A Snapshot of Florida's Freshwater Anglers: Angler composition, behaviors and attitudes.

Abstract

Prior to this study, little research has been conducted that comprehensively evaluated Florida's Freshwater anglers. In this study, I conducted a mixed-mode survey of Florida freshwater anglers using a stratified random sample of freshwater license holders. The survey assessed motivations to fish, fishing preferences, attitudes towards management issues and a measure of value orientations. Eighty percent of anglers were white, 40% targeted largemouth bass, and there were significant differences in target species by age, income, and race/ethnicity. Motivations to fish varied among respondents and most anglers favored eco-centric value orientations. Opinions about management issues varied and results provide an opportunity for managers to better understand views of recreational anglers in an effort to enhance management of freshwater resources.

Study objective

The objectives of this study were to 1) evaluate Florida freshwater angler composition, 2) determine angling behaviors and attitudes towards freshwater fisheries management issues, and 3) to use the results of this study to inform management decisions and to identify areas of future human dimensions research related to Florida's freshwater fisheries resources.

Introduction

Florida has over 8,000 named lakes and over 10,000 miles of rivers, streams, and canals, thus freshwater fishing is an important recreational activity. Freshwater anglers comprise 39% of the 3.1 million anglers in Florida and Freshwater fishing contributes $1.7 billion to Florida's economy annually (USFWS, 2011; Southwick 2012). With such a large recreational presence, it is important to understand the characteristics, behaviors, and perspectives of this state's diverse anglers allowing managers to make better informed decisions that enhance fishing experiences on Florida's freshwater systems.

Florida's aquatic resources are managed under the public trust doctrine. Traditionally, freshwater fisheries management in Florida has been driven by biological science, and management objectives have largely been determined by resource managers and agency leaders in the interest of the public that utilize those resources. However, there is growing recognition that stakeholders of Florida's aquatic resources should have considerable input on management objectives. In recent years, freshwater fisheries managers have made an emphasis to participate in stakeholder engagement, but lacked the capacity and expertise to conduct quantitate analysis of stakeholder's behaviors, attitudes, and expectations. This survey was developed as a starting point to better understand who comprises Florida's freshwater anglers, their motivations for fishing, their values, and attitudes toward some critical

management issues. While some of the results are immediately useful for fisheries managers, other results lead to more in depth questions that need to be addressed with future social science research.

Methods

Questions were developed in collaboration with staff from the Florida Fish and Wildlife Conservation Commissions' freshwater fisheries research (FWRI- FFR) and management (DFFM) divisions. Using similar surveys from other state agencies and university researchers as well as specific topics from FWC staff, I developed an instrument that would give a broad overview of angler characteristics and opinions. In addition to the general angler questions, I included a section of items specific to bass anglers. Angler motivation and value orientation indices were shortened to reduce survey fatigue. These items were pre-tested on a sample of anglers from a local fishing organization. Cronbach's alpha and item total correlations (ITC) were calculated for each set of indices. Items with Cronbach's alpha under 0.7 and ITC less than 0.3 were removed.

I used a mixed mode design (online and mailed surveys) with stratified random sampling of Florida's freshwater fishing license holders. The strata included 4 geographic regions based on number of license holders and a strata composed of minority license holders. Each strata represented about 20% of the overall sample. A total of 35,780 surveys were distributed with 3,277 responses. The majority of the sample consisted of online surveys (28,762). Online surveys included an initial email and two reminders, 1 week and 3 weeks out. Mailed surveys included an initial mailing with cover letter and survey booklet and 1 reminder after a month.

Descriptive and inferential statistical analyses were run on the data. Chi squared tests were used to detect non-response bias and to analyze differences in awareness of TrophyCatch. Analysis of variance (ANOVA) were conducted to analyze differences among group means. Principle components analyses using Varimax rotation were conducted on motivation and value orientation items.

