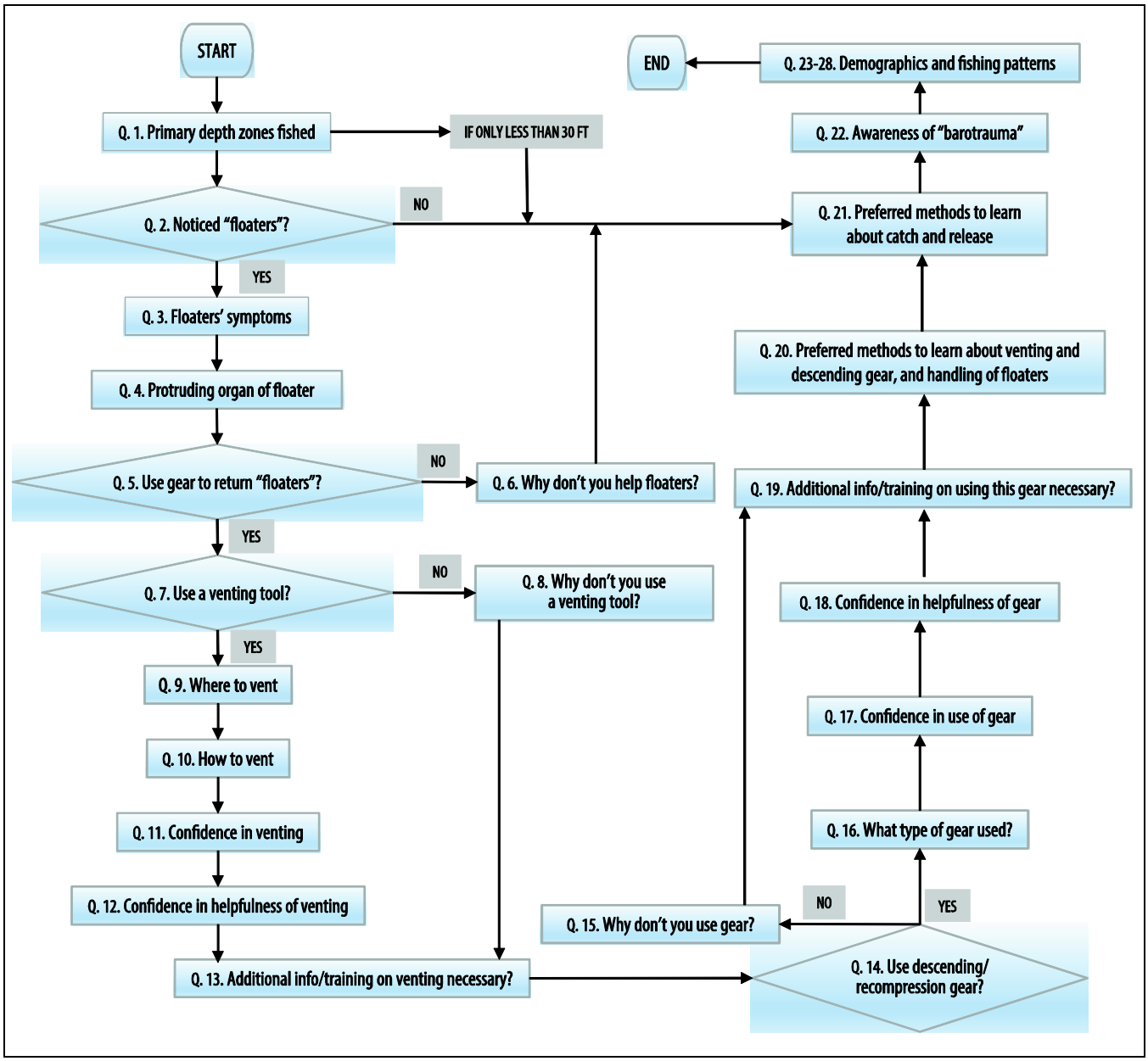

Figure 1. Survey Flow Chart

Survey Design

The survey was designed to solicit a wide range of information from the respondents. This information included:

1) Basic fishing patterns (depth, fishing experience, avidity, location, mode)
2) Ability to recognize symptoms of barotrauma
3) Use and confidence associated with venting tools
4) Use and confidence associated with descending gear
5) Reasons for not using barotrauma mitigation tools
6) The need for additional training on the use of barotrauma mitigation tools
7) Preferred methods to learn more about barotrauma mitigation and catch and release practices
8) Awareness of the term "barotrauma"
9) County of residence

The survey instrument was designed to solicit information in a logical sequence, with options for the respondent to skip questions that did not apply, while ensuring all respondents provided basic information on key topics. The schematic flow chart of the survey instrument is provided in Figure 1.

