

Final NOAA Coral Reef Grant Report

Project Title: Biscayne National Park Fisheries Education Class

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Program Priorities to Which Responded: Fishery Impacts: developing effective locally relevant outreach and communication strategies to increase community support for revised or new regulations

Geographic Location of Project: Miami, Florida; Homestead, Florida

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Project End Date: March 31, 2012

Summary

Key Marine Consulting, Inc. in partnership with Biscayne National Park (BNP) and Everglades National Park (ENP) achieved visitor compliance with fishing regulations through active visitor education and interaction to reduce the number of fishing violations and ensure the treasured fisheries and coral reef resources of the upper Florida Keys that the Park protects are conserved and accessible to future generations. To accomplish this, a first-of-its-kind fisheries education program was designed to help fishers better understand local regulations, improve fish identification skills, and learn how their individual actions impact the marine environment. The class is available as a mitigation option for anglers who have been cited with a fishing violation. The class is also open to the public for free as a service to the community and a means of preventing future violations. South Florida's National Parks are the first institution to offer a fishing class as a mitigation option, and this is the first time that an education course has been used directly as a fisheries management tool.

Background

Biscayne and Everglades National Parks protect a tropical marine ecosystem located at



the southeastern tip of the Florida mainland, south of the city of Miami. This thriving, underwater environment consists of living coral reefs, sea grass meadows, mangrove shorelines, and tropical lagoons, which synergistically provide habitat to over 500 species of fish. The role ecologically balanced fish populations play in maintaining the health of coral and the sustainability of coral reef system function is well documented.¹ In addition, many of the fish species that call these parks home also support an economically important recreational fishery, which in addition to providing aesthetic value to divers and snorkelers, contributes to the multimillion dollar tourist industry on which much of South Florida depends. Due to the proximity to the city of Miami, recreational fishing is a popular past time for visitors to the parks, drawing many local residents to these natural areas throughout the year. Rapid growth and development in South Florida has caused the number of anglers who visit Biscayne and Everglades National Parks to dramatically increase in recent years.² In response, state fishing regulations are continuously updated to ensure that fish populations are being harvested in a sustainable manner.³

However, these important regulations are not always followed. Angler ignorance or indifference often leads to frequent infraction of the fishery regulations, thereby compromising the sustainability of Florida's coral reef resources. Over the past ten years, on average, fishing violations have made up over one fifth of the total documented law enforcement infractions that occur inside Biscayne National Park. This, coupled with Florida's increasing population, has resulted in documented declines in fish abundance and reproductive potential in Biscayne and Everglades National Parks.² Different from our nation's other national parks, the majority of Biscayne and Everglades National Park is underwater, making park boundaries easily penetrable, difficult to discern, visitor use harder to assess, the severity of resource degradation harder for the average person to understand, and law enforcement more of a challenge. Furthermore, due to our proximity to the seventh-largest metropolitan area in the United States, law enforcement personnel have historically been consumed by the responsibility of enforcing public safety issues rendering them unable to take the time to educate park visitors about the fishing regulations.

¹ Montgomery, W.L. 1990. "Zoogeography, Behavior, and Ecology of Coral Reef Fishes." *Ecosystems of the World v. 25-Coral Reefs*. Edited by Z. Dubinsky. Elsevier Science. New York, NY.

Jackson, J. B. C., Kirby, M. X., Berger, H., Bjorndal, K. A., Botsford, L. W., Bourque, B. J., Bradbury, R. H., Cooke, R., Erlandson, J., Estes, J. A., Hughes, T. P., Kidwell, S., Lange, C. B., Lenihan, H. S., Pandolfi, J. M., Peterson, C. H., Steneck, R. S., Tegner, M. J., and R. R. Warner. 2001. Historical Overfishing and the Recent Collapse of Coastal Ecosystems. *Science*, 293: 629-636.

Glynn, P.W. 1990. "Feeding Ecology of Selected Coral-Reef Macroconsumers: Patterns and Effects on Coral Community Structure." *Ecosystems of the World v. 25-Coral Reefs*. Edited by Z. Dubinsky. Elsevier Science. New York, NY.