Results

In order to ensure the respondents of the survey represent the sampled population, a non-response bias check was conducted, comparing the original sample to the actual responses (Vaske, 2008). The responses did not significantly differ from the sample (X^2=3.17, df= 4, p=0.53).

Angler composition and behaviors

Of the respondents, 80% were white, 9% black, 4% Hispanic (any race), 3% Asian, and 4% other. Sixty-four percent of respondents were over the age of 45, 30% were between 25 and 44 years old, and 6% were between 16 and 24 years old. Fifty-four percent had less than a college degree, 30% had an associates or bachelor's degree, and 16% had a graduate or professional degree.

Forty percent of anglers reported primarily targeting largemouth bass (LMB), 23% bream, 16% crappie, 12% catfish, 5% striped bass, and 4% primarily targeted other black bass. Only 15% of anglers reported participating in at least one tournament in the past year. Further analysis revealed differences in fishing behavior by demographic categories. Angler effort for LMB, crappie, and bream differed significantly by race/ethnicity (Table 1). Effort for LMB, crappie, bream, and catfish differed significantly by income (Table 2). Effort for LMB, crappie, and other bass differed significantly by age (Table 3).

Anglers generally traveled less than 50 miles to fish and fished for half a day or less. Forty six percent of respondents fished in public lakes all or most of the time, 28% in rivers, 14% in private lakes or ponds, and 12% in reservoirs. A majority of anglers (62%), fished all or most of the time from a motor boat, 29% from banks or piers, 8% from non-motorized boats, and 2% with paid guides. Analyses revealed that African-American, Asian, and Hispanic anglers were significantly more likely to fish from banks all or most of the time ($F=26.24$, $p=.00$) while White anglers were significantly more likely to fish from motor boats most or all of the time ($F=15.77$, $p=.00$). Anglers with incomes less than $19,000 were also significantly more likely to bank fish most or all of the time ($F=26.36$, $p=.00$), while those with incomes above $80,000 were significantly more likely to fish from motor boats most or all of the time ($F=7.46$, $p=.00$).

When asked about sources of fishing information, the top preferred sources were word of mouth (28%), magazines/newspapers (13%), internet forums (12%), and YouTube (12%). Results of an ANOVA showed that preference for word of mouth was not significantly different across age groups, suggesting that this method of communication is important across ages ($F=1.84$, $p=.10$).

Angler motivations and value orientations

A principle components analysis showed motivations falling into 3 distinct components, nature/relaxation, social/skills, and challenge/trophy (Table 4). Value orientations fell into 2 distinct components, eco-centric and anthropocentric (Table 5). The composite mean of eco-centric values ($M=4.30$, $SD=.70$) was significantly higher than the mean for anthropocentric values with a response scale of 1 being strongly disagree and 5 being strongly agree ($M=2.73$, $SD= .89$, $t(3916)=1.96$, $p=.00$).

Angler attitudes about management issues

Anglers reported neutral opinions of the importance of FWC's stocking of hatchery and wild-caught fish to a successful fishery with a response scale of 1 being very important and 5 being not at all important ($M=3.30$, $SD= 0.85$). They believed that 29% of public water bodies were stocked and 26% of anglers believed they had caught stocked fish. This contrasts with the estimated 3% of water bodies stocked by FWC and less than 1% stocked with largemouth bass in FY 2015.

On a response scale of 1 being excellent and 5 being terrible, respondents were generally confident in their abilities to identify non-native fish ($M=2.04$, $SD= 1.07$) and plants ($M=1.40$, $SD=.99$). Anglers rarely caught ($M=.90$, $SD=.84$) or kept non-native fish ($M=.86$, $SD=1.40$). They

believed that non-native fish (M=4.04, SD=1.01) and plant (M=3.92, SD=1.04) species negatively affected their target species.

In general, anglers reported that they would support the sale of farm-raised bass as food fish in Florida with a response scale of 1 being definitely would support and 5 being definitely would not support (M=2.21, SD=1.19) and felt that the production of bass as food fish would have a somewhat positive influence on wild populations (M=2.08, SD=.97).