SURVEY FINDINGS

A total of 825 completed surveys were obtained from the 50,000 email messages that were sent out over the ten-week sampling period. However, a meaningful response rate is not readily available, as data were not collected regarding how many respondents, for whatever reason, may have deleted the survey email message without opening or reading. In addition, the number of respondents who may have failed to submit a partially completed survey was also not collected. These sources of non-response, and the inherent biases that are associated with them, also exist for other survey implementation methods, such as a mailed survey. However, the motivation behind such non-response may be inherently different for online surveys, as potential respondents may have concerns about Internet security and the receipt of electronic junk mail or "spam" (Kaplowitz, Hadlock and Levine, 2016).

The survey findings will be discussed by question in the order in which the questions were presented on the survey instrument. Unless stated otherwise, all tabulated response data are provided as percentages, the total of which may not equal 100 for the respective question, due to rounding errors. In addition, respondents were directed to select "all that apply" for a suite of choices on certain questions. Other sources of discrepancies may exist due to incomplete responses for all options within a given question. Finally, some questions had an open-ended response option for "Other." Those responses are not tabulated or discussed in this report and can be obtained from the authors upon request.

Depth Zone Fished

Q.1 – *Of the total number of saltwater fishing trips you take on a vessel in an average year, what percentage are spent primarily in the following depth zones?* (Table 1)

For the respondents who answered Q.1, 37% of the saltwater fishing trips that are taken in an average year are in water less than 30 feet in depth. The majority of trips (63%) are taken in deeper water, with 16%, 15%, and 11% taken in depths of 31-60 feet, 61-90 feet, and 91-120 feet, respectively. A total of 21% of trips are taken in water greater than 120 feet in depth, with 10% taken in water greater than 200 feet in depth. [Note: Those respondents who indicated that all their trips were taken in depths of less than 30 feet were routed to Q.21 to complete the survey.]

Key Finding: Almost two-thirds of the trips taken by respondents were in depths greater than 30 feet, which are depths for which barotrauma symptoms can be more pronounced.

Table 1. Of the total number of saltwater fishing trips you take on a vessel in an average year, what percentage are spent primarily in the following depth zones? (n=825)

Less than 30 feet	37%
31 to 60 feet	16%
61 to 90 feet	15%
91 to 120 feet	11%
121 to 150 feet	5%
151 to 180 feet	4%
181 to 200 feet	3%
Greater than 200 feet	10%

Familiarity with Floaters

Q.2 – *While releasing reef fish (for example, snapper, grouper, etc.) caught from deep water have you ever noticed that some were physically unable to return to the bottom on their own? Such fish are often referred to as "floaters."* (Yes/No)

Though recognition of the specific symptoms was not solicited, 71% of the respondents indicated having seen fish that had difficulty returning to depth. At this point in the survey, respondents had not been asked about their knowledge of barotrauma or specific symptoms of fish suffering from barotrauma,

Key Finding: Almost three-fourths of survey respondents who fished at depths greater than 30 feet had observed fish having difficulty returning to depth. Thus, the key problem with barotrauma was familiar to respondents, regardless of their level of exposure to the barotrauma concept or their avidity to fishing in deeper water. [Note: Those respondents who indicated they had never noticed fish having difficulty returning to depth were routed to Q.21 to complete the survey.]

Q.3 – *True or False. The following symptoms are visible signs associated with floaters.* (Table 2)

Respondents were provided with four different conditions and asked which of these were symptomatic with floaters. The correct response was "True" for all four symptoms. The majority of respondents correctly indicated that "Bugged eyes" (82%), "Swollen belly" (90%), and "Organ protruding out of the mouth" (94%) were symptoms associated with barotrauma. However, only 64% of the respondents correctly identified "Guts protruding" as a barotrauma symptom.

Key Finding: Most respondents correctly identified the key barotrauma symptoms, with anal protrusions being the symptom less familiar.

Table 2. True or False. The following symptoms are visible signs associated with floaters**.**

	True	False	% Correct
"Bugged" or protruding eyes (n=504)	414	90	82%
Swollen or distended belly (n=506)	453	53	90%
Organ sticking out of the mouth (n=511)	481	30	94%
"Guts" protruding from anal opening (n=502)	320	182	64%

Q.4 – *What is the organ that may protrude out of a floater's mouth?* (Table 3)

This question was intended to determine if respondents could correctly identify the organ often seen protruding from the mouth of a floater. A majority of respondents (47%) incorrectly identified the organ as the swim bladder. An additional 1% either suggested the organ was the spleen or other organ. Only 34% of respondents correctly identified the organ as the stomach. Further, 18% indicated they couldn't identify the organ.