² Ault, J.S., S.G. Smith, G.A. Meester, J. Lou, and J.A. Bohnsack. 2001. Site Characterization for Biscayne National Park: Assessment of Fisheries Resources and Habitats. National Oceanic and Atmospheric Administration (NOAA) Technical Memorandum 468.

³ Although Biscayne is a National Park, managed under the Department of Interior, State of Florida fishing regulations apply within park.

Fishing Class Overview

The fishing education class was developed in response to the above-described issues. The course is preferentially offered as a mitigation option for individuals who have received fishing citations or to individuals who may be mandated by a judge to attend. Similar to driving school, individuals who have received fishing citations may, at the discretion of the U.S. Attorney's office and the ticketing law enforcement agent, take the course in exchange for having their fine reduced or waived. The course is also offered for free to the general public as a service to the community and a means of preempting further violations from taking place by educating angling park visitors. The focus of this class is to help participants better understand the local fishing regulations and why they are biologically important. Technical scientific jargon is deliberately avoided during class instruction; class instructors use colloquial terminology that is easily understood by the general public. In addition, the class provides information on fish identification and a section on ethical angling, which is taught by a volunteer who is a local fishing guide. The class is offered in both English and Spanish in order to serve the needs of the entire South Florida community.

The course is approximately 3.5 hours in length and is designed to improve angler understanding of the local fishing regulations, fish identification, and how their actions impact the marine environment. Emphasis is placed on helping anglers understand the regulations, know where they can be found (as opposed to setting unrealistic expectations that someone fishing should memorize all of the regulations), and understand biologically why they are in place using terminology to which the public can relate. Participating anglers will also learn new and environmentally responsible fishing techniques from a participating local fishing guide to improve their angling ethic, skill and enjoyment while on the water. The class is primarily instructed by the Course Coordinator (contracted part time), with support from the BNP Park Fisheries Biologist and a volunteer who is a local fishing guide. A law enforcement representative is present in each class to assist individuals with legal issues related to their citation and answer questions. Individuals attending the course as mitigation for a citation must pass (80 percent or better) a short exam in order to receive the mitigation that was arranged. If they are not able to pass the exam to this standard, then they have the opportunity to repeat the class and have another try at the exam. Egregious violators and repeat offenders are not offered the course as a mitigation option.

The following chart summarizes the course curriculum:

Concept	Course Section	Purpose
Biscayne and Everglades' roles as National Parks	Introduction	Learn the protection that BNP and ENP receive as a component of the National Park Service
Why fishing regulations are necessary	Introduction	Learn the purpose behind regulating fishing

Correctly interpreting and following the fishing regulations	Fishing Regulations	Practice looking up and applying the fishing regulations to realistic scenarios
Function of regulations	Fishing Regulations	Learn the biological significance behind the different types of regulations
Correctly identify catch	Fish Identification	Practice and learn how to identify fish commonly caught in BNP so that the appropriate species-specific regulations can be followed
Catch and release	Responsible Fishing Techniques	Learn appropriate way to handle a fish out of the water and how to safely release that animal alive
Gear choice and maintenance	Responsible Fishing Techniques	Learn how circle hooks provide for successful catch and release, and how to select and maintain fishing gear



Biscayne National Park’s fisheries biologist and her two support staff, the park science coordinator, members of law enforcement, and the chief of education and outreach, assembled with local anglers who regularly use the park to develop the course content. . This steering committee provided the course coordinator with input on curriculum and course implementation. This group continues to advise the course coordinator on necessary modifications in order to keep the curriculum current with the current fishing regulations, which are updated every six months, and with ever changing issues in fisheries management. While speaking with stake-holder groups (local anglers, fishing organizations, and park managers and law enforcement), it was discovered that the majority of anglers who receive a fishing citation in Biscayne or Everglades National Park are simply ignorant to the local fishing regulations and fish species identification. One of the main reasons for angler ignorance is that the Miami metropolitan area where the park is located serves as a port of entry for many immigrants and the concepts of fishing regulations and ethical angling are not a part of their culture in their home country. For those who are ignorant, the course helps participants better understand the local fishing regulations, which can be complicated and are updated or changed regularly,

and helps participants improve their knowledge of fish identification. For those who may be indifferent to following fishing regulations, the course aims to encourage voluntary compliance by explaining how individual actions impact the marine environment and by teaching, in plain terms, the biological significance behind each of the fishing regulations.

