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A Socio-Economic Assessment of Marine Turtle Eco-tourism

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A SOCIO-ECONOMIC ASSESSMENT OF MARINE TURTLE ECO-TOURISM

by

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ABSTRACT

Marine turtles have historically contributed to economic activity through consumptive harvest for food, tools, and decorative objects. Only recently have they begun to benefit humans economically through non-consumptive roles, primarily as a focal point of educational eco-tourism. In recent years, the annual number of turtle walks conducted around the Archie Carr National Wildlife Refuge (ACNWR) has risen. This expansion contributed to a statistically significant increase in attendance from 2,162 in 2001 to 3,047 participants in 2014. I examined the regional economic impacts of marine turtle eco-tourism around the ACNWR using social surveys and an economic impact analysis tool. IMPLAN, an input-output modeling package, has been used in tourism industries around the U.S. since 1992, but this study is the first to use this tool to evaluate the holistic economic effects of marine turtle-based eco-tourism within a selected region. During the 2014 turtle walk season (June through July), surveys were distributed at six different turtle walk locations within Brevard and Indian River Counties, Florida, along the central Florida Atlantic coast. Adults attending the turtle walks (n=2,274) were given time before the educational presentation began to complete a one-page survey. Approximately 93% of turtle walk participants completed surveys. Due to market interactions within this two-county region, turtle walks contributed a minimum of three new jobs and a conservative estimate of almost $250,000 (USD) to the local economy during the two-month turtle walk season. Using financial comparisons and economic impact tools, like IMPLAN, can improve our understanding of the many roles, especially non-consumptive uses, sea turtles

have in our communities. This information can be useful in resource management and conservation-based decision making.

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and final year of graduate school when I was analyzing these data and preparing to make presentations at multiple conferences.

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CHAPTER ONE: INTRODUCTION

The field of environmental economics emerged in 1981 when President Reagan issued Executive Order 12291, requiring all U.S. federal agencies to conduct a Regulatory Impact Analysis (RIA), including economic impacts, of all proposed major regulations (Ascher and Steelman 2006). The concept of using economics in environmental policy was later expanded to habitat and species valuation when the Oil Pollution Act was passed in 1989 (Carson et al. 2003). This Act mandated that all damages, including environmental losses, be given a value. These estimates of environmental losses were then used to determine compensation amounts from the company at fault. In 1991, the U.S. Environmental Protection Agency (EPA) used a broader concept of environmental valuation to estimate a value of the environmental services provided to humans either directly or indirectly (Table 1; Bingham et al. 1995, Millennium Ecosystem Assessment 2005). Further adaptations of environmental or resource valuation allowed for appraisals of ecosystem health and management practices of the forest service (Krieger 2001), as well as fisheries and coastal ecosystems (Bell 1997, Jenkins et al. 2010, Barbier et al. 2011).

Table 1: Ecosystem service categories (Carpenter and Folke 2006)

Service Category	**Examples of Services Provided**
Provisioning	Food, Fresh Water Wood and Fibers, Fuel
Regulating	Climate Regulation, Flood Regulation Disease Regulation, Water Purification
Supporting	Nutrient Cycling, Soil Formation Primary Production
Cultural	Recreational, Educational Spiritual, Aesthetic

Economic assessments of services provided by individual species have also been considered an effective tool to support wildlife management and education (Whitehead 1992, Carpenter and Folke 2006) and are required by the U.S. Endangered Species Act (ESA) before designating critical habitat for protected species. For example, services provided by dung beetles processing cow manure were estimated at $380 million USD per year (Losey & Vaughn 2006), as dung beetle presence in pastures reduced cattle loss due to sickness and death. The expansion of valuation studies to the species level has allowed for optimization of the decision-making process (Ascher and Steelman 2006); however, Egoh et al. (2007) and Redfoot and Adams (2009) suggest it should never be used independent of other complementary decision making tools, including changes in biodiversity, ecosystem and species disturbance requirements, cultural constraints, and land-use.

Eco-tourism Valuation

In recent years, there has been an emphasis on eco-tourism research (Ruffo and Kareiva 2009, Hamann et al. 2010, Kuo et al. 2012, Farr et al. 2014), due to its usefulness in decision-making for economic growth (Reimer and Walter 2013). Eco-tourism is a service that promotes environmentally responsible travel to appreciate and learn about nature, it's accompanying cultural features, and conservation, while also having a low visitor impact, involving local peoples, and economically benefiting the community (Ceballos-Lascuráin, 1993). It is different from other nature-based tourism due to its emphasis on education, conservation, and community interaction (Wallace 1992).

Multiple methods are used to determine conservative estimations of environmental value. Contingent valuation (CV), otherwise known as "willingness to pay", and gross income comparison are commonly used methods of determining a dollar value for the conservation of a species or ecosystem (Farber et al. 2002). Contingent valuation uses surveys to ask participants questions about how much they would be willing to spend to possibly implement a

new policy, management action, etc. involving the species or ecosystem in question. This approach is one of the only ways to estimate non-use values, which include existence and/or aesthetic value. For example, Bandara and Tisdell (2004) determined that urban residents of Sri Lanka were willing to pay 2,012.43 million Rupees per year, the equivalent of $15.39 USD per person, towards the conservation of Asian elephants. This estimate constitutes nearly twice the amount necessary to compensate farmers who experienced crop and property damage caused by the elephants (Bandara and Tisdell 2004). The Sri Lankan government has since drafted a ten-year development framework to insure sustainable development and conserve the country's natural heritage, including the elephants. One strategy outlined in this policy describes using elephant eco-tourism as a way to create profits that can reimburse farmers for their losses.

Gross income comparison (GIC), the other most common approach to environmental valuation, is an estimate of value based on direct expenditures in a market. This method is used to compare annual total gross incomes from the consumption of species versus the gross income from the non-consumptive services these species provide through educational guided wildlife observation. Numerous studies show that eco-tourism has a larger gross income versus species consumption. For example, Kuo et al. (2012) compared the economic impacts of commercial whaling and whale watching tourism in Iceland, Norway, and Japan. This study found significant negative economic impacts on the whale watching tourism industry with each minke whale harvested (Kuo et al. 2012). On the other hand, non-consumptive whale watching services generated twice the revenue of commercial whaling (Kuo et al. 2012). The GIC approach demonstrated these whales are worth more alive than dead.

Although both CV and GIC methods have contributed to policy and management decisions, the estimates derived from these assessments do not fully encompass the value of the species in question, or entirely describe how they impact the economy. The CV approach only approximates a biased theoretical value (Desvousges et al. 2012) and does not measure actual human behavior in the marketplace (Witherington and Frazer 2003). The majority of the estimates generated by this method place a value on cultural services the species provide (e.g.,

aesthetic or spiritual); however, these estimates are conservative. This is due to individuals valuing nature in different ways. For instance, wildlife may be considered priceless to some individuals or cultures (Rolston 1994). Furthermore, the GIC method only considers part of the expenditure flow through the market, and not the total economic impact of the wildlife (or activity) being assessed.

Eco-tourism typically provides income to local residents through direct tour purchases and other travel expenditures (Witherington and Frazer 2003). Eco-tourists may travel from around the world to participate in activities leading to additional purchases in the location of the wildlife experiences such as lodging, food, and transportation. When these purchases are included, the species in question has a much larger perceived economic impact within the local region than that which was accounted for by GIC alone.

Input-Output (I-O) models are used to assess the total economic impact, including additional secondary purchases related to the eco-tourism activity. These models describe economic transactions between interacting markets within the economy: an initial output in one market sector has an impact on a second market sector, which then impacts a third market sector. I-O models define total impact by summing the direct effects and secondary effects (i.e., indirect and induced effects) generated by purchases related to the activity (Stynes 1999, Mulkey and Hodges 2004).

An example of using this method for eco-tourism purposes is found in a study conducted by Hjerpe and Kim (2007). They used I-O modeling to estimate the total economic impact of kayaking in the Grand Canyon. The study found that 22,000 rafters contributed $21,000,000 in regional expenditures to the Grand Canyon regional economy, and supported 394 jobs within the region (Hjerpe and Kim 2007). These data were used to help the U.S National Park Service managers foster better compatibility between the park and the surrounding community (Hjerpe and Kim 2007). The I-O method was also used to determine the economic impact of the largest birding festival in the U.S., the Space Coast Birding and Wildlife Festival (Slotkin et al. 2012). In 2012, the weeklong event, located in Brevard County, Florida,

had a total economic impact of $929,777 and the creation of an estimated 11.4 jobs within the county (Slotkin et al. 2012). The large demand for wildlife watching through the Birding and Wildlife Festival provides direct and indirect financial support for protection of these local ecosystems. As seen in previous studies, using I-O models to determine economic impact provides (a) useful holistic data to policy makers, (b) can promote conservation efforts, and (c) can stimulate continual educational eco-tourism.

Marine Turtle Eco-tourism

Marine turtle species provide a non-consumptive service through educational eco-tourism around the world (Tisdell and Wilson 2001, Troeng and Drews 2004). Historically, turtles' eggs and meat have been consumed as food (Carr 1954), their skin used for leather, fat for oils, bones for tools (Thorbjarnarson et al. 2000), and their shells have been desired for decorative objects (Parsons 1972). Marine turtles are captured incidentally as fisheries bycatch, contributing to population declines over time (Lewison et al. 2004, Lewison and Crowder 2007, Wallace et al. 2010). While individual sea turtles lay hundreds of eggs during a nesting season, it is estimated that few offspring survive to maturity (TEWG 2009). As a result of their historic consumptive value and presence as bycatch in marine fisheries, these animals are now listed as threatened and endangered species on the IUCN Red List, and are protected under the ESA.