Key Finding: Approximately two-thirds of the respondents misidentified or could not identify the organ often seen protruding from the mouth of fish brought up from depth. This finding can have greater implications for the successful use of venting tools and suggests a need for further education regarding the physiology of barotrauma.

Table 3. What is the organ that may protrude out of a floater's mouth?

Spleen (n=6)	1%
Stomach (n=174)	**34%**
Swim bladder (n=240)	47%
Other (n=4)	1%
I don't know (n=92)	18%

***bold** indicates correct answer

Q. 5 – *Do you use any gear or other methods to help return floaters to depth? (Yes/No)*

A large majority of respondents, 89%, indicated using some method to help floaters overcome the effects of barotrauma and return to depth. [**Note:** If the answer was No, then the respondent was routed to Q. 6. If the answer was Yes, then the respondent was routed to Q. 7.]

Key Finding: Most respondents attempt to assist floaters to return to depth.

Q. 6 – *Please indicate the reason(s) why you said no to helping floaters return to depth (check all that apply).* (Table 4)

Several reasons were provided as to why the respondent did not attempt to assist floaters. The most frequently selected reason (61%) was the lack of awareness of methods and gear to use. Other reasons included a belief that floaters would eventually return to depth (17%), that only a few fish are affected (15%), that floaters would not survive anyway (8%), or that the inability to return to depth was a problem (3%). [**Note:** Respondents who were routed to Q. 6 were then routed to Q. 21 to complete the survey.]

Key Finding: Most respondents who did not attempt to assist floaters were motivated primarily by a lack of knowledge of mitigation methods and gear, or that the issue was simply not problematic enough to warrant action.

Table 4. Please indicate the reason(s) why you said no to helping floaters return to depth. Check all that apply.

The fish will not survive anyway (n=5)	8%
They can eventually get back down on their own (n=10)	17%
I'm not aware of methods and/or gear to help fish return to depth (n=36)	61%
I don't think it's a problem (n=2)	3%
It doesn't affect that many fish (n=9)	15%
Other (n=15)	25%

Use of a Venting Tool

Q. 7 – *Do you use a venting tool to help floaters return to depth? (Yes/No)*

Of those respondents who answered Yes to Q. 5, 92% indicated they used a venting tool. [**Note:** Those respondents who answered No were routed to Q. 8 and then to Q. 13. Those who answered Yes were routed to Q. 9.]

Key Finding: Virtually all of the respondents who indicated they use some method to assist floaters also used venting tools.

Q. 8 – *Please indicate the reason(s) you do not use a venting tool (check all that apply).* (Table 5)

Several alternative reasons were provided for not using a venting tool. The most frequently selected reason (29%) was that the respondent instead used a descending/recompression device. However, 20% of the respondents also selected reasons associated with each of the following:

a lack of understanding of use, difficulty to use, fish will die anyway, and not knowing what a venting tool was. Fewer respondents also indicated that a venting tool took too much time (6%), was unsafe (3%), and required too much space for storage (3%). An additional 17% of the respondents provided other reasons for not using a venting tool.

Key Finding: Although most respondents who attempted to assist floaters used a venting tool, almost a third of those who did not used a descending/recompression tool instead. The others found numerous reasons for not using a venting tool, including lack of understanding or knowledge, difficulty of use, ineffectiveness, cost, and safety.

Table 5. Please indicate the reason(s) you do not use a venting tool. Check all that apply**.**

Takes too much time (n=2)	6%
Unsafe on a moving deck (n=1)	3%
Costs too much (n=1)	3%
Requires too much space for storage (n=1)	3%
Don't understand how to use it (n=7)	20%
Difficult/cumbersome to use (n=7)	20%
Don't think it helps the fish … they will die anyway (n=7)	20%
I use a fish descending/recompression device (n=10)	29%
I don't know what a venting tool is (n=7)	20%
Other, please explain (n=6)	17%

Q. 9 – *Please select on the following graphic where you typically vent your fish.* (Table 6)

Respondents were asked to indicate on a fish graphic where they typically vent fish. The online survey instrument allowed respondents to place the cursor on a fish image, and the discrete choices they chose are provided in **Table 6**. Almost two-thirds of the respondents (64%) chose the correct location to vent fish, which is in the area of the pectoral fin. An additional 21%, 10%, 4% and 1% indicated they vented the fish in incorrect locations, such as the belly region, mouth, intestines, and muscle region (respectively). An additional 5% indicated they vented fish in other locations. The question did not solicit any additional information about the venting method, only the location.