Bass angler- specific attitudes about management issues

Sixty three percent of bass anglers indicated that they had not heard of the TrophyCatch angler recognition program. Significantly more non-tournament anglers were unaware of the program than tournament anglers (X^2=30.97, df= 2, p=.00). Tournament participation overall was low, with 79% of anglers indicating that they had not participated in a fishing tournament in the past year. With a response scale of 1 being very positive and 5 being very negative, bass anglers reported neutral opinions on the effects of tournaments on bass health, bass habitat, water quality, and environmental health and had positive opinions about tournament effects on local economy (M=1.92, SD=.76).

Thirty seven percent of bass anglers indicated that they bed fished. Of bass anglers, 50% of tournament anglers reported bed fishing while 33% of non-tournament anglers reported the behavior. Perceptions of bed fishing significantly differed between those who did and did not bed fish (Table 6). There were no significant differences in perceptions between tournament anglers and non-tournament anglers.

Respondents indicated that the protection of genetic purity of Florida bass was moderately important on a scale with 1 being very important and 5 being not at all important (M=1.52, SD=.79) and reported that they would put more fishing effort into a water body if they knew it had pure Florida bass on a scale of 1 being much more and 5 being much less (M=2.21, SD=.86). Anglers also agreed that FWC should supply hatchery-raised bass to other states to improve fishing with 1 being strongly agree and 5 being strongly disagree (M=2.21, SD=1.06) and to aid in disaster relief (M=1.97, SD=.92).

Anglers had neutral attitudes about hydrilla but indicated that 30% coverage of hydrilla in a water body would improve bass fishing. When asked where hydrilla most improves fishing, 36% didn't know, 36% of anglers indicated the emergent vegetation zone, 15% indicated the offshore zone, 9% indicated just outside the emergent zone, and 4% indicated more than one zone (Figure 1). There were some slight differences in opinions about hydrilla between tournament and non-tournament anglers (Table 7).

Discussion

This survey provides a broad overview of angler characteristics, behaviors, and opinions. While no single topic was explored in great detail, results are a useful springboard to suggest areas where managers can improve communication and outreach with anglers and better understand their perspectives.

Angler composition and behaviors

The demographics of Florida's freshwater anglers are similar to the nationwide composition of anglers (USFWS, 2011). As US demographics shift, particularly in urban centers, it is important for managers to develop programs to recruit and retain more diverse anglers (Hunt and Ditton, 2002). Programs seeking to reach underserved communities should direct efforts to understanding the motivations and barriers to participation of these particular groups. Studies have suggested that people participate in activities if they exist in close proximity to home and are affordable (Lindsay & Ogle, 1972). Different communities also have different preferences or behaviors. Minorities and low income anglers are more likely to fish for consumptive purposes (Johnson et al., 1998). This survey showed racial/ethnic differences in targeted species. Understanding these factors can help managers better serve diverse angler groups. Given this study's results showing lower income and minority anglers tend to fish more from shore, managers should provide more and better pier and shore fishing opportunities. Understanding barriers to participation will also help managers recruit and retain diverse anglers. Floyd (2006) found that people in lower socioeconomic brackets were less likely to participate in outdoor recreation because of lack of financial resources, lack of accessibility, and lack of interest or skill due to education. Discrimination (perceived or real), language barriers, and safety concerns were identified as constraints to fishing participation for communities of color (Schroeder et al. 2008).

It is also important for managers to understand how anglers get their information. In this study, word of mouth was the most popular way for anglers to get information. Word of mouth can be an important tool for communicating about research (Cardona-Pons et al., 2010). Managers should work to better understand these word of mouth networks to more effectively engage with anglers. The Internet and social media are also important sources of fishing-related information. One study found that anglers commonly use the internet to exchange fishing information (where to find fish, when to fish, etc) and to get information about fishing licenses, rules, and regulations (Martin et al., 2012). The study also found that forums, blogs, and websites were used by both avid and casual anglers. Understanding the preferred methods of communication for angler groups is important for creating an engaged, informed, and knowledgeable angling community.

