Perception of Management Success in the Florida Keys National Marine Sanctuary: A Comparative Analysis Between Residents and Visitors

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UNIVERSITY OF MIAMI

PERCEPTION OF MANAGEMENT SUCCESS IN THE FLORIDA KEYS NATIONAL MARINE SANCTUARY: A COMPARATIVE ANALYSIS BETWEEN RESIDENTS AND VISITORS

By

Charline Tina Quenée

A THESIS

Submitted to the Faculty of the University of Miami in partial fulfillment of the requirements for the degree of Master of Science

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UNIVERSITY OF MIAMI

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PERCEPTION OF MANAGEMENT SUCCESS IN THE FLORIDA KEYS NATIONAL MARINE SANCTUARY: A COMPARATIVE ANALYSIS BETWEEN RESIDENTS AND VISITORS

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Perception of Management Success in the Florida Keys National Marine Sanctuary: A Comparative Analysis Between Residents and Visitors

Abstract of a thesis at the University of Miami.

Thesis supervised by Dr. Davie Die and Dr. Christopher Kelble
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The Florida Keys National Marine Sanctuary is a multiple-use marine protected area with a history of tension between management entities and local stakeholders. At the root of the issues are differences in the definition of “successful management” between these two stakeholder groups and recent administrative vacancies within the Sanctuary’s management staff have made it difficult for the Sanctuary to update its management plan. This study surveyed two primary stakeholder groups in the Florida Keys in order to gain understanding of their perceptions of successful management. A comprehensive intercept survey detailing various management objectives was presented to participants in person using tablets and targeted emails over a period of five months. Results found that residency status was not the primary parameter influencing perception of management success, and that rather industry affiliation was strongly linked with views on management success. Significant differences between residents and visitors did exist when perception of threats to the Sanctuary was analyzed, indicating that those groups could benefit from targeted outreach and education ahead of changes to the management plan of the Florida Keys National Marine Sanctuary.
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<td>CR</td>
<td>Condition Report</td>
</tr>
<tr>
<td>CRCP</td>
<td>Coral Reef Conservation Program</td>
</tr>
<tr>
<td>DEIS</td>
<td>Draft Environmental Impact Statement</td>
</tr>
<tr>
<td>DMP</td>
<td>Draft Management Plan</td>
</tr>
<tr>
<td>EIS</td>
<td>Environmental Impact Statement</td>
</tr>
<tr>
<td>ER</td>
<td>Ecological Reserve</td>
</tr>
<tr>
<td>FKNMS</td>
<td>Florida Keys National Marine Sanctuary</td>
</tr>
<tr>
<td>IEA</td>
<td>Integrated Ecosystem Assessment</td>
</tr>
<tr>
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<td>Institutional Review Board</td>
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<td>MPA</td>
<td>Marine Protected Area</td>
</tr>
<tr>
<td>NCRMP</td>
<td>National Coral Reef Monitoring Program</td>
</tr>
<tr>
<td>NMFS</td>
<td>National Marine Fisheries Service</td>
</tr>
<tr>
<td>NMSP</td>
<td>National Marine Sanctuaries Program</td>
</tr>
<tr>
<td>NOAA</td>
<td>National Oceanic and Atmospheric Administration</td>
</tr>
<tr>
<td>RC</td>
<td>Results Chain</td>
</tr>
<tr>
<td>SAC</td>
<td>Sanctuary Advisory Council</td>
</tr>
<tr>
<td>SCTLD</td>
<td>Stony Coral Tissue Loss Disease</td>
</tr>
<tr>
<td>SPA</td>
<td>Sanctuary Preservation Area</td>
</tr>
<tr>
<td>SUA</td>
<td>Special Use Area</td>
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<td>WMA</td>
<td>Wildlife Management Area</td>
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Chapter 1: Introduction

1.1 Florida Keys National Marine Sanctuary

In 1972, the United States Congress passed the Marine Protection, Research, and Sanctuaries Act, paving the way for the preservation of marine environments around the nation (United States Congress, 1972). Today, the National Marine Sanctuaries Program (NMSP) encompasses 13 national marine sanctuaries plus Papahānaumokuākea and Rose Atoll National Marine Monuments (National Ocean Service, 2018). These protected areas cover a range of habitats from freshwater lakes to deep water corals and whale migration corridors. Currently, the NMSP provides protection for less than ten percent of marine environments in the waters of the contiguous United States and its islands and territories (Benson, 2011).

The Florida Keys National Marine Sanctuary (FKNMS or Sanctuary) has been a topic of heated discussion since its designation by Congress in 1990, via the Florida Keys National Marine Sanctuary and Protection Act (United States Congress, 1990). With this legislation, Congress established the framework to develop a management plan for a protected area surrounding the Florida Keys (Figure 1); with the aims of protecting corals, seagrasses, mangroves and other unique ecological components found in the area (D. Suman, Shivlani, & Walter, Milon, 1999). As part of the designating legislation, the National Oceanic and Atmospheric Administration (NOAA) was to develop a zoning scheme to better emphasize resource protection (D. O. Suman, 1997). Over the next several years, researchers met with and engaged various stakeholder groups throughout the Keys to determine how to best implement the zoning schemes and in 1995, a Draft Management Plan (DMP) was released. The DMP detailed the action plans related to each of the five
proposed management zones: Replenishment Reserves, Sanctuary Preservation Areas (SPAs), Wildlife Management Areas, Special-use Areas, and Existing Management Areas (Bohnsack, 1997; National Oceanic and Atmospheric Administration, 1996; D. Suman et al., 1999).

From the outset, this management plan introduced tension between residents, particularly those involved in the marine industry, and FKNMS management (D. Suman et al., 1999). Public concerns were especially clear when it came to the Zoning Action Plan and the proposed hypothesis that the Replenishment Reserves would result in the growth of fish populations for the surrounding area via spillover and larval dispersal (Haskell et al., 2000; D. Suman et al., 1999). This disagreement can perhaps be attributed to the idea that marine ecosystems have historically been open access, as opposed to their terrestrial counterparts and that the Replenishment Reserves were designed as no-take areas (Watson, Dudley, Segan, & Hockings, 2014). In the Keys, a coalition of marine industry stakeholders led a strong opposition to the DMP and as a result, the Final Management Plan was not
released until late 1996 with significant changes in the zoning scheme. Three Replenishment Reserves were part of the original plan but only one small zone, Western Sambo, was kept (National Oceanic and Atmospheric Administration, 1996; D. Suman et al., 1999). The name of the Replenishment Reserves was also changed to “Ecological Reserves” in order to “reflect public concerns over the purpose of these areas” (National Oceanic and Atmospheric Administration, 1996). In 2001, a decade after the Sanctuary was designated, the Dry Tortugas Ecological Reserve was added to the FKNMS as a no-take zone in order to protect the abundant and primarily healthy marine life found in the remote archipelago (Haskell et al., 2000). The reserve was met with some renewed opposition, predominantly from fishermen arguing once again that there was no proof reserves would benefit fish populations, but the boundaries were unanimously approved by a group of stakeholders involved in the process, reducing conflicts when compared to the original designation of the Sanctuary (Haskell et al., 2000).