Further information about venting technique was solicited via Q. 10.

Key Finding: The majority of respondents indicated they had vented fish in the anatomically correct location. The approximately one-third of respondents who indicated they were venting fish in the wrong location suggests a strong need for additional outreach.

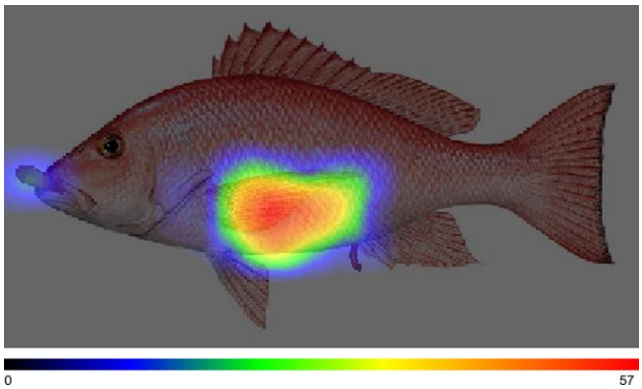

Table 6. Please select on the graphic where you typically vent your fish. Drag you cursor to the appropriate location and click to enter your response.

mouth (n=41)	10%
pectoral fin (n=265)	64%
belly region (n=85)	21%
intestines (n=15)	4%
posterior (n= 1)	0%
muscle region (n=3)	1%
other (n=5)	1%

Q. 10 – *Please select the option below that most accurately describes how you insert a venting tool needle into a fish.* (Table 7)

Following Q. 9, which asked only about the location on the fish of where a venting needle is used, the survey solicited information from the respondent about the proper technique for the use of a venting needle. Several options were provided, only one of which was correct. The majority of users (51%) selected the correct response, which was "… just under the skin … at a 45% angle". The alternative options were associated with the incorrect angle or depth of needle insertion. Some respondents (8%) selected the ability to provide an open-ended response, with almost one-third of those describing a generally correct technique.

Key Finding: Almost one-half of the respondents were unable to correctly select the proper technique for using a venting needle. Additional outreach on the subject is needed.

Table 7. Please select the option below that most accurately describes how you insert a venting tool needle into a fish.

Insert the needle just under the skin into the body cavity at approximately a 45 degree angle (n=202)	51%
Insert the needle all the way into the body cavity at approximately a 45 degree angle (n=121)	31%
Insert the needle just under the skin into the body cavity at a 90 degree angle (n=23)	6%
Insert the needle all the way into the body cavity at a 90 degree angle (n=19)	5%
None of the above. Please briefly explain. (n=31)	8%

Q. 11 – *How confident are you that you're properly venting fish?*

A sliding scale method was used to assess respondents' confidence in their ability to properly vent fish. Respondents were instructed to use their cursor to move a sliding locator between the values of 1 and 5, with"1 being least confident and 5 being most confident. The resulting average value across all respondents was 3.71, suggesting respondents were somewhat confident in their ability to properly vent fish.

Key Finding: Respondents indicated an average confidence level suggesting a need for further improvement in training on the use of venting tools.

Q. 12 – *How confident are you that venting helps fish to survive?*

A sliding scale method was used to assess respondents' confidence that venting helps floaters to survive. As with Q. 11, respondents were instructed to use their cursor to move a sliding locator between the values of 1 and 5, with 1 being least confident and 5 being most confident. The resulting average value across all respondents was 3.63, suggesting respondents were somewhat confident that venting helps floaters survive being released.

Key Finding: Respondents provided a generally positive level of confidence that venting does help released floaters survive.

Q. 13 – *Do you feel you need more information/training on the proper use of venting tools? (Yes/No)*

Approximately two-thirds of the respondents (63%) indicated that they needed more information and/or training on the use of venting tools.

Key Finding: This finding corroborates the responses given for questions 9 through 11, indicating a need for additional training.

Use of Descending/ Recompression Gear

Q. 14 – *Do you use a descending/recompression gear to help floaters return to depth? (Yes/No)*

Of the total number of respondents who indicated they used some form of gear to assist floaters to return to depth, only 9% indicated using descending/recompression gear. And of the respondents who used descending/recompression gear, approximately three-fourths also use venting tools, which is 6% of the total number of respondents. (**Note:** If "No", then the respondent was directed to Q. 15 and then to Q. 19.)

Key Finding: The number of Florida saltwater respondents who use descending/recompression gear is dramatically lower than the number of respondents who use venting tools.