Angler motivations and value orientations

A review of research on angling motivations grouped motives for fishing into categories: 1) psychological and physiological, 2) nature, 3) social, 4) resource related, and 5) skill and equipment (Fedler and Ditton, 1994). Relaxation and getting into nature were rated important across several studies. Social desires to interact with other people were also important, and somewhat at odds with results showing a desire to get away from people. Researchers suggested that anglers' social motives were to spend time with friends or family, as opposed to seeing other people on the water bodies. Challenge and catching trophy fish was important for some anglers, mostly those who targeted large sportfish. Developing skills and testing equipment was of moderate to low importance. The motives in this study were condensed into

three categories, but generally aligned with existing research. Further analysis is needed to judge which motivations were the strongest.

Studies across human dimensions research have suggested that value orientations are useful for predicting attitudes about natural resource management (Bruskotter and Fulton, 2008). Rokeach (1973) refers to values as end-states of existence, or goals (such as happiness, freedom, wisdom, friendship, etc.) a person would like to achieve in his or her lifetime. Value orientations are expressions of core values (Fulton et al., 1996). Bruskotter and Fulton's (2008, p.209) study referred to value orientations as here as *patterns of basic beliefs governing how human beings should interact with (i.e. use, treat, value, manage or otherwise affect) fisheries and other aquatic resources.* Similar to that study, survey results showed that anglers favored more bio-centric views. While this survey did not correlate value orientations with stewardship behaviors or attitudes, future research could explore these relationships. Understanding value orientations could help predict stakeholder views of potential management actions.

Angler attitudes about management issues

Anglers vastly over-estimated the occurrence of stocking in public water bodies. In an unpublished survey of Florida anglers, 36% of respondents said they had fished in a stocked water body and 30% said they have caught stocked largemouth bass (Lorenzen, 2013). This suggests a need for better outreach and education about stocking.

Florida has one of the highest numbers of established non-native species in the country (Pimentel et al., 2005). Non-native species can have serious impacts on freshwater systems and recreational fisheries. Our results suggested that anglers are aware of the various non-native plant and fish species and have generally negative attitudes about their effects on native species. Another study found that a majority of respondents expressed negative opinions of non-native species, with the most negative opinions associated with perceived negative impacts on desirable native species (Edwards and Rehage, 2016).

While there has been no official proposal for the sale of largemouth bass as food fish in Florida, the potential for a market has been suggested by the Florida Department of Agricultural and Consumer Services (DACS). The two items regarding this topic were included to get a baseline of angler opinions. While responses were generally favorable, some have expressed concern over the risks of negative consequences such as poaching (Montgomery, 2011). It is important to get more detailed stakeholder input if the topic is to be pursued further.

Bass specific items

Black bass are an important resource in Florida (FWC, 2011). Results of this survey indicated that largemouth bass were the most frequently targeted sportfish species. As such, it was important to include bass-specific items in the survey to better understand angler perspectives on this resource.

TrophyCatch, an incentive-based conservation program, has upwards of 12,000 registrants (Quintana, 2016). While participation has grown steadily over the past 4 seasons, results of this survey found a gap in awareness, and non-tournament anglers were significantly less likely to

be aware of TrophyCatch than tournament anglers. Furthermore, overall awareness estimates are significantly different between this survey and direct estimates from reward-based tagging studies of trophy largemouth bass. This could be because highly specialized anglers (i.e., tournament anglers) are more likely to catch a trophy-sized bass with a reward tag. This is not surprising given the marketing effort of TrophyCatch has focused on tournaments anglers.These results suggest the need to expand marketing to increase awareness among casual and non-tournament anglers.