More recently, the Sanctuary has been affected by administrative troubles. In 2016, following a detailed investigation on claims of “management dysfunction”, three high ranking officials in the FKNMS were reassigned within NOAA (Wadlow, 2017). As a result, an update to the management plan and associated rezoning strategy was stalled and was only completed in August 2019. On a global scale, critics have gone as far as to blame marine protected areas (MPAs) for negative impacts on local people and communities, and it is believed that only around a quarter of all MPAs globally are managed “soundly” (Bennett & Dearden, 2014b, 2014a; Rife, Erisman, Sanchez, & Aburto-Oropeza, 2013). Though it is difficult to say if that sentiment is echoed by inhabitants and visitors of the Florida Keys, the general worsening of ecological conditions within the Sanctuary has
presented additional challenges for the update of the FKNMS management plan (Meyer et al., 2019; Office of National Marine Sanctuaries, 2011).

1.2 Present State

On August 20, 2019, the FKNMS released the Draft Environmental Impact Statement (DEIS) for an updated management plan, subtitled “The Restoration Blueprint” (Office of National Marine Sanctuaries, 2019). The DEIS features three alternatives with increasing conservation targets and a status quo alternative. The new plans propose a variety of changes to existing management and zoning strategies throughout the Sanctuary, including the addition of new protected areas. The DEIS is available for public comment through January 31, 2020, after which there will be another review period, followed by the release of a final plan and a second public comment period. Prior to this, the most recent Sanctuary management plan was released in 2007 and is outdated in the face of today’s pressures including climate change, coral disease outbreaks, and increasing human impacts. In a May 2018 Integrated Ecosystem Assessment meeting with Sanctuary staff, it was determined that there is a need for better understanding of stakeholder perceptions of management. A comprehensive review process of previous management policies began in 2016 to inform the DEIS and once the selection process is complete, the Sanctuary will overhaul its dated management and zoning policies with hopes to increase collaboration across agencies and levels of government and ultimately better conserve and restore the important ecosystems within its boundaries, as was mandated by Congress in 1990.
Chapter 2: Perception and Management

2.1 Impact of Perception on Management

In natural resource conservation, there are multitudes of studies showing strong positive linkages between involvement of local stakeholders in the planning process and management success (Ban et al., 2017; Gall & Rodwell, 2016; Himes, 2007; Voyer, Gladstone, & Goodall, 2012). Some researchers even state that in order to understand ecosystems, we have to first understand human perceptions of ecosystems and their resulting services (Bennett, 2016; Blasiak et al., 2015). Perception is an overarching term describing components such as “knowledge, interest, social values, attitudes or behaviours” (R. Jefferson et al., 2015). Numerous studies have indicated an increase in compliance, acceptance and continued support for MPAs when stakeholders were involved early on in the planning process, leading to better ecological and socio-economic outcomes overall (Arias, Cinner, Jones, & Pressey, 2015; Ban et al., 2017; Bennett & Dearden, 2014b). In fact, the Dry Tortugas Ecological Reserve process saw a large increase in support from stakeholders compared to the initial reserve, due to the manner in which the planning process was developed (Haskell et al., 2000; D. Suman et al., 1999). With time, researchers have also observed that users have increasingly positive views of an MPA as they begin to see benefits resulting from designation of the protected area and become familiar with regulations and management techniques; and in some cases, ultimately changing the way they interact with the MPA (Shivlani, Leeworthy, Murray, Suman, & Tonioli, 2008; Taylor & Buckenham, 2003).

When involving stakeholders, it is important to manage expectations and “engagement should have defined parameters that are clear and transparent” in order to minimize
possible loss of support (Gall & Rodwell, 2016). Additionally, perception of whether or not the managers in charge are worthy of having stakeholder support can affect the overall feeling of support or opposition by stakeholders (Bennett, 2016). Trust in a system derives from trust in the people implementing that system. In a place with diverse stakeholder groups, as is the case in the Florida Keys, the definition of success may also vary significantly between groups according to their individual demographics and interests (Christie 2004; Dahl-Tacconi 2005; Oracion et al. 2005; Himes 2007; Pajaro et al. 2010; Jefferson et al. 2014; Diedrich et al. 2016). Even if users have similar knowledge of marine environmental issues, there could be significant variation in how they respond to different approaches (R. Jefferson et al., 2015). It is also possible that resource managers and users have entirely different expectations and definitions of success when it comes to MPAs (Reynolds, Bostrom, Read, & Morgan, 2010; Savadori et al., 2004). Determining what is considered successful by stakeholders is the first step in ensuring that management objectives align with local interests and beliefs and that successes in the eyes of management are also viewed as successes by stakeholders (Pidgeon & Fischhoff, 2011).

The last comprehensive study of user perception regarding marine resources in South Florida was conducted in 2013-2014 by NOAA’s Coral Reef Conservation Program (CRCP) in accordance with the National Coral Reef Monitoring Plan (NCRMP) (Gorstein, Dillard, Loerzel, Edwards, & Levine, 2014). This study was completed prior to the most recent mass bleaching and disease events on the Florida Keys reef tracts and prior to the administrative issues in the Sanctuary’s management team. CRCP’s survey was conducted across multiple counties and primarily addressed perceptions regarding coral reefs, without differentiating between the perceptions of various stakeholder groups. Additionally, in the
six years since that study, there have been several changes in national legislation, economics, and politics, all of which could play a role in shaping the perception of stakeholders in the Florida Keys. Management of natural resources is an ever-changing process rather than a “product or final achievement” and as such requires consistent updates in information (Pajaro et al., 2010).

2.2 Current Management Objectives

In the Sanctuary’s designating legislation, the four main objectives were: 1) protect the resources of the area described (the Sanctuary), 2) educate and interpret for the public regarding the Florida Keys marine environment, 3) manage human uses consistent with this Act, and 4) develop a comprehensive management plan and regulations to achieve the goals of this Act (United States Congress, 1990). Some of these overarching objectives had specific, more detailed sub-objectives, such as identifying the cause and effect relationship between factors threatening the health of the coral reef ecosystem in the Sanctuary and developing a comprehensive water quality protection program for the Sanctuary. Natural resource management is largely a reactive process, but recently there is a push for methods to engage in more proactive management in the time between official management plans, which in the case of FKNMS, has been over a decade (Kelble et al., 2013; Liu & Heino, 2015). This adaptive capability would allow resource managers to more effectively deal with point pressures such as natural disasters, disease events, or even direct human impacts such as vessel groundings, by making smaller, more localized changes in order to stay on track for the long-term goals and objectives of a management plan.