Q. 15 – *What is/are the reason(s) why you don't use fish descending/recompression gear? (Check all that apply)* (Table 8)

Respondents provided a variety of reasons as to why they do not use descending/recompression gear, which are provided in Table 9. The two most frequently chosen reasons were a lack of knowledge about the gear (50%) and "I vent fish" (46%). Other less frequently chosen reasons were not knowing how to use the gear (16%), "costs too much" (10%), "… too much time" (7%), and "… too much space …" (6%). In addition, fewer respondents indicated that they felt the fish would die anyway (3%) and the gear was unsafe to use on a moving deck (2%).

Key Finding: The most frequent reason for not using descending/ recompression gear was a lack of knowledge about the gear, as well as that venting tools were already being used. This finding suggests a need for additional outreach regarding the use of descending/recompression gear as a viable option for barotrauma mitigation.

Table 8. What is/are the reason(s) why you don't use fish descending/ recompression gear? Check all that apply.

Takes too much time (n=27)	7%
Unsafe on a moving deck (n=7)	2%
Costs too much (n=37)	10%
Requires too much space for storage (n=23)	6%
Don't understand how to use it (n=63)	16%
Difficult/cumbersome to use (n=29)	7%
Don't think it helps the fish … they will die anyway (n=11)	3%
I vent fish (n=178)	46%
I don't know what fish descending/recompression gear is (n=195)	50%
Other, please explain (n=49)	13%

Q. 16 – *What type(s) of fish descending gear devices do you use? (Check all that apply)* (Table 9)

Several different types of descending/recompression gear are currently available on the market in Florida, with some innovations yet to become commercially available. Respondents were asked to choose between three key types of gear. The majority (57%) use gear that features a weighted lip-gripping device. A weighted hook device was used by 32% of the respondents, while 24% used an inverted, weighted basket/crate.

Key Finding: All three major types of descending/recompression gear were used by the collective sample of respondents, with the lip-gripping device being the most popular.

Table 9. What type(s) of fish descending gear devices do you use? Check all that apply.

Weighted lip-gripping devices (examples include the Seaqualizer, Roklees Fish Descending Device or Blacktip Catch and Release Recompression Tool) (n=21)	57%
Weighted hook devices (examples include the Sheldon Fish Descender or Fish Saver Device) (n=12)	32%
Weighted basket/crate (n=9)	24%
Other, please explain (n=5)	14%

Q. 17 – *If you use fish descending/recompression gear, how confident are you that you're using the gear properly?*

A sliding scale method was used to assess respondents' confidence in their ability to properly descend/recompress floaters.

Respondents were instructed to use their cursor to move a sliding locator between the values of 1 and 5, with 1 being least confident and 5 being most confident. The resulting average value across all respondents was 4.54, suggesting respondents were confident in their ability to properly descend/recompress fish.

Key Finding: Respondents indicated a high confidence level regarding the use of descending/recompression gear.

Q. 18 – *If you use fish descending/recompression gear, how confident are you that this gear helps fish to survive?*

A sliding scale method was used to assess respondents' confidence in their ability to properly descend or recompress fish. Respondents were instructed to use their cursor to move a sliding locator between the values of 1 and 5, with 1 being least confident and 5 being most confident. The resulting average value across all respondents was 4.49, suggesting respondents were confident in their ability to properly descend/recompress fish.

Key Finding: Respondents indicated a high confidence level that the use of descending/recompression gear does help floaters to survive.

Q. 19 – *Do you feel you need more information/training on the proper use of descending/recompression gear? (Yes/No)*

Over two-thirds of the respondents (70%) indicated that they needed more information and/or training on the use of descending/recompression gear.

Key Finding: This finding suggests respondents would like to continue to improve the effectiveness of their use of descending/recompression gear, even though Q. 17 suggests a high level of confidence in the use of such gear.

Preferred Methods to Learn More

Q. 20 – *Please rank your top three preferred methods to learn about venting, fish descending/ recompression gear, and/or handling of floaters. Enter a 1, 2, or 3 next to your three responses.* (Table 10)

Respondents were provided a list of 12 different methods by which they could learn more about the use of barotrauma mitigation methods. Those choices are provided in Table 10. Respondents were asked to select a unique first, second and third choice method for learning. The numbers (as opposed to percentages as provided in previous tables) of first, second, and third choice selections are tabulated.

Table 10. Please rank your top three preferred methods to learn about venting, fish descending/recompression gear, and/or handling of floaters. Enter a 1, 2, or 3 next your three responses.

