

QUANTITATIVE EVALUATION OF A
BOATER EDUCATION PROGRAM FOR MANATEE PROTECTION

By

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Abstract of Thesis Presented to the Graduate School
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A QUANTITATIVE EVALUATION OF A
BOATER EDUCATION PROGRAM FOR MANATEE PROTECTION

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Watercraft collisions are the most common human related causes of manatee mortality, and account for approximately 25% to 30% of manatee deaths annually. Educational interventions for boaters are one strategy for reducing watercraft collisions. This study provides a quantitative evaluation of an educational intervention by Manatee Watch in Tampa Bay, Florida. A telephone survey was conducted during July to August 2002, of primary boat users whose boats were observed by the Florida Marine Research Institute and/or approached by Manatee Watch in Tampa Bay during 1999 to 2001. We compared the attitudes, knowledge and behavioral intentions of boaters who had received educational materials from Manatee Watch (treatment group) with boaters who had not (control group).

Survey questions were designed based on Manatee Watch educational materials given to boaters and previous surveys of Florida boaters. Overall knowledge and attitude scores were compared. Boaters receiving the educational treatment averaged 8.22 (S.D.=2.4) on a 12-point knowledge scale; this did not differ statistically from the control

group average of 8.06 (S.D.=2.5) ($t = -.731, p=0.465$). Treatment group boaters had a mean of 33.7 (S.D.= 7.13) on a 45-point attitude scale, and did not differ from the control group mean of 33.2 (S.D.=7.4) ($t = -.731, p=0.465$). Behavioral intention items were measured independently; no differences were found between the groups.

Attitude was found to positively influence boating behavior, and was positively associated with a willingness to pay for increased public education and enforcement to protect the manatee. Knowledge and one behavior item were positively associated: maintaining a slower speed when boating in shallow water.

In addition, boaters' experience with manatees and boating was examined as an influence on knowledge, attitudes and behaviors. There was no association between experience and knowledge or experience and behaviors. Years of boating experience and the number of times seeing manatee while boating negatively influenced attitude.

Forty-six percent of the treatment group responded "no" when asked if they had received educational materials from Tampa Bay Manatee Watch. This could be due to lack of memory, lack of impact, or surveying technique. Regardless, the boaters' replying "yes" to receiving Manatee Watch materials did not score differently than the control group on the knowledge and attitude scales, or any behavior items.

This study is limited by reliance on a survey instrument to measure self-reported behaviors rather than actual boating behaviors or impacts on manatee mortality.

To increase the effectiveness of the program we recommend targeting audience attitudes, addressing ownership and empowerment feelings in boaters, increasing the duration of the intervention, adopting a multi-faceted approach, and incorporating active participation of the boaters.

INTRODUCTION

The West Indian Manatee (*Trichechus manatus*) is listed as endangered in Florida and the US. The main causes of its endangered status are loss of habitat, high mortality and low reproduction rates, and human activities (Van Meter, 1989). Approximately 25% to 30% of manatee deaths statewide are attributed to watercraft injuries (Arrison, 2003). Despite their protected status, the number of manatees killed by boats continues to rise; watercraft killed 95 manatees in the 2002, a new state record (Arrison, 2003). Concomitant with increased mortality is an increase in the number of boats on the water in Florida. In 2002, 961,719 vessels were registered in Florida, and an additional 300,000 to 400,000 additional boats are thought to use Florida's waters (Florida Fish and Wildlife Conservation Commission, 2003).

Florida has numerous nonprofit organizations, private businesses and a state agency dedicated to manatee conservation. Many regulations protect the manatees from watercraft. These include limited and no entry areas and zones limiting boat speed in manatee habitat. Also, a number of educational publications and programs target manatee conservation and protection (Appendix A). An in-depth review of some programs is presented in Appendix B.

This study evaluates the efficacy of a popular manatee educational program targeting boaters conducted by the Manatee Watch educational program in Tampa Bay, Florida. We tested whether this program (a) increased boaters' knowledge about manatees and their conservation, (b) shifted attitudes toward support for greater manatee

protection, and (c) increased proconservation behavioral intentions among Tampa Bay boaters. The study compares boaters in Tampa Bay who have received educational materials from Manatee Watch with a control group of boaters who have not. We designed and conducted a survey of boaters to determine if any significant differences existed as a result of the educational intervention.

We also examined the influence of experience with manatees, such as swimming and boating with them, on attitudes and behaviors of boaters. Firsthand experience has been shown to influence attitudes and behaviors (Jacobson, Monroe, & Marynowski, 2001). “Natural” contact with nature seems to reinforce environmental education and increase empathy for the conservation of species in the wild (Miles, 1986). Experiential education programs also have been shown to be successful in increasing knowledge, and improving attitudes and behavior in regards to wildlife (Ewert, 1996). We assessed whether direct experience with manatees is positively correlated with knowledge, attitudes and proconservation behavioral intentions toward manatees (Figure 1).

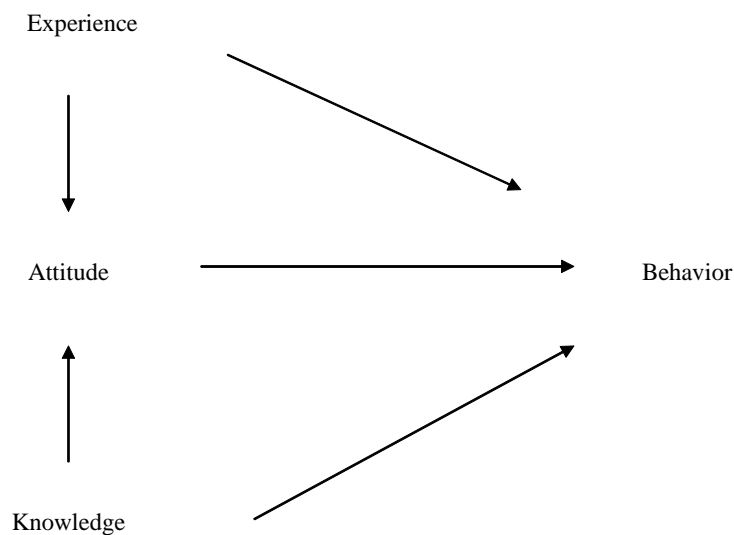


Figure 1. Theoretical model: The role of knowledge, attitudes, and experiences on behavioral intentions

Manatee Watch Education Program

Tampa Bay Manatee Watch is a nongovernmental organization that educates the public about boating with manatees. Their goal is to reduce watercraft-related mortality and impacts to manatee habitat in Tampa Bay. Tampa Bay Manatee Watch targets boaters in Tampa Bay by directly intervening on the water and on boat ramps. This program is unusual in that it focuses its educational message directly at one of the sources of manatee mortality: boaters. Approximately 2 to 3 volunteers for Manatee Watch distribute boater's kits to boaters on the water. The strategy of the outreach vessel is to patrol waterways that are designated slow speed zones where manatees might be present. Volunteers also distribute kits at boat ramps. The boater's kits include waterproof charts of the local area, polarized sunglasses, fish-measuring stickers, and floating key chains. These are illustrated with data and recommendations about boating safely with manatees, including speed zone information and advice on avoiding manatees. These kits are designed to give the boaters things they can use while boating, and provide an educational message as well.

The waterproof chart shows where manatee habitat is located and suggests voluntary speed zones of 5mph in areas where manatees are found. Information on the chart asks boaters to voluntarily boat slowly in less than 6 feet of water. The map explains the meaning of different regulatory signs and the different speed zones. Manatee protection tips include wearing polarized sunglasses, staying in deep water channels, and obeying posted signs. Boaters are given information on how to look for manatees in the water (e.g., a snout sticking up, expanding circles in the water, and a swirl or a smooth spot in the water). Advice on what to do if the boat runs aground is also given on this chart. This includes turning the motor off, tilting the motor up, and push

poling into deeper water. Phone numbers are given for the Florida Marine Patrol and Fish and Wildlife Conservation Commission in the event a dead or injured manatee is encountered. Statistics are provided on watercraft-related manatee deaths, and a brief message explains how boaters can make a difference to manatee conservation.

The floating key chain has the message “Boat Slow, Manatees Below!” and information about who to call for a manatee emergency. The fish-measuring sticker carries the same tips for boating with manatees as the waterproof chart. The message “Go Slow! Manatees Below! Where Seagrasses Grow” is written on the sticker. A pair of polarized sunglasses is provided so that boaters can see manatees more easily in the water.

Every time a boater kit is given away, Manatee Watch volunteers give boaters a brief, informational talk on manatees. They convey the message that the boaters are in manatee habitat and that the boaters should go slow and watch for manatees. Information is presented in a friendly and nonconfrontational manner and lasts a minute or two.

A key component of their program is working with boaters, not against them, in the quest to reduce manatee mortality.

Role of Experience

Studies of direct environmental experience have demonstrated the power of experiences in developing greater understanding and awareness of environmental issues. Direct environmental experiences are more likely to lead to increased knowledge and positive attitudes about the environment (Jacobson et al., 2001). Experiences with nature can make important contributions in the development of environmental concern and individual actions that results in proconservation behaviors (Ewert, 1996). Orams (1996) found that experiential education programs helped control tourist behavior toward

wildlife. Experiential programs have resulted in increased knowledge and an improvement in environmental attitudes on the part of the participants (Knapp & Poff, 2001). We investigated whether direct experience swimming and boating with manatees influenced boaters' knowledge, attitudes and behavioral intentions.

Research Objectives

The objectives of this study were to

- Evaluate the effectiveness of the Manatee Watch Program by determining differences in the knowledge, attitudes and behavioral intentions between boaters who received the educational intervention and boaters who had not.
- Examine the association of experience of swimming or boating with manatees with boaters' knowledge, attitudes and behavioral intentions.
- Describe the sociodemographic background of the boaters and influences on knowledge, attitudes and behaviors.
- Explore the association of knowledge about manatees with attitudes and boating behaviors.
- Make recommendations to improve the Manatee Watch Program.

METHODS

The sample for the survey was selected from two groups: boaters in Tampa Bay who had received educational materials from Manatee Watch and boaters who had not. The Florida Marine Research Institute recorded boat registration numbers of 13,200 boaters who had been observed by staff and volunteers in Tampa Bay during 1999 and 2001. They were able to obtain corresponding telephone numbers for 4,148 boat owners.

Boat observations were conducted by the Florida Marine Research Institute in two areas in Tampa Bay, Gandy and Maximo, during the 3-year time period. There were two lines of site at Gandy, and three at Maximo where boats were observed throughout the year, in three sessions. A research intern and volunteer conducted observations at each site. They recorded registration numbers of the passing boats, and later obtained corresponding telephone numbers of boat owners. The sites were chosen for several reasons: they had to have boating, be accessible, fit more than one line of site, and have manatees.

The sample of boaters who had received educational materials from Manatee Watch consisted of 1122 boaters that Manatee Watch approached on the water or at boat ramps from June of 1999 through July of 2001. Based on boat registration numbers obtained by Manatee Watch, the FMRI was able to obtain 487 corresponding phone numbers

Trained interviewers with the University of Florida Bureau of Business and Economic Research conducted the telephone interviews. They asked to speak with the

primary boat user before administering the survey. They used computer-aided dialing to call boaters until approximately 500 questionnaires were completed to ensure an adequate sample for statistical analysis.

Questionnaire Design and Pilot Testing

The questionnaire followed standard procedures to construct simple questions that would provide accurate results (Salant & Dillman, 1994). The survey consisted of 16 knowledge questions, 9 attitude questions, 5 behavior questions, 5 questions about Manatee Watch, 6 questions regarding experience with manatees, and 10 sociodemographic questions. The questions were based on a review of the content of the program conducted by Manatee Watch and a baseline survey of Tampa Bay boaters conducted in 2000 (Aipanjiguly et al., 2003). Knowledge and attitude questions were designed around a symmetric, 5-point, Likert-type scale (1 = strongly disagree to 5 = strongly agree) with a central, neutral category. Knowledge items included questions on boating safely with manatees, manatee biology and status, and definitions of manatee harassment. The Likert scale was collapsed to create a knowledge index; items answered correctly received a score of 1 and other answers received a score of zero.

Attitude questions measured boater support for boating regulations, manatees and conservation efforts. Answer choices for these items were on a 1 to 5 scale, with 5 indicating pro-manatee behavior. Answers for the attitude questions were summed to create a composite score.

A mixture of scaled and open-ended questions measured the boating behavior targeted by Manatee Watch. They included questions on maintaining a slow speed in shallow water, where to avoid manatees and what to do if a boat runs aground, to protect seagrass beds.

Items measuring the effectiveness of the Manatee Watch materials also questioned if people received and used the materials.

The association of experience with manatees with boater's knowledge, attitudes and behavior was measured by how many times people had seen manatees while boating or swimming, if they had visited an area for the purpose of seeing manatees and if they had ever participated in an educational program about manatees.

Sociodemographic variables included questions on education, income, boating experience, distance of home from the waterfront, owning a manatee license plate and number of years in Florida.

A panel of social scientists at the University of Florida and state and federal marine mammal specialists reviewed the survey. The survey instrument was pilot tested ($n = 20$) on boaters from Tampa Bay in June of 2002; revisions to the survey were made based on results of the pilot test. The survey was conducted between July and August of 2002.

Data Analysis

Survey data was entered into an SPSS 10.0 software package for statistical analysis. Answers for open-ended questions were examined and recoded as necessary.

We compared knowledge, attitudes and behaviors between boaters that received the intervention (treatment group) and those that did not (control group). The 5-point knowledge, attitude and belief measures were treated as interval level data; T-tests were used to identify significant differences in mean scores between the treatment and control groups. Additionally, T-tests were used to determine significant differences in attitudes, knowledge and behaviors between boaters who remembered receiving the intervention, and those that did not. T-tests were used to compare the knowledge, attitudes and

behaviors between those that had had experiences with manatees and those that had not. A post-hoc test for means comparison was used to determine significant differences within the treatment group based on the year that they received educational materials. Significant differences are reported at the alpha level of $p \leq 0.05$. Cronbach's alpha (inter-item correlation reliability) was used to ensure scale reliability for the attitude and knowledge questions. Behavior items were measured independently. The Pearson correlation coefficient was used to measure the strength of relationships between knowledge, attitudes, behavioral intentions and experience. We employed a path model, using multiple regressions, to estimate the role of knowledge, attitude and experiences on behavioral intentions. We used unstandardized regression coefficients to measure direct effects. Indirect effects are calculated by multiplying unstandardized coefficients. Total effects of knowledge, attitudes and experience on behavioral intentions are obtained by adding the direct and indirect effects together.