MPA design has evolved to not only conserve marine ecosystems but also to meet the socioeconomic needs of the surrounding area. Thus, success depends on both the ability to
achieve conservation goals and to integrate the protected area into the community’s way of life and economy (Rossiter & Levine, 2014). Due to the complex nature of socio-ecological systems, it is important to maintain communication with all involved entities throughout the planning process. Consistent communication ensures that the strategies are well-informed, justifiable, and accepted by the community (Bennett, 2016; Gall & Rodwell, 2016). Successful management of MPAs is highly dependent on “modifying human behavior”; thus, stakeholder interests should be captured in the primary stages of the planning process, because the support of stakeholders is essential to success (Pollnac & Seara, 2011). “Meaningful, regular and focused” engagement before making new management decisions can predetermine how well certain strategies will succeed in the public eye and ensure that management objectives are met (Patrick Christie et al., 2017).
Chapter 3: Study Objectives

This thesis research aims to discover if there is a difference in the way FKNMS management success is perceived between residents and visitors of the Florida Keys, and if not, where the differences in opinion occur. To achieve this goal, the thesis poses several research questions. Firstly, do residents and visitors have varying perceptions of success for FKNMS. Participants will have the opportunity to score the likelihood of a management action to reach its intended goal for the various marine zones in the Sanctuary. Secondly, do residents and visitors perceive different pressures to be of greater importance upon the Sanctuary. Using a list of pressures, both natural and human-driven, participants will score the top three threats to the Sanctuary. Lastly, do residents and visitors prefer different types of outreach and communication to obtain news about regulations and changes in the Sanctuary. These questions can also be further analyzed by self-identified marine industry affiliation in addition to resident or visitor status if differences arise. The results from this study will be used to inform FKNMS staff of general trends in stakeholder perceptions and communication preferences throughout the public comment period for the DEIS for the new management plan, in order to better prepare education and outreach materials for the various stakeholder groups of the Keys.
Chapter 4: Methods

The study area for this research was the Florida Keys National Marine Sanctuary. Research was conducted over a five-month period, from January 2019 through May 2019. Surveys were administered by two methods: first, in-person surveys were collected on multiple dates at John Pennekamp Coral Reef State Park and the city of Key West; second, e-mails containing an short introduction and the survey link were sent to residents of the Florida Keys.

4.1 Results Chains

The first step in creating a survey to assess perception of management success was to develop results chains for four of the five marine zone types in the FKNMS. These zones include: Sanctuary Preservation Areas (SPAs), Ecologic Reserves (ERs), Wildlife Management Areas (WMAs) and Special-Use Areas (SUAs). Existing Management Areas are not considered in the study because of their complex governance, with multiple agencies having responsibility over them. A results chain is a tool that enables researchers to show the pathway from an action to a particular result (Foundation of Success, 2007). It is often derived from conceptual models but goes one-step further by showing the effect of an action in relation to the original management strategy. Boxes are added to show stepwise progression to intermediate objectives or benchmarks making explicit the “Theory of Change” underpinning the management action and how it will achieve its goal. Results chains can provide a way to determine the likelihood of management success and help develop planning for adaptive management strategies that meet both long and short-term conservation goals.
The results chains in this study were developed using the designating legislation of the Sanctuary and the 2007 Management Plan. Full results chains were created for the four marine zone types listed above (Figure 2). The Results Chains underwent internal vetting by a small working group within the Gulf of Mexico Integrated Assessment (IEA) team and also by a small group of FKNMS staff. Vetting consisted of verifying the accuracy of the pathways between management strategies and desired goals. However, this format is not amenable to all types of participants and in order to streamline the content for a more diversified audience, simplified logic chains depicting management regulations in each zone along with their intended outcomes were developed (Figure 3). These figures help participants visualize the management process and the relationship between the specific regulations for each zone type and their intended outcome in a way that ensures all
participants are given the same amount of information in the survey, regardless of prior knowledge about Sanctuary regulations.

4.2 Survey

The purpose of this survey was to determine the perceptions of residents and visitors regarding Sanctuary management success, potential risks to the Sanctuary, and potential changes in management strategies. Survey design and methodology was influenced by Newing et al. 2010 and Dillman et al. 2014 (Dillman, Smyth, & Christian, 2014; Newing, Eagle, Puri, & Watson, 2010). The survey was designed using Qualtrics software through the University of Miami and contained a total of 34 questions, though not all participants were asked to answer every question (Table 1). Skip and display logic was created to show participants only questions related to management zone types they had heard of, so a participant could see as few as 24 questions or as many as 34. The survey included several questions based on examples from NCRMP’s database and responses were formatted as Likert scales, multiple choice, and slider bars to facilitate analysis and reduce bias. Versions in both English and Spanish were available to make sure that participants were not left out for linguistic reasons. The survey also featured a set of basic demographic questions and included several specific questions relating to management
objectives. Institutional Review Board (IRB) approval was obtained through the University of Miami prior to dissemination.

Table 1. List of questions included in the survey including type of response and skip & display logic if applicable.

<table>
<thead>
<tr>
<th>No.</th>
<th>Question</th>
<th>Response Type</th>
<th>Skip &amp; Display Logic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Do you consent to participating in this study?</td>
<td>Yes/No</td>
<td>If &quot;No&quot;, end survey.</td>
</tr>
<tr>
<td>2</td>
<td>What is your age?</td>
<td>Multiple Choice</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Have you heard of the Florida Keys National Marine Sanctuary?</td>
<td>Yes/No</td>
<td>If &quot;No&quot;, end survey.</td>
</tr>
<tr>
<td>4</td>
<td>How familiar are you with the management goals of the Florida Keys National Marine Sanctuary?</td>
<td>5-Point Likert</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>The primary goal of the Sanctuary is to &quot;protect the marine resources&quot; of the Florida Keys. To what extent to you agree or disagree with the following state: Current management strategies effectively meet this goal.</td>
<td>7-Point Likert</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Has the condition of marine resources in the Florida Keys National Marine Sanctuary gotten better or worse over the last 10 years?</td>
<td>5-Point Likert</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>What do you believe are the greatest threats to the Florida Keys National Marine Sanctuary?</td>
<td>Ranking</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Prior to this survey, had you heard of any of the following management zone types?</td>
<td>Multiple Choice</td>
<td>Only show Scoring questions for the zone types selected</td>
</tr>
<tr>
<td>9</td>
<td>How likely is the prohibition of fishing (except bait fishing on a permit) to result in increased marine species populations in Sanctuary Preservation Areas?</td>
<td>Scoring</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>How likely are Sanctuary Preservation Areas to sustain critical marine species and habitats of the Florida Keys?</td>
<td>Scoring</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>How likely is the prohibition of anchoring on coral reefs (both living and dead) to result in increased coral health in Sanctuary Preservation Areas?</td>
<td>Scoring</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>How likely are Ecological Reserves to help area return to natural states?</td>
<td>Scoring</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>How likely are Ecological Reserves to protect biodiversity in the Florida Keys?</td>
<td>Scoring</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>How likely are Ecological Reserves to protect the food and homes of commercially and recreationally important species?</td>
<td>Scoring</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>How likely are Special Use Areas to result in increased scientific research?</td>
<td>Scoring</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>How likely are Special Use Areas to result in increased educational output?</td>
<td>Scoring</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>How likely are Special Use Areas to help in resource restoration and recovery?</td>
<td>Scoring</td>
<td></td>
</tr>
</tbody>
</table>
18 How likely are Wildlife Management Areas to result in the protection of endangered species? Scoring
19 How likely are Wildlife Management Areas to result in the protection of endangered habitats? Scoring
20 How likely are public use regulations in Wildlife Management areas to minimize disturbances to sensitive species or habitats? Scoring
21 Of the areas listed, please select all the ones you have used or visited: Multiple Choice
22 What gender do you identify with? Multiple Choice
23 What is the highest level of education you have completed? Multiple Choice
24 Please select which category (resident or visitor) best applies to you? Multiple Choice If "Visitor", skip to 26
25 How many years have you lived in the Florida Keys? Multiple Choice If "No", skip to 29
26 Is your occupation affiliated with the marine environment/marine industry in the Florida Keys? Yes/No
27 Please select the industry that best fits your profession. Multiple Choice
28 Do you work for the Sanctuary or other natural resource management organization in the Florida Keys? Yes/No
29 What is your zip code? Write In
30 Which of the following activities to you participate in within the boundaries on the Florida Keys National Marine Sanctuary? Multiple Choice
31 Which of the following activities was your main reason for your visitor to the Florida Keys National Marine Sanctuary? Multiple Choice
32 Which of the following sources do you primarily rely on for updates on news and regulations about the Sanctuary? Multiple Choice
33 Would you like to be notified when the results of this survey are published? Yes/No If "No", end survey.
34 Please enter your email. Write In