Marine turtles are considered charismatic animals; combined with federal and global protection laws, and the potential to provide a service through ecotourism, marine turtles are excellent candidates for economic valuation. However, relatively few economic valuation studies for marine turtles have been conducted (Table 2). Troeng and Drews (2004) determined that non-consumptive recreational use of turtles, in the form of educational tours in nine countries[1], generated three times more gross profit and thousands more jobs than traditional consumptive uses such as food, tools, and decorations. The educational tours allowed guests to

[1] Costa Rica, Brazil, Oman, Malaysia, Trinidad and Tobago, Sri Lanka, Barbados, South Africa, Cape Verde

watch adult female loggerheads (*Caretta caretta*), green turtles (*Chelonia mydas*) and leatherbacks (*Dermochelys coriacea*) lay their eggs, and/or participate in hatchling releases (Troeng and Drews 2004). In Australia, Wilson and Tisdell (2003) estimated the economic impact of guided educational observations of nesting marine turtles, within a national park, located in Mon Repos, Australia. During the 1999/2000 nesting season, tours contributed an estimated $747,602 USD to the regional economy (Wilson and Tisdell 2003). This seasonal activity is recognized as one of the most important economic inputs to the region, apart from whale watching and farming activities (Tisdell and Wilson 2000).

Table 2: Marine turtle valuation studies

Methods used: WTP/CV = "Willingness to Pay," i.e., contingent valuation; GIC = Gross income comparison.

Author	Year	Location	Type	Average Value
Whitehead	1993	North Carolina, USA	WTP/CV	$10.98/person
Wallmo and Lew	2012	USA	WTP/CV	$43.72/person ($41.13-$46.43)
Troeng and Drews	2004	9 Locations Worldwide[1]	GIC	$1,659,250/year ($41,147-$6,714,483)
Wilson and Tisdell	2003	Mon Repos, Aus	GIC	*$747,602/year * Converted to USD

To date, no study has investigated marine turtle eco-tourism participant demographics or quantified the economic impact of educational conservation activities for sea turtles in the United States. Nor has the I-O modeling method been used to estimate the total economic impact of sea turtle educational tours on local or regional economies. Due to this current knowledge gap, I designed and implemented an economic impact study for marine turtle-related tourism associated with the central east coast of Florida to provide a dataset and an economic tool for regional and state policy makers. This study contributes to the limited knowledge we have regarding roles of socio-economics in marine turtle conservation efforts.

CHAPTER TWO: SOCIO-ECONOMIC IMPACTS OF MARINE TURTLE-BASED ECO-TOURISM AT THE ACNWR

Introduction

Economic assessments of services provided by species are an effective tool for wildlife management and education (Costanza et al. 1997, MEA 2005, Carpenter and Folke 2006, Losey and Vaughan 2006). These assessments help optimize the political and managerial decision-making process (Bingham et al. 1995, Ascher and Steelman 2006) by providing empirical data and tools needed as components of successful conservation efforts. Eco-tourism valuation research provides data that are useful for preventing environmental neglect, can promote economic growth (Reimer and Walter 2013), and its use has increased in recent years (Ruffo and Kareiva 2009, Hamann et al. 2010, Kuo et al. 2012, Farr et al. 2014). Due to the difficulty of collecting data about monetary contributions, estimates generated from this field of research tend to be conservative. Many different methods are used to determine these estimations of value (e.g., contingent valuation, gross income comparison, travel costs analysis), with each method providing a different perspective of eco-tourism activities. Contingent valuation and gross income comparison studies contribute to policy development or improved management efforts (O'Connor et al. 2009, Bandara and Tisdell 2004, Troeng and Drews 2004). However, these and other estimates do not encompass the full value of the environmental services, nor do they describe how these services fully impact the local or regional economy through expenditure flow. Until comprehensive value estimates of environmental services are known,

long-term management strategies and policies for wildlife conservation that use these estimates may be compromised.

Eco-tourists travel from around the world to participate in guided outdoor activities or to have wildlife encounters. Often, these trips are pre-planned, specifically for a target destination or activity. This travel leads to additional local purchases such as lodging, food, and transportation, thereby contributing to the total regional economic value associated with the outdoor experience. When these purchases are included in environmental valuation analyses, decision-makers can better understand the total economic impact of the service in question. Typically, this holistic view of total economic impact is much larger than what was previously understood. Input-output (I-O) modeling is one method that can be used to assess the total economic impact wildlife or an outdoor experience can have through eco-tourism activities. The model describes the flow of money by identifying and quantifying changes in sales, income, and employment resulting from transactions made between linked industries of the economy. Economic impact is defined by summing the direct, indirect, and induced effects generated by the service being evaluated (Stynes 1999, Mulkey and Hodges 2004) while describing transactions between sectors within the economy. This method provides a "snapshot" of the regional economy (Hjerpe and Kim 2007) and is considered the best method to illustrate interactions between industries (Davis 1990). This approach has been successful in conservatively valuing regional impacts of diverse environmental services, such as kayaking in the Grand Canyon (Hjerpe and Kim 2007) or wildlife-viewing festivals (Slotkin et al. 2012). Using I-O models to determine economic impact of an eco-tourism event provides useful data for

policy makers, natural resource managers, and local communities allowing them to make decisions based on a more holistic set of information. In addition, these economic data can be used to evaluate existing eco-tourism activities and stimulate additional ones by promoting economic stability and preventing services from being considered "free."

Florida has approximately 1,800 miles of coastline (State of Florida 2014), more than any other state in the continental United States. Sandy beaches comprise about 825 miles of Florida's coast (Clark 1993), attracting millions of tourists per year. This coastline is home to many businesses, property owners, and federally protected species (Defeo et al. 2009). Florida's sandy habitat is used by marine turtles, primarily the loggerhead (*Caretta caretta*), green turtle (*Chelonia mydas*), and leatherback (*Dermochelys coriacea*), for seasonal reproduction from March-October. The Florida nesting loggerhead population is considered to be the second largest in the world (Meylan et al. 1995, Ehrhart et al. 2007, TEWG 2009) accounting for 35-40% of nesting worldwide (NMFS and USFWS 1991). The beaches of Brevard and Indian River Counties are of particular importance to sea turtle reproduction and are home to the Archie Carr National Wildlife Refuge (ACNWR), established in 1991. Located on Florida's central east coast, the 33 km (20.5 mi) of beaches comprising the ACNWR host an average of more than 11,556 loggerhead nests laid per year (1982-2012; Ehrhart et al. 2014). This constitutes an average of 25% of the statewide nesting (Ehrhart et al. 2014).

Throughout the world, marine turtles provide non-consumptive services through educational eco-tourism activities (Tisdell and Wilson 2001, Troeng and Drews 2004), typically delivered through turtle walks which are guided educational tours focused around viewing a

nesting marine turtle. Florida's first organized guided turtle walks were initiated in the early 1990's (FWC *unpub. data*), and demand for these guided walks has increased significantly over the past decade, specifically in and around the ACNWR (Figure 1).

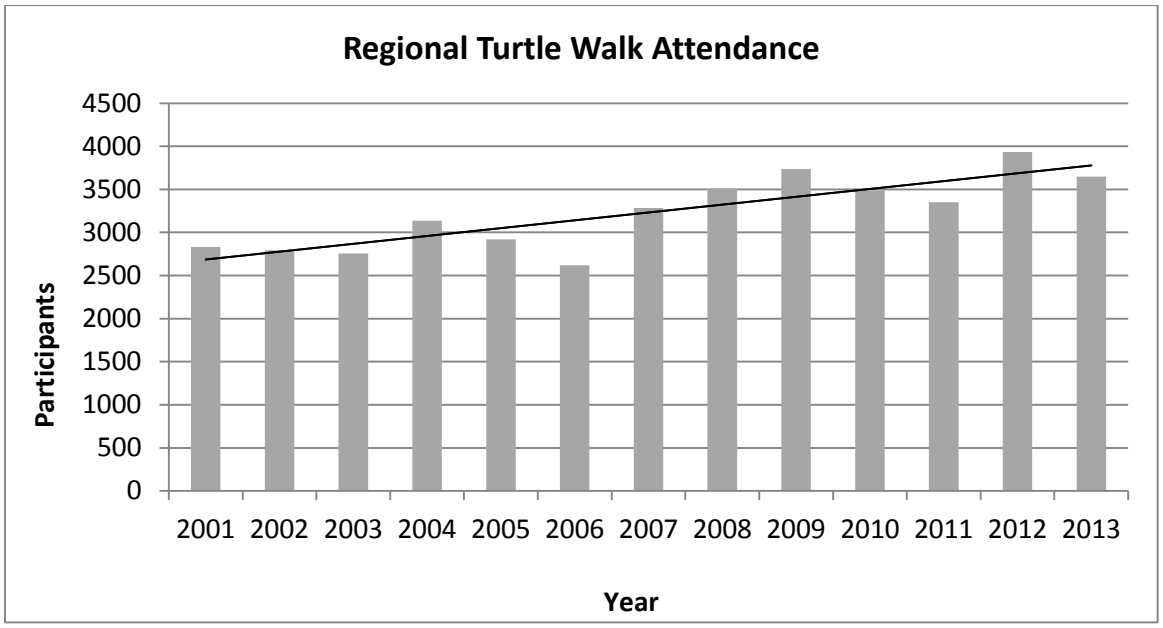

Figure 1: Total turtle walk attendance across the Brevard and Indian River County Region from 2001-2013. (Linear Regression: p=<0.01*, R^2= 0.70488, FWC *unpublished data*)

Marine turtles are excellent candidates for economic valuation via eco-tourism expenditures, given that they are charismatic species and protected domestically and internationally, and because there is a potential to provide service through turtle-oriented eco-tourism. However, relatively few marine turtle valuation studies have been conducted worldwide (e.g., Whitehead 1993, Wilson and Tisdell 2003, Troeng and Drews 2004, Wallmo and Lew 2012). To date, no study has investigated marine turtle eco-tourism participant demographics or quantified the economic impact of educational conservation activities for

marine turtles in the United States. Additionally, the total economic impact of marine turtle educational tours on local or regional economies has not been estimated. Accordingly, this study has three objectives:

1) Define demographic characteristics of individuals participating in turtle walks around the ACNWR;
2) Identify differences in participants based on the organization leading the activity; and
3) Determine the economic impact of marine turtle tourism using an I-O modeling approach.