Fishing for bass on spawning beds is considered a controversial activity by many anglers. During the spawning season, male largemouth bass excavate small depressions and provide sole parental care of offspring (Suski & Philipp, 2004). Males show increased agression and susceptability to angling while on beds. Different management strategies could influence the effects of bed fishing on bass mortality (Gwinn and Allen, 2010). Management decisions regarding regulations for bed fishing would not only be subject to biological factors, but also to angler perceptions. Results of this survey showed that those who engaged in the behavior viewed bed fishing more favorably than those who did not. Before making management decisions, it would be important to better understand the sources of these opinions and address any gaps in knowledge, particularly the recent research findings that there are no population-level effects of nest fishing and no significant differences in nesting success between fish caught off nests and controls

Overall, anglers believed it is important to protect the genetic purity of Florida largemouth bass. However, anglers were also open to aiding other states by stocking Florida bass to improve their recreational fisheries and aid in disaster relief. This suggests an acknowledgement of anglers of the trophy value of Florida largemouth bass and a desire to improve sport fishing in other areas of the US.

Hydrilla is another controversial topic among the angling community. The submersed macrophyte is native to Asia, but has been in the US since 1960 and has characteristics that make the plant well adapted to Florida freshwater environments (Langeland, 1996). Researchers have found that moderate (15-30%) submersed vegetation cover can positively influence largemouth bass production and have resulted in increased abundance and catch rates of bass (Sammons et al., 2003). This estimate is in line with anglers' responses on their desired coverage of hydrilla to improve bass fishing. This suggests that management of the plant at those levels would be acceptable for both largemouth bass and anglers. Interestingly, the majority of anglers were unsure where they would like the presence of hydrilla. Fish and plant managers need to work with anglers to better determine desired location of hydrilla.

Conclusion

This study presents a broad overview of Florida freshwater angler behaviors and opinions. The goals of this project were not to make specific management recommendations, but to explore stakeholder behaviors and perspectives and to present managers with baseline information that might encourage more in-depth research of angler perspectives on specific management issues.

Future research opportunities include further exploring predictors of angling behaviors, using angler value orientations to predict attitudes about management actions, and understanding regional differences in attitudes or behaviors. The results of this study also present opportunities for managers to increase outreach to non-traditional angling groups, leverage different methods of communication, and to increase awareness of TrophyCatch to a broader audience. Understanding stakeholder behaviors and opinions is important to effectively managing natural resources.

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Table 1. Using a likert-type response format with 1 being always and 5 being never, anglers were asked how often they targeted the following species. Targeted species significantly differed by race/ethnicity.

Species	M White	M Black	M Asian	M Hispanic	F	Sig
LMB	2.32	2.832	2.69	1.94	7.25	.000*
Striped bass	4.05	4.01	4.23	3.83	.724	.652

Crappie	3.18	2.77	4.00	3.47	8.238	.000*
Bream	2.94	2.10	3.35	3.03	14.46	.000*
Catfish	3.45	3.26	3.66	3.29	1.51	.160
Other bass	4.13	4.10	3.93	3.77	1.79	.086

*p<.00

Table 2. Using a likert-type response format with 1 being always and 5 being never, anglers were asked how often they targeted the following species. Targeted species significantly differed by income.

Species	M Less $19k	M $20-39k	M $40-59k	M $60-79k	M $80-100k	M $100-150k	M Over $150k	F	Sig
LMB	2.55	2.58	2.41	2.30	2.43	2.27	2.20	3.50	.002**
Striped bass	3.96	3.96	4.03	3.95	4.11	4.10	4.10	1.10	.360
Crappie	3.20	3.05	3.07	3.11	3.18	3.41	3.16	2.32	.016***
Bream	2.44	2.69	2.76	2.92	2.87	2.94	3.09	5.11	.000*
Catfish	2.95	3.08	3.32	3.42	3.51	3.66	3.77	12.12	.000*
Other bass	4.03	4.13	4.05	3.99	4.16	4.12	4.11	.894	.498

*p<.00, **p<.01, ***p<.05

Table 3. Using a likert-type response format with 1 being always and 5 being never, anglers were asked how often they targeted the following species. Targeted species significantly differed by age.