END OF SURVEY

4.3 Participants and Procedure

To collect responses for the survey, a total of six, day trips to Key Largo and three two-day trips to Key West were made. During each trip, two iPads connected to a WiFi hotspot were used to capture survey responses. In Key Largo, data collection took place at John Pennekamp Coral Reef State Park. The park runs frequent snorkeling and glass bottom boats tours and visitors are often sitting around for about a half an hour prior to
boarding their vessels, giving them time to answer surveys. Visitors were approached and asked to take a survey. If they declined, a response of “I do not consent to participating in this study” was recorded on the iPads. Those who did engage in the survey did so with minimal explanation from the researcher, only getting help with technical issues or simple definitions. In Key West, participants were found while walking around town and stopping near tourist landmarks. The original plan was to survey residents this way as well, but this proved to be difficult due to the fact that residents were usually working or in their private residences when the researcher tried to contact them. To overcome this difficulty and better capture resident responses, a Google search of “Florida Keys Businesses” and the Yellow Pages helped construct a list of businesses with openly listed email addresses in the Keys. A total of 460 emails were sent to different businesses in a variety of industries throughout the Keys. Additionally, the survey was emailed to all employees at the FKNMS (n = 40) and to members of the Sanctuary Advisory Council (SAC) (n = 50).

A minimum sample size calculation was derived for a 95% confidence interval with 5% and 10% margins of error using the formula in (Figure 4). The sample size was based

\[
\text{Sample Size} = \frac{z^2 \times p(1-p)}{e^2} \div \left(1 + \frac{z^2 \times p(1-p)}{2 \times N}\right)
\]

*Population Size = N \ I \ Margin of error = e \ I \ z-score = z \ I \ e is percentage, put into decimal form \ I \ p is the proportion of population expected to show a trait (0.5 for sample calculation)*

**Figure 4.** Equation for sample size calculation.
on the total population of the Florida Keys and the number of tourists visiting annually (Monroe County Tourist Development Council, n.d.; U.S. Census Bureau, 2018) (Table 2).

Table 2. Calculated total survey completions needed for a 95% confidence interval with 5% and 10% margins of error.

<table>
<thead>
<tr>
<th>Margin of Error</th>
<th>Residents</th>
<th>Visitors</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%</td>
<td>96</td>
<td>97</td>
<td>193</td>
</tr>
<tr>
<td>5%</td>
<td>383</td>
<td>385</td>
<td>768</td>
</tr>
</tbody>
</table>
Chapter 5: Results

Over the course of five months (January 2019 through May 2019), a total of 482 stakeholder surveys were completed (Figure 5). Survey results were downloaded as a comma separated values file from Qualtrics in order to perform checks for quality and completion of the data. Out of 482 total surveys, 15% (n = 72) were considered “Non-Consent Terminations”. In these instances, a participant declined to take the survey; thus, the single response “I do not consent to taking this survey” was recorded for the entire survey. The “Non-Consent Terminations” were only quantifiable for the in-person surveys. Email participants were assured anonymity which made it impossible to distinguish the number of non-participating respondents from those who simply did not see or open the email. Thus, the “Non-Consent Terminations 33% of in-person surveys and 33% of visitors and 0% of residents that took the survey in person.

Figure 5. Description of survey completions (n=482). Non-Consent Termination indicates that a participant did not consent to taking the survey. Question 3 Termination indicates that a participant had not previously heard of the Sanctuary, thus the survey was terminated after the third question. Partial Completion indicates that a participant made it past Question 3 but not to the end of the survey. Total Completion indicates that a participant finished through the last question of the survey.
The next group of participants who did not finish the survey made it to Question 3, which asked if they had previously heard of the Sanctuary. Participants who responded “No” were then sent to the termination page of the survey. This group made up 18% (n = 88) of total respondents. In the remaining number of participants (n=322), 15% (n = 71) fit the “Partial Completion” category, meaning the participant started the survey but did not complete it. The results from those sections are in varying degrees of usability for analyses, based on how far a participant answered a set of questions. As such, partial responses were reviewed on a case by case for each type of analysis performed to determine if their answers should be included or if they might introduce bias and incomplete associations.

Lastly, 52% (n = 251) of the surveys were deemed “Total Completions”, meaning that a participant completed questions through the end of the survey. Of those, the vast majority were residents (77%, n = 194), with visitors making up the remaining 23% (n = 57). Thus, the completed survey population is heavily biased towards residents, but when counting the early terminations and non-consent terminations, the proportion evens out to 40% for residents and 45% for visitors (Table 3). In the partially completed surveys, some respondents had gotten to the residency question while others did not. The unidentifiable responses were listed as “Unknown”. The number of responses by residents and visitors meets the 95% confidence interval and reduces margin of error from 10% to about 7%.

Table 3. Survey responses by residency status (*Unknown describes the responses that did not have a self-identified residency status, and therefore could not be used for certain analyses).

<table>
<thead>
<tr>
<th>Residency Status</th>
<th>Usable Responses</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resident</td>
<td>194</td>
<td>40%</td>
</tr>
<tr>
<td>Visitor</td>
<td>217</td>
<td>45%</td>
</tr>
<tr>
<td>Unknown*</td>
<td>71</td>
<td>15%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>482</td>
<td>100%</td>
</tr>
</tbody>
</table>
5.1 Demographics

The demographic questions in the survey allowed the researcher to identify and categorize respondents based upon age, gender, education, and occupation/industry. The sample size varies for each question due to the number of partially completed surveys, but age and gender in particular have well represented sample sizes due to their early presentation in the survey. Thus, only those who did not offer consent or failed to reach the end of the demographic questions were excluded from the demographic analysis. All data was analyzed for normality using the Kolmogorov-Smirnov test, the results of which confirmed that the data were non-parametric. Data were also analyzed for reliability using Cronbach’s Alpha and all questions passed the reliability test with standardized alpha scores over 0.90. In both resident and visitor sample groups the age of participants was well distributed, with residents skewing a little to the right while visitors skewed a bit to the left (Figure 6). The median age group for residents was 45 – 54 years old, while the median age group for visitors was 35 – 44 years old. The next demographic component, gender, was evenly matched between residents and visitors. Residents skewed slightly

![Figure 6. Breakdown of age between resident and visitor responses.](image)
toward males while visitors skewed slightly toward females (Figure 7). Education levels for residents were normally distributed across the board,

![Gender Breakdown Chart](image1)

Figure 7. Breakdown of gender between resident and visitor responses.

but visitors had a strong skew toward higher education, being more evenly distributed between graduate school and college/trade school graduates. No participants responded in the “Some high school” category in either residents or visitors. (Figure 8).