Answer	1	2	3
Magazines and newspaper articles (n=195)	79	62	54
TV shows about fishing (n=189)	69	74	46
Talking with bait and tackle shops (n=69)	18	24	27
Agency brochures and other educational print materials (n=106)	32	35	39
Websites (n=199)	84	63	52
Online forums (n=51)	13	17	21
Social media (Ex: Facebook, Twitter, Pinterest) (n=21)	4	5	12
YouTube videos (n=168)	56	56	56
Word of mouth from other anglers (n=88)	18	33	37
Presentations/displays at community fishing events and/or club meetings (n=42)	5	17	20
Fishing workshops or classes (n=49)	17	13	19
Webinars (online presentations) (n=35)	12	6	17
Other (n=13)	8	1	4

The most frequently selected first-choice method was Websites (84), followed by Magazines and newspaper articles (79), TV shows about fishing (69), and YouTube videos (56). Agency brochures (32), Talking with bait and tackle shops (18), Word of mouth (18), and Fishing workshops (17) were less frequently selected as a first choice. The least frequently selected first-choice method was Social media (4) and Presentations/displays at fishing events (5). This pattern of preference was generally consistent for second and third choices.

Key Finding: High-tech methods of finding information, such as websites and online videos were among the most frequently selected as first-choice training methods. However, television and print media also are in demand as a learning tool. Interestingly, fishing event presentations, social media, webinars, and online forums were some of the least frequently selected methods.

Q. 21 – *Please rank your top three preferred methods to learn about catch and release fishing practices. Enter a 1, 2, or 3 next to your three responses.* (Table 11)

Similar to Q. 20, respondents were provided a list of 12 alternative methods by which they could learn more about catch and release fishing practices. Those choices are provided in Table 11.

Table 11. Please rank your top three preferred methods to learn about catch and release fishing practices? Enter a 1, 2, or 3 next your three responses.

Answer	1	2	3
Magazines and newspaper articles (n=155)	**66**	**53**	**36**
TV shows about fishing (n=178)	**70**	**66**	**41**
Talking with bait and tackle shops (n=83)	**19**	**28**	**35**
Agency brochures and other educational print materials (n=65)	**18**	**19**	**27**
Websites (n=120)	**46**	**46**	**28**
Online forums (n=42)	**10**	**15**	**17**
Social media (Ex: Facebook, Twitter, Pinterest) (n=17)	**5**	**4**	**8**
YouTube videos (n=58)	**17**	**16**	**25**
Word of mouth from other anglers (n=127)	**43**	**34**	**50**
Presentations/displays at community fishing events and/or club meetings (n=16)	**1**	**5**	**10**
Fishing workshops or classes (n=25)	**6**	**6**	**13**
Webinars (online presentations) (n=7)	**0**	**3**	**4**
Other (n=29)	**18**	**6**	**4**

Respondents were asked to select a unique first, second and third choice method for learning. The numbers (as opposed to percentages as provided in previous tables) of first, second, and third choice selections are tabulated. The most frequently selected first-choice method was TV shows (70), followed by Magazines and newspaper articles (66), Websites (46), and word of mouth (43). Talking with bait and tackle shops (19), agency brochures 18), and YouTube videos (18) were less frequently selected as a first choice.

Key Finding: More traditional sources of information appear to be in greater demand by respondents regarding learning more about catch and release practices. However, websites and YouTube videos are also indicated as preferred sources of information.

Awareness of the Term "Barotrauma"?

Q. 22 – *Are you aware of the term barotrauma? (Yes/No)*

Up to this point in the survey, the term barotrauma had not been used. Respondents were now asked if they were familiar with that more technical term that describes the set of