Outreach Efforts

How are fishing violators reached?

During routine patrols, Biscayne and Everglades law enforcement officers conduct safety stops and fish checks to ascertain that park visitors are in compliance with boating safety and fishing regulations. During these check points one of the park's biologists often participate to assist in the identification and measuring of regulated species. When an officer finds that a violation has taken place, he/she may, at his/her discretion offer to the violator the opportunity to participate in the fisheries education class as mitigation for the violation in order to educate the park visitor about the regulations and prevent future violations. Every violator is given a class flyer with information about the class and how to register. Violators can also find information about the class through the class website:

<http://www.nps.gov/bisc/planyourvisit/fisheries-awareness-class.htm>

How is the general public reached?

Although by design the Fisheries Education Class was primarily established as a mitigation program for individuals who received a fishing citation, the program also serves as a free educational opportunity for members of the local community. Flyers are distributed in Biscayne and Everglades National Parks visitor's centers and by resource management employees during the course of recreational fishing surveys. Printed materials promoting the class are also disseminated in local marinas adjacent to the parks. To promote the class in the community, we have had a display table at Bass Pro Shop fishing-related store events, and participated in their store seminar series. Additionally, we have presented simplified versions of the class to local sailing clubs and at a local middle school in Homestead, adjacent to Biscayne National Park headquarters. A website has also been created to inform the public about the class and how to participate, <http://www.nps.gov/bisc/planyourvisit/fisheries-awareness-class.htm> Lastly, those attending the class for mitigation purposes are encouraged to bring family members and friends along with them.

Performance Measures

Success of the Fisheries Education Class is predicated on the well published fact in the field of fisheries science that understanding and managing the behavior of the fishermen is a necessary component to successful fisheries management.⁴ Implementing

⁴ Hilborn, R. 1985. Fleet dynamics and individual variation: why some people catch more fish than others. Canadian Journal of Fisheries and Aquatic Sciences 42: 2-13.

Lane, D.E. 1988. Investment decision-making by fishermen. Canadian Journal of Fisheries and Aquatic Sciences 45: 782-796.

change in human behavior from regulatory ignorance to compliance, however, takes time. Once compliance is in place, obtaining the expected fish population recovery response is also a slow process and one that is dependent on many other exogenous factors. As a result, it is difficult to measure the success of the fisheries class in the short term using metrics such as improvement in angler compliance and ecosystem function. Despite this, there are various indicators to show that the fisheries education program has and will continue to be a success.

As of May 2012, 598 people with fishing citations and 263 people without tickets have attended the fisheries education class (Figures 1 and 2). Over the four continuous years that the fisheries education class program has been in place, between 30 and 40 percent of individuals issued either a warning or violation attend the class (Table 1 and Figure 4). It is important to understand that when National Park Service law enforcement encounters a fishing violation, they can either write a warning or a violation. A warning does not carry any penalty, fine or court requirements, whereas a violation requires payment of a fine and/or court appearance. As a result, only those individuals who are issued a violation can be offered the fisheries education class as a mitigation option since warnings don't carry any mitigation requirements. In addition, a law enforcement ranger has the option of offering a violator the option to take the fishing class, and therefore not everyone issued a violation is eligible to take the class. Thus the fraction of class participants in table one below may seem low because it includes a total number of both warnings and violations combined, and because class participation is dependent on law enforcement discretion. The years 2007 and 2012 are not included in Table 1 because the class began in late 2007 and therefore only covered a couple of months in that year and, and because 2012 data are not yet complete.