This study provides data that can serve as an economic tool for local policy makers and natural resource managers, thus contributing important new knowledge and a better understanding about the role of socio-economics in sea turtle conservation efforts.

Methods

Study Location

Brevard and Indian River Counties are located on the east central coast of Florida, U.S.A. (Figure 2). In 2013, Brevard County loggerhead marine turtle nesting represented 32% of the species' nesting within the state of Florida (FWC 2014). Both of these counties include sections of the ACNWR, which was established in 1991 to protect nesting habitat for one of the largest loggerhead-nesting rookeries in the western hemisphere (Ehrhart and Raymond 1983, Meylan

et al. 1995, Ehrhart et al. 2003, Ehrhart et al. 2014). The high nesting density and large aggregation of nesting sea turtles make this region an ideal location for turtle walks.

Currently, over 150 individual turtle walks are led annually along the coast of Brevard and Indian River Counties (Figure 2) through the months of June and July. There are seven organizations that lead these turtle walks including: the Canaveral National Seashore (not part of this study), Sea Turtle Preservation Society, the Sea Turtle Conservancy, U.S. Fish and Wildlife Service/Friends of the Carr Refuge, Sebastian Inlet State Park, the Disney Resort (only employees are included in study) and Coastal Biology Incorporated (Table 3). Based on Florida Fish and Wildlife Conservation Commission (FWC) guidelines, these tours allow guests to observe one female loggerhead as she lays her eggs, covers her nest, and returns to the ocean. Prior to viewing the nesting turtle, all participants are given a state-regulated educational presentation about sea turtle life history, threats to survival, information about their protection, and how to become involved in sea turtle conservation. The FWC has strict guidelines regarding turtle walks. These guidelines include (FWC 2006):

- Turtle walks are limited to viewing one nesting loggerhead sea turtle per walk;
- An educational presentation must be provided to all participants and must include updated information outlined by the state;
- There may not be more than 25 participants per guide and no more than 50 individuals in total;
- No more than five walks can be conducted per week within a given area; and
- Walks can only be conducted during June and July.

It should be noted that turtle walks cannot be commercialized by organizations. Instead, all fees must be recycled back into support for continuous conservation efforts.

Table 3: Summary of information about organizations leading turtle walks in study region

Name	Abbreviation	Type of Organization	Description	Location
Sea Turtle Preservation Society	STPS	Local Non-Profit and Advocacy Group	Actively marketing activities and conducting education programs	North of ACNWR
Sea Turtle Conservancy	STC	International Non-Profit and Advocacy Group	Actively marketing activities and conducting education programs	Within ACNWR
U.S. Fish and Wildlife Service[2]	FWS	Federal Government, Refuge Management	Specifically marketing activities to special groups	Within ACNWR
Sebastian Inlet State Park	SISP	State Government, Park Management	Passively marketing activities	Within ACNWR
Disney Vero Beach Resort	DISNEY	For-Profit Recreational Vacation Company	Only employees surveyed. Actively markets activities to resort guests	South of ACNWR
Coastal Biology Incorporated	CBI	Local Non-Profit	Actively marketing activities	South of ACNWR

[2] Friends of the Carr Refuge; a non-profit built to provide funds and services to support the needs of the ACNWR

Figure 2: Locations of guided turtle walks conducted in Brevard and Indian River counties, FL (five locations were used by six organizations)

Economic Survey

During two months of the 2014 sea turtle nesting season, economic surveys were distributed to voluntary participants during turtle walks in Brevard and Indian River Counties. The survey was approved by the Internal Review Board (IRB# SBE-13-09651) at the University of Central Florida for dispersal to turtle walk participants.

The one-page survey included two sections and 13 questions (Appendix A): (1) participant demographics, and (2) financial expenditures. The first group of questions was designed to gather the respondent's socio-economic demographics (age, education level, gender, location of residency), previous knowledge level about sea turtles, and marketing method used to attract the guest to the walk. This section included multiple-choice questions with fixed answers from which to choose, and one open-ended answer for the participant's primary reason for visiting the region. These data were used to characterize turtle walk participants and also for economic impact analyses. Participants' location of residency was used to create a hotspot map using ArcMap (Version 10.1). A layer of participants' zip code data points was overlaid on a base layer of U.S. states and color-coded based on frequency of reported zip codes to determine relative distances of travel to the two-county region and relative spatial densities of participants' points of origin.

The second section of the survey asked participants to estimate their expenditures while in the region. Six spending categories (e.g., eating and drinking, lodging, retail shopping, gasoline purchases, groceries, all other likely expenses) were utilized representing different types of consumer purchases turtle walk attendees made during their visit. Local residents of the two-

county region were asked to estimate only their expenses for the night of their turtle walk, while non-locals were asked to estimate all of their expenses in the two counties during their entire visit to the region.

Lastly, attendees were asked to leave their email address if they were willing to participate in a follow-up survey regarding educational and behavioral impacts of the turtle walk they attended. Methods and data from this follow-up survey are found in Appendix D.

Survey Implementation

Using a comprehensive sampling strategy, one trained tour guide, one graduate student, and four trained undergraduate students from the University of Central Florida distributed the one-page economic impact surveys to willing turtle walk participants at 147 separate turtle walks conducted in the two-county region in June and July 2014. Canaveral National Seashore walks were fully excluded and Disney Guests walks partially excluded from the study due to the relatively large distance from the ACNWR, or minimize any potential negative impacts to Disney guests' experience. This comprehensive sampling approach increased the probability of obtaining samples (completed surveys); larger sample sizes minimize potential error.

Prior to the educational presentation conducted at each turtle walk, a one-paragraph standardized full disclosure of the study description and instruction clause was read to attendees to explain the survey and the potential contribution of the data set to marine turtle

research, protected resources policy and management, and future conservation efforts (Appendix B). Instructions were as follows:

- Participants must be 18 years or older;
- If attending the walk as a single adult-only, complete one survey (to prevent double-counting);
- If attending the walk as a group with one individual paying for all expenses (e.g., family, field trip, date night) complete one survey; and
- If attending the walk as a group with all or some individuals paying expenses separately (e.g., friends, work event, distant families), complete one survey per party responsible for expenses.

As surveys were distributed, participants were given the option to either opt-out or complete the economic impact research survey. All completed surveys were collected before the normal turtle walk events commenced. The survey asked the respondent to list the ages of everyone in his or her associated group. To determine the survey response rate, a random sub-sample (n=30) of turtle walks was selected. Knowing the ages of everyone encompassed under the survey, the average adult party size could be determined from all the completed surveys collected in the sub-sample. Using the average adult party size, the ratio of actual surveys completed to the possible maximum number of surveys completed was compared and used to define the survey response rate.

Demographics of turtle walk participants

To prevent guests' from having a negative vacation experience, survey participants for Disney walks were limited to Disney employees only, eliminating the possibility of gathering data on resort guests who attended a turtle walk during 2014. Therefore, all demographic analyses exclude Disney survey responses. The other five organizations involved in these demographic analyses are located in different areas around or within or around the ACNWR, have different goals, and differing levels of advocacy about marine turtle conservation. To determine if differences exist between turtle walk participants among organizations leading turtle walks, a Pearson's chi-square test was used to compare survey responses for residency types, group type, and tourists' primary reason for visiting the region. These data were visually represented with mosaic plots created using R statistical software.

To characterize demographic classifications (e.g., resident status, education level, income level, group type) of attendees participating in educational marine turtle walks, the demographic survey questions were separated into two sections: basic and complex demographics. Participants' basic characteristics were defined by: location of residency, gender, age, education level, and annual household income. The distributions of these visitor characteristics were evaluated by comparing frequencies of response categories for each of the characteristics in question.

The complex set of demographic questions focused on: participant's reason for visiting the region (non-residents only), characterizing the group attending the turtle walk (e.g., couple, immediate family, friends), participant's level of knowledge about marine turtles prior to the

walk, and identifying the most successful marketing method used to attract the visitor to the turtle walks. Frequency distributions for these visitor characteristics were tabulated to better describe the type(s) of guests attending turtle walks.

The state of Florida collects annual visitor demographic data through VisitFlorida.com, a state-funded vacation planning and information website. Mean state-wide visitor demographic characteristics from the 2011, 2012, and 2013 annual state visitation surveys were compared with mean data from the 2014 turtle walk economic impact surveys to determine if differences in characteristics existed between the average Florida tourist and turtle walk participants. Florida visitor information was not available for the time period this study was being conducted. Only age and annual household income characteristics were used in the comparison due to the lack of gender and educational level data collected by the annual state survey. Data that were collected by the state survey are reported in averages, while data collected from the turtle walk survey were reported in modes due to response categories' being ranges instead of individual values.