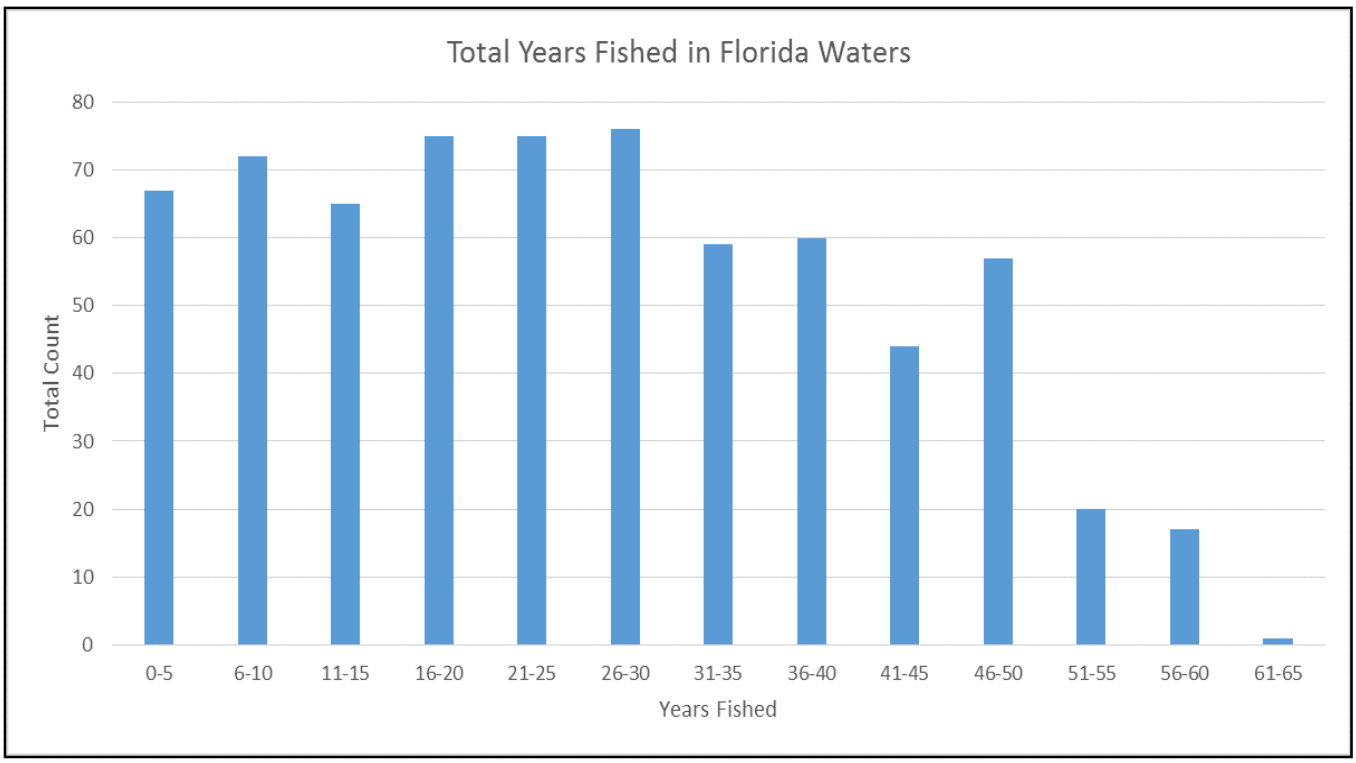

Figure 2. Distribution of Fishing Experience (Years Fished) by Survey Respondents.

symptoms characterizing floaters. Over half the respondents (54%) were not familiar with the term barotrauma.

Key Finding: The majority of the respondents that had observed floaters, as revealed by Q. 2, were not aware of the technical term describing the condition. A greater familiarity of the term may help interested anglers find more information related to barotrauma within online and market settings.

Florida Fishing Experience and Avidity

Q. 23 – *How many years have you fished in Florida's coastal and/or marine waters?* (Figure 2)

The majority indicated they had fished in Florida waters for up to 30, with greater than half of those fishing for 16 to 30 years (Figure 2). However, a number of respondents indicated they had been saltwater fishing in Florida waters for over 40 years.

Key Finding: Respondents who fish in Florida's coastal/marine waters often have many years of overall experience.

Q. 24 – *Have you been fishing in Florida's coastal or marine waters in the past 3 years? (Yes/No)*

As expected (given the source of the survey sample), the majority of respondents had been fishing in the past 3 years. Only 1% of the respondents had not been fishing in Florida's coastal or marine waters in the past 3 years.

Key Finding: Respondents to the survey were currently active marine anglers.

***Q. 25 – How many Florida saltwater fishing trips do you take in an average year?* (Table 12)**

As suggested by the findings from Q. 23 and Q. 24, the survey respondents are active marine anglers. Although 12% of respondents take 5 trips or less in the average year, 41% of the respondents take between 6 and 20 trips per year. In addition, 30% of the respondents take greater than 30 trips per year.

Key Finding: Further corroborating the finding for Q. 24, respondents to the survey were active marine anglers.

Table 12. How many Florida saltwater fishing trips do you take in an average year?

0-5 trips (n= 89)	12%
6-10 trips (n=105)	15%
11-15 trips (n=96)	13%
16-20 trips (n=95)	13%
21-25 trips (n=70)	10%
26-30 trips (n=48)	7%
Greater than 30 trips a year (n=217)	30%

Q. 26 – *When fishing in Florida waters, what percentage of your time is spent on the following coasts?*

Respondents were asked to allocate their fishing time between the Gulf and Atlantic coasts of Florida. Overall, respondents spent an average of 53% of their time fishing on the Gulf coast, and 47% of their time fishing on the Atlantic coast.