Of the 598 individuals who took the class as a citation-mitigation, only three have subsequently been issued another fishing-related citation. Thus, the repeat offense rate (0.5%) is very low and suggests that this class is an effective way of deterring future violations of the fishing regulations. The three repeat offenders were not permitted to take the class a second time for mitigation. In addition, the number of people who decide to take the class without having a citation has been increasing. Exam scores for participants have been relatively consistent (Figure 3). This has only been measured since the class in June of 2008 since we restructured the exam at that point. The drop in exam score in February of 2009 was due to translational issues since that was when we first started to offer the class entirely in Spanish (prior to that the class was offered in English with simultaneous translation). Although the total absolute number of warnings and violations due to fishing has increased in recent years (Figure 5), the number of law enforcement rangers working at Biscayne National Park has also increased. Over the past 14 years, the majority of fishing warnings and violations has been issued due to anglers not having a fishing license, catching undersized fish, harvesting fish over the bag limit, and fishing in a closed area (predominantly harvesting lobster inside of the lobster sanctuary) (Figure 6). The regulations section of the fisheries education course focuses

Branch, T.A., R. Hilborn, A.C. Haynie, G. Fay, L. Flynn, J. Griffiths, K.N. Marshall, J.K. Randall, J.M. Scheuerell, E.J. Ward, M. Young. 2006. Fleet dynamics and fishermen behavior: lessons for fisheries managers. *Canadian Journal of Fisheries and Aquatic Sciences* 63: 1647-1668.

Hilborn, R. 2007. Managing fisheries is managing people: what has been learned? *Fish and Fisheries* 8: 285-296.

heavily on these areas due to the frequency of infraction. The species most affected by infraction of the size and bag limits (Figures 7 and 8) are those that the class focuses on in the fish identification section.

We believe that the observed increase in violations from 2007 to 2008 is partly due to rangers' responsiveness to the fishing education class. In other words, rangers now have the option to send violators to the class to help prevent future violations. This provides an incentive for law enforcement to increase efforts to better manage park resources and devote more time to enforcement of fishing regulations. The drop in violations during 2009 is also noteworthy due to extensive fish mortality as a result of extremely cold weather conditions in the winter resulting in temporary season closures for many species.

Table 1: The total number of people who attended the fishing education class each year and what percentage of those issued a warning or violation for a fishing citation attended the class.

Year	Public Who Attended Class	Violators Who Attended Class	Total Violations and Warnings	Percentage of Violators Who Attended Class
2008	29	96	345	28%
2009	110	214	565	38%
2010	45	109	286	38%
2011	57	142	344	41%

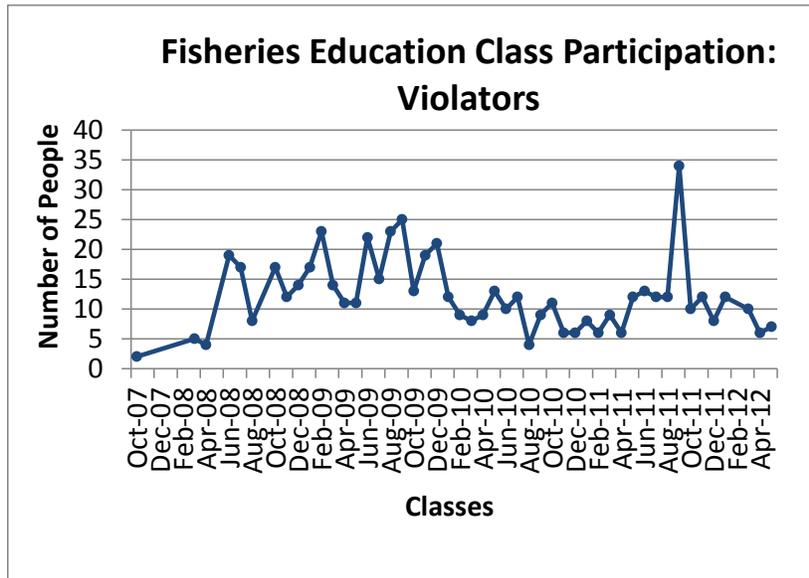


Figure 1: Class participation by fishing violators.