RESULTS

Survey Response

The survey (Appendix C) resulted in 503 completed questionnaires; 297 from the control group and 202 from the treatment group. The completed surveys from the treatment group included 4 that were ineligible, due to the fact that the respondents received the educational intervention after the time period of this study; they were excluded in the data analysis.

The response rate calculated for this survey was 47%, based on the percentage of completed interviews out of all eligible respondents, following standards of the American Association for Public Opinion Research. Categories that were considered ineligible for the survey included technical phone problems, fax lines, nonworking numbers, disconnected numbers, changed numbers, cell phones, businesses or governmental organizations, and no eligible respondents (American Association for Public Opinion Research, 2002).

There were 180 refusals, which included 106 strong refusals, and 74 soft refusals. The cooperation rate (response rate for answered telephones) calculated as a percentage of number of responses per ($\#$ of responses + $\#$ of refusal) was 74%. The cooperation rate for the treatment group was 82%, with 55 refusals and 477 attempted calls. The cooperation rate for the control group was 69%, with 135 refusals and 881 attempted calls. The total attempted numbers called was 1,359. Appendix D shows the disposition reports for the survey.

Socio-Demographic Background

There were no statistically significant differences in sociodemographic backgrounds between the treatment and control groups (Table 1). The mean age of respondents in the treatment group was 46.2 years (SD = 12.6), and 47.9 years (SD = 13.0) for the control group ($t = -1.44$, $df = 491$, $p = .152$). Seventy-nine percent of respondents in the treatment group were male, and 20% were female; in the control group 82% were male, and 19% were female ($t = -.45$, $df = 497$, $p = .622$). Within the treatment group, more respondents (24.4%) fell into the \$41,001 to \$60,000 income bracket, followed by 21.4% in the \$61,001 to \$80,000, and 17.3% in the \$100,001 to \$150,00 range. In the control group, the greatest percentage of people (20.9%) fell into the \$61,001 to \$80,000 income bracket, followed by 20.1% in the \$41,001 to \$60,000 range and 17.6% in the \$81,001 to \$100,000 category; ($t = 1.163$, $df = 410$, $p = 0.370$).

Table 1. Comparison of individual demographic items for treatment and control groups

Item	Treatment Group			Control Group			<i>t</i>	<i>p</i>	df
	mean	n	SD	mean	n	SD			
Age	46.20	200	12.60	48.00	293	13.00	1.44	0.15	491
Sex 1=male; 2=female	1.20	202	.40	1.20	297	.39	-.45	0.62	497
Years in Florida	30.96	202	15.40	28.91	296	16.60	1.39	0.16	494
Home from Tampa Bay waterfront. (1-5) 1=on water; 5=<20 miles	2.97	201	1.26	3.20	293	1.40	1.88	0.06	492
Manatee license plate 1=yes; 2=no	1.97	201	.17	1.96	297	.21	.80	0.42	496
Highest year of school/college completed	14.44	201	2.21	14.58	296	2.37	.66	0.51	495
Household Income (1-5) 1=>20,000; 5=<150,000	4.14	168	1.56	4.29	244	1.63	.90	0.37	410
Member of wildlife, conservation or sporting club organization 1=yes; 2=no	1.73	201	.44	1.79	296	.41	1.44	0.15	495

Twenty-seven percent in the treatment group and 21.3% in the control group answered “yes” to being a member of a conservation, wildlife or sporting club or organization ($t = 1.44, p = .0151$). Clubs that respondents are members of are listed in Appendix F.

There was no significant difference in the distance of home from Tampa Bay waterfront between the groups ($t = 1.88, p = 0.06$). The treatment group had a mean of 14.4 years of education ($SD = 2.2$) and the control group 14.58 years ($SD = 2.4$); ($t = .662, p = 0.508$). Respondents in the treatment group had lived in Florida for an average of 31 years ($SD = 15.4$), in the control group the average was 28.91 years, ($SD = 16.6$); ($t = 1.39, p = 0.165$).

Boating Activity

The two groups did not differ in years of boating experience, times boated in Tampa Bay in the past year, primary activity while boating, and having taken a boating safety course (Table 2).

Table 2. Comparison of boating experience for treatment and control groups

Item	Treatment Group			Control Group			<i>t</i>	<i>p</i>	df
	mean	n	SD	mean	n	SD			
Years of boating experience	24.96	200	15.5	24.02	296	14.70	-.685	0.49	494
Times boated in Tampa Bay in past year (1-5) 1=>10; 5=<50	2.27	202	.827	2.21	296	.931	-.671	0.50	496
Taken a boating safety course 1=yes; 2=no	1.40	201	.492	1.40	297	.492	.024	0.98	496
Primary activity 1=fishing; 2=sailing; 3=cruising; 4=recreation; 5=skiing; 6=commuting; 7=jet-ski; 8=work-related	2.60	199	2.30	2.70	289	2.30	.541	0.60	486
Season 1=summer; 2=winter; 3=year-round	2.97	201	.45	2.86	292	.67	-2.060	0.04*	491

The average years of boating experience for those in the treatment group was 24.96 years (SD = 15.5) and 24.02 years (SD = 14.7) for those in the control group.

Within the treatment group 28.7% reported boating in Tampa Bay more than 50 times in the past year, 47% had boated 11 to 50 times, 16.8% less than 10 times, and 7.4% said they hadn't boated in Tampa Bay in the past year.

Twenty-two percent of people in the control group reported boating in Tampa Bay more than 50 times in the past year, 43.6% boated 11 to 50 times, 23.3% less than 10 times, and 11.5% said they hadn't boated at all in Tampa bay in the past year.

Fifty-eight of respondents in the treatment group and 51.9% in the control group said their primary activity in Tampa Bay was sport fishing.

The two groups differed in the time of year people reported boating: within the treatment group 3.0% said they boated in the summer, 2.5% said they boated in the winter, and 89% reported boating year round. In the control group 9.2% reported boating in the summer: 4.5% boated in the winter, and 77.7% boated year-round ($t = -2.1$, $df = 491$, $p = 0.04$, Table 2).

Boating Behavior

Three items with scaled choices measured desirable boating behavior: carrying nautical charts while boating, maintaining a slower speed while boating in shallow water, and watching out for manatees while boating in shallow water. The two groups did not differ in any of these items (Table 3). The percentage of respondents that indicated positive boating behavior is shown in Appendix G.

Two open-ended items also measured boating behavior. One asked what boaters do if the boat runs aground; answers included using a push pole, getting out and pushing the boat, calling a towboat, turning off the engine or starting the engine up. The two groups'

responses did not differ ($X^2 = 3.6$, $df = 6$, $p = 0.74$, Table 4). Another question asked boaters what they would do if they saw a sick or injured manatee. The two groups did not differ on answers for this question ($X^2 = 6.82$, $df = 5$, $p = 0.23$, Table 5).

Table 3. Comparison of behavior items for treatment and control groups

Behavior Items (1-5) 1=always; 5=never	Treatment Group			Control Group			<i>t</i>	<i>p</i>	df
	mean	n	SD	mean	n	SD			
I carry nautical charts with me when boating.	2.15	200	1.51	2.04	293	1.46	-.741	0.46	491
Maintain a slower speed when boating in shallow water.	2.02	199	1.17	1.89	291	1.03	-1.260	0.21	488
Watch out for manatees when boating in shallow water.	1.42	199	.93	1.38	295	.84	-.423	0.67	492

Table 4. What to do if you run aground

What do you do if you run aground?	Treatment Group (%)	Control Group (%)	N
Start the engine up	1.0	2.1	8
Use a push pole	7.5	6.4	33
Wait for the tide to come in	6.5	9.3	39
Get out and push the boat into deeper water	58.8	52.5	269
Call a tow boat	6.5	7.1	33
Turn off the engine	5.5	6.4	29
other	14.1	16.1	74

$X^2=3.6$, $df=6$, p

Table 5. What to do if you see a sick or injured manatee

What do when see sick/injured manatee	Treatment Group (%)	Control Group (%)	N
Call coast guard	10.3	13.8	60
Call Florida Marine Patrol	40.0	41.2	201
Call local law enforcement	2.6	4.5	18
Call Florida Fish and Wildlife Commission/Officer	12.3	15.2	69
Call someone	17.9	13.1	73
Other	17.0	12.1	69

$X^2=6.82$, $df=5$, $p=0.23$

We also tested if experiences with manatees had any affect on behavioral intentions towards manatees. Boaters who had seen manatees while boating did not have

significantly different behavioral intentions than those who had not (Table 6). Seeing manatees while swimming did not affect behavioral intentions (Table 7), nor did visiting a place to see manatees (Table 8.). Boaters that participated in an educational program on manatees carried nautical charts more often than boaters who had not; ($t = 2.02$, $df = 496$, $p = 0.043$, Table 9). However, participation in an educational program had no effect on maintaining a slower speed while boating in shallow water and watching out for manatees in shallow water (Table 9).

Table 6. Comparison of behavior items with having seen a manatee while boating

Behavior Items (1-5) 1=always; 5=never	Have seen manatees while boating.			Have not seen manatees while boating.			t	p	df
	mean	n	SD	mean	n	SD			
I carry nautical charts with me when boating.	3.90	458	1.5	4.1	41	1.5	-.91	0.36	497
Maintain a slower speed when boating in shallow water.	4.05	453	1.1	4.1	43	1.2	-.49	0.63	494
Watch out for manatees when boating in shallow water.	4.61	460	.85	4.5	40	.96	.627	0.53	498

Knowledge About Manatees and Their Conservation

Sixteen items measured knowledge about manatees. Fourteen were on a scale of 1 to 5, and 2 were opened-ended. Two of the scaled items—(1) manatees are harmful to seagrass beds and (2) manatees have to be fed because there isn't enough natural food—were removed from the final knowledge measure due to poor inter-item reliability. Reliability analysis on the other 12 scaled items indicated a Cronbach's alpha of .764 with an inter-item means of .22. A 12-point knowledge index was created using these 12 variables; correct answers received a "1" and all others received a "0".

Table 7. Comparison of behavior items with seeing a manatee while swimming

Behavior Items 1-5) 1=always; 5=never	Have seen manatees while swimming.			Have not seen manatees while swimming.			<i>t</i>	<i>p</i>	df
	mean	n	SD	mean	n	SD			
I carry nautical charts with me when boating.	4.06	214	1.40	3.82	282	1.50	1.78	0.08	494
Maintain a slower speed when boating in shallow water.	3.98	212	1.10	4.12	281	1.10	-1.40	0.15	491
Watch out for manatees when boating in shallow water.	4.59	213	.95	4.62	284	.81	-.40	0.69	495

Table 8. Comparison of behavior items with having visited a place to see manatees

Behavior Items (1-5) 1=always; 5=never	Visited a place to see manatees.			Have not visited a place to see manatees.			<i>t</i>	<i>p</i>	df
	mean	n	SD	mean	n	SD			
I carry nautical charts with me when boating.	4.00	269	1.40	3.82	230	1.60	1.36	0.17	497
Maintain a slower speed when boating in shallow water.	4.02	266	1.30	4.10	230	1.00	-.87	0.38	494
Watch out for manatees when boating in shallow water.	4.58	269	.85	4.63	231	.89	-.57	0.57	498

Table 9. Comparison of behavior items with having participated in an educational program on manatees

Behavior Items (1-5) 1=always; 5=never	Have participated in an educational program on manatees.			Have not participated in an educational program on manatees.			<i>t</i>	<i>p</i>	df
	mean	n	SD	mean	n	SD			
I carry nautical charts with me when boating.	4.21	82	1.30	3.85	416	1.50	2.020	0.04	496
Maintain a slower speed when boating in shallow water.	4.18	81	.94	4.03	414	1.10	1.120	0.26	493
Watch out for manatees when boating in shallow water.	4.62	82	.73	4.60	417	.89	.167	0.87	497

The average knowledge score for the treatment group was 8.2 (SD = 2.4) and did not differ from the score of the control group, 8.1 (SD = 2.5); ($t = -0.73$, $df = 497$, $p = 0.47$). None of the individual knowledge items differed between the treatment and control groups.

There were no significant differences in knowledge for those that indicated a willingness to pay for increased public education or for those that were willing to pay for increased patrols

Experience with manatees did not influence knowledge scores (Table 11). Respondents that had seen manatees while boating or swimming, visited an area to see a manatee or participated in an education program about manatees did not score differently from respondents that had no experience with manatees.

Knowledge was not correlated with the amount of times someone had seen a manatee while boating or while swimming, carrying nautical charts while boating, or watching out for manatees in shallow water (Table 12). Knowledge was correlated with maintaining a slower speed while boating in shallow water ($r = 0.087$, $p = 0.052$, Table 12).

There were no correlations between knowledge and the years of boating experience or the number of times someone had boated in Tampa Bay in the last year; nor were demographic variables correlated with knowledge, including years in Florida, the distance from a person's home to the Tampa Bay waterfront, family's income, and the highest year of education completed (Table 12).

Attitudes about Manatees and their Conservation

Nine items were used to assess boaters' attitudes about manatees, and conservation efforts to protect them. Reliability analysis resulted in a Cronbach's alpha of .88, with an

item means of .43. The scores for these items were summed, resulting in a total possible scale of 45, to determine correlations with knowledge, behavior, experience with manatees, and other variables.