Key Finding: In general, both Florida coasts are important destinations for saltwater fishing trips according to the survey respondents.

Q. 27 – *Of the total number of saltwater angling trips you take in an average year, what percentage of your trips are taken using the following modes? (Table 13)*

Across all respondents, the majority of fishing trips (83%) were taken in a private vessel. The remainder of the trips were allocated to guide/charter boat (6%), head/party boat (2%), and pier or shore (9%).

Key Finding: The overwhelming majority of fishing trips taken by survey respondents were in private vessels.

Table 13. Of the total number of saltwater angling trips you take in an average year, what percentage of your trips are taken using the following modes? Please make sure your responses add to 100%.

Private vessel	83.44
Guide/Charter boat	6.02
Head/ Party boat	2.18
Pier or shore	8.62

Q. 28 – What is your Florida county of residence?

A summary of responses is available in Figure 3.

Figure 3. Percentage Distribution of Survey Respondents by Florida County.

SUMMARY

This survey to assess the current level of angler awareness, knowledge, and perceptions regarding barotrauma and the use of barotrauma mitigation devices was conducted as part of a statewide Florida Sea Grant barotrauma outreach program.

Its purpose was to provide state and federal fishery managers with information useful toward developing management strategies that will better ensure the sustainable use of reef fish stocks. An email survey was conducted in 2014 and solicited information from Florida Saltwater Angler license holders.

A total of 825 completed surveys were obtained from 50,000 email messages sent to license holders via five waves over a ten-week period. The survey solicited information concerning basic fishing patterns, experience, and avidity; ability to recognize barotrauma symptoms; use and confidence associated with venting tools and descending devices; reasons for not using such mitigation tools; the need for additional training; preferred methods to receive training; and other information.

Approximately two-thirds of survey respondents fished at depths greater than 30 feet, with three-fourths of those respondents having observed fish having difficulty returning to depth. While most respondents correctly identified key

barotrauma symptoms, a majority were not able to correctly identify the organ that often protrudes from the mouth of fish brought up from depth, which is a common symptom of barotrauma. Most respondents attempted to assist "floaters," and those who did not were constrained by a lack of knowledge of methods and gear. Of those who did assist fish to return to depth, the majority used a venting tool, while a much smaller number of respondents used descending devices.

The survey findings suggest that additional outreach is needed to help anglers better understand the proper techniques in the use of venting tools and descending devices. This would help increase the confidence anglers will have in the use of barotrauma mitigation devices, with the survey indicating that the majority of respondents requested additional training in the use of venting tools and descending devices. Though traditional sources of information are still in high demand by anglers, the survey indicated a strong preference for training through more "high-tech" methods, such as websites and online videos.

Barotrauma is recognized by fishery managers as a key source of release mortality associated with the recreational reef fish fishery. With the popularity of recreational fishing for reef fish in deeper water environments remaining strong, the need to better understand mortality associated with released fish persists. As the number of fishing trips increases, while more stringent management imposes regional/seasonal closures, increased minimum sizes, and stricter bag limits, the number of released fish will likely increase. As a result, the developing management strategies that encourage the use of barotrauma mitigation devices may be warranted. If so, the findings of this survey may be useful in better understanding the incentives and constraints that play a role in the use of barotrauma mitigation devices by the saltwater anglers of Florida.

REFERENCES

Kaplowitz, M.D., T.D. Hadlock, and R. Levine. 2015. A comparison of web and mail survey response rates. *Public Opinion Quarterly*, 80(1):94-101.

National Oceanic and Atmospheric Administration. 2016. Office of Science and Technology. National Marine Fisheries Service, Economics Program, Recreational Fisheries Economics. https://www.st.nmfs.noaa.gov/apex/f?p=160:8.

Stevely, J., B. Fluech, B. Staugler, J. Hazell, L. Krimsky, H. Abeels, B. Saari, C. Verlinde, and L. Carnahan. 2014. Florida Sea Grant Fish Descending Project Final Report. https://eos.ucs.uri.edu/EOS_Linked_Documents/flsgp/PD-12-11_Stevely_2014.pdf

Science Serving Florida's Coast

Florida Sea Grant College Program
P.O. Box 110409
University of Florida
Gainesville, FL 32611-0409
(352) 392-2801
www.FLSeaGrant.org

TP-224