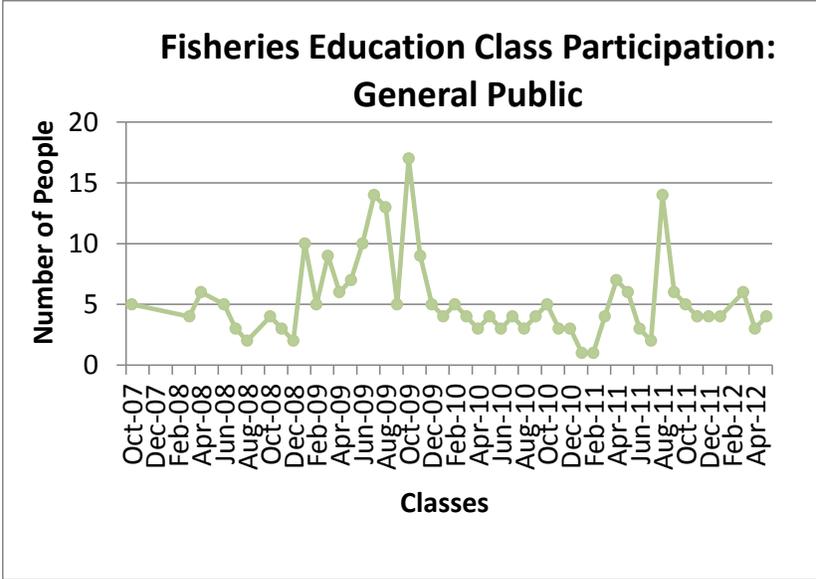


Figure 2: Class participation by the general public.

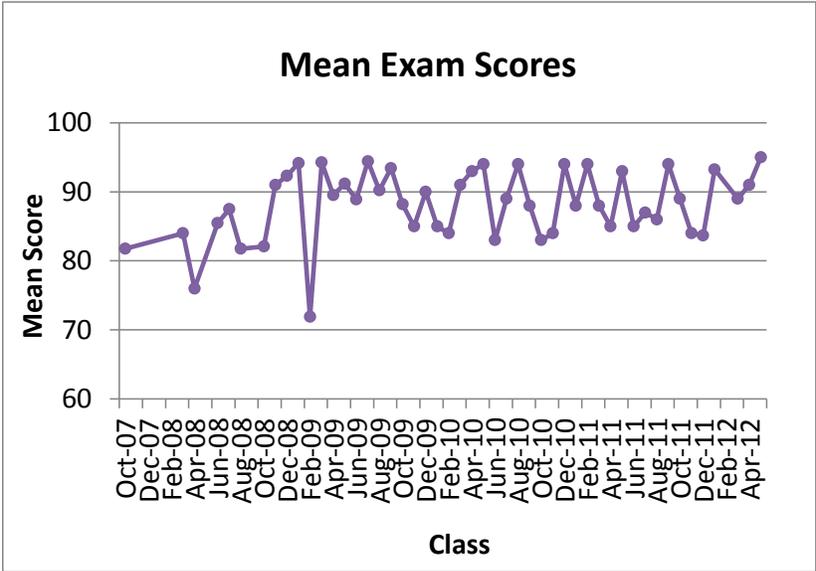


Figure 3: Average exam scores for fishing violators.

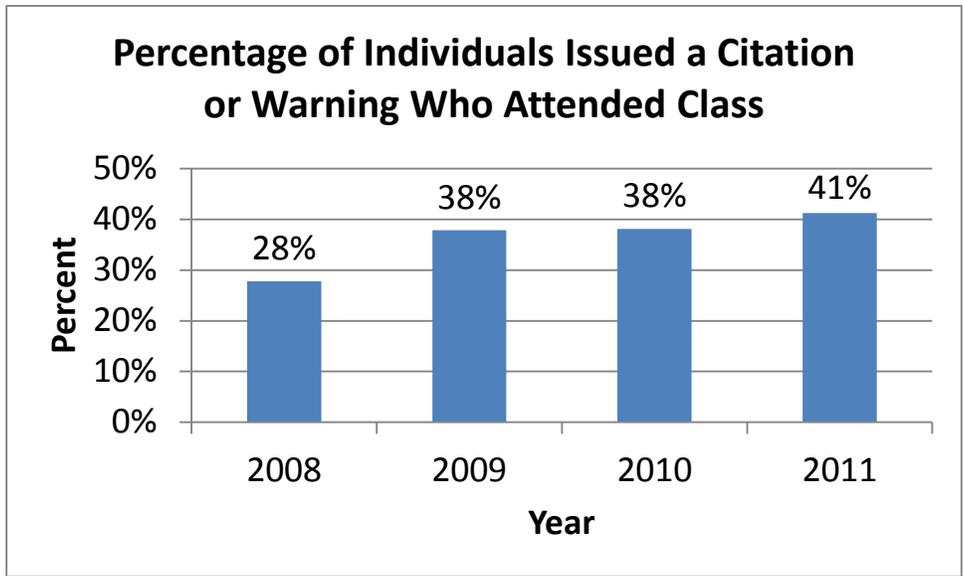


Figure 4: The percentage of individuals who were issued either violation or a warning for a fishing related incident who attended the fisheries education class.