Species	M 16-24	M 25-34	M 35-44	M 45-54	M 55-64	M 65+	F	Sig
LMB	2.11	2.26	2.40	2.37	2.46	2.44	2.63	.022**
Striped bass	4.12	4.06	4.02	4.03	4.05	4.02	.21	.957
Crappie	3.69	3.83	3.32	3.09	3.05	2.76	15.38	.000*
Bream	2.94	2.98	2.93	2.83	2.74	2.84	1.88	.095
Catfish	3.27	3.37	3.43	3.44	3.50	3.57	1.23	.294
Other bass	4.06	3.92	4.08	4.11	4.16	4.23	2.24	.048***

*p<.00, **p<.01, ***p<.05

Table 4. Motivations.

	Component		
Item	Nature/Relax	Social/Skill	Challenge/Trophy
to be outdoors	.872		
to be closer to nature	.863		
to reduce stress	.735		
to meet new people with similar interests		.780	
to pass along my angling skills to younger generations		.650	
A lot of my friendships are centered around fishing		.641	
for physical exercise		.603	
To develop my own skills as an angler		.470	
I prefer to fish where I know I can catch trophy fish			.851
I would rather catch 1 or 2 big fish than 10 smaller fish			.802
I am happiest with a fishing trip if I catch a challenging game fish			.678
Eigenvalue	3.52	1.73	1.30
Cronbach's Alpha	.673	.775	.717
% Variance Explained	31.97	15.76	11.80

Table 5. Values.

	Component	
Item	Eco-centric	Anthropocentric
People have a duty to protect fish and other parts of nature.	.609	
Fish are valuable in their own right, regardless of people.	.717	
Management should focus on doing what is best for nature instead of what is best for people.	.803	
Fish have as much right to exist as people.	.835	
Fish are primarily valuable as food for people.	.731	
Humans were meant to rule over the rest of nature.	.542	
Fish should primarily be managed for human benefit.		.658
Nature's primary value is to provide things that are useful to people.		.801
Fish are valuable only if people get to use them in some way.		.765
Humans have a right to change the natural world to suit their needs.		.719
Eigenvalue	3.70	1.86
Cronbach's Alpha	.73	.82
% Variance Explained	36.99	18.62

Table 6. Bed fishing.

	M Bed fishers	M Non-bed fisher	t	df	Sig (2 tailed)
Effect of bed fishing on bass populations	3.22	3.9	-12.15	949	.000
How do most anglers view bed fishing?	2.76	3	-4.18	1076	.000

Table 7. Hydrilla.

	M Tournament	M Non-tournament	T	df	Sig (2 tailed)
How much does hydrilla improve bass fishing?	2.53	3.00	5.81	993	.000
Percent hydrilla	32.49	29.62	-2.09	910	.037
How important is location of hydrilla to bass fishing?	2.00	2.43	5.41	1023	.000
How important is abundance of hydrilla to bass fishing?	2.78	3.18	4.95	1021	.000