Table 10. Comparison for individual knowledge items

Knowledge statements	Treatment		Control		Chi-square	<i>p</i>
	Correct (%)	n	Correct (%)	n		
The manatee is an endangered species	71.0	190	72.0	268	2.300	0.08
Feeding a manatee will disturb it.	68.0	183	61.0	249	1.000	0.18
Touching a manatee that does not first approach you is considered harassment.	74.0	189	69.0	273	1.009	0.35
Any human activity that changes a manatee's behavior is harassment.	53.0	194	57.0	273	.808	0.21
Manatees feed on seagrass beds.	89.0	173	89.9	246	.016	1.00
Boating slowly over seagrass beds will help me to avoid manatees.	73.0	190	72.0	268	.003	0.52
Boats should have no wake in an idle speed zone.	79.0	197	79.0	290	.004	0.52
I can better avoid manatees by staying in deep water channels while boating.	71.0	192	74.0	285	.593	0.25
Discarded fishing lines are a threat to manatees.	90.0	193	94.0	276	3.34	0.08
Wearing polarized sunglasses can help me to see manatees better.	93.0	191	90.0	269	1.01	0.48
A swirl on the surface of the water may signal that a manatee is below.	91.2	194	88.0	274	1.23	0.29
Nautical charts can help me to determine where manatees are located.	40.0	195	32.0	271	1.36	0.28

Table 11. Comparison of average knowledge scores for experience with manatee items

	"Yes"		"No"		<i>t</i>	<i>p</i>	df
	Mean Score (SD)	n	Mean Score (SD)	n			
Have you seen manatees while boating?	8.08 (2.5)	462	8.50 (2.3)	43	1.090	0.28	503
Have you seen Manatees while swimming?	8.00 (2.5)	215	8.21 (2.4)	287	.919	0.36	500
Visited an area to see a manatee	8.10 (2.4)	270	8.13 (2.5)	235	.131	0.89	503
Participated in an educational program about manatees	8.30 (2.3)	82	8.10 (2.5)	422	-.649	0.51	502

Table 12. Correlations of experience with manatees, safe boating behavior and sociodemographic variables with boaters' knowledge

Item	N	Pearson Correlatio	
		n	<i>p</i>
Experience			
Times seen manatees while boating	462	-.005	0.92
Times seen manatees while swimming	215	.047	0.49
Safe Boating Behavior			
I carry nautical charts with me while boating	499	-.059	0.19
Maintain a slower speed when boating in shallow water	496	.087	0.05
Watch out for manatees in shallow water	500	.071	0.11
Sociodemographic background			
Years of boating experience	502	-.039	0.39
Times boated in Tampa Bay in the past year	504	-.005	0.91
Years in Florida	504	.012	0.79
Distance from home to Tampa Bay	500	-.026	0.56
Family's income	418	.056	.025
Highest year of education	503	-.019	0.67

There was no significant difference in attitude score for boaters that were members of an organization, had taken a boating course, or owned a manatee license plate.

The mean attitude score for the treatment group was 33.7 (SD = 7.13) and 33.2 (SD = 7.4) for the control group, not significantly different ($t = -.731$, $df = 497$, $p = 0.465$), Treatment and control groups did not differ on any individual attitude items (Table 13).

Table 13. Comparison of individual attitude item scores for treatment and control groups

Attitude Items	Treatment Group			Control Group			<i>t</i>	<i>p</i>	df
	mean	n	SD	mean	n	SD			
I support Programs to protect the manatee even though it means reducing the speed allowed on some waterways.	3.84	201	1.210	3.83	296	1.170	-.075	0.94	495
I support programs to protect the manatee even if it means boats would not be allowed to enter some areas.	3.37	199	1.350	3.35	287	1.320	-.121	0.90	484
I support setting speed limits in areas where natural resources, such as sea grass, need protection.	4.08	201	.935	4.08	289	.821	.043	0.97	488
I support increased public education to protect the manatee.	4.13	202	.958	4.06	294	.851	-.866	0.38	494
I support increased patrols by law enforcement officers to protect the manatee.	3.45	197	1.28	3.40	295	1.280	-.439	0.66	490
Manatees need protection.	3.95	200	.968	3.89	291	1.080	-.613	0.54	489
There should be protected areas for manatees, where boats are not allowed to enter.	3.69	201	1.19	3.62	290	1.190	-.694	0.49	489
The manatee is worth saving, despite the need for regulations.	4.11	194	.767	4.06	287	.832	-.723	0.47	479
I have been negatively affected by regulations protecting the manatee. (Recoded same direction)	3.51	198	1.160	3.65	284	1.290	1.340	0.18	480

To test if experience was associated with attitude we compared attitude scores between those respondents that had seen manatees while boating, seen manatees while swimming, visited an area to see a manatee or participated in an education program about manatees, and those who had not had these experiences; there were no significant differences (Table 14). In fact, boaters who had seen manatees 5 or less times in the past year had a significantly higher attitude score than those who had seen manatees 6 or more times ($t = 3.00$, $df = 460$, $p = 0.003$).

Table 14. Comparisons of average attitude scores with experience with manatee items

	Yes			No			t	p	df
	Mean score	n	S.D.	Mean score	n	S.D.			
Have you seen manatees while boating?	33.42	462	7.22	33.16	43	7.83	.225	0.82	503
Have you seen manatees while swimming?	32.86	215	7.74	33.81	287	6.86	-1.47	0.14	500
Visited an area to see a manatee	33.59	270	7.04	33.18	235	7.53	.619	0.53	503
Participated in an educational program about manatees.	34.44	82	7.58	33.21	422	7.19	1.34	0.16	502

Attitude was negatively correlated with the number of times someone had seen a manatee while boating ($r = -0.105$, $p = 0.024$), but there was no correlation with the number of times seeing manatees while swimming (Table 15). Attitude was negatively correlated with years of boating experience ($r = -0.103$, $p = 0.021$), but not with the number of times boating in Tampa Bay in the past year (Table 15).

Attitude was positively correlated with maintaining a slower speed while boating ($r = 0.279$, $p = 0.000$) and watching out for manatees in shallow water ($r = 0.279$, $p = 0.000$) (Table 15).

There was no correlation between attitude and years in residence in Florida, distance of home from Tampa Bay waterfront, family income, or highest year of education completed (Table 15).

Table 15. Correlations of boaters' attitude with experience with manatees, safe boating behavior and sociodemographic variables

Item	N	Pearson Correlation	<i>p</i>
Experience			
Times seen manatees while boating	462	-.105*	0.02
Times seen manatees while swimming	215	-.098	0.15
Safe Boating Behavior			
Carrying nautical charts while boating	499	-.036	0.42
Maintain a slower speed when boating in shallow water	496	.279**	0.00
Watch out for manatees in shallow water			
Sociodemographic Background			
Years of boating experience	500	.124**	0.00
Years of boating experience	502	-.103*	0.02
Times boated in Tampa Bay in past year	504	-.043	0.33
Years in Florida	504	-.047	0.29
Distance from home to Tampa Bay	500	.053	0.23
Family's income	418	-.084	0.08
Highest year of education	503	-.004	0.93

* correlation is significant at the .05 level

** correlation is significant at the .01 level

Other Attitude Measures

Boaters were asked about their willingness to pay for increased public education and increased patrols for manatee protection. The treatment and control groups did not differ in their willingness to pay for increased public education and patrols, or the mean amount each group was willing to pay. Boaters that indicated a willingness to pay for increased public education to protect the manatee had a significantly higher attitude score than those who did not ($t = 10.3$, $df = 406$, $p = 0.000$); as did those who were willing to pay for increased patrols ($t = 5.95$, $df = 296$, $p = 0.000$). There were no significant differences in knowledge for those that indicated a willingness to pay for increased

public education ($t = 0.445$, $df = 406$, $p = 0.657$); or for those that were willing to pay for increased patrols ($t = 0.009$, $df = 296$, $p = 0.993$).

More control group boaters thought that speed limits were adequately signed (mean = 3.39) than treatment group boaters (mean = 3.12; $t = 2.47$, $df = 482$, $p = 0.01$).

Another open-ended question asked boaters what caused boat-related manatee deaths. Boater carelessness (Treatment: 41%, Control 34%) was the most common answer given; there were no significant differences between the groups in the answers given ($X^2 = 3.5$, $df = 5$, $p = 0.63$, Table 16).

Table 16. Responses to the question, “Why are there boat related manatee deaths?”

Why are there boat related deaths	Treatment Group (%)	Control Group (%)	N
Manatees get in the way/can't get out of the way	11.8	14.2	65
Boaters are careless/carelessness	41.0	34.9	180
Lack of propeller guards	7.2	8.5	39
Lack of boating regulations	2.6	1.4	9
Speeding	13.3	12.8	62
Other	24.1	28.1	127

$X^2=3.5$, $df=5$, $p=0.63$

Additional Analysis of Treatment Group Boaters

We additionally compared responses among boaters receiving the educational treatment in 1999, 2000, and 2001. Knowledge scores ($F = 0.262$, $p = .770$) and attitude scores ($F = 0.325$, $p = .723$) did not differ based on the year boaters received educational materials.

Three behavior items were also compared for boaters receiving the educational treatment in 1999, 2000, or 2001; carrying nautical charts while boating ($F = 0.040$, $p = 0.961$), nor for maintaining a slower speed while boating in shallow water ($F = 0.022$, $p = 0.978$) or for watching out for manatees while boating in shallow water ($F = 0.381$, $p = 0.684$).

Several questions asked about interaction with Manatee Watch and educational interventions while boating. Although the educational treatment reached all boats recorded by Manatee Watch, we were not certain that the primary boater that was interviewed by phone necessarily personally received the educational treatment. For this reason we additionally asked treatment group boaters if they had received the educational intervention. In response to the question “Has anyone from Tampa Bay Manatee Watch ever given you any educational materials while you were boating in Tampa Bay,” 54% of boaters in the treatment group answered “yes” to this question, and 45.5% answered “no.”

Within the treatment group, 47.5% of the people said they used the educational materials while boating, and 42% agreed or strongly agreed that the materials helped them to learn about manatees. Of the 54% of boaters in the treatment group who said they received education, 87.3% said they used the educational materials and 77.3% agreed or strongly agreed that the materials helped them to learn about manatees. Use of each material by boaters in the treatment group ranged from 13% for stickers to 35% for polarized sunglasses (Table 17). Use of each material by boaters that said they received education ranged from 23.6% for stickers to 65.5% for polarized sunglasses (Table 17).

Table 17. Use of educational materials by boaters

Material	Use by treatment group (%)	Use by those that said “yes” to receiving materials (%)
Polarized Sunglasses	35.5	65.5
Waterproof Chart	30.7	56.4
Floating Key Chain	25.7	47.3
Brochures	21.3	37.3
Fishing yardstick	20.3	39.1
Stickers	12.9	23.6

Respondents that said “yes” to receiving educational materials and the control group both had a similar mean knowledge score of 8.06 (SD = 2.5). Only one individual knowledge item was significantly different between those that answered yes to receiving education and the control group: more “yes” respondents knew that feeding a manatee will disturb it ($X^2 = 6.6, p = 0.011$, Table 18).

There was no significant difference in the mean attitude score between those in the treatment group that said they received materials and the control group ($t = -1.07, df = 405, p = 0.285$), or in any of the individual attitude items (Table 19). Nor was there a significant difference in any of the behavior items between those that said yes to receiving educational materials and the control group (Table 20).

A quarter of the boaters additionally were asked if they could finish the slogan “Go Slow! Manatees below!” The interviewer read the first part of the slogan “Go Slow,” and respondents were asked if they could finish it. Only 4% said “Manatees Below,” 44.2% gave an answer that included the word “manatee,” and the remaining 52% gave an unrelated answer, or could not respond.

Path Analysis

We employed a path model to estimate the direct and indirect effects of the independent variables (knowledge, attitude, and experiences) on a dependent variable- (behavioral intentions, Figure 2). A regression analysis showed attitude to be a positive predictor of behavioral intentions ($r^2 = 0.075, B = .055, p = 0.000$). Two experiences showed a negative effect on attitude: the number of times seeing a manatee while boating ($r^2 = 0.097, B = -2.55, p = 0.03$) and years of boating experience ($r^2 = 0.097, B = -.104, p = 0.02$). The number of times seeing a manatee while boating did not significantly predict behavioral intentions ($B = 0.034, p = 0.75$) nor did years of boating experience

($B = -0.002$, $p = 0.76$). Knowledge was not a significant predictor of attitude ($B = 0.36$, $p = 0.09$) or behavioral intentions ($B = .053$, $p = 0.06$).

The combined direct and indirect effects of knowledge on behavioral intentions were 0.073 (Table 21). The total effect of attitude on behavioral intentions was 0.055 (Table 25). The number of times seeing a manatee while boating had a negative total effect of -0.11 , and years boating an effect of -0.168 (Table 21).