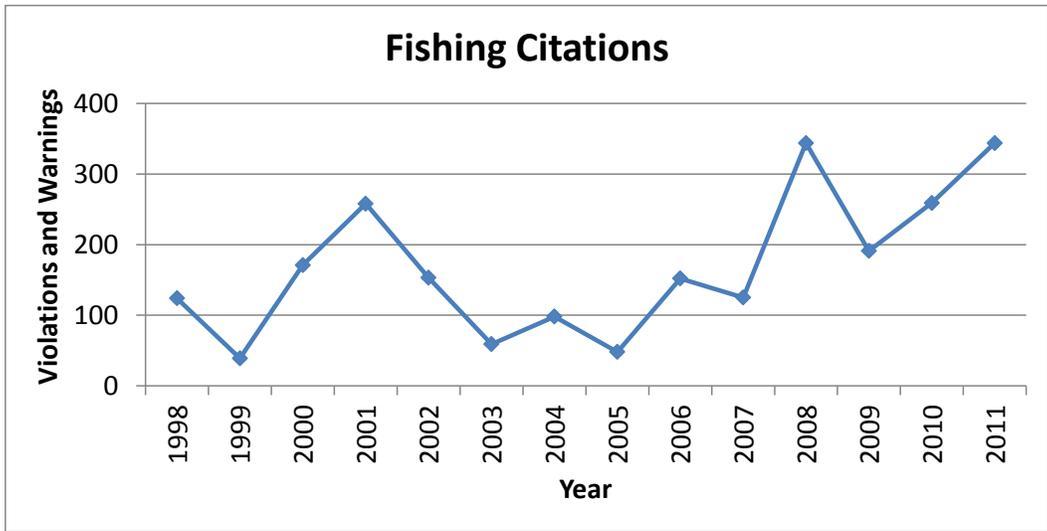


Figure 5: Total number of fishing warnings and violations issued by rangers in Biscayne National Park.

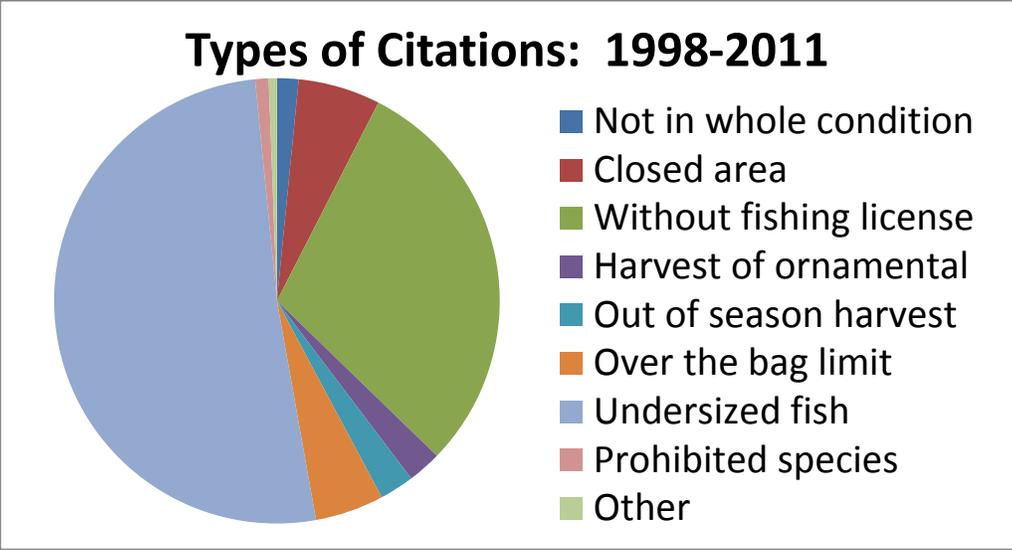


Figure 6: The kinds of citations issued by rangers for fishing violations and warnings in Biscayne National Park.