Residency Impact Categories

In the expenditure estimation section of the survey (Appendix A), each spending category represented a different industry in the regional economy: eating and drinking, lodging, retail shopping, gasoline purchases, groceries, all other likely expenses. These industries interact with each other through secondary effects (e.g., an initial change in demand in one

industry has an impact on linked sectors, which subsequently affects other sectors), which create a total impact a multiple greater than the direct expenditures alone. For turtle walk attendees, regional residents and guests have different levels of impact than tourists due to the different quantity and types of purchases made in association with their turtle walk.

Based on residency classification, there were three sub-categories of impact included in the analysis. The first, "residents," referred to spending by local attendees: only the purchases made by residents the night of the turtle walk were included in the I-O estimation, provided they left their home specifically for the turtle walk. The second sub-category, "non-local primaries'" referred to expenditures by non-local attendees who claimed their primary reason for visiting the region was to view marine turtles. For this segment, all expenditures made were part of the analysis, as these attendees would not have come to the region if the possibility of viewing a marine turtle did not exist. The third, and last sub-category, "non-local non-primaries," comprised spending by the non-local attendees who were visiting the region for a primary reason other than to attend a turtle walk, but while visiting, chose to participate. For this sub-category, only direct attendance expenses (i.e., entrance fees and donations) were entered into the model's impact estimate, since these tourists were already going to visit the area regardless of whether marine turtles were present. Since the other two residency-classification types also paid admission fees and donations, these expenses were all grouped together to create the third sub-category inputted into the I-O model. Expense data from every survey were segmented into the three residency-based scenarios (resident, non-local primaries, and non-local non-primaries) described above. For each scenario, spending data were summed

and then, for input-output purposes, entered into the appropriate industry sector for I-O modeling.

Input-Output Analyses

Regional economic contributions were analyzed using IMPLAN (Minnesota Implan Group 2014)--a system of social accounting matrices that use county-level data from up to 528 adjusted market sectors (Stynes 1999). The model generates a report of regional direct, indirect, and induced changes (or effects) in the following categories: employment, value added (Gross Domestic Product [GDP]), and total output. The direct effects represented the primary level of spending by turtle walk attendees. These were the total expenses they paid in the six industry sectors associated with turtle walk participation, as well as the turtle walk donations. There were two types of secondary effects. The indirect effects were triggered sales changes in affected industries' supply chains due to purchases made by turtle walk participants and induced effects were changes in local spending resulting from income earned by employees working in industries supported by the turtle walk participants' spending. The total economic impact to the region was calculated by summing these effects (i.e., direct, indirect, and induced). To represent the secondary impacts or changes in the region from turtle walk participant expenditures, a multiplier was calculated by dividing the total effect by the direct effect.

Results

Survey Response Rate

Based on turtle walk attendance data collected by tour guides at 147 turtle walks in Brevard and Indian River Counties, 2,274 adults were present at the turtle walks in 2014. Group sizes ranged from 1-6 people. The mean numbers of adults reported for each of the 30 walks were averaged together to determine the average adult party size of approximately 1.82. If 100% of the eligible adults completed a survey the expected number of surveys would have been 1,249. The actual number of completed surveys collected was 1,167, or a 93.36% response rate.

Demographic Representation

To gain a better visual understanding of where turtle walk guests live, residency information from these surveys were used in the creation of the hotspot map. However, Disney employee turtle walk participants contributed a total of 60 surveys to this study. To reduce bias in the demographic portion of this study the 60 survey responses were excluded for the remainder of the demographic section. The remaining 1,107 partial and completed surveys were used to compare the demographic characteristics of guests attending the turtle walks and to determine if statistical characteristic differences were present among the organizations.

Each organization led a different total number of walks throughout the summer based on the availability of trained volunteers (Figure 3). The Sea Turtle Preservation Society provided the highest number of returned surveys (402), while Costal Biology Incorporated had the lowest number of responses (77). The number of survey responses received was affected by the number of tours these organizations led, as well as the willingness and eligibility (based on instructions) of tour guests to participate in the voluntary survey.

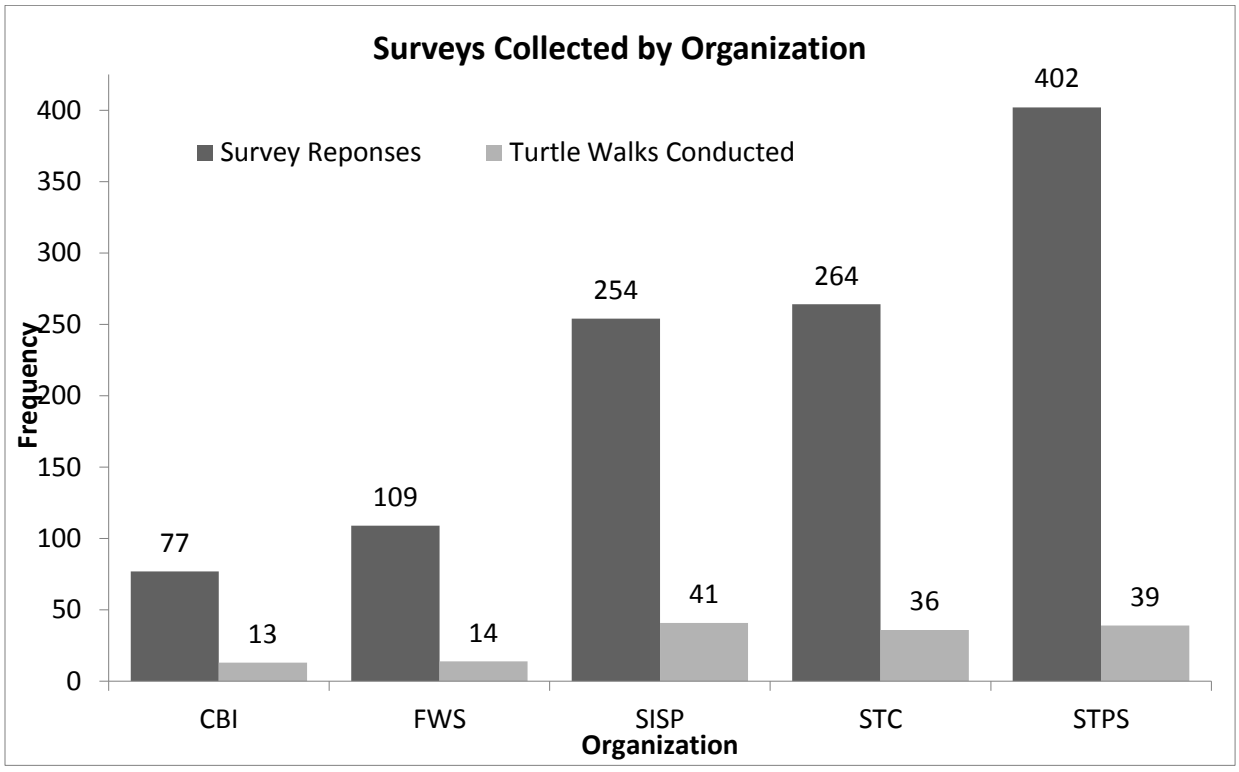

Figure 3: Number of survey responses collected at turtle walks led by each organization and the number of turtle walks each organization led through June and July 2014

Participant Residence Representation

Fifty-two surveys were completed by tourists from 9 countries outside of the U.S., many of whom visited the region primarily to partake in the turtle walk. The United Kingdom had the largest international representation with 23 survey responses, followed by other countries with multiple visitors including Canada (11), Germany (6), France (4), and the Netherlands (3). The rest of the international countries represented at the turtle walks had only one survey response, including: Ireland, Belgium, Kenya, and Switzerland. In addition to these international visitors, guests resided in zip codes from 41 U.S. states (Figure 4) and there was a very dense population of visitors residing in Central Florida zip codes attending the walks, creating a residential density hotspot (Figure 4).

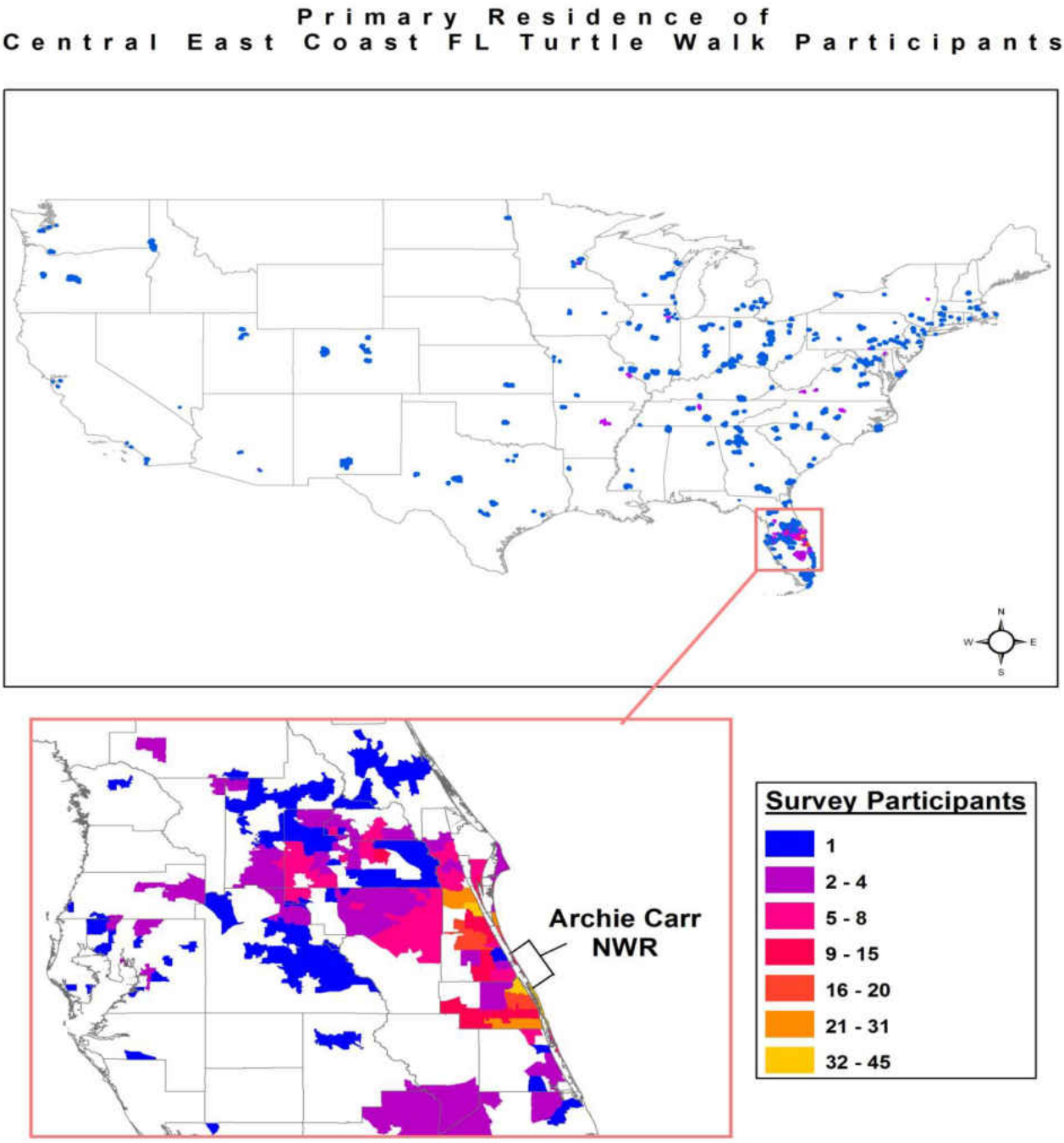

Figure 4: Distribution of U.S. resident survey participants (41 states represented, with a high residential density from central Florida zip codes)

Basic Demographic Characteristics

The number of residents versus non-resident participants who completed a survey was almost equal, with 45% locals and 55% tourists (Table 4). Almost half of survey participants were between the ages of 40-60, with the modal age category being between 50-60 years old (Table 4). A 4-year degree was the modal highest level of educational attainment at 35% of participants, followed closely by a graduate level degree at 34%. The modal level of reported annual household income for turtle walk guests was $100,000 USD or above (37%) (Table 5).

Table 4: Frequency distribution of residency classification and the age of survey participants

Regional Residents (Y/N)			**Age of Survey Participant**		
Resident	**Frequency**	**Percentage**	**Age Range**	**Frequency**	**Percentage**
No	**605**	**54.7%**	18-29	105	9.6%
Yes	501	45.3%	30-39	180	16.5%
			40-49	**253**	**23.1%**
			50-59	252	23.0%
			60-69	223	20.4%
			70+	80	7.4%
Total	1106	1.000	Total	1093	1.000

Table 5: Frequency distribution of survey participant education level and level of household income

Highest Level of Education			Annual Household Income (USD)		
Education	**Frequency**	**Percentage**	**Income Range**	**Frequency**	**Percentage**
No High School Diploma	7	0.7%	$24,999 and below	70	6.8%
High School Diploma/GED	74	6.7%	$25,000-$49,999	172	16.6%
Some College or Equivalent	270	24.6%	$50,000-$74,999	210	20.2%
4-year degree	**379**	**34.5%**	$75,000-$99,999	197	19.0%
Graduate Degree(s)	368	33.5%	**$100,000 and above**	**389**	**37.4%**
Total	1098	1.000	Total	1038	1.000

Complex Demographic Characteristics

Of the 615 non-local survey responses, 49% reported visiting the region primarily to see a marine turtle (Table 6). The other 51% of non-locals came primarily for 11 other reasons, including vacation (20%) and visiting family (16%). The most common type of group attending the walks was defined as the immediate family, which included about 38% of survey participants (Table 7). Although children's ages were not included in this study, there were children of all ages present at the walks. A vast majority of participants stated they only had a limited level of knowledge about marine turtles before coming to the turtle walk (Table 7). Of guests reporting having extensive knowledge, 45% were locals and 55% were non-locals. Almost half (46%) of all guests learned about the turtle walk from another person, or what can

be described as word of mouth. The other 54% of guests were attracted to the turtle walk using one of ten other marketing methods (i.e., newspaper, social media, websites), each of which drew in 12% or less of the total attendants (Table 6).

Table 6: Frequency distribution of guests' primary reason for visiting the area and the marketing method used to attract participants to the educational tour

Primary Reason			**Marketing Method**		
Reason	**Frequency**	**Percentage**	**Method**	**Frequency**	**Percentage**
Turtle Walk	**301**	**48.9%**	**Word of Mouth**	**502**	**45.8%**
Vacation	125	20.3%	Newspaper	128	11.7%
Visit Family	96	15.6%	Social Media	116	10.6%
Disney Resort	23	3.7%	Other	104	9.5%
Beach Vacation	22	3.5%	Government Website	85	7.7%
Work Trip	14	2.3%	Educational Outreach Program	76	6.9%
Visit Friends	11	1.8%	Internet Search	45	4.1%
Camping	7	1.1%	Website	19	1.7%
Recreation	6	1.0%	Returning Attendee	12	1.1%
Other	5	0.9%	Disney Resort	10	0.9%
Space Center	5	0.9%			
Total	615	1.000	Total	1097	1.000

Table 7: Frequency distribution of guests' ranking of prior knowledge of marine turtles and the group type attending the turtle walk

Prior Knowledge			Group Type		
Level of Knowledge	**Frequency**	**Percentage**	**Groups**	**Frequency**	**Percentage**
Limited	**817**	**74.4%**	**Immediate Family**	**415**	**37.6%**
Extensive	203	18.5%	Couple	225	20.4%
None	78	7.1%	Friends	223	20.2%
			Single	119	10.7%
			Extended Family	118	10.7%
			Camp Group	2	0.1%
Total	1098	1.000	Total	1102	1.000

To determine if each organization was attracting a different participant demographic, a Pearson's Chi-Square was performed which compared the residency classification of each participant at each organization's turtle walk (Figure 5). There was a significant difference among the organizations ($p<.0001$). The FWS walks and STC walks had 65% or more non-residents versus regional residents, while the other three organizations hosted more locals than tourists (Figure 5).

Figures 5-7 are mosaic plots of counts of each category being compared across organizations. The height and width of each of the squares represent the relative quantity of responses in each category and the colors represent the change in residuals (i.e., the difference of the observed value from the expected value calculated in the chi-square). Blue represents a category that was a more frequent answer, while red represents a less frequent answer.

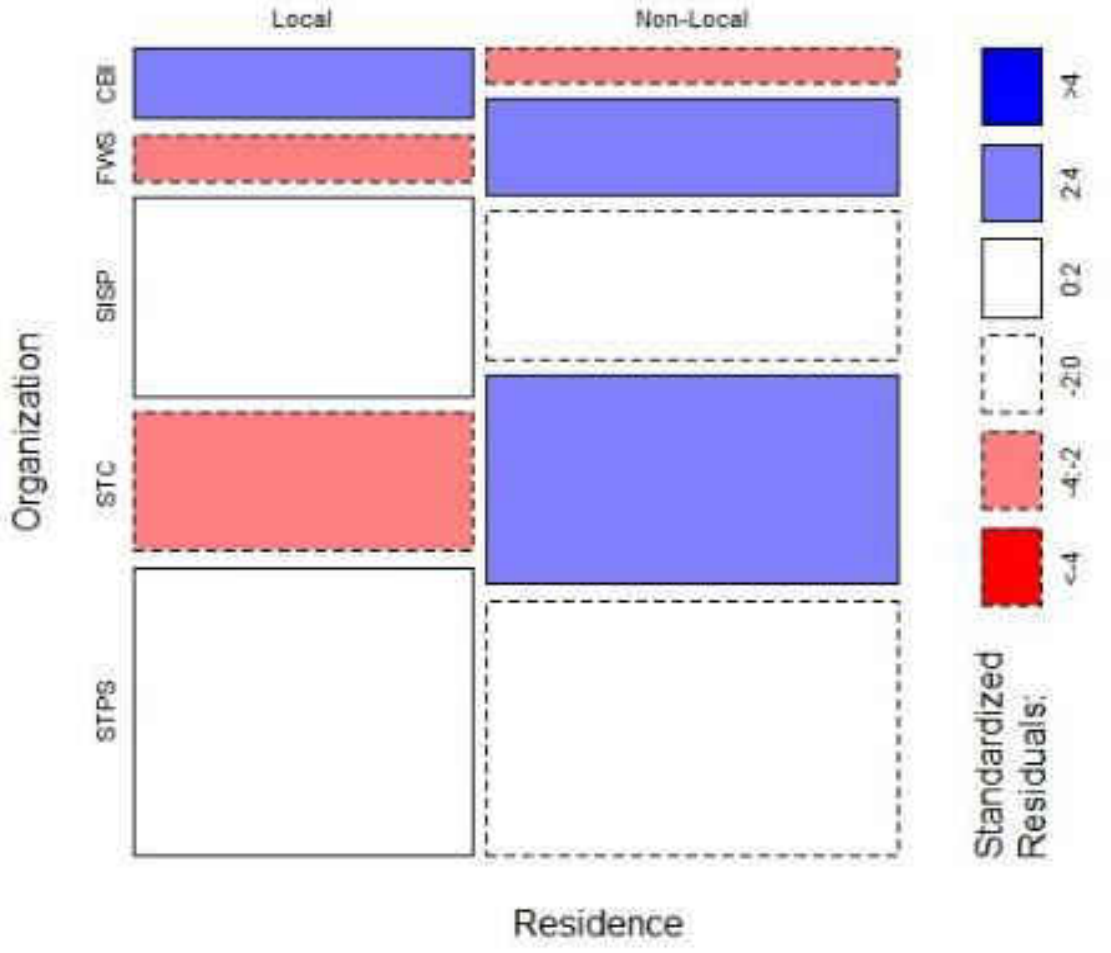

Figure 5: Mosaic plot comparing residency status of survey participants among organizations (p<.0001*, Chi-square=38.369, DF=4)

Among the organizations leading the turtle walks, no significant difference existed between the types of participant groups present at the walks (Figure 6). Immediate families were the most common group present at the walk and extended families were the least common, a consistent pattern for walks led by each organization.

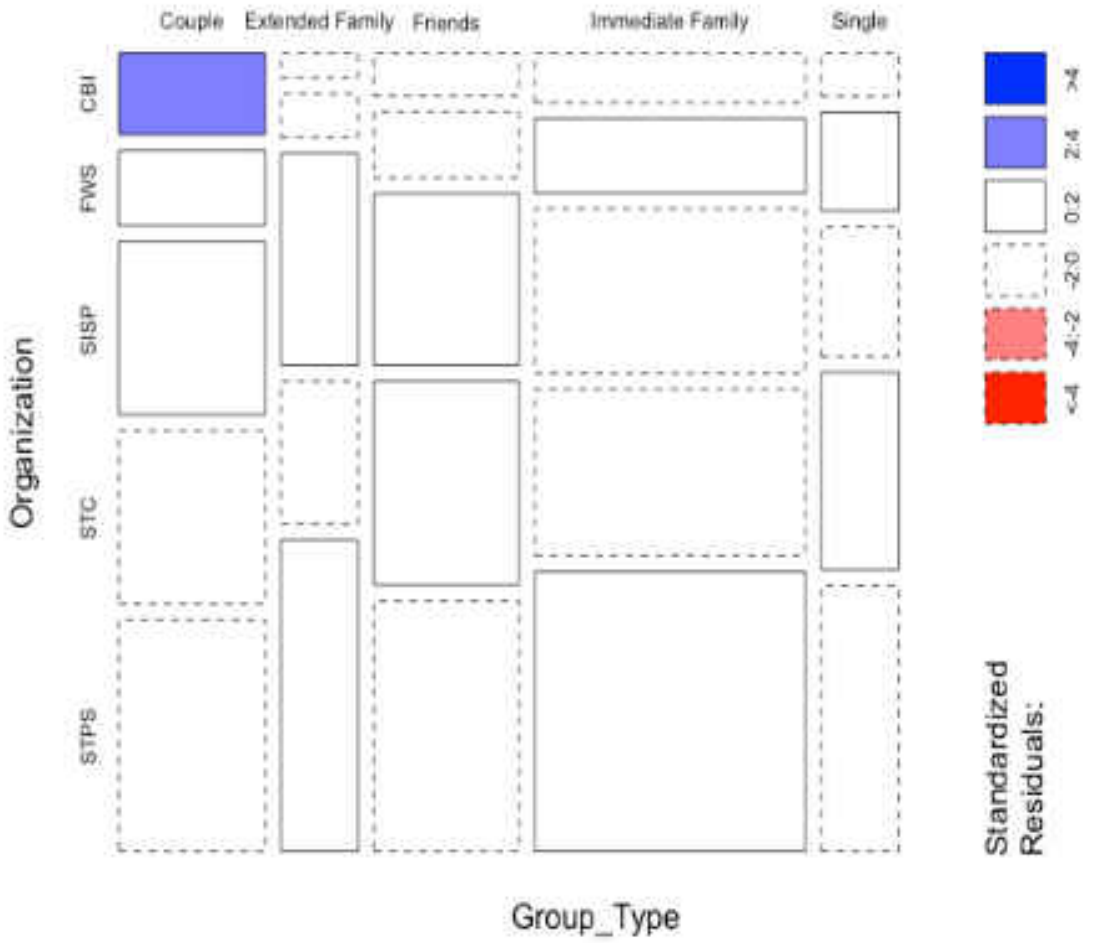

Figure 6: Mosaic plot comparing types of groups present at turtle walk among organizations (p=0.1552, Chi-square=21.6389, DF=16)

Among the organizations leading the turtle walks, a significant difference existed between non-locals' primary motivation to be visiting the region (Figure 7). Half or more of the non-local participants attending walks led by STC, CBI, and FWS came to the area primarily to view a nesting marine turtle, however, less than half of the non-local participants attending walks led by the state park or a local advocacy group reported viewing marine turtles as the primary purpose for their trip.

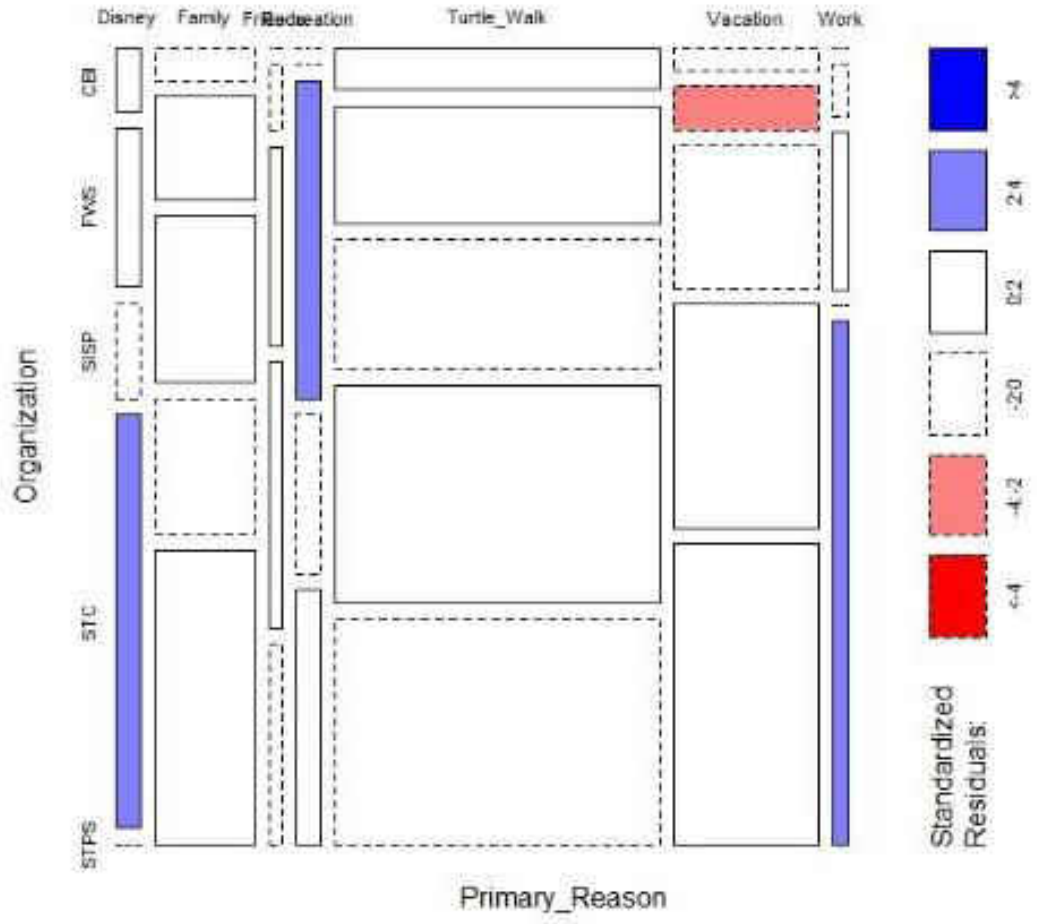

Figure 7: Mosaic plot comparing the organization leading the turtle walk and the primary reason why their guests were visiting the region (p<.0001*, Chi-square=57.455, DF=24)

Florida Tourist Comparison

As seen in Table 8, the average age of the general Florida tourist, from 2011-2013, was 46.7 years old with an average annual household income of $102,966. In comparison, the most common age range of survey takers attending a turtle walk was 50-59, and the average annual household income was $100,000 or greater.

Table 8: Reported tourists' ages and income levels for general Florida guests and marine turtle eco-tourists (data from VisitFL.com)

	FL Tourist (Average) 2011-2013	Marine Turtle Eco-Tourist (Mode) 2014
Age	46.7	50-59
Household Income	$102,966	$100,000 or more

Economic Impact

Thirty-three survey responses were not included in the economic impact portion of this study due to improper, erroneous, or no estimates reported regarding purchases in the county. The remaining 1,134 completed surveys were first separated by residency type (local versus

non-local), and then non-local survey responses were separated by primary reason for visiting the region (turtle walk and other).

Resident Contributions

Locals reported an expended an estimated $42,672 on purchases in industries directly linked to the turtle walk (Table 9). Visitors, who came to the region primarily to view turtles, spent an estimated $111,705 on these same associated purchases, and all turtle walks guests, contributed $38,359 directly to regional marine turtle conservation efforts through entrance fees and additional donations. When broken down into average spending amounts per survey, local residents spent an average $158 on directly associated purchases (Table 10). The average tourist visiting primarily to view a marine turtle spent $425 in directly linked industries (Table 10); amounting to almost three times more than that of local residents. Purchases related to lodging which contributed the largest portion of these linked expenditures.

Table 9: Total estimated expenditures for each spending class associated with turtle walks

Local		Non-Local Primary		Donations (all scenarios)	
Description	**Value Estimation (USD)**	**Description**	**Value Estimation (USD)**	**Description**	**Value Estimation (USD)**
Eating and Drinking	$14,909.00	Eating and Drinking	$30,980.00	Admission / Extra Donation	$38,359.00
Lodging	$3,345.00	Lodging	$43,892.00	**Total**	**$38,359.00**
Retail Shopping	$4,787.00	Retail Shopping	$12,380.00		
Gasoline Purchases	$7,526.00	Gasoline Purchases	$11,734.00		
Groceries	$8,086.00	Groceries	$6,972.00		
All Other Expenses	$4,019.00	All Other Expenses	$5,747.00		
Total	**$42,672.00**	**Total**	**$111,705**		

Table 10: Local and non-local primary average spending in associated industries per survey

Industry	Local	Local Spending Range	Non-local Primary	Non-local Primary Spending Range
Eating and Drinking	$44.00	$0 – 1,000.00	$98.00	$0 – 1,000.00
Lodging	$30.00	$0 – 1,500.00	$173.00	$0 – 3,000.00
Retail Shopping	$16.00	$0 – 400.00	$49.00	$0 – 500.00
Gasoline Purchases	$22.00	$0 – 200.00	$43.00	$0 – 500.00
Groceries	$29.00	$0 – 600.00	$30.00	$0 – 400.00
All Other Goods	$17.00	$0 – 1,500.00	$32.00	$0 – 800.00
Total Per-Survey Spending	**$158.00**		**$425.00**	

After utilizing IMPLAN to establish secondary effects, the total output (or sales) generated in the region from purchases is greater than only reported direct expenditures. Locals directly contributed $24,507 in direct output, but had a total impact of $35,110, due to the additional secondary effects of money flow (Table 11). Furthermore, non-local primaries generated a total output of $118,256 (more than three times the overall contribution by locals; Table 12), and the economic contribution of donations to marine turtle tourism in the region generated a total output of $74,657 after secondary effects were considered (Table 13).

Table 11: IMPLAN Scenario 1- Economic impacts by local residents attending the turtle walks

	Direct	Indirect	Induced	Total
Output = Sales	$24,507.50	$4,324.70	$6,277.70	**$35,110.00**
Value Added = GDP	$14,459.00	$2,617.40	$3,889.30	$20,965.70
Labor Income	*$9,455.80*	*$1,386.00*	*$2,146.10*	*$12,987.90*
Employment (# jobs)	0.4	0.0	0.1	0.5

Table 12: IMPLAN Scenario 2- Economic impacts by non-local residents visiting primarily for the turtle walk

	Direct	Indirect	Induced	Total
Output = Sales	$84,146.10	$15,513.00	$18,597.10	**$118,256.10**
Value Added = GDP	$50,648.90	$9,114.20	$11,522.00	$71,285.00
Labor Income	*$26,867.80*	*$5,224.50*	*$6,357.50*	*$38,449.80*
Employment (# jobs)	1.1	0.1	0.2	1.4

Table 13: IMPLAN Scenario 3- Economic impacts of admission and additional donations by all turtle walk attendees

	Direct	Indirect	Induced	Total
Output = Sales	$38,359.00	$19,592.40	$16,706.20	**$74,657.70**
Value Added = GDP	$10,110.60	$11,031.60	$10,350.40	$31,492.60
Labor Income	*$21,904.20*	*$6,924.30*	*$5,711.10*	*$34,539.70*
Employment (# jobs)	0.6	0.2	0.2	1.0

Total Economic Impact

When aggregated together, reported expenditure estimates from surveys amounted to a cumulative $192,736.00 USD (i.e., $42,672 + $111,705 + $38,359) in direct expenses either at the turtle walks or with associated industries from locals, non-locals, and donations, respectively. Due to the aforementioned margining of retail goods, the total sales direct effect

found in Table 14 (i.e., $147,012.00 USD), which aggregates the respective direct sales effects (highlighted in Tables 11, 12, and 13) for locals, non-local primaries, and donations, is less than the aggregate estimated expenditures cited above from survey responses. It is the addition of secondary effects (i.e., $81,011) from money flow, either indirect or induced, which defines the total economic impact.

The economic impact from turtle walks, due to direct and secondary contributions, amounted to $228,023.80 USD of total output (Table 14). Of that estimate approximately $123,743.00 was contributed through income earnings, $81,011 through secondary effects of indirect or induced purchases, and these purchases helped create three jobs (Table 14). Tourists who visited the region primarily to view a nesting marine turtle contributed about half of the total sales impact, with $118,256.10 USD (Table 12). The total sales impact estimate generated was far greater than the donation income reported by the turtle walk organizations ($38,359.00 USD) and also larger than the direct impacts on industries linked to the turtle walk ($192,736.00). For turtle walks conducted in and around the ACNWR, the output multiplier was estimated at 1.55 (i.e., for every $1.00 change in sales there is an additional $0.55 change in linked industries through secondary effects).

Table 14: Total economic impact of marine turtle walks in the 2-county region in and around the ACNWR

	Direct	Indirect	Induced	Total
Output = Sales	$147,012.60	$39,430.20	$41,581.00	**$228,023.80**
Value Added = GDP	$75,218.50	$22,763.20	$25,761.70	$123,743.40
Labor Income	*$58,227.90*	*$13,534.80*	*$14,214.70*	*$85,977.40*
Employment	2.1	0.4	0.4	2.9

Discussion

Participant Demographics

Participant Residency Hot Spot

Turtle walks conducted within or around the ACNWR attracted visitors from across the country, as well as others from around the world. Forty-one U.S. states were represented at the walks, as were 9 different countries, almost all of which do not have coastlines with nesting sea turtles (excluding Kenya). People are known to travel internationally to view marine turtles (Wilson and Tisdell 2003, Tisdell and Wilson 2005, Ballantyne et al. 2009) and to participate in other eco-tourism activities (Wight 1996, Ballantyne et al. 2011). The current study, however, is the first to document where visitors attending walks in and around the most populated loggerhead-nesting beach in the U.S. originate. Of the U.S. residents traveling from outside the study region, 49% came primarily to view a nesting marine turtle. U.S. zip codes were used to identify the visitor's location of residency. There was a low overall density of surveys originating from each individual zip code, ranging from one to three surveys, excluding central Florida.

Interestingly, there was one area where resident zip codes were represented in high densities within central Florida. This residential density hot spot is likely due to easy and cheaper access to turtle walks, reduced travel time, and greater regional awareness of the eco-tourism opportunities of the ACNWR.

Basic Participant Information

This study found a diverse age range of individuals attending the turtle walks. Children's' ages were not listed in the survey results, since they did not qualify to complete a survey; however, a total of 749 children were present out of a total of 2,996 attendees. This implies that one-fourth of the audience was under the age of 18. In addition, surveys reported a diverse range of ages. The majority (46%) of individuals completing the survey were 40-49 and 50-59 years of age. Turtle walk guests represented a variety of education levels, with the audience heavily skewed towards having higher levels of educational experiences. The majority (34%) of participants had a 4-year college degree, followed by graduate level degrees (33%). Higher-level degrees correlate with larger annual household incomes (Cook et al. 1992, Backman and Potts 1993, Southwick and Allen 2008), and this statistic is supported by this study; 37% of survey responders had an annual household income of $100,000 or more. Demographics defined by this study are very similar to participant demographics reported by other nature-based or eco-tourism activities (Cook et al. 1992, Backman and Potts 1993, Wight 1996, Southwick and Allen 2008). One reason for these findings could be that people with

higher levels of education and available funds are able to travel more easily (Wight 1996). Also, having a higher level of education may have provoked individuals to want to experience educational tourism activities more than others.

Complex Participant Information

Although 49% percent of tourists planned a trip to the region primarily to view marine turtles, the other 51% came for other reasons. Many of the reported reasons for travel were negligible compared to the top six reported reasons, and many individuals reported answers that were similar to others (e.g., vacation and beach vacation). These similar answers were combined with the most closely related topic found within the following: vacation, visiting family or friends, work, outdoor or site-seeing recreation, or visiting the Disney Resort. The majority (74%) of all guests reported having limited knowledge about marine turtles prior to the turtle walk, but some did say they knew nothing prior to the walk and others rated their knowledge level as being extensive. Guests claiming to have extensive prior knowledge were almost evenly distributed between locals (45%) and non-locals (55%), and some reported attending a turtle walk in the past. There was a variety of group types present at the turtle walks. The immediate family was the most common group composition of participants (37%), but many couples, friends, extended families, and also single adults came to a turtle walk to experience and connect with wildlife through viewing a nesting marine turtle. Since the turtle walks are conducted by many different entities that serve different purposes (Table 3), and are

almost always filled to the state regulated capacity (n=25), they are commonly not broadly advertised. Local newspapers may advertise or mention the walks while reporting on current nesting numbers, a flyer may be hung up at the organizational office, or information may be listed on the organization's website. However, this study highlighted word of mouth as a significant tool, with about 46% of turtle walk participants learning about the event from someone else that had previously participated in one, or had heard of them.

Influence of Organization on Participants

Knowing that the different organizations leading the walks are located in different proximities relative to the ACNWR, have different goals, differing levels of organizational capacity to market the walks and different levels of experience conducting walks, comparisons were made among the organizations to determine whether each organization was attracting a different demographic. The STPS, STC, and CBI are sea turtle specialist non-profit organizations with varying educational, outreach, and advocacy goals. The SISP and FWS are both generalist government entities, which have a goal to provide natural resource-based recreational opportunities. Additionally, some organizations lead walks closer to more developed beaches, which may attract more guests, while some are located in less developed areas, of which many tourists may be unaware.

There was a significant difference between the ratio of locals and non-locals among all organizations. The STC and FWS had more than 65% of the guests attending their walks claim to

be non-local residents of the study region, while STPS, CBI, and SISP had the majority of their guests claim to be local residents. Most of these differences may be due to the location of walks. Coastal Biology Inc. and SISP both conduct walks in Indian River County, close to or within large residential communities. The other organizations lead walks out of environmental education centers or public parks in Brevard County. Specifically, the STPS is located in a development city center, easily attracting more tourists.

There were no significant differences between the organizations and the types of groups present in the audience. The audiences at each of the turtle walks were a mix of immediate families, friends, couples, extended family, and single adults. However, the immediate family was the most prominent group type found attending turtle walks, representing 35.6-39.7% of the audience, with each organization.

Finally, this study examined the non-locals who traveled to the region and compared whether the guests' reason for visiting the region was different among the organizations. The purpose of this was to evaluate if there were organizations attracting guests to the region solely for the purpose of viewing marine turtles. The chi-square test identified a significant difference among the organizations for tourists' primary reason for visiting the region. Although turtle walks were the dominant reason for tourists to be visiting the region, the level varied across all organizations. Coastal Biology Inc., FWS and STC all had more than 50% of their non-local guests visiting the region primarily to view marine turtles, while SISP and STPS both had only 44% of their non-local guests visit the region primarily to view marine turtles and a larger variety of

other primary reasons including vacation, visiting family, and recreation. These differences are most likely due to the location of the walk and organization type. For example, the SISP is located away from developed towns in the middle of the ACNWR but does provide space for many outdoor recreational opportunities like camping and boating. It is possible SISP guests learned about the turtle walks after arriving at the state park.

Florida Tourist Comparison

Summary statistics of data collected by the State of Florida from 2011-2013 on average tourist age and annual household income show the average traveler to Florida is about 46.7 years old with an annual household income around $100,000 per year or more. For this study, summary statistics of these data identify the modal age range as 50-59 years old and the modal annual household income level as $100,000 or more. In comparison to the data collected by the State of Florida, the most common socio-demographic represented at turtle walks in the study region is similar to the most common demographic identifying the average Florida tourist. The result from this data comparison contradicts many previous eco-tourism studies, which report eco-tourist being older and having a higher level of income and level of education (Cook et al. 1992, Backman and Potts 1993, Wight 1996, Southwick and Allen 2008). However, more data points need to be compared to make a more accurate assessment describing these two types of tourists.

Economic Impact

Conservative Estimations

It is important that all estimates generated by this study be considered conservative. The FWC has in place strict guidelines for turtle walks (e.g., the number of tours and participant capacities) to minimize stress to the turtles. Often there are more people who want to participate in a turtle walk, but cannot do so due to capacity limits. It is possible these people may still visit the region to see nesting marine turtles, but do so on their own without proper guidance. It is also possible that people may not be aware that turtle walk activities currently exist, but want to see nesting marine turtles, and come to the region to admire and connect with nature through viewing a nesting turtle on their own without guidance. This study did not survey individuals on the beach who may fit into these two categories. Additionally, this study did not have a 100% response rate from eligible adults. These sampling caveats contribute to the conservative nature of the estimations generated using IMPLAN for impacts from turtle walks.

Regional Contributions

This study showed that guests who visited the region primarily to view marine turtles financially contributed over three times more in linked industries than that of local residents attending turtle walks, and provided half of the total economic contribution to the region. Total sales are an accumulation of direct, indirect, and induced spending effects within the region

from all three scenarios (locals, non-local primaries, and donations). The directly impacted industries (e.g., hotels, retail stores, grocery stores) must pay wages to employees and may make changes to their supplies, which creates secondary impacts (indirect and induced effects). The indirect effects are those in which changes in industry supplies are made due to increased demands from the turtle walk participants (Mulkey and Hodges 2004) and the induced effects are the changes in local spending, as a result of income changes to employees impacted by the turtle walk participants (Mulkey and Hodges 2004). The secondary impacts on the regional economy from turtle walks conducted in 2014 amounted to $81,011 (indirect= $39,430.20 and induced=$41,581.00). In combination with direct impacts ($147,012.60 USD), the two-county region surrounding the ACNWR experienced a total estimated economic impact of three newly created jobs, $123,743 in GDP, and $228,023 USD in total output. Changes in the economy based on secondary effects from an activity, like turtle walks, can be measured using a multiplier. The regional multiplier effect calculated for turtle walks was 1.55, which is a number similar to other tourism activities in the study region (Praecipio EFS 2015).

Conclusions

There are of many types of sea turtle-based conservation activities that occur in central Florida (e.g., interactive educational experiences, satellite tagging outreach events, educational hospitals, music festivals, races). This study identified the socio-demographics of participants of a popular eco-tourism activity in central Florida called a turtle walk, and by using a new holistic

valuation technique determined only a snapshot of the economic impacts from marine turtle conservation in central Florida. The results from this study determined that turtle walks created a minimum estimate of three additional jobs and contributed a conservative estimate of a quarter-million dollars in two months regional economy within the vicinity of the ACNWR; an area protected specifically for nesting marine turtles. Although contributions seem modest, compared to the few previously conducted studies (Table 2), the time period in which turtle walks are conducted is much smaller, there is a statewide capacity limit that prohibits more than 25 guests per tour guide, and there are other statewide limits to the number of tours allowed within one area. Moreover, most tours are led by groups of volunteers, and the availability of these volunteers fluctuates seasonally, sometimes reducing the ability to conduct turtle walks. All of these factors (i.e., short tourism season, guests limits, and lack of volunteers), in addition to the sampling limitations of conducting social surveys, contribute to the conservative estimate of total economic impact to the region. However, it is important to note that in the U.S. turtle walks were created to inform the public about threats to marine turtles and how they can help support conservation efforts. Economic impacts were not part of the original reason to create these educational tours.

Previous marine turtle tourism studies conducted by Wilson and Tisdell (2003) on protected beaches located in Mon Repos, Australia found that turtle walks provide positive experiences with nature for locals and non-local residents, and provide economic support for future conservation (Wilson and Tisdell 2003). Additionally, Tisdell and Wilson (2001) found that 40% of turtle walk guests would not have traveled to the area if the option to view a

marine turtle did not exist, potentially causing an economic decline of 0.8 million AUS dollars per year. Furthermore, at least one-foruth of turtle walk guests were non-local residents and were willing to pay larger amounts of money to conserve turtles than the local Australians.

Based on information collected by this study and others conducted in Australia (Tisdell and Wilson 2001, Wilson and Tisdell 2003), we know that marine turtle eco-tourists are educated, want to learn more, want to contribute to conservation efforts of protected wildlife, and contribute large quantities of money to local economies. Many times people overlook the comprehensive value of wildlife, ultimately considering it free (Fisher et al. 2008, Perrings et al. 2011). With differing perceptions of value among individuals, this study cannot fully describe the significance of conserving marine turtles to each participant. However, these findings can contribute to the decision-making process by illustrating the relative economic importance of marine turtles to a local economy. Local wildlife managers and policy makers may also use this information as justification to promote marine turtle-friendly practices among beachside businesses, and contribute to the creation of more public marine turtle conservation-based activities.

Recommendations for future marine turtle-based eco-tourism management strategies include: (1) allowing more organizations to conduct walks within a select area; (2) have local mangers facilitate communication between organizations leading the walks within a select area; (3) and create new opportunities for the public to interact with wildlife through marine turtle-based activities. Implementing these suggestions with proper regulation should alleviate

the number of guests turned away from marine turtle eco-tourism activities due to capacity limits, ultimately allowing for an increasing in public awareness of threats facing marine turtles while not degrading nesting habitat or detouring other turtles from nesting. Additionally, these suggestions can help facilitate the creation of a unified goal among organizations leading marine turtle eco-tourism activities to attract other social demographics aside from highly educated, wealthy individuals, and also indirectly increase contributions to the local economy that promote a positive outlook on wildlife conservation.

APPENDIX A: ECONOMIC IMPACT SURVEY

1. What is the zip code (or Country) of your **PRIMARY** residence? _____

2. Are you currently a resident of Brevard or Indian River County? *Yes* *No* (if Yes): *Annual* *Seasonal*

If you answered "Yes" to question #2, skip to question #5.

3. (Non-Locals ONLY) Is the Turtle Walk the main reason for your visit to Brevard and/or Indian River County? *Yes