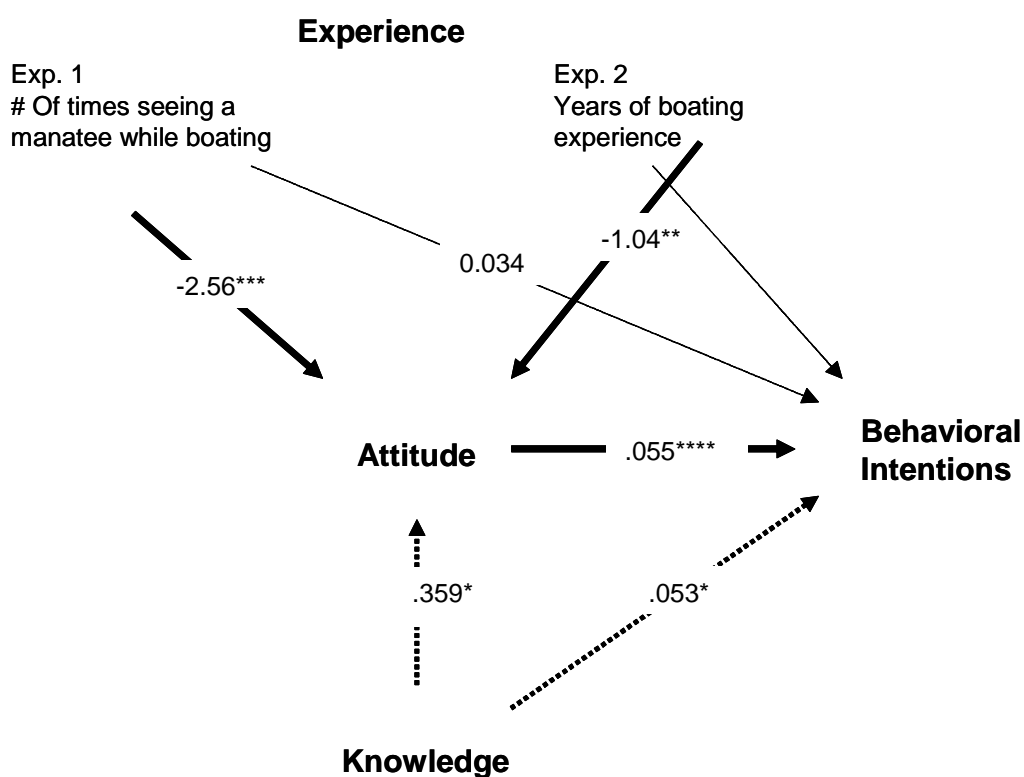


Figure 2. Path model of the effects of knowledge, attitudes and experience on behavioral intentions * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$, **** $p < 0.001$

Table 18. Comparison of individual knowledge items for control group and those in the treatment group that said yes to receiving educational materials

Knowledge statements	Said yes to receiving education (%) correct		Control group (%) correct		Chi-square		<i>p</i>
	Mean	n	Mean	n	square		
The manatee is an endangered species	79.0	105	76.2	268	.296	0.67	
Feeding a manatee will disturb it	80.0	104	66.2	249	6.600	7.01*	
Touching a manatee that does not first approach you is considered harassment.	80.0	105	73.0	273	2.040	0.17	
Any human activity that changes a manatee's behavior is harassment	63.5	108	62.0	273	.007	1.00	
Manatees feed on seagrass beds	94.4	101	89.0	246	2.210	0.16	
Boating slowly over seagrass beds will help me to avoid manatees	72.5	106	75.2	268	.269	0.59	
Boats should have no wake in an idle speed zone	81.2	107	84.8	290	.660	0.46	
I can better avoid manatees by staying in deep water channels while boating	77.0	107	76.0	285	.000	1.00	
Discarded fishing lines are a threat to manatees	95.1	106	97.0	276	.493	0.54	
Wearing polarized sunglasses can help me to see manatees better	95.0	107	92.0	269	.974	0.37	
A swirl on the surface of the water may signal that a manatee is below	96.2	107	91.3	274	2.660	0.12	
Nautical charts can help me to determine where manatees are located	46.0	109	36.0	271	3.3	0.09	

Table 19. Comparison of individual attitude items of boaters in the treatment group who said they received educational materials versus the control group

Attitude Items	Said yes to receiving education			Control group			<i>t</i>	<i>p</i>	df
	mean	n	SD	mean	n	SD			
I support programs to protect the manatee even though it means reducing the speed allowed on some waterways	3.87	109	1.400	3.83	296	1.170	-.337	0.74	403
I support programs to protect the manatee even if it means boats would not be allowed to enter some areas	3.39	107	1.270	3.35	287	1.320	-.274	4.79	392
I support setting speed limits in areas where natural resources, such as sea grass, need protection	4.11	110	.860	4.08	289	.821	-.279	0.79	397
I support increased public education to protect the manatee	4.17	110	.956	4.06	294	.851	-1.160	0.24	402
I support increased patrols by law enforcement officers to protect the manatee	3.56	108	1.240	3.40	295	1.280	-1.080	0.27	401
Manatees need protection	3.96	109	.942	3.89	291	1.080	-.653	0.51	398
There should be protected areas for manatees, where boats are not allowed to enter	3.75	110	1.100	3.62	290	1.190	-.984	0.32	398
The manatee is worth saving, despite the need for regulations	4.16	106	.732	4.06	287	.832	-1.100	0.27	391
I have been negatively affected by regulations protecting the manatee (Recoded same direction)	2.40	108	.900	3.65	284	1.290	1.170	0.24	390

Table 20. Comparison of individual behavior item scores of boaters in the treatment group who said they received educational materials versus the control group

Behavior Items	Responded “yes” to receiving education			Received no education (control group)			<i>t</i>	<i>p</i>	df
	mean	n	SD	mean	n	SD			
I carry nautical charts with me when boating.	1.88	110	1.37	2.04	293	1.47	1.010	0.31	401
Maintain a slower speed when boating in shallow water.	2.01	107	1.13	1.89	291	1.03	-.967	0.33	396
Watch out for manatees when boating in shallow water.	1.35	109	.865	1.38	295	.836	.364	0.71	402

Table 21. Effects of knowledge, attitudes and experiences on boaters’ behavioral intentions

Dependent variable	Independent variables	Direct effects	Indirect effects	Total
Behavioral Intentions	Knowledge	0.053*	0.02	0.073
	Attitudes	0.055****	-	0.055
	Experience			
	Exp. 1 # times seeing manatee	0.034	-0.14	-0.11
	Exp. 2 years boating	-0.002	-0.06	-0.168

* $p < 0.10$, **** $p < 0.001$

DISCUSSION

Watercraft collisions are the most common human-related cause of manatee deaths and have increased at the rate of 7.2% a year. From 1997 to 2002, watercraft related deaths have been the highest recorded. Watercraft caused 81 manatee deaths in 2001 and 95 in 2002. As of July 31 there have been 55 watercraft-related manatee deaths in 2003 (Arrison, 2003). Presently, over 961,719 vessels (recreational and commercial) are registered in the state of Florida, a 42% increase since 1973 (Florida Fish and Wildlife Conservation Commission, 2003). It is estimated that an additional 300,000 to 400,000 boats registered elsewhere also use Florida waters (Florida Fish and Wildlife Conservation Commission). Strategies to protect manatees include increased public education, as well boating regulations, law enforcement, and habitat protection.

Effectiveness of the Educational Treatment

We evaluated the Manatee Watch educational intervention designed to reduce manatee mortality in Tampa Bay. There were no significant differences in knowledge or attitude regarding manatees between the boaters that received the educational materials and those who did not. Knowledge items on the survey were designed based on the content of materials distributed by Manatee Watch. These results indicate that the materials had little effect on the knowledge of the recipients of the intervention. There were also no significant differences between the treatment and control groups on the attitude items.

Boaters who received the educational intervention were less likely to agree that speed limits were adequately signed than did the treatment group. Manatee Watch literature describes the different speed limit signs, depicted on its chart. Possibly, recipients of the educational program were more aware that speed limits are not adequately signed because of the chart.

The behavior items in the survey were designed based on the behaviors targeted by Manatee Watch, yet the treatment and control groups did not differ on any of the scaled behavior items. Although recipients of the education program received nautical charts, these boaters did not report carrying nautical charts while boating more frequently than other boaters. The other items, regarding boating speed and awareness of manatees in shallow water, were primary messages conveyed by Manatee Watch on their materials. Answers to the open-ended behavior questions about what to do if you run aground or what to do if you see a sick or injured manatee did not differ between treatment and control groups.

Based on these findings, it appears that the Tampa Bay Manatee Watch did not have a significant effect on the boaters' attitudes, knowledge, or behavior regarding manatees.

One question on the survey: "Has anyone from Tampa Bay Manatee Watch ever given you any materials while you were boating in Tampa Bay?" attempted to assess if people remembered the educational intervention from Tampa Bay Manatee Watch. Only 55% percent of those in the treatment group reported receiving the educational intervention. We could not distinguish whether this was due to people's faulty memory or if the methods used in the study did not adequately identify the treatment boaters. The study began in June of 1999; it is possible that people did not remember receiving this

intervention 3 years after the fact, although there were no significant differences in responses for the boaters that received the treatment for any of the 3 years. We also could not determine if we actually surveyed the people who received the intervention or if someone else received the materials on the boat or was interviewed on the phone

Regardless, we compared differences between boaters in the treatment group who said “yes” to receiving educational materials with the control group. There was no significant difference in their overall mean knowledge scores, although more boaters in the treatment group who said yes to receiving materials knew that feeding a manatee might disturb it. There were no significant differences in any of the attitude or behavior items between the respondents that said yes to receiving materials and the control group.

Manatee Watch Intervention

The Manatee Watch program is focused on influencing boaters to boat slowly in manatee areas. The slogan “Go Slow! Manatees Below!” is printed on all materials. When boaters in the treatment group were asked to finish the slogan “Go slow . . . ,” only 5 answered “Manatees Below.” Another 41 gave an answer that included “manatee.” The most successful behavioral intervention strategies have been those that focus on a specific target behavior, as manatee Watch has targeted safe boating (Ham & Krumpke, 1996; Hines, Hungerford, & Tomera, 1986). The Manatee Watch program specifically targets the boaters in Tampa Bay, yet this program has had limited impact based on our survey results.

Studies show that those who feel a degree of personal responsibility are more likely to exhibit positive behavior (Hines et al., 1986; Hungerford & Volk, 1990). In order to influence behavior, Manatee Watch must go beyond attempting to increase knowledge; people must be given the opportunity to develop a sense of ownership or empowerment.

Manatee Watch offers an informal program of short duration. Informal programs are generally less effective in shifting attitudes than formal, school-based programs (Asch & Shore, 1975; Orams & Hill, 1998; Zelezny, 1999). Short-term exposure to an educational intervention, such as this case, is less effective in changing behaviors; the length of the duration of the program is positively correlated with its effectiveness (Hines et al., 1986; Zelezny, 1999). The interactive component of the ManateeWatch intervention lasts only about a minute, and it is unknown how long the materials remain on the boat. This intervention may be too brief to result in significant changes in attitudes, knowledge, or behavioral intentions. Additionally, the Manatee Watch program is somewhat passive; volunteers talk to the boaters for a brief time, and then boaters are given some materials. They do not actively participate in this program, other than a brief interaction to receive the materials. Passive types of programs have been shown to be ineffective in changing behaviors (Zelezny, 1999).

This program evaluation had several limitations. The data suggest that the program was not effective given the lack of differences between the treatment and control groups. However, both groups exhibited fairly high knowledge scores, pro-manatee attitudes, and pro-manatee boating behavior. The majority of both groups answered two-thirds of the knowledge items correctly. It is possible that the Manatee Watch program focuses on teaching things boaters already know and focuses on behaviors that boaters already exhibit.

Care was taken to develop a questionnaire that focused on the messages Manatee Watch attempted to impart to the boaters. However, it is possible the survey did not adequately identify all of these targeted messages and thus missed actual differences between the groups.

Additionally, this study relied on self-reported behavioral intentions. We do not know if boaters receiving the educational treatment actually altered their boating behaviors or if manatee mortality was affected.

Association of Experience with Manatees with Knowledge and Attitudes and Behavioral Intentions

Direct experience with nature has been positively related to knowledge and attitudes (Jacobson et al., 2001; Siemer & Knuth, 2001). Participation in outdoor recreation activities has been positively associated with environmental attitudes and behavior (Teisl & O'Brian, 2003). This study revealed no positive associations between boaters' experience with manatees and their knowledge, attitudes, or behaviors. There are a number of reasons why experience with manatees may not positively affect knowledge and attitude or behavioral intentions. Most people (92%) had seen manatees while boating. The negative influence of the number of times seeing a manatee while boating and the years of boating experience on attitude could be due to boaters' beliefs that manatees are readily seen and therefore not threatened. Boaters who had seen manatees five or less times in the past year had a significantly higher attitude score than people who had seen them six or more times. Williams, Ericsson, and Heberlein (2002) found a similar pattern in an analysis of surveys of public support for wolves; people with the most positive attitudes towards wolves were those with the least direct experience with them.

Popular boating areas in Tampa Bay have been declared off-limits or now have stricter speed zones for manatee protection. These regulations may result in more negative attitudes among boaters who see manatees frequently and may not perceive them to be in danger. Some boaters may feel manatees are responsible for regulations

that have curtailed their freedom to boat where and as fast as they want. This is an interesting finding to consider when targeting messages to the boating community. Educational messages could focus on the health of the ecosystem as reasons to boat slowly, rather than just manatees.

Fifty-four percent of respondents had visited an area to see manatees; however, visiting an area to see manatees was not correlated to knowledge or attitude or related to reported behaviors. The 16% of respondents who had participated in an educational program about manatees (Appendix I) did not have significantly different knowledge or attitude scores than those who had not participated in an educational program, although their scores were slightly higher. However, boaters who had participated in an educational program did report that they carried nautical charts more often than those who had not. This question was asked because Manatee Watch gives boaters nautical charts that were marked with manatee habitat. Although boaters in the treatment group did not carry nautical charts more often while boating, it is possible that participation in another educational program on manatees could be related to carrying a nautical chart. Participation in an education program on manatees is not a direct experience with manatees, but it does indicate that an educational program could affect behavior. Because we measured self-reported experience with manatees, we cannot be absolutely certain of what experiences boaters have actually had. We did not validate the hypothesis that direct experiences with manatees positively affected knowledge, attitudes or behavioral intentions towards manatees.

Recommendations

Manatee Watch has identified specific target audiences and target behaviors, which are essential steps in an educational intervention. The results of this study indicate that

educational intervention does not influence boating behavior. Based on the findings of this study and a literature review of successful educational interventions (Appendix J), we recommend the following actions to improve the Manatee Watch program.

1. Target boater's knowledge and attitudes.

Studies have shown that environmental knowledge is needed to shift positive attitudes (Ericsson & Heberlein, 2003; Papageorgiou, 2001). People with proconservation attitudes are more likely to engage in responsible behavior (Hines et al., 1986). Interventions should target people's underlying beliefs in order to influence behavior (Ham & Krumpal, 1996).

We found that boater's attitudes and knowledge positively influenced the boating behavior that Manatee Watch attempts to influence. Knowledge had a slightly greater effect on behavioral intentions when both direct effects and its indirect effects on attitude were examined. A positive attitude influenced behavioral intentions directly. Attitude was also correlated with a willingness to pay a boat license surcharge for increased public education to protect the manatee and increased patrols to protect the manatee.

In order to influence boating behavior, Manatee Watch should focus on increasing knowledge and shifting towards more positive attitudes. Current materials convey facts about the manatee and boating, and messages to boat slow. The slogan: "Go Slow! Manatees Below! Where Seagrasses Grow," may not appeal to boater's beliefs and attitudes. Materials may be more effective if they appealed to boater's emotions and increased knowledge. Materials that make the manatee more appealing to humans could focus on their vulnerability, gentleness, and social behavior. Raising boaters' concern about manatees should increase their appreciation of the biological needs of manatees and the ecological role the manatees play in the ecosystem.

2. Address boaters' feelings of ownership and empowerment.

People that feel a degree of personal responsibility to the environment are more likely to exhibit positive behavior. Education also needs to give people a sense of empowerment; if people feel like they can make a difference, they are much more likely to act (Hungerford & Volk, 1990). Manatee Watch does this in a sense; boaters are told how they can make a difference by boating slow, watching for manatees, and obeying posted signs. The nautical chart depicts voluntary speed zones, so boaters are given a sense of empowerment in that they can make a difference by choosing to go slow.

Connecting the boaters feelings of empowerment and ownership of the fishery to manatee protection may be more successful in changing behaviors than focusing a message primarily on manatee protection. The primary activity reported by boaters was sport fishing (55%). Boaters who fish may feel a degree of responsibility to the fishing grounds that they may not feel towards manatees. Boaters who feel that their actions will directly affect the health of the ecosystem they fish in will be more likely to exhibit proconservation behavior.

3. Increase duration of intervention.

Educational interventions that consist of a one-time, short-term exposure are usually ineffective in encouraging responsible behaviors (Zelezny, 1999; Young, 1993). The brief intervention by Manatee Watch is unlikely to permanently change boater's attitudes or behaviors. A longer, more repetitive or interactive intervention should be successful. This may not work when approaching boaters on the water, but other locations may be feasible such as ramps or community events. A number of respondents were members of boating clubs or organizations; Manatee Watch may be able to work with these groups in educating boaters. Attitude changes from one intervention are

temporary; repetition is often necessary to effect cognitive change (Jacobson, 1999). It could be that additional meetings with boaters would help increase retention of the Manatee Watch message.

4. Have a multi-faceted approach.

Interventions that utilize a multi-faceted approach have a higher chance of changing behaviors (Blanchard 1995; Richter 1996). People respond to many different types of education, be it through the media, face-to-face meetings, educational events, or active participation. This evaluation only focused on one brief, face-to-face intervention. Manatee Watch is also involved in neighborhood and community groups and local events. By reaching out to boaters in a variety of ways, they would have a greater chance of success in reaching their goals. More boaters listed newspapers and magazines as their source of information about boating regulations and manatees than any other media (Appendix K). Interpretative materials, such as kiosks at ramps and marinas may be an effective way to educate boaters.

5. Incorporate active participation of boaters.

Passive interventions that do not involve active participation are less successful at changing behaviors than interventions that involve the participants (Zelezny, 1999). Manatee Watch gives the boaters materials, and volunteers speak for less than a minute; but little involvement is required of the boaters besides slowing down to receive the materials. Involving the boaters via active participation or interaction would be more successful in changing behavior than by simply giving them materials. Again, this may be difficult on the water, but there may be opportunities at ramps, or by visiting boating clubs and community organizations.

Conclusion

From 1999 to 2001, Manatee Watch provided educational materials to 1,222 boaters. The data from this study indicates that the Manatee Watch educational intervention had little effect on the boater's attitudes, knowledge and behaviors regarding manatees. We also found no positive associations with boaters' experience with manatees and their knowledge, attitudes and behaviors, although, some boating behaviors were correlated with knowledge and positive attitudes. Manatee Watch targets specific behaviors and a specific target audience, which has been a successful approach in other educational programs. To improve effectiveness of this and program we suggest the following: (a) increase knowledge levels and target boaters' attitudes towards manatees and ecosystem health, their feelings of ownership and empowerment, (b) increase the duration of the intervention, (c) adopt a multi-faceted approach, and (d) incorporate active participation of the boaters.

APPENDIX A
MANATEE EDUCATIONAL PROGRAMS

Organization	Target	Materials/Interventions	Content
Save the Manatee Club (www.savethemanatee.org)	Kids	Student Education packets (k-12) (includes, brochures, min-poster, facts, educational info). Student Activity/Coloring Book. Video: Manatee Messages, (k-5, 6-12). Also info via web.	Ecology/threats. Facts, current news. How to help.
Manatee Observation & Education Center (http://www.manateecenter.com)	Kids	Manatee/conservation curriculum for K-5. Camps, festivals, interpretive programs/observation Download from web/mail.	Focus on ecology geared for lower grade levels, power plants/use Save the Manatee Club video. video. 5 th grade curriculum focuses more on watercraft dangers/mortality and research
Florida Fish and Wildlife Conservation Commission (http://www.floridacommervation.org/psm/)	Kids	Educational packets/materials/information Student Activity Workbook (Middle/High school)-FWC. Coloring/activity book (k-5)-SMC. Video: A Closer Look at Manatees (6-12)-FWC. (Distributed to schools, libraries, educators). Mini-poster-FWC.	Biology/anatomy/boating safety/harassment. Use some Save the Manatee Club information.
Homosassa Springs Wildlife Park (http://www.hsswp.com/main.html)	General public/kids/teachers	Observation/educational programs about manatees. Info from SMC for teachers/students via mail, web	Viewing, comprehensive programs re. ecology, threats. Focus is Homosassa springs.
Save the Manatee Club (www.savethemanatee.org)	Teachers	Educators Guide/In service training/speakers for class/video. Posters, activity books, coloring books, info booklets Mini-poster-FWC.	Natural history, habitat, problems affecting manatees, causes of mortality efforts at conservation ways to help/classroom activity ideas, lessons.

Organization	Target	Materials/Interventions	Content
Save the Manatee Club (www.savethemanatee.org)	General Public	Promote awareness, education. Through web materials, media. Activism. Adopt a Manatee Program. Brochure: Attention: Swimmers, boaters, divers. By FPL/SMC/USFWS/FWC). Manatee Radio Station w/USFWS	Basic ecology, heavy on activism/legislation/boater threats. How to act around manatees.
Florida Fish and Wildlife Conservation Commission (http://www.floridacomservation.org/psm/)	Teachers	Educator guides (SMC). Classroom materials. Video: A Closer Look at Manatees-FWC. Way of the Manatee Teacher Kits-FWC.	Use Save the Manatee Club information for educators guides. Classroom materials include posters, skulls. Video covers basic biology. Teacher kits are delivered to schools, teachers are provided with instructions.
Blue Springs State Park (http://www.floridastateparks.org/bluespring/default.asp)	All Ages	Observation/manatee programs	
Manatee Observation and Education Center (http://www.manateecenter.com/)	All Ages	Observation/interpretive programs/presentations to organizations/formal manatee classes/boating safety classes	Manatee ecology/current trends/threats
Tampa Electric Company (http://www.manateetecco.com/)	All Ages	Observation/visitor center	Environmental education building, learn about features, history and habitat.
Epcot (http://disneyworld.disney.go.com/waltdisneyworld/parksandmore/attractions/attractionindex?id=EPTheLivingSeasAtt&bhcp=1) Lowry Park Zoo (http://www.lowryparkzoo.com/NewMainPage/HomePage/LowryParkZoo.htmZoo/) Miami Seaquarium (South Florida museum http://miamiseaquarium.com/index.htm) Sea World (http://www.seaworld.org/)	All Ages	Captive viewing/Interpretive Programs	

Organization	Target	Materials/Interventions	Content
Florida Power and Light (http://www.fpl.com/environment/endangered/contents/protecting_manatees.shtml ; Van Meter, Victoria. 1989. The Florida Manatee. Florida Power and Light Company)	Adults-boaters/ swimmers/ divers	Booklet via mail or web. Brochure: Attention: swimmers, boaters, divers-guidelines for protecting manatees (SMC/FPL/US Fish and Wildlife/FWC). Also Student Activity Workbook (Middle/high school) by FWC. Mini-poster-FWC.	In-depth booklet of manatee ecology, populations trends, threats. Brochure-Do's/Don'ts, guidelines for protection.
Florida Fish and Wildlife Conservation Commission (http://www.floridacommervation.org/psm/)	Boaters	Educational information, via web, mail. Brochures. Manatees; Miss Her Now or Miss Her Forever, Attention: Swimmers, Boaters, Divers. Boating Safety Classes. Video: The State of the Manatees. (Distributed to Coast Guard, parks, dive shops, gov't. facilities.)	Brochure/web info on how to boat responsibly, What to look for, where to avoid. What boats do to manatees. How to behave around manatees. Classes cover manatee protection zones, harassment, how to boat around manatees. Video covers tips for safe boating, how to read signs, spot manatees, avoid causing injury.
Florida Fish and Wildlife Conservation Commission (http://www.floridacommervation.org/psm/)	General public	Info via web, mail. Brochures: Manatees Miss her now or miss her forever. Attention: Swimmers, boaters, divers. Guidelines for protecting manatees. Booklet: Commonly Asked questions about manatees. FPL booklet. Educational inserts. Manatee News Quarterly Newsletter. Mini-poster. Brochure from Disney World: Tips for Protecting Manatees. No formal program	Manatee facts, biology, where to see manatees, current threats/regulations. Guidelines for protection. Newsletter on current manatee news/Florida Fish and Wildlife Conservation Commission involvement.
Crystal River NWR. US Fish and Wildlife (http://crystalriver.fws.gov/)	Visitors to Crystal River NWR.	Brochures-by FWC. Booklet-FPL. Student Activity Book-FWC Mini-poster-FWC. Manatee Radio station in Crystal River-w/SMC.	Same as others.
Save the Manatee Club (www.savethemanatee.org)	Boaters	Brochures	Tips on how to boat safely through lock structures.

Organization	Target	Materials/Interventions	Content
Tampa Bay Manatee Watch (http://www.tampabaywatch.org/)	Boaters, neighborhood associations, waterfront communities	Free boater education kits/intervention on water, boat ramps brief educational talk Establish 'manatee' neighborhoods	For boaters, basic info re. Threats/habitats. Neighborhoods: presentations re. Manatee ecology, status, conservation, Manatee Watch education programs, and ways to get involved.
Tampa Bay Estuary –Manatee Awareness Coalition (MAC) (http://www.tbep.org/manateefriendly.html)	Boaters	Brochure: Look out below! Where Seagrasses Grow, Manatees Go	Map of Tampa Bay; information pertaining to Manatees in Tampa Bay, how to protect Manatees and seagrasses

APPENDIX B
REVIEW OF EDUCATIONAL PROGRAMS ABOUT MANATEES

Numerous groups are involved in manatee education in the state of Florida. The Florida Fish and Wildlife Conservation Commission is the state agency involved with education and protection efforts. Several non-profit organizations, nature centers, parks and electric companies conduct their own educational programs. These programs and publications try to reach many audiences, such as students, the general public and boaters.

The content of educational materials vary greatly from one program to another. Some focus on manatee ecology, such as habitat, range, behavior, and reproduction, while others focus on the perils facing the manatee, such as boats, habitat loss and lack of protection. The content of these programs and publications are examined in this review to determine their pertinence in light of the present threats to the manatee. The media for the educational programs varies from program to program. Brochures, booklets, coloring books, posters, videos, school curriculums, interpretive tours and direct intervention are all methods used to educate people about the manatees.

Florida Fish and Wildlife

The Bureau of Protected Species Management is the arm of the Florida Fish and Wildlife Conservation Commission charged with protecting the manatee in Florida waters. They are responsible for planning and implementing management activities for the protection of the manatee. Their management strategy includes the implementation of

outreach and education programs (Florida Fish and Wildlife Conservation Commission, 2001). The FWC maintains a website devoted to manatee information. The web site is comprehensive, covering manatee biology, natural history, habitat, range, behavior, current status, threats, where to see manatees, where to swim with manatees, manatee events and festivals, etc. Students and teachers can access information via web or mail. FWC will provide students with activity books, posters and other information pertaining to their grade level. The FWC utilizes some information developed by the Save the Manatee Club. Teachers can receive an educators guide (SMC), posters, classroom materials, and a video. Manatee Teacher Kits are also in the process of being implemented in some school systems.

Information for boaters is provided on the website. This includes information on why boats are a threat to manatees, how they affect and kill manatees, how to boat safely around manatees, and what constitutes harassment of manatees. Through the internet boaters can access information on how to take a boating safety course; courses can also be taken online. Education on boating with manatees is a component of the courses. There is a mandatory law requiring anyone born after September 30, 1980 to take a boating education course (Florida Fish and Wildlife Conservation Commission, 2001). There are numerous brochures developed by the FWC about boating safely with manatees. A video: *The State of the Manatees*, covers tips for safe boating, how to read manatee signs, how to spot manatees, and avoid injuring them. The video had been distributed to coast guard auxiliaries, law enforcement personnel, various government representatives, dive shops and environmental workshops (Florida Fish and Wildlife Conservation Commission, 2001) The FWC also develops and distributes manatee signs for the Florida waterways. These signs are either regulatory or educational in content.

In 1989 the governor directed 13 counties that were thought to be key areas in manatee protection to develop manatee protection plans. These plans are to include educational and outreach programs to the public, divers and boaters. To date five of these counties have developed Manatee Protection Plans; several others counties are in the process of developing one. FWC education staff work with Manatee Protection Plan staff to determine each county's educational needs, and how to implement the programs (Florida Fish and Wildlife Conservation Commission, 2001).

The FWC education plan focuses on different target audiences: schoolchildren, boaters, and the general public. While it is multifaceted in approach- utilizing different methods and targeting different audiences, literature suggests that a more "hands on" approach, where people were more involved, would be more effective (Blanchard, 1995; Morse, 1996; Richter, 1996; Zelezny, 1999). Brochures, the web and videos and other written information are the primary methods utilized by FWC. Educational interventions have shown to be most effective when there is active participation by the target audience (Zelezny, 1999). Short-term programs, with no active participation are the least effective in changing behavior (Zelezny, 1999). Educational outreach programs are successful when they involve people, and when people have a vested interest and a sense of ownership about the problem or species in question (Hungerford & Volk, 1990, Morse, 1996). Past studies suggest that educational strategies that actively involved boaters, and gave them a sense of responsibility would be effective (Hungerford & Volk, 1990). Children respond well to long-term classroom interventions. Activity books such as distributed by the FWC need to be accompanied by a more structured program, where the children can actively participate. The educators guide facilitates this, as do the Manatee Teachers Kits that are now being implemented.

While classrooms provide an ideal environment for the type of structured, longer-term interventions that are so successful, it is necessary to develop programs of this nature for other audiences, such as boaters. Schoolchildren are the primary recipients of an excellent education program, while boaters mainly receive brochures and read signs.

Manatee Observation and Education Center

The Manatee Observation and Education Center is a nonprofit nature education and wildlife observation facility located on the Indian River lagoon, in Ft. Pierce, Florida. Through a wide range of techniques they are able to educate a variety of people about manatee ecology and the threats facing the animal. The center has developed formal curriculums for grades k-5; teachers can schedule classes or download the curriculum from the web. These lesson plans cover local ecology and are focused around manatees. The Center runs spring and summer camps for school age children, and has nature and manatee centered festivals throughout the year. For adults that are interested in learning about manatees a series of classes are offered at the center. People can participate in naturalist programs on south Florida/Indian River Lagoon ecology. Interpretative programs are offered for visitors and it is possible to observe manatees in the wild from the center. Presentations about manatee biology and current hazards are available to community groups in the local area. The Manatee Observation and Education targets boaters by offering free boating safety classes, taught by the Florida Fish and Wildlife Conservation Commission.

The Manatee Observation and Education Center reaches out to a wide array of people, tourists, boaters, students and adults. Their education techniques range from short and informal, to programs of a longer and more structured nature. The center receives over 80,000 visitors a year, and reaches many more through other outreach programs. The

type of formal, structured curriculum offered by the center has proven to be very effective in changing the behaviors and attitudes of school children (Zelezny 1999).

Past studies have shown that outreach programs of this multi-faceted type, reaching out to different groups of people, have proven to be effective (Morse, 1996).

Save the Manatee Club

Save the Manatee Club was established in 1981 by former Florida Governor Bob Graham and singer/songwriter Jimmy Buffett. SMC was started so the public could participate in conservation efforts to save endangered manatees from extinction. SMC is a membership-based, national nonprofit organization. The funds from their Adopt-A-Manatee Program go toward public awareness and education projects; manatee research; rescue and rehabilitation efforts; advocacy and legal action in order to ensure better protection for manatees and their habitat. Presently there are approximately 40,000 members (www.savethemanatee.org)

SMC releases information regarding current manatee issues to the press on a regular basis. They produce signs alerting people to the presence of manatees on Florida waterways, and produce waterproof decals for boats that offer tips on how to reduce harm to manatees. SMC, in conjunction with other groups, has produced numerous brochures, focusing on boating safety and manatee harassment. SMC, together with the U.S. Fish and Wildlife Service have co-funded a manatee information radio station in Crystal River Florida, which informs the public on how to act around manatees. SMC also maintains a web site devoted to manatee ecology, information, threats, current issues, and conservation efforts.

Much of the SMC educational efforts have been focused on school children in Florida. Students can download information from the web, or send away for student

information packets geared for their specific grade level. Teachers can send away for educator's guides; these guides cover a wealth of information about manatees, and give ideas for lessons and activities, as well as strategies for teaching about the manatee. SMC offers in service training to educators, and has speakers available to speak to classes. SMC has produced: "Manatee Messages: What You Can Do!" an educational videotape distributed to schools throughout Florida. This video provides a description of manatees, and includes information on their behavior and habitat, conservation information, and what students can do to help save manatees from extinction. The video is available in elementary (grades K-5) and secondary (grades 6-12) formats.

Children are the primary target audience of the Save the Manatee Education Program. While there is no formal curriculum, information is geared to specific grade levels, and teachers are given guides, as well as in-service training on how to teach about the manatee. Literature shows that classroom programs are more effective when teachers are given training, rather than just receiving printed material (Charles, 1988). Much of the educational material is focused on the dangers of watercrafts to manatees, and how to boat more safely. Reckless boating is identified as a problem behavior, yet children are the main recipients of this message. When a target behavior is identified, education should be targeted to the audience that performs that certain behavior. In this case, while children respond well to classroom interventions, they are not the ones engaging in the behavior that is harmful to manatees. Educational interventions should target a specific audience and should focus on the behavior known to cause the conservation problem (Ham & Krumpel, 1996). This educational program targets the behavior but not the audience.

Save the Manatee Club boater education consists of brochures and media campaigns. Nonformal, passive programs of this type have not been effective in the past (Zelezny 1999).

APPENDIX C
SURVEY QUESTIONNAIRE

Hello, My name is _____. I'm calling from the University of Florida. We are conducting a study about boating in Tampa Bay. This is not a sales call in any way. This research is being conducted by the university and we would only like your opinion. (As necessary: We started an interview a few days ago and I'm calling back to complete that interview. May we begin?)

My questions are for the primary boat user in your household. May I please speak to him or her?

Hello. We are conducting a study about boaters' opinions and boating in Tampa Bay. This is not a sales call in any way. This research is being conducted by the university and we would only like your opinion. According to our selection procedures, I need to interview you as the primary boat user in the household.

Your phone number was selected at random, from a list of boat owners in Florida. Your answers will be completely confidential. You do not have to answer any questions you don't wish to.

May I begin with your first name?

Record sex of respondent (not informant)

1. Male
2. Female

And what is your age?

Q 1: About how many times have you boated in Tampa Bay in the last year? (Read Choices)

1. Less than 10
2. 11 to 50
3. More than 50
4. Haven't boated in Tampa Bay
- 8 don't know
- 9 not available

Q 2: What is your primary activity when you are boating in Tampa Bay? (Read Choices)
consciousness

1. Sport fishing
2. sailing
3. power cruising
4. recreation
5. Water Skiing
6. Commuting
7. personal watercraft use
8. Other work-related
9. other
- 8 don't know
- 9 not available

Q 3: During which season do you usually visit Tampa Bay: summer, winter or year-round

1. Summer
2. Winter
3. all-year round
- 8 don't know
- 9 unavailable

Now, I would like your opinion on some issues. Please tell me if you strongly agree, agree, neither agree nor disagree, disagree or strongly disagree with the following statements. There is no wrong or right answer, and we are interested only in your personal opinion. If you do not have an opinion on an issue, you may answer, "don't know."

Q 4: I support programs to protect the manatee even though it means reducing the speed allowed on some waterways.

1. strongly disagree
2. disagree
3. neither agree nor disagree
4. agree
5. Strongly agree
6. don't know
7. unavailable

Q 5: I support programs to protect the manatee even if it means boats would not be allowed to enter some areas.

1. strongly disagree
2. disagree
3. neither agree nor disagree
4. agree
5. strongly agree
6. don't know
7. unavailable

Q 6: I support setting speed limits in areas where natural resources, such as sea grass, need protection.

1. strongly disagree
2. disagree
3. neither agree nor disagree
4. agree
5. strongly agree
6. don't know
7. unavailable

Q 7a: I support increased public education to protect the manatee.

1. strongly disagree
2. disagree
3. neither agree nor disagree
4. agree
5. strongly agree
6. don't know
7. unavailable

Q 7b: If agree or strongly agree, go to: Would you be willing to pay a boat license surcharge for increased public education to protect the manatee?

- 1 Yes
- 2 No

Q 7c: If yes, go to: On a scale from 0 to 20 dollars, how much would you be willing to pay?

0-20

Q 8a: I support increased patrols by law enforcement officers to protect the manatee.

1. strongly disagree
2. disagree
3. neither agree nor disagree
4. agree
5. strongly agree
6. don't know
7. unavailable

Q 8b: If agree or strongly agree, go to: Would you be willing to pay a boat license surcharge for increased patrols by law enforcement officers to protect the manatee?

- 1 Yes
- 2 No

Q 8c: If yes, go to: On a scale from 0 to 20 dollars, how much would you be willing to pay?

0-20

Q 9: Speed zones are adequately signed.

1. strongly disagree
2. disagree
3. neither agree nor disagree
4. agree
5. strongly agree
- 8 don't know
- 9 unavailable

Q 10: Manatees are in need of protection.

1. strongly disagree
2. disagree
3. neither agree nor disagree
4. agree
5. strongly agree
- 8 don't know
- 9 unavailable

Q 11: There should be protected areas for manatees, where boats are not allowed to enter.

1. strongly disagree
2. disagree
3. neither agree nor disagree
4. agree
5. strongly agree
- 8 don't know
- 9 unavailable

Q 12: The manatee is an endangered species.

1. strongly disagree
2. disagree
3. neither agree nor disagree
4. agree
5. strongly agree
- 8 don't know
- 9 unavailable

Q 13: I have been negatively affected by regulations protecting the manatee.

1. strongly disagree
2. disagree
3. neither agree nor disagree
4. agree
5. strongly agree
- 8 don't know
- 9 unavailable

Q 14: The manatee is worth saving despite the need for regulations.

1. strongly disagree
2. disagree
3. neither agree nor disagree
4. agree
5. strongly agree
- 8 don't know
- 9 unavailable

Q 15: Feeding a manatee will disturb it.

1. strongly disagree
2. disagree
3. neither agree nor disagree
4. agree
5. strongly agree
- 8 don't know
- 9 unavailable

Q 16: Touching a manatee that does not first approach you is considered harassment.

1. strongly disagree
2. disagree
3. neither agree nor disagree
4. agree
5. strongly agree
- 8 don't know
- 9 unavailable

Q 17: Any human activity that changes a manatee's behavior is harassment.

1. Strongly disagree
2. disagree
3. neither agree nor disagree
4. agree
5. strongly agree
- 8 don't know
- 9 unavailable

Q 18: Manatees have to be fed by people because there may not be enough natural food for them.

1. strongly disagree
2. disagree
3. neither agree nor disagree
4. agree
5. strongly agree
- 8 don't know
- 9 unavailable

Q 19: Manatees feed in seagrass beds.

1. strongly disagree
2. disagree
3. neither agree nor disagree
4. agree
5. strongly agree
- 8 don't know
- 9 unavailable

Q 20: Manatees are harmful to seagrass beds.

1. strongly disagree
2. disagree
3. neither agree nor disagree
4. agree
5. strongly agree
- 8 don't know
- 9 unavailable

Q 21: Boating slowly over seagrass beds will help me to avoid manatees.

1. strongly disagree
2. disagree
3. neither agree nor disagree
4. agree
5. strongly agree
- 8 don't know
- 9 unavailable

Q 22: Boats should have no wake in an idle speed zone.

1. strongly disagree
2. disagree
3. neither agree nor disagree
4. agree
5. strongly agree
- 8 don't know
- 9 unavailable

Q 23: I can better avoid manatees by staying in deep water channels while boating.

1. strongly disagree
2. disagree
3. neither agree nor disagree
4. agree
5. strongly agree
- 8 don't know
- 9 unavailable

Q 24: Discarded fishing lines are a threat to manatees.

1. strongly disagree
2. disagree
3. neither agree nor disagree
4. agree
5. strongly agree
- 8 don't know
- 9 unavailable

Q 25: Wearing polarized sunglasses can help me see manatees better.

1. strongly disagree
2. disagree
3. neither agree nor disagree
4. agree
5. strongly agree
- 8 don't know
- 9 unavailable

Q 26: A swirl on the surface of the water may signal that a manatee is below.

1. strongly disagree
2. disagree
3. neither agree nor disagree
4. agree
5. strongly agree
- 8 don't know
- 9 unavailable

Q 27: I carry nautical charts with me when boating. (Read Choices)

1. all of the time
2. a lot of the time
3. sometimes
4. occasionally
5. never

Q 28: Nautical charts help me to determine where manatees are located.

3. strongly disagree
4. disagree
5. neither agree nor disagree
6. agree
7. strongly agree
- 8 don't know
- 9 unavailable

Q 29: In your opinion, what proportion of manatee deaths are boat-related? (READ CHOICES)

1. almost none
2. about a quarter
3. about half
4. about three-quarters
5. almost all
- 8 don't know
- 9 unavailable

Q 30: Why do you think there are boat-related manatee deaths? (Please don't read choices.)

1. Manatees in the way of boats/they can't get out of the way
2. Boaters are careless/any form of carelessness
3. too many boats on the water
4. lack of law enforcement
5. Other
6. excessive speed
- 8 don't know
- 9 not available

Q 31 In your opinion, what proportion of boaters violate speed zones? (READ CHOICES)

1. almost none
2. about a quarter
3. about half
4. about three-quarters
5. almost all
- 8 don't know
- 9 unavailable

Q 32: In your opinion, what proportion of boaters enter areas closed for manatee protection? (READ CHOICES)

1. almost none
2. about a quarter
3. about half
4. about three-quarters
5. almost all
- 8 don't know
- 9 unavailable

Q 33: In your opinion, what proportions of boaters harass manatees? (READ CHOICES)

1. almost none
2. about a quarter
3. about half
4. about three-quarters
5. almost all
- 8 don't know
- 9 unavailable

Q 34: Manatees are in Tampa Bay (READ CHOICES).

1. during the summer only
2. during the winter only
3. all-year round
4. seldom
- 8 don't know
- 9 not available

Q 36: Do you maintain a slower speed when boating in shallow water, less than 6 feet deep? (Read Choices)

1. always
2. frequently
3. sometimes
4. seldom
- 5.** never

Q 37: When boating in shallow water, do you watch out for manatees in order to avoid them? (Read Choices)

1. always
2. frequently
3. sometimes
4. seldom
- 5.** never

Q 37: Have you taken a Boating Safety Course? (NEW)

1. Yes
2. No
- 8 don't Know
- 9 Unavailable

Q 39: If you run aground what do you do? (Not necessary to read choices)

1. Start the engine up
2. Wait for the tide to come in
3. Use a push pole
4. Get out and push the boat into deeper water
5. call a tow boat
6. Other
7. turn off the engine
8. don't know
9. refused

Q 40: If you see a sick or injured manatee, what would you do? (*Not necessary to read choices*)

1. call someone
2. call coast guard
3. call Florida Marine Patrol
4. call local law enforcement
5. tell people at the marina
6. call Mote Marine
7. avoid manatee
8. assist manatee
9. do nothing
10. other
11. call the fish and wildlife officer/commission(FWC)
- 8 don't know
- 9 refused

We are almost finished. The next set of questions I have will help us analyze your answers along with the answers of others.

Q 41: Where do you get MOST of your information about boating regulations? (Not necessary to read choices.)

1. family and friends
2. personal experience/knowledge
3. boating clubs
4. casual contacts with fellow boaters
5. fishing clubs
6. boat supply stores
7. bait and tackle stores
8. printed material such as brochures
9. newspapers or magazines
10. radio
11. television
12. signs posted on waterways
13. navigational charts
14. other
15. Websites
16. Coast Guard
- 8 don't know
- 9 not available

Q 42: Where do you get MOST of your information about manatees? (Not necessary to read choices)

1. family and friends
2. personal experience/knowledge
3. educational signs
4. local environmental organizations
5. printed materials such as brochures
6. boat supply stores
7. bait and tackle stores
8. newspaper or magazines
9. radio
10. television
11. other
12. websites
13. don't get information on manatees
- 8 don't know
- 9 not available

Q 43: Has anyone from an organization ever talked to you about boating safely with manatees while you were boating in Tampa Bay?

- 1 Yes
- 2 No
- 8 don't know
- 9 Unavailable

Q 44: Has anyone from Tampa Bay Manatee Watch given you informational materials about manatees such as, a nautical chart, keychain, fishing yardstick or polarized sunglasses while you were boating in Tampa Bay?

1. Yes
2. no
- 8 don't know
- 9 unavailable

If no, go to question 47. If yes, go to:

Q 45: Do you use any of these materials while boating?

- 1 yes
- 2 no
- 9 don't know
- 9 unavailable

If no, go to question 46. If yes, go to:

Q 46: Of these materials, which ones do you use? (Read Choices)

1. waterproof chart yes no
2. polarized sunglasses yes no
3. floating keychain yes no
4. fishing yardstick yes no

Q 47: These materials have helped me to learn about manatees.

1. strongly disagree
2. disagree
3. neither agree nor disagree
4. agree
5. strongly agree
- 8 don't know
- 9 unavailable

Q 48: How many years have you lived in Florida?

- 0-100
- 8 don't know
- 9 not available

Q 49a: Have you ever seen manatees while boating?)

1. Yes
2. No
- 8 don't know
- 9 not available

Q 49b: If yes, go to: About how many times have you seen manatees while boating in the past year? (Read Choices)

1. Never
2. 1 to 5 times
3. 6 or more

Q 50a: Have you ever seen manatees while swimming?

1. Yes
2. No
- 8 don't know
- 9 unavailable

Q 50b: If yes, go to: About how many times have you seen manatees while swimming? (Read Choices)

1. Never
2. 1-5 times
3. 6 or more

Q 51: Have you ever visited an area for the purpose of seeing manatees?

1. Yes
2. No
- 8 don't know
- 9 unavailable

Q 52: Have you ever participated in an educational program about manatees?

1. Yes
2. No
- 8 don't know
- 9 unavailable

Q 53: Are you a member of any local wildlife, conservation or sporting club or organization? (Changed it to include conservation organization)

1. Yes
2. No
- 8 don't know
- 9 unavailable

If yes, which one(s)?

Q 54: How many years of boating experience do you have?

0-100

-8 don't know

-9 unavailable

Q 55: How far is your home from the Tampa Bay waterfront? (Read choices)

1. I live on the water

2. less than a mile

3. 1-5 miles

4. 6-20 miles

5. more than 20 miles

Q 56: Do you have a manatee license plate?

1. yes

2. no

-8 don't know

-9 unavailable

Q 57: What is the highest grade of school or year in college you have completed? (Not necessary to read choices)

0 None

11 High School

1 Elementary

12 High School

2 Elementary

13 College

3 Elementary

14 College

4 Elementary

15 College

5 Elementary

16 College

6 Elementary

17 Some Graduate School

7 Elementary

18 Graduate/Prof. Degree

8 Elementary

-8 Don't Know

9 High School

-9 not available

10 High School

Q 58: How would you describe your race or ethnic background? (If necessary, read choices.)

1. Caucasian

2. African American

3. Asian or Pacific islander

4. American Indian

5. Hispanic/Latino

6. Other (specify)

7. Multi-racial or mixed race

-8 don't know

-9 unavailable

Q 59: Now consider your family's household income from all member sources before taxes. As I read a list, please stop me when I get to the income level that best describes your household income in 1999.

1. less than 20,000
2. 21,000 to 40,000
3. 41,000 to 60,000
4. 61,000 to 80,000
5. 81,000 to 100,000
6. 100,000 to 150,000
7. Over 150,000
- 8 don't know
- 9 not available

Q 60: If we were to repeat the survey next year, would you be willing to participate in it?

- 1 Yes
- 8 don't know
- 9 Unavailable

Slogan:

Now I'm going to read the first part of a phrase and ask that you complete it.

The phrase begins:

Go Slow, Blank, Blank

(Int: resp. should complete phrase--.)

(Probe if resp. says they don't know how to finish phrase)

1. Manatees below
2. Any other answer that includes "Manatee" or "Manatees"''''
3. All other answers
- 8 don't know
- 9 refused

Thank you.

This completes the survey. Thank you very much.

If you have any questions regarding the survey, you may contact Dr. Susan Jacobson, Professor as the Department of Wildlife Ecology and Conservation, University of Florida, Gainesville. Her phone number is 352-846-0562

APPENDIX D
DISPOSITION REPORTS

Treatment Group

Sample Report By Last Disposition:BOAT2

Treatment Group		09/09/02 11:06 AM
DISPOSITION CODE	DESCRIPTION	RECORDS
1100	Complete	206
1200	Partial complete	
2110	Strong refusal	23
2120	Soft refusal	22
2210	Resp never available	1
2221	Ans machine, no message	69
2222	Ans machine, message	10
2320	Phys/mentally unable	1
2330	Lang unable-don't use for sp	1
2340	Misc unable	
3120	Busy	5
3130	No answer	42
3150	Technical phone problems	6
4200	Fax/data line	6
4310	Non-working number	5
4320	Disconnected number	22
4410	Number changed	
4420	Cell phone	
4510	Business/government/other org	4
4520	Institution	
4530	Group quarters	
4700	No eligible respondent	41
5100	Callback, resp not selected	6
5200	Callback, respondent selected	7
TOTAL ATTEMPTED		477
	Not Attempted	0
TOTAL SAMPLE		477

Control Group
 Sample Report By Last Disposition:BOAT2

Control Group		09/09/02 11:15 AM
DISPOSITION CODE	DESCRIPTION	RECORDS
1100	Complete	296
1200	Partial complete	1
2110	Strong refusal	83
2120	Soft refusal	52
2210	Resp never available	
2221	Ans machine, no message	120
2222	Ans machine, message	11
2320	Phys/mentally unable	2
2330	Lang unable-don't use for sp	
2340	Misc unable	
3120	Busy	15
3130	No answer	68
3150	Technical phone problems	4
4200	Fax/data line	21
4310	Non-working number	11
4320	Disconnected number	63
4410	Number changed	1
4420	Cell phone	
4510	Business/government/other org	8
4520	Institution	
4530	Group quarters	
4700	No eligible respondent	88
5100	Callback, resp not selected	29
5200	Callback, respondent selected	8
TOTAL ATTEMPTED		881
	Not Attempted	0
TOTAL SAMPLE		881

APPENDIX E
LIST OF CLUBS THAT RESPONDENTS ARE MEMBERS OF BOATING CLUBS

Boating Club (2)
Westcoast Cruisers
Windjammers Sailing Club
St. Petersburg Power Squadron
Tampa Sailing Squadron (2)
Coast Guard Auxiliary (4)
Yacht Club (2)
Boat Scuba West
National Association of Charter Boat Operators
A boating club
Davis Island Yacht Club
Boat U.S. (4)
Pasadena Yacht Club
Boca Ciega Squadron Club
U.S Power Squadron

Environmental Clubs

Audubon Society (3)
World Wildlife Fund (2)
Key West Environmental Reef Protection
Coastal Conservation Organization (25)
Save the Manatee Club
Sierra Club (5)
Sanctuary
Florida Wildlife Federation
Defenders of Wildlife
Tampa Bay Watch
Audubon Society (2)
Florida Conservation Association (2)
Nature Conservancy
Snook Foundation
Ducks unlimited (5)
Surfrider

Fishing Clubs

National Fishing Association
 Fishing Conservation Association
 Freshwater Sporting Club
 St. Petersburg Power Squadron
 Old Salts Fishing Club (6)
 Florida Sportsmen magazine fishing Forum (2)
 St. Pete Pro-Bass (2)
 Bass Society (2)
 Gainesville/Alachua Fishing Club
 Ft. Pierce Sport Fishing Club
 St. Pete Underwater Club
 Southern Kingfish Association (2)
 Florida Fishermen Association
 Golden Triangle Sport Fishing Club
 Fishing Sporting Club
 North American Fishing Organization (3)

Sporting Club

Hunting Club of Cross City
 Junior Sportsmen Association
 National Recreational Association
 National Rifle Association (4)
 International Game Fish Association (3)
 Safari Club
 International Game Club
 National Wild Turkey Federation

Other

Seabug (2)
 Boyd-Hill Nature park
 NOAH
 Florida Guides Association (4)
 Lowry Park Zoo
 Duet Park
 State Wild Park
 United States Coast Guard
 National Estuary Policy Board

APPENDIX F
 BEHAVIOR SUMMARY: RESPONDENTS WHO ANSWERED
 ALWAYS/FREQUENTLY

Behavior Item	Treatment (%)	Control (%)	Total (%)
I carry nautical charts with me while boating.	65.5	68.3	67.3
Do you maintain a slower speed when boating in shallow water?	66.8	71.1	69.6
When boating in shallow water, do you watch out for manatees, in order to avoid them?	89.4	89.8	89.8

APPENDIX G
SUMMARY OF ATTITUDE RESPONSES

Attitude	Strongly Agree/Agree (%)		Neither Agree/Disagree (%)		Strongly Disagree/Disagree (%)	
	Treat.	Cont.	Treat.	Cont.	Treat.	Cont.
	Support for speed reduction.	75.1	78	5	5.4	19.9
Support for no-entry areas.	59.3	61.7	6.5	5.2	34.2	33.1
Support for speed limits in seagrass areas.	87.1	90.7	4.0	1.7	9.0	7.6
Support for public education	56.5	66.5	5.5	3.5	38.0	29.9
Support for increased patrols.	63.5	63.7	5.1	3.7	31.5	32.5
Manatees need protection.	81.0	80.8	9.0	3.8	10.0	15.5
Manatee is worth saving	86.6	89.5	8.8	3.5	4.6	7.0
Negatively affected by regulations.	20.4	24.5	8.5	5.5	71.1	70.0

APPENDIX H
SUMMARY OF BOATERS' EXPERIENCE WITH MANATEES

Experience Item	Yes (%)	No (%)
Have you ever seen manatees while boating?	92.0	8.5
Have you ever seen manatees while swimming?	43.0	57.2
Have you ever visited an area for the purpose of seeing manatees?	53.5	46.5
Have you ever participated in an educational program about manatees?	16.3	83.7

APPENDIX I REVIEW OF EDUCATION PROGRAMS FOR CONSERVATION

State education systems, conservation agencies and non-profit groups have designed formal short-term and long-term school curricula for all ages of students. Programs by state and non-profit environmental groups targeting communities, in regards to local endangered species, and informal outreach programs are also methods used in educating the public about conservation issues. Television, newspapers, magazines and radio are important channels in educational outreach campaigns.

Formal and informal programs with children are evaluated more often than programs with adults. Structured programs associated with schools have proven to be the most effective in changing behaviors of children (Zelezny, 1999). Short-term programs result in an increase in positive attitudes, while longer-term programs are more effective and result in increases in pro-conservation behavior (Hines et al., 1986, Bogner, 1998). Studies in which children and adults are exposed to a variety of environmental education programs show that children show the most potential for changing their attitudes and behavior, compared to adults (Zelezny, 1999).

Media Interventions

Media interventions, when used alone as an educational tool, have not been found to have significant effects on behavior or attitudes. A study on a television documentary on marine mammals showed that viewer's knowledge increases and attitudes shifted immediately after watching the program, but only for the short-term (Fortner & Lyon, 1985).

A mass media campaign on the greenhouse effect, sponsored by the Dutch government was evaluated to determine its success. This program in the Netherlands had two goals: to provide information on the characteristics, causes and consequences of the greenhouse effect, and to enhance awareness on how to solve the problem. No effects were found for emotional concern, perceived seriousness of the problem or voluntary behavior change. Knowledge and awareness did not have a strong correlation with behavior in this instance (Staats, Wit, & Midden, 1996).

Environmental education programs that utilize the media as an educational tool, in conjunction with other methods, have been effective (Morse, 1996, Richter, 1996). These will be discussed in further detail below.

Community Outreach Programs

Community outreach programs pertaining to endangered species have been effective, resulting in changes in individuals' behaviors and an increase in protected areas. When citizens are taught the natural history of a species, and are exposed to a wide variety of information through television, print media, radio and field trips, they become more actively involved in recovery efforts. The Fish and Wildlife Service's New England Field Office in Keene, New Hampshire designed an outreach program focusing on the Dwarf Wedge Mussel, an endangered species threatened by encroaching development. Schoolteachers, town officials, businessmen, media and citizens were invited to participate in a "Meet the Mussel Day." Informative talks on the natural history of the mussel were given; people learned that protecting the mussels would also protect the city's water supply. Plans to expand a golf course into mussel habitat were modified, citizens are now actively involved in mussel recovery efforts (Morse, 1996).

Seabirds on the North Shore of the Gulf of St. Lawrence were suffering major population declines between 1955-1978. A comprehensive management plan was designed in 1980 that included a strong educational component for the communities in the area. Both children and adults were the focus of a multifaceted education strategy that included print media, face-to-face lessons, interpretative tours and volunteer programs. A follow up survey in 1998 documented improvement in knowledge, attitudes and behavior, increased local involvement in seabird protection, and increased populations of seabirds (Blanchard, 1995).

The protection of the Karner Blue Butterfly in Concord, New Hampshire is another example of a successful community outreach program (Morse, 1996). This animal survives in a remnant of pine barren habitat near the Concord airport; an area proposed for industrial development. The Fish and Wildlife Service and the Nature Conservancy began an informational campaign to protect the butterfly, focusing on the uniqueness of the species. Outreach efforts included television, print media, radio interviews and field trips to see the butterfly. An agreement was made to set aside 28 acres of habitat for the butterfly, and most area businesses are now cooperating with The Nature Conservancy and the Fish and Wildlife Service in the effort to protect the butterfly.

Outreach programs by state and non-profit groups have been successful when they are multi-faceted, involving entire communities, especially when the people have a vested interest in the animals' survival. The Kirtland's Warbler is an endangered species that nests in the Upper and Lower Peninsula of Michigan. The species had a total count of 334 individuals in 1987. At the time of this study (1995), the count was at 1,530 individuals. An outreach plan by the Fish And Wildlife Service was designed to increase the public's understanding of the bird. The plan detailed various goals, target audiences,

key messages, guidelines and specific actions. The education committee consisted of interpretation specialists, biologists and private citizens. Free daily tours to see the birds were offered at the inception of the plan. Now the tours attract birders from all over the world, bringing money into the local communities. Another strategy has been a Kirtland's Warbler Festival, an event that allows birdwatchers and local communities to participate in bringing tourist dollars into the local area. Local businesses and residents now view the Kirtland's Warbler as an asset worth preserving, not an obstruction to economic development (Richter, 1996).

Programs for Children

Numerous studies have documented changes in attitude, knowledge and behavior in schoolchildren after exposure to an environmental education program. A study of 5th grade boys by Asch and Shore (1975) showed that children exposed to a formal program of environmental education will demonstrate (in a natural setting) more proconservation behavior than a control group.

A meta-analysis by Zelezny (1999) of educational interventions showed that interventions of a longer duration have more of an effect on behavior. Hines and colleagues (1986) found that programs that consisted of short-term exposures were ineffective in promoting environmentally responsible behaviors. Bogner (1998) measured changes in behavior of schoolchildren after involvement in a one-day ecology program versus a five-day residential program. Results showed that only the residential five-day program had any result on behavioral levels. Studies of schoolchildren's conservation attitudes who participated in 4-H outdoor ecology programs showed that experiences of a longer duration were more successful than short term experiences (Shepard & Speelman, 1985).

In general, formal, long-term programs directed at students have the greatest effect in changing attitudes and behaviors. Studies of outreach programs targeting adults are few, but the ones that do exist show that behaviors and attitudes can be changed in regards to a particular species, especially when the programs are more structured and multifaceted in nature.

Experiential Education Programs

Studies of experiential education have demonstrated the power of direct experiences in developing greater understanding and awareness of environmental issues. Experiential education can make important contributions in the development of environmental concern and individual actions that results in pro-conservation behaviors (Ewert, 1996). “Natural” contact with nature seems to reinforce environmental education and increase empathy for the conservation of species in the wild (Miles, 1986). Through direct experience with the natural world we can develop a better understanding of wildlife and their needs, and become more committed to their conservation.

Siemer and Knuth (2001) studied the effects of an experiential fishing and aquatic stewardship program, versus the effects of non-experiential fishing and aquatic stewardship program on teenagers. The experience-based program resulted in higher levels of knowledge of fishing, aquatic environments, ecological concepts and aquatic habitat protection. In addition, youth that were involved in the experiential program placed more importance on visiting wetlands, thinking about how personal actions affect aquatic plants and animals, and limiting the impact on the environment while fishing.

Knapp and Poff (2001) measured the differences in physical, experiential interpretative programs versus passive interpretative programs. He found that physical

experiences were much more memorable than passive experiences, and resulted in increased knowledge on the part of the participants.

Orams (1996) suggests that wildlife can benefit from ecotourism by encouraging ecotourists to take a more active role where their activities can contribute to the conservation of wildlife and the environment. He argues for an increase in education-based management regimes that are designed to control visitor interaction with wildlife, increase tourist enjoyment, and promote a change in attitudes and behavior.

Formal programs for adults have shown to be effective when targeting specific behaviors. A study of the impact of an educational intervention at a wild dolphin feeding facility in Australia showed that a formal, structured educational program was effective in controlling ecotourists' behaviors towards the dolphins (Orams & Hill, 1998). In this particular study, education reduced all inappropriate behaviors (measured).

APPENDIX J
SOURCES OF INFORMATION ABOUT BOATING REGULATIONS
AND MANATEES

Source of Information about Boating Regulations	Treatment Group (%)	Control Group (%)
Family and friends	3.5	4.1
Personal experience/knowledge	9.0	10.7
Boating clubs	1.5	1.7
Fishing clubs	1.0	0.3
Casual contacts w/ boaters	1.5	1.7
Boat supply stores	2.0	1.4
Bait and tackle stores	2.5	2.1
Printed material (brochures)	12.4	8.3
Newspapers or magazines	28.4	24.1
Television	1.5	2.1
Signs posted on waterways	2.5	2.1
Navigational charts	1.5	0.3
Websites/internet	5.5	5.9
Coast guard	10.0	11.4
Other	17.4	23.8

Source of Information about Manatees	Treatment Group (%)	Control Group (%)
Family and Friends	4.0	3.0
Personal experience/knowledge	9.0	8.4
Educational signs	2.5	4.1
Local environmental organizations	8.5	2.4
Printed materials such as brochures	10.0	5.7
Bait and tackle stores	1.5	0.7
Newspapers and magazines	28.4	36.8
radio	2.5	0.7
television	12.9	16.9
websites	2.0	3.7
Don't get information on manatees	3.5	4.4
other	15.4	13.2

APPENDIX K
LIST OF REASONS FOR BOAT-RELATED DEATHS: REPORTED IN
THE "OTHER" CATEGORY

Treatment Group

“Because it’s difficult for man and manatees to co-exist”
Boats and manatees both use the water (5)
“They occupy canals, channels, where there are boats there are manatees, where there are manatees there are boats”
“Over-boating”
“Because they get run over (2)
“Three ports in Tampa bay. Lots of boats to get hit by, get trapped in structures”
“Too much drinking of people on boats”
“Lack of a person knowing how to operate a boat correctly”
“Have never seen a death”
“Too much traffic in mating times”
“Boats are going to hit manatees as long as the two co-exist”
“On the surface, proximity to the surface, don’t hear the boat coming”
“I wonder how many jet skies there are, they are slow and boaters can’t see them”
“I think there are more manatees than reported”
““The number of boats and the population of people”(2)
Not enough education (2)
Too many boats (2)
“Because people boat where they live”
“Boats with deep draft in shallow waters in board only”
“Stupidity”
“Improper signage”
“People not obeying signs and no wake”
“Number of boats and more manatees than ever before”(2)
“ Why don’t they tell us the right answers”
Natural selection”
“Because the manatee cannot get out of the way of the propeller”
“Hitting them”
“There are too many manatees. They are not declining but growing in population and increased number of boats. There are more manatees then when I came to Florida in 1962.”
“High traffic area”
Propeller (2)
]”There are boaters who do not care about the needs of the manatees”
“Too many people out there”
“Because they are a stupid animal, nice but stupid”

“Hit by props, if not deep even at idle they can get hit”
 “Boating activity in manatee areas, and manatee activity in boating areas”
 “Too many speed boats. When they go 90 miles an hour the manatees don’t have a chance.
 Saw a bunch on Shell Island and People were trying to catch them and they had scars-even
 the babies”

Control Group

“Striking manatees, impact”
 “Manatees and boaters both exist”
 “Commercial traffic in shipping lanes”
 “Population of boaters increases”
 “Poor information”
 People can’t see them (6)
 “They go after the sound of the propeller”
 “Our pleasure and their (manatee) living at the same time”
 “It just happens, no one does it on purpose”
 “I’ve seen pictures of the scars”
 “Because they are slow- we don’t hit dolphins”
 “When a boat runs into a manatee it cuts them up”
 “Accidents happen”
 “Boaters are not aware that manatees are there”
 “We don’t know about them, like their habits”
 “The manatee got in the way of the boat”
 “Boats are traversing manatee areas”
 “ I do not know if there are manatee deaths”
 We are in the same space (4)
 Get hit by propellers (4)
 Manatees are in channels that they don’t normally go
 “Boats are manatees only natural enemy”
 “Public unawareness of the habitats and their overall lack of mobility; they don’t move
 as fast as other animals, (like a dolphin)”
 “Some people pay attention”
 “No fences underwater for the manatees”
 “People are not informed on how to protect them”
 Boating traffic
 “There are more of them. They are too friendly”
 “They are mammals, they have to breath, so accidents occur
 “People do not follow regulations
 “Because they can’t hear the low frequency idle engine while we’re idling in low speed
 zones”
 “Increase in motor boats”
 “Human interaction, feeding, taming, petting them used to being around boats”
 “Failure to obey laws”
 “People don’t know where manatees are”
 “Too many boats on the water” (2)

“Lack of knowledge on boaters behalf”

Boats hit the manatee (2)

“Because manatees come to the surface”

Too many manatees (2)

“Boaters are unaware of where they are”

“So few, and anything can get in the way of a propeller. The boats aren’t that much of a hazard, only three deaths in the county in the last ten years.”

“Just like car accidents, they are bound to happen”

“Lack of awareness by boater”

“They come in close proximity with props form the engines”

“They are large and slow”

“They are underneath the water, and they are slow moving”

“There are power plants that force manatees to be in inappropriate areas, they are artificially attracted and boaters are clueless”

“ Lots of manatees, lots of boats”

“Manatees are not boat shy”

“Dumb asses”

”Large boats create a vacuum with their propellers that manatees get sucked into”

“Unacknowledged people who aren’t willing to take responsibility for watching out for manatees”

REFERENCES

- Aipanjiguly, K., Jacobson, S. K., & Flamm, R. 2003. Conserving manatees: Knowledge, attitudes, and intentions of boaters in Tampa Bay, Florida. *Conservation Biology*, 17(4), 1098-1105.
- American Association for Public Opinion Research. (2002). Standards and best practices. Retrieved November 1, 2002, from <http://www.aapor.org>
- Arrison, K. (2003). 2002 manatee mortality. Retrieved November 3, 2003, from <http://www.Floridamarine.org>
- Asch, J., & Shore, B. (1975). Conservation behavior as the outcome of environmental education. *Journal of Environmental Education*, 6, 25-33.
- Blanchard, K. (1995). Reversing population declines in seabirds on the north shore of the Gulf of St. Lawrence, Canada. In S. K. Jacobson (Ed.), *Conserving wildlife, international education and communication approaches* (pp. 51-63). New York: Columbia University Press.
- Bogner, F. X. (1998). The influence of short-term outdoor ecology education on long-term variables of environmental perspective. *Journal Of Environmental Education*, 29, 17-29.
- Ericsson, G., & Heberlein, T. A. (2003). Attitudes of hunters, locals, and the general public in Sweden now that the wolves are back. *Biological Conservation*, 111(2), 149-159.
- Ewert, A. O. (1996). Experiential education and natural resource management. *The Journal of Experiential Education*, 19, 29-32.
- Florida Fish and Wildlife Conservation Commission. (2001). Education and information. *Manatee News Quarterly*, 5(3), 9-10.
- Florida Fish and Wildlife Conservation Commission. (2003). Boating and Waterways. Retrieved November 3, 2003, from <http://Floridaconservation.org/psm/>
- Fortner, R. W., & Lyon, A. E. (1985). Effects of a Cousteau television program on viewer knowledge and attitudes. *The Journal of Environmental Education*, 16(3), 12-20.

- Ham, S. H., & Krumpe, E. E. (1996). Identifying audiences and messages for nonformal environmental education—A theoretical framework for interpreters. *Journal of Interpretation Research*, 1(1), 11-23.
- Hines, J., Hungerford, H., & Tomera, A. (1986). Analysis and synthesis of research on responsible environmental behavior: A meta analysis. *The Journal of Environmental Education*, 18(2), 1-8.
- Hungerford, H. R., & Volk, T. L. (1990). Changing learner behavior through environmental education. *Journal of Environmental Education*, 21(3), 8-21.
- Jacobson, S. K. (1999). *Communication skills for conservation professionals*. Washington, DC: Island Press.
- Jacobson, S. K., Monroe M. C., & Marynowski, S. (2001). Fire at the wildland interface: The influence of experience and mass media on public knowledge, attitudes and behavioral intentions. *Wildlife Society Bulletin*, 29(3), 929-937.
- Knapp, D., & Poff, R. (2001). A qualitative analysis of the immediate and short-term impact of an environmental interpretive program. *Environmental Education Research*, 7(1), 55-65.
- Mitchell, K. (1998). The act of saving the wolf. *Endangered Species Bulletin*, 14(1), 7-13.
- Miles, J. C. (1986). Wilderness as a learning place. *The Journal of Environmental Education*, 18(2), 33-40.
- Morse, L. (1996). Making the Connection. *The Endangered Species Bulletin*, 13(3), 1-4.
- Orams, M. (1996). A conceptual model of tourist-wildlife interaction: The case for education as a management strategy. *Australian Geographer*, 27(1), 41-51.
- Orams, M., & Hill, G. (1998). Controlling the ecotourist in a wild dolphin feeding program: Is education the answer? *The Journal of Environmental Education*, 29(3), 33-38.
- Papageorgiou, K. (2001). A combined park management framework based on regulatory and behavioral strategies: Use of visitors' knowledge to assess effectiveness. *Environmental Management*, 28(1), 61-73.
- Richter, J. (1996). New friends for the Kirtland's warbler. *Endangered Species Bulletin*, 13(3), 12-13.
- Salant, P., & Dillman, D. (1994). *How to conduct your own survey*. New York: Jon Wiley and Sons.