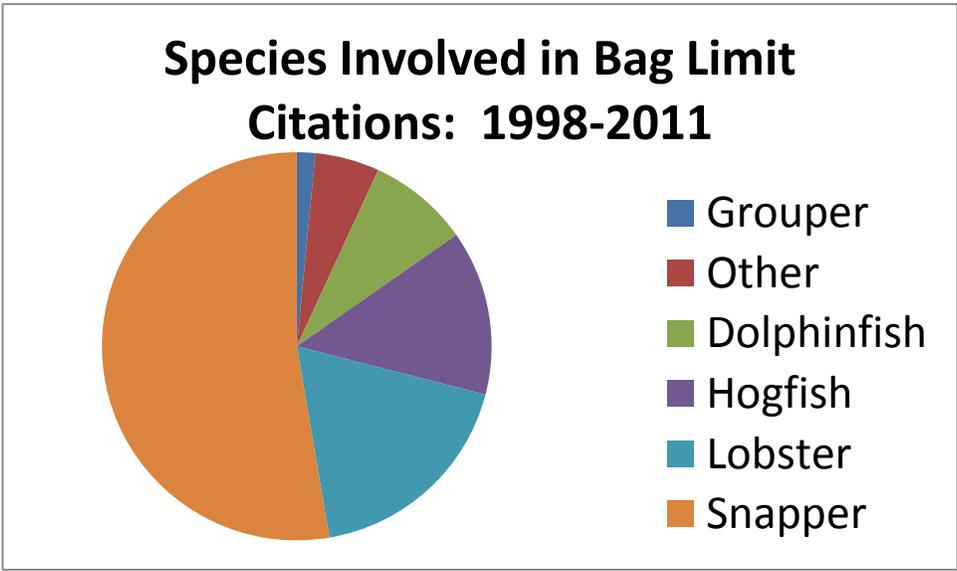


Figure 7: The species that were harvested over the bag limit.

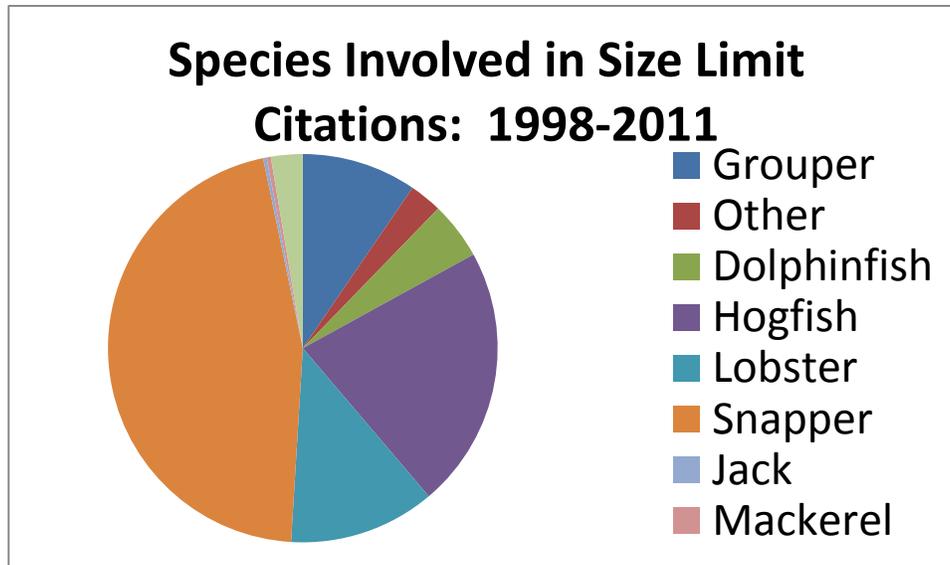


Figure 8: The species that were harvested over the size limit.