![Education Breakdown Chart](image2)

Figure 8. Breakdown of education between resident and visitor responses.
The last demographic question participants were asked was if their occupation was affiliated with the marine environment. Those who answered “No” skipped ahead one question, but those who answered “Yes” were given the option to choose from a list of marine affiliated industries or enter their own. Write-in answers were only included on the figure if they had more than four respondents in that category. Those that did not, were listed as “Other”, which includes industries such as “Marketing”, “Hospitality”, “Artisan” and “Photography” among others. Ten categories were provided in the survey, but “Artisan” and “Other water sports” only had one response each and as such were consolidated in the “Other” category and replaced by “Conservation” and “Enforcement/Government” (Figure 9). Most “Yes” respondents were residents (n = 151), only 13 visitors answered positively, but they were not included in Figure 9.

Unsurprisingly, the most numerous categories were directly related to Sanctuary waters (Charter fishing/Sports fishing and Dive/Snorkel Operations).

Figure 9. Description of industries self-identified by residents whose occupation is affiliated with the marine environment.
5.2 Perceived Threats to the Sanctuary

The first opinion section of the survey asked respondents to review a list of threats to the Sanctuary, including anthropogenic and natural threats. From the list of 12 possible threats, the respondent had to choose the top three and rank them 1 – 3. Scores were tallied up by weighting the ranking and number of elections (for example, a rank of one was awarded three points, multiplied by the number of times that threat was ranked in first place; a rank of two was awarded two points multiplied by the number of times that threat was ranked second, etc.). Cumulative scores for each threat were calculated for residents and visitors separately (Figure 10). Residents scored Pollution, Coral Disease, and Coral Bleaching as the top three threats while visitors scored Pollution, Coral Bleaching and Coastal Development as the most threatening. However, only Pollution and Coral Bleaching were scored significantly higher than random chance by residents. For visitors, only Pollution scored significantly higher than random chance. None of the listed threats scored significantly lower than random chance for either residents or visitors. When comparing the scoring proportions between residents and visitors, a few key differences were observed (Figure 11). A Two Proportion Z-Test with alpha = 0.05 revealed that a
significantly higher proportion of visitors ranked Pollution, Coral Bleaching, and Coastal Development as threats than did residents. Conversely, a significantly higher proportion of residents ranked Coral Disease, Marine Debris, Invasive Species and Non-extractive Human Activities than visitors.

![Proportional Threat Scores](image)

**Figure 11.** Proportional score for each threat by residency status (numbers indicate score for the top three threats indicated by each group, * indicates a significant difference between the proportional score of a threat chosen by residents versus visitors)

### 5.3 Perception of Management Success

Respondents were also asked to rate their familiarity with the Sanctuary’s management plan and how successful they believed the Sanctuary has been in achieving its management goals. Answers were formatted as 5 and 7-point Likert scales, respectively, to allow for a variety of opinions to be captured. The first question was used to assess how
familiar the participant was with the Sanctuary. Visitors skewed toward lower familiarity while residents skewed toward higher familiarity (Figure 12). This was expected since residents are much more likely to have heard about Sanctuary management goals and regulations than visitors, if only because of their frequent proximity to the Sanctuary.

As for the ratings of management success, both groups skewed toward agreeing that Sanctuary management is indeed meeting its goals and plans to some extent (Figure 13). The “Somewhat agree” category was significantly higher in both groups, showing that many of the respondents feel management’s actions and plans have been at least somewhat successful. Though overall ratings were positive, most participants did not select “Strongly agree”. This medium level of support could possibly be explained by the way respondents...
described the changing condition of marine resources over the past decade. When asked about the condition of marine resources over the past decade, the majority of participants selected that marine resource conditions have worsened over the past decade, with significantly higher than expected numbers of responses in the “Worse” category for both groups (Figure 14). The “Significantly better” category also had a significantly lower amount of responses than expected for both groups.

![Figure 14. Rating of changes in condition of marine resources in the past decade by residency status (* indicates number of responses was significantly different than would be randomly expected as denoted by the dotted line).](image)

### 5.4 Management Zone Scores

The final section of the survey asked participants to score the enacted Sanctuary regulations based on the likelihood that specific management zone types have achieved their intended objectives. Using the logic chains discussed in the Methods section, participants moved a slider bar (from 0 – 100) to give a score to three regulations per management zone type. Participants only answered questions for zone types they were familiar with, since before starting this section, each respondent was asked to select which of the four listed management zone types they had heard of. For example, one person could have answered only the three questions about Ecological Reserves while another could have answered three questions for each of the four zone types. The results for each zone type were analyzed by residency status for each question, and then again by industry
affiliation, but only for residents since the number of visitors who responded that their occupation was affiliated with the marine environment was too low for analysis. All questions were analyzed using a Mann-Whitney U Test for Significance.

For Sanctuary Preservations Areas (SPAs), there was slight variation between resident and visitor scores for all questions, but only the first question (*How likely is the prohibition of fishing (except bait fishing on a permit) to result in increased marine species populations in SPAs?*) had a significantly different score between residents and visitors (p=0.0164) as displayed in Figure 15. In Question 1, visitors gave the likelihood of increased marine species populations as a result of the prohibition of fishing a significantly higher
score than residents. The same questions were then analyzed in relation to industry affiliations for residents and it was clear that respondents involved in the fishing industries (Charter fishing/Sports fishing and Commercial fishing) were more skewed toward the lower end of the scores than the other industries (Figure 16). In order to determine how strongly those two groups differed from the rest, I performed a second analysis using a Mann-Whitney U Test to compare the scores from the two fishing industries against all the others combined. Here, the results were significant for each of the three questions, with scores given by those in the fishing industries as the lowest (Q1 p = 0.0001, Q2 p = 0.0001, Q3 p = 0.0047) (Figure 17).
Figure 16. Box plots representing the distribution of scores for questions about Sanctuary Preservation Areas by industry affiliation for residents (X represents the mean of the distribution).
The next management zone type analyzed was Ecological Reserves (ERs). Three questions about management regulations were supplied to respondents who were asked to score each one from 0 – 100. In this case, none of the questions had significantly different scores when compared by residency status. The overall distribution of scores averaged in the mid-60s for residents and the low-70s for visitors (Figure 18). Overall, visitors gave slightly higher scores than residents, but not at a statistically significant level. When the results were compared by industry, however, the scores from the two fishing groups were again extremely low compared to the others (Figure 19). A Mann-Whitney U
Test between the two fishing groups combined versus all other groups combined yielded significant results for all three questions (Q1 p = 0.0000, Q2 p = 0.0000, Q3 p = 0.0048). This set of questions also appeared to have the most polarization when analyzed by industry. The fishing groups’ scores averaged in the low to mid-30s while the other groups averaged in the low-70s (Figure 20).
Figure 19. Box plots representing the distribution of scores for questions about Ecological Reserves by industry affiliation for residents (X represents the mean of the distribution).
Next, I looked at the responses relating to Special Use Areas (SUAs). These areas are much smaller and are designated for research only, but many respondents (n = 147) still had heard of them. Out of the Mann-Whitney U Tests run on all three questions, only the third question (How likely are SUAs to help in resource restoration and recovery?) showed a significant difference in scores between residents and visitors (p = 0.0208) (Figure 21). Residents seem to have lower confidence in the ability of SUAs to help in resource restoration and recovery. Interestingly, when looking at the results by industry, the fishing groups’ scores were not different than rest of the groups for questions 1 and 2, but in the last question they scored much lower. Even more interestingly, participants who self-
identified as working in ocean and coastal management had similarly low scores for Question 3, and results were significant when compared to the other groups (p = 0.0414), but this could be skewed due to the small sample size of the ocean and coastal management group (Figure 22). When comparing the fishing groups to all other groups, a Mann-Whitney U Test showed that there was again a significant difference in the scores given by the fishing groups and all other groups (p = 0.0061) (Figure 23).
Figure 22. Box plots representing the distribution of scores for questions about Special Use Areas by industry affiliation for residents (X represents the mean of the distribution).
The last management zone type participants were asked about was Wildlife Management Areas (WMAs). This zone type differs from other Sanctuary managed areas due to the fact that WMAs are co-managed with other agencies and can also include a terrestrial component restricting access to areas sensitive to disturbance (i.e. bird and crocodile nesting sites). In this category, when comparing resident and visitor scores, none of the questions had significantly different results (Figure 24). When analyzing the questions based on industry affiliations, results were less homogeneous than previous questions (Figure 25). The fishing groups, particularly commercial fishing, were still giving the lowest average scores, and a Mann-Whitney U test between the fishing groups
and the other groups revealed significant differences in scores for all three questions (Q1 \( p = 0.0366 \), Q2 \( p = 0.0264 \), Q3 \( p = 0.0021 \)) (Figure 26).

**Figure 24.** Box plots representing the distribution of scores for questions about Wildlife Management Areas by residency status (X represents the mean of the distribution).
Figure 25. Box plots representing the distribution of scores for questions about Wildlife Management Areas by industry affiliation for residents (X represents the mean of the distribution).
When looking across all four zone types, the combined average of the three questions for each zone type shows that visitors tend to give slightly higher scores overall than residents (Table 4). A Mann-Whitney U Test between resident scores and visitor scores showed that only Ecological Reserves had significantly different scores between residents and visitors (ER p = 0.0409). The combined average scores for the three questions in each zone type were all in the mid-60s, indicating that participants deem Sanctuary zone regulations as somewhat successful, but further surveying efforts would yield more conclusive answers.

Figure 26. Box plots representing the distribution of scores for questions about Special Use Areas for groups involved in fishing versus all others (X represents the mean of the distribution).
Table 4. Cumulative scores across all three questions for each management zone type (* indicates significant score difference between residents and visitors).

<table>
<thead>
<tr>
<th>Management Zone Type</th>
<th>Cumulative Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Overall</td>
</tr>
<tr>
<td>Sanctuary Preservation Areas</td>
<td>65.08</td>
</tr>
<tr>
<td>Ecological Reserves</td>
<td>66.73</td>
</tr>
<tr>
<td>Special Use Areas</td>
<td>63.57</td>
</tr>
<tr>
<td>Wildlife Management Areas</td>
<td>65.78</td>
</tr>
</tbody>
</table>

5.5 Linear Mixed Effects Model

In order to further corroborate the results, I used a linear mixed effects model to look at the twelve scoring questions as a function of ten different demographic and opinion parameters from other questions (Winter, 2013). I started the process by running each of the twelve questions as a function of only one parameter (i.e. Question 1 Score ~ Industry), recording the p-values of individual components and of the model for each one. From there, I ranked the models from 1 – 10 based on the ascending sum of the p-values for that parameter across the twelve questions. Next, I layered the effect with the lowest p-values with the next lowest (i.e. Question 1 Score ~ Industry + Gender), and iterated that through the list, again generating a table of p-values for all twelve questions, for a total of 45 different models. Again, the list was ranked, and the top ten models were used to move on to a three-effect model (i.e. Question 1 Score ~ Industry + Gender + Education), this time running eight models based on the significant relationships discovered. This continued through a four-effect model until I ended up with a single model with five-effects: (Question 1 Score ~ Industry + Gender + Residency + Education + Management + Error), which was able to significantly explain the data for 11 out of the 12 questions (Table 5).
No model was able to represent the results for all twelve scoring questions with significance. Notably, the first question about Wildlife Management Areas (How likely are WMAs to result in the protection of endangered species?) only had two models yield significant results out of the 68 models run, both of which were affected by a participant’s education level.

Using the linear mixed effects model helped establish which factors seemed to determine how participants scored management actions. For this dataset, industry was more impactful than gender, residency status, education, and views on current management. There are limitations due to the fact that not all participants reached the scoring questions, particularly visitors, and also because industry data was mostly limited to participants who also identified as residents. However, in the survey there was also a binary question asking participants whether their occupation was affiliated with the marine environment, and this particular question did not yield significant results across the various models, regardless of residency status. Additionally, though the R² values were low (~0.20) for all questions, residuals plotted normally, and the Quantile-Quantile plots for each question show that the

<table>
<thead>
<tr>
<th>Model</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPA 1</td>
<td>0.0016 *</td>
</tr>
<tr>
<td>SPA 2</td>
<td>0.0000 *</td>
</tr>
<tr>
<td>SPA 3</td>
<td>0.0152 *</td>
</tr>
<tr>
<td>ER 1</td>
<td>0.0000 *</td>
</tr>
<tr>
<td>ER 2</td>
<td>0.0006 *</td>
</tr>
<tr>
<td>ER 3</td>
<td>0.0216 *</td>
</tr>
<tr>
<td>SUA 1</td>
<td>0.0110 *</td>
</tr>
<tr>
<td>SUA 2</td>
<td>0.0148 *</td>
</tr>
<tr>
<td>SUA 3</td>
<td>0.0137 *</td>
</tr>
<tr>
<td>WMA 1</td>
<td>0.1790</td>
</tr>
<tr>
<td>WMA 2</td>
<td>0.0048 *</td>
</tr>
<tr>
<td>WMA 3</td>
<td>0.0088 *</td>
</tr>
</tbody>
</table>

Table 5. Model p-value for each of the twelve scoring questions as run by the final 5-effect model (* denotes significant p-value).
data are normally distributed (Figure 27).

Figure 27. Example residual histogram and Quantile-Quantile Plot of the data from Question 1 about Sanctuary Preservation Areas, as run by the final linear mixed effect model using 5 effects.
Chapter 6: Discussion

The results from this study indicate that not all user groups seem to perceive Sanctuary management with the same lens. When comparing data by residency status, there were numerous reasons to believe that visitors and residents greatly differ in their understanding and support of Sanctuary management and regulations. Firstly, visitors perceived threats to the Sanctuary differently than residents. Pollution was listed as the number one threat in both groups, and both visitors and residents also selected Coral Bleaching, but in second and third place respectively. Visitors chose Coastal Development as the third greatest threat, which could be due to the fact that such a change is visible to the naked eye and easy to comprehend when viewed at discontinuous points in time, in addition to being globally regarded as having a negative effect on coastal environments. Residents, however, listed Coral Disease as the second greatest threat, which shows the cultural, ecological and economic importance of coral reefs in the Florida Keys and to the magnitude of the devastation currently being caused by the Stony Coral Tissue Loss Disease (SCTLD) epidemic throughout the South Florida reef tract (Meyer et al., 2019; National Oceanic and Atmospheric Administration, 2019). When comparing the proportional scores from each group, it was also clear that there is a difference in knowledge about the Florida Keys marine ecosystem between visitors and residents. Visitors were most likely to give higher rankings to threats widely recognized such as pollution and overfishing while residents ranked threats like invasive species and coral disease which, while not unique to the Florida Keys, are threats that are less discussed on a public global scale. Residents also suggested additional threats not listed in the survey such as “Poor Everglades water management”, “Poor enforcement”, and “Water quality
issues”, but visitors did not. Recognizing and acknowledging this gap in knowledge could help the Sanctuary’s outreach and education teams to better target programs and campaigns about issues that are more prevalent in and around the Sanctuary, especially when publicizing the plans for updated management strategies later this year.

Given that residents had a higher level of local knowledge, it was unsurprising that residents were more familiar with Sanctuary management goals than visitors. A significant number of respondents from both groups stated that they somewhat agreed that current management strategies are meeting the Sanctuary’s goals to “protect the marine resources of the Florida Keys”. Both groups skewed towards agreement, but most responses stayed within one category of the middle of the scale (neutral to somewhat agreeing). This slight agreement could indicate that stakeholders might be receptive to changing the way the Sanctuary is currently managed. A significant number of respondents from both groups also stated that the condition of marine resources has gotten worse over the past decade, with the majority of responses pointing to a decrease in the condition of marine resources.

In the section about the likelihood of success of the four listed management zone types, respondents who self-identified as part of the Commercial Fishing or Charter fishing/Sports fishing groups were most critical of regulations and least confident in management’s ability to meet Sanctuary goals and objectives. These two groups made up 27% of the resident survey respondents and in addition to participating in the survey, several sent direct emails with additional comments. One such email from a commercial fisherman detailed that:

“There’s too many things the sanctuary can’t do anything about. Like the water quality that coming down and killing all the fish. They can’t stop that with a
regulation. So it doesn't matter, the water is bad anyways.”

Other direct comments mostly focused on lack of enforcement, with one boat operator stating, “Never see anyone getting caught for breaking the rules so they just keep breaking them.” This attitude of helplessness is an echo of previous studies in the Florida Keys and could explain why fishermen are so hard-pressed to support Sanctuary regulations, since in their eyes, the issues are not things that Sanctuary management can fix, and the people who are supposed to be enforcing are not visible enough (Pita, Pierce, Theodossiou, & Macpherson, 2011; Shivlani et al., 2008; D. Suman et al., 1999). Stakeholders in the fishing group pose the question of why they should abide by regulations if it means someone else can make a better profit by cheating the system. When comparing all four management zone types, overall average scores were similar, but when splitting the scores between residents and visitors, Ecological Reserves had significantly higher visitor scores than resident scores. Conducting more detailed surveys with a greater visitor population could perhaps help determine if there is something residents see about the success of this zone type that a visitor might not know or see.

Another important result was specifically among visitors. When conducting surveys, more than 40% of visitors had never heard of the Florida Keys National Marine Sanctuary. All visitors surveyed were domestic travelers, but 40% had never heard of the Sanctuary, even when polled while physically in Key Largo or even Key West. This points to a much bigger problem in the Sanctuary’s ability to advertise and advocate for itself with visiting tourists. People are more apt to care about something they know at least a little bit about (McClanahan, Davies, & Joseph, 2005; Pita et al., 2011; Tupper, Asif, Garces, & Pido, 2015). The fact that so few visitors know about the Sanctuary when visiting in the
Florida Keys will not help with enforcing regulations and making sure that people are sustainably exploring the marine environments of the Keys.

The linear mixed effects model also showed that there are a variety of factors that affect how people view and approve of the Sanctuary’s management process. Within residents especially, belonging to a certain industry was the most impactful element influencing how a management zone’s likelihood of success was scored. This result mirrors the earlier analyses showing the respondents involved in fishing industries had the most critical views of the Sanctuary’s management, across all zone types. Those particular stakeholders are also the ones most directly affected by changes in zone regulations, fishing regulations, and even transit regulations, since they have to cross the Sanctuary to arrive at their fishing sites. According to the local commercial fishing organization, commercial fishermen make up over 5% of the population of the Keys and support around 1,600 households (Florida Keys Commercial Fishermen’s Association, 2018). In previous studies, commercial fishermen have reported feeling that they were not being involved in the planning and designation process and that their participation at meetings would not affect the outcomes (D. Suman et al., 1999). Alienating their views would be a loss to understanding the overall dynamics of the Sanctuary and involving them early as key members in the planning and decision-making process is critical to the general success of the FKNMS.

Management success or effectiveness is often measured in biological or socioeconomic terms, such as increased biodiversity and biomass or changes household income. Rarely, are stakeholder opinions about specific management actions or regulations included in reviews of management effectiveness, even though it has been demonstrated
globally that the support of stakeholders plays a critical role in the overall success of a marine protected area (Gallacher et al., 2016; Tupper et al., 2015). Surveying people on a large scale can be timely and sometimes costly, but the results of this pilot study indicate that it can be a useful tool for managers to understand public perceptions and determine where gaps in knowledge and trust exist, to better educate and plan for adaptive changes in marine protected area management.
Chapter 7: Broader Impacts

Even though the linear mixed model showed that residency status is not the strongest factor determining in a participant’s answer, it was still deemed to have a significant effect on how respondents answered questions about management in the Sanctuary. As the managers in the Sanctuary release and update the DEIS for a new management plan, they will likely face very different reactions from the various groups of stakeholders in the Keys. Though visitors are less likely to be involved in the comment and review process because they lack proximity to the matter, their views can still be useful and important, especially because of the importance of tourism to the economy and livelihood of the Florida Keys. The success of future management plans will depend heavily on the transparency of the adaptive management process, as well as the frequent re-evaluation of management decisions. To ensure that the new regulations are indeed better than the previous ones, another assessment of public perception of management success can be conducted in a few years to determine how much confidence there is in Sanctuary managers’ ability to meet their objectives based on the new management plan. It has been over a decade since the last management plan was approved and reviewed for effectiveness, and the Sanctuary would benefit greatly from more frequent introspective analysis in order to gain, and more importantly, gain the trust of the stakeholders in the Florida Keys.
References


Appendix

Survey

This survey aims to determine your perception of management goals for the Florida Keys National Marine Sanctuary.

Section I

1. Have you heard of the Florida Keys National Marine Sanctuary (FKNMS)?
   a. Yes
   b. No

   (If “No”, end survey, if “Yes”, move to question 2)

2. How familiar or unfamiliar are you with the management goals of the FKNMS?
   a. Extremely familiar
   b. Slightly familiar
   c. Neither familiar nor unfamiliar
   d. Slightly unfamiliar
   e. Extremely unfamiliar

The FKNMS is currently undergoing an update to its management plan. The following questions ask for your perception of the success of two management goals.

Goal 1: Protect the resources of the Sanctuary

3. Current management strategies effectively meet this goal
   a. Strongly agree
   b. Moderately agree
   c. Neither agree nor disagree
   d. Moderately disagree
   e. Strongly disagree

4. Has the condition of marine resources in FKNMS gotten better or worse over the last 5 years?
   a. Significantly better
   b. Better
   c. No change
   d. Worse
5. Has the condition of marine resources in FKNMS gotten better or worse over the last 20 years?
   a. Significantly better
   b. Better
   c. No change
   d. Worse
   e. Significantly worse
   f. Not sure

Goal 2: Educate and interpret for the public regarding the Florida Keys marine environment

6. Current management strategies effectively meet this goal
   a. Strongly agree
   b. Moderately agree
   c. Neither agree nor disagree
   d. Moderately disagree
   e. Strongly disagree

7. What do you believe is the greatest threat to the FKNMS today?
   a. Climate change
   b. Coral bleaching/coral disease
   c. Pollution (example: oil spills, chemical leakage, pesticides, etc.)
   d. Marine debris (example: trash, ghost nets, abandoned traps, etc.)
   e. Coastal development
   f. Non-extractive human activities (example: boating, snorkeling, etc.)
   g. Extractive human activities (example: fishing, collecting coral or shells, etc.)
   h. Invasive species (example: lionfish)
   i. Ocean acidification
   j. Commercial shipping/cruise ships
   k. Illegal harvesting/illegal fishing
   l. Other illegal activities
m. Natural disasters (example: hurricanes, etc.)

n. Other:___________________________

8. How often do you believe people from the Florida Keys comply with Sanctuary regulations?
   a. Always
   b. Most of the time
   c. Sometimes
   d. Rarely
   e. Never
   f. Not sure

9. How often do you believe people from outside the Florida Keys comply with Sanctuary regulations?
   a. Always
   b. Most of the time
   c. Sometimes
   d. Rarely
   e. Never
   f. Not sure

Section II

This section will ask for your opinion of the potential for success at different stages of management. Results chains shown below will ask for a score from 0-100% for each of the stages Labeled A, B and C.

Section III

This section asks for basic, non-personal information to help make the results of this survey more understandable.

10. What gender do you identify with?
    a. Female
    b. Male
    c. No response

11. What is your age?
a. 18 - 24 years old  
b. 25 - 34 years old  
c. 35 - 44 years old  
d. 45 - 54 years old  
e. 55 - 64 years old  
f. 65 - 74 years old  
g. 75 years or older  
h. No response

12. What is the highest level of education you have completed?  
a. Some high school  
b. High school diploma/GED  
c. Some college/trade school  
d. College/trade school graduate  
e. Graduate school  
f. No response

13. What is your annual household income?  
a. Under $10,000  
b. $10,000 to $19,999  
c. $20,000 to $29,999  
d. $30,000 to $39,999  
e. $40,000 to $49,999  
f. $50,000 to $59,999  
g. $60,000 to $74,999  
h. $75,000 to $99,999  
i. $100,000 to $149,000  
j. $150,000 or more  
k. No response

14. Please select the answer which best applies to you  
a. Full-time resident of the Florida Keys  
b. Part-time resident of the Florida Keys (Less than 6 months/year)  
c. Tourist  
d. Other (please describe)  
(If “Tourist” skip to question 20)

15. How many years have you lived in the Florida Keys?  
a. 0-1 year
b. 1-5 years  
c. 5-10 years  
d. 10-20 years  
e. 20-30 years  
f. More than 30 years

16. Is your occupation affiliated with the marine environment/marine industry in the Florida Keys?  
   a. Yes  
   b. No  
   c. Not sure  

   (If “No” skip to question 19)

17. If “Yes”, please select the industry that best fits your primary profession  
   a. Commercial fishing  
   b. Charter fishing  
   c. Dive/snorkel operation  
   d. Marine/boat operation  
   e. Other watersports  
   f. Eco-tour operation  
   g. Ecological research  
   h. Ocean/coastal management  
   i. Artisan  
   j. Education  
   k. Other: ______________________________

18. Do you work for the FKNMS or other natural resource management agency in the Florida Keys?  
   a. Yes  
   b. No

19. What is your Florida Keys zip code? (participant enters themselves)  
   a. __ __ __ __

20. Which of the following activities do you participate in within the boundaries of the FKNMS? (Select all that apply)  
   a. Recreational fishing  
   b. Commercial fishing  
   c. Swimming/wading
d. Snorkeling  

e. SCUBA Diving  
f. Boarding (surfing, kitesurfing, Stand-up Paddleboard)  
g. Jet-ski/Thrill-craft  
h. Water skiing/wake boarding  
i. Pleasure boating/sailing  
j. Kayaking/Canoeing  
k. Bird watching  
l. Other: ___________________

21. Which of the following was the main reason for your visit to the FKNMS?  
   a. Recreational fishing  
   b. Commercial fishing  
   c. Swimming/wading  
   d. Snorkeling  
   e. SCUBA Diving  
   f. Boarding (surfing, kitesurfing, Stand-up Paddleboard)  
   g. Jet-ski/Thrill-craft  
   h. Water skiing/wake boarding  
   i. Pleasure boating/sailing  
   j. Kayaking/Canoeing  
   k. Bird watching  
   l. Other: ___________________

22. Which of the following sources do you primarily rely on for updates on regulations and news about the FKNMS? (Please select one)  
   a. Newspaper  
   b. Radio  
   c. Television  
   d. Brochures  
   e. Informational Signs  
   f. Word of mouth  
   g. FKNMS Website  
   h. FKNMS Staff  
   i. Sanctuary Advisory Council  
   j. Government publications  
   k. Conservation group publications  
   l. Other: ___________________
Results Chains

Sanctuary Preservation Areas (detailed)
Objective: Protect shallow, heavily used reefs and reduce user conflicts

Ecological Reserves (detailed)
Objective: Protect biodiversity by setting aside areas with minimal human disturbance
Special-Use Areas

Objective: scientific research and education, recovery/restoration of injured or degraded resources (may also facilitate access to or use of resources and prevent user conflicts)

- Management Strategy
  - Access restricted to permitted entry only
  - Permitting process

- Immediate Outcome
  - Reduced impacts on ecosystem

- Latent Outcome
  - Improved monitoring conditions for research
  - Indicators of recovery and restoration

- Measurable Impact on Objective
  - Measurable ecosystem recovery and restoration progress
  - Identify possible areas for additional zoning