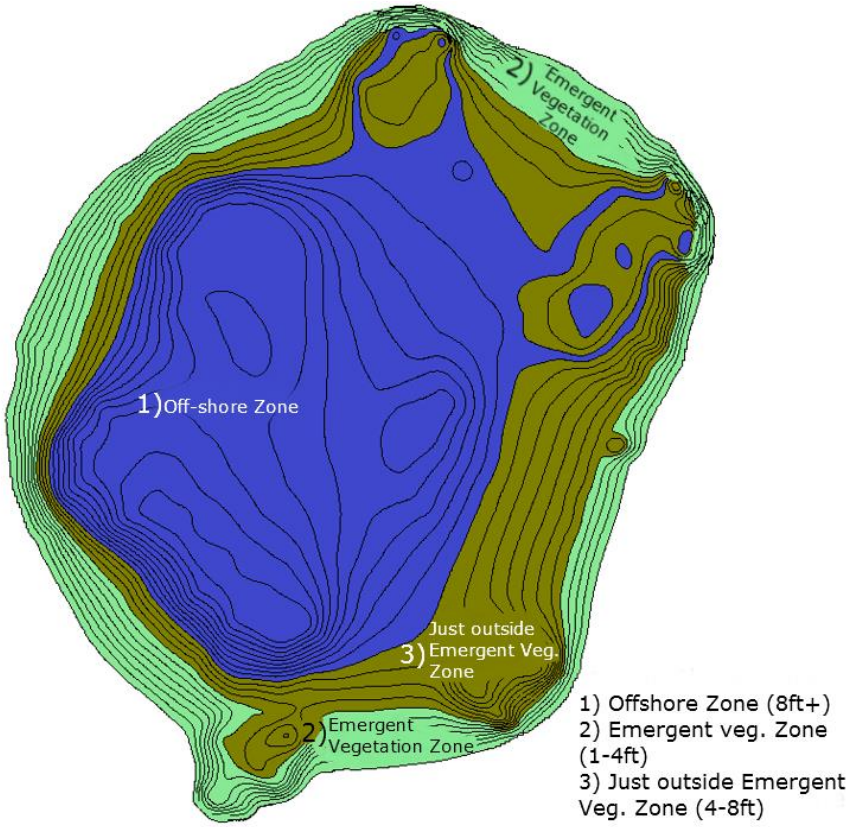

Figure 1. Locations preferences of hydrilla. When asked where hydrilla most improves fishing, 36% didn't know, 36% of anglers indicated the emergent vegetation zone, 15% indicated the offshore zone, 9% indicated just outside the emergent zone, and 4% indicated more than one zone.

Appendix 1 – Significant Findings

A Snapshot of Florida's Freshwater Anglers: Angler composition, behaviors and attitudes.

Nia Morales

- This study consisted of a stratified random sample of licensed Florida freshwater anglers. Surveys were distributed via email and mailed survey booklets.
- Goals of the study were to get a broad understanding of angler characteristics, behaviors, and opinions about management topics.
- Demographics of freshwater anglers match overall national demographics- majority white males.
- There were demographic differences in angling behaviors by race/ethnicity and income, suggesting the need for better outreach to angling communities to better understand their behaviors and to target them for recruitment/retention outreach based on their fishing habits.
    - Minorities and lower income anglers were more likely to fish from banks.
    - Minorities were more likely to target crappie, catfish, and bream.
- Bass (40%), Bream (23%), and Crappie (16%) were the three most targeted species
- 29% of respondents fished all or most of the time from banks or piers
- Anglers used many sources of communication to get information about fishing, but word of mouth was preferred. Managers should leverage these communication methods to engage with anglers.
- Anglers vastly overestimate the rate of stocking on public water bodies.
- In general, anglers agreed that non-native plant and fish species pose a serious threat to their target species. However, most anglers did not harvest non-native fish.
- About 2/3 of bass anglers were not aware of the TrophyCatch program. Non-tournament anglers were less likely to know about the program than tournament anglers. This suggests a need for more outreach to non-tournament anglers to promote this program.
- Anglers felt that 30% hydrilla coverage was the optimum amount for bass fishing, although the majority of anglers were unsure where in the lake they preferred the hydrilla.
- In general, anglers would be supportive of a program to raise bass as food fish in Florida.
- More tournament anglers reported bed fishing than non- tournament anglers. Those who engaged in the behavior were more likely to view more positively than those who did not. This indicates the need for better outreach about the effects of bed fishing on bass in the state.

Appendix 2 – Presentations and Seminars

- This research was presented at:
    - Eustis Fisheries Research Seminar on July 29, 2016
    - American Fisheries Society Annual Meeting in Kansas City, MO on August 23, 2016
    - University of Florida, Fisheries and Aquatic Sciences Seminar Series on September 9, 201