Impact of the Fisheries Regulation Class

Lessons Learned

Since the fishing education class was started in 2007, the program operating procedures and curriculum have gone through a number of different iterations as we learned what approaches worked better than others. Here is a list of some of the main lessons that have been learned:

1. Participants are aware that there are regulations, but lack the proper interpretation of the regulation and how to apply it. As a result, the course spends a substantial amount of time showing participants to how the regulations pamphlet is laid out, with emphasis on how to read and interpret the regulations, as opposed to encouraging memorizing every regulation. We encourage anglers to carry a copy of the regulations at all times while fishing so that they can refer to it and offer ways to keep it weather-proof (i.e. by laminating it or placing it in a sheet protector).
2. Anglers often don't know the basic biological and ecological rationales for having the various regulations. This is very important to achieving compliance as once people understand the larger purpose for the regulation they are more willing to comply.
3. Flexibility of exam administration – although the exam serves as a court requirement, more than anything else, the exam is used to help reinforce the course material and offer an opportunity to practice applying their newfound understanding of the fishing regulations. To this point, there have been occasions when individuals have participated in the class, and although they understood the material that was presented, they had difficulty with the exam. Some of the reasons for these difficulties have been because the participant was not able to read well, forgot their glasses, or was not fluent in English or Spanish. In these cases, the participants were offered the exam orally and in all cases, able to demonstrate that they understood the material.
4. Class participants have a better response to collaborative learning. Participant

involvement is very important as it enables you as the class facilitators to gauge how the class understands the concepts, and it keeps the class interesting for participants. In addition, it is very important that the course is **not** presented with a punishment focus, as participants will not respond with an open mind to the information that is being presented. Sometimes class participants may want to vent to you about their violation and a limited amount of this is sometimes entertained because if participants feel like you are listening to and understand their concerns, they are more likely to listen to the information that you have to offer.

5. Visuals are better than words. Participants seem to respond better to slides that have visuals as opposed to slides that are populated with many words. Thus a balance between slides with words and those with visuals are important. Slides with too many words or all words should be kept to a minimum. An example of this is the way that bag limits are taught by using a slide that has a number of partitions in which fish can go, and then animated fish are placed into the partitions to demonstrate how to understand the bag limit.
6. Extraneous variables often affect recruitment. At one point during the program, the law enforcement division was very understaffed, and as a result, class participation was much lower than other times. Boat maintenance also affects class participation such that when a few of the law enforcement division's boats are broken, attendance often decreases. Finally, participation is greatly affected by the weather conditions and seasons. During periods of windy conditions, bad weather, or when hurricanes are near South Florida, people are not out fishing and therefore, the attendance of the class often goes down. Conversely, recruitment increases during periods of good weather and also around holiday weekends when people tend to have more time off to get out on the water.
7. Stakeholder involvement in the class. Finally, participants respond very favorably to the last section of the class, when they hear the information that was presented in the previous sections reinforced by a local fishing guide, one of their peers.

Class Evaluation and Peer-Review Publication

A class survey has been developed (see Appendix A) to evaluate participants attitudes and behaviors related to fishing regulations before and after attending the class. The first part of the survey has 7 demographic questions. The second part of the survey examines fishing frequency (questions 8-10), compliance with size and bag regulations (11-12) and attitudes towards fishing regulations (13-16) before attending the class. The third section of the survey, also examines participants' mastery of fish identification, measuring, catch and release and understanding of regulation (questions 26-31). Finally, questions 32-33 examines self-reported recidivism.

A focus group will take place on June 30th, where 5 participants will be invited to take the survey and give feedback about the organization and wording of the survey. We are also conducting a small pilot group by mailing 40 surveys to past class participants. These 40 individuals will be randomly selected and will be asked to complete the survey and provide feedback about the structure and wording of the survey. After the focus group and pilot study, the survey will be edited and submitted to all class participants in the database. Ultimately, a peer review paper will be written presenting the results of this study. A copy of this paper containing the study's results will be sent to NOAA's Coral

Reef Program.

Grounding Awareness Program

Due to the success of the fishing education program, a parallel program at Biscayne National Park has been developed and is also being facilitated by Key Marine Consulting, which targets individuals who receive a boating citation for running aground and/or destroying natural resources. This is a serious problem in Biscayne National Park due to the many shallow sea grass flats and shallow patch reefs within the park. The structure and operating procedures of the fishing education class have been used to develop and launch the grounding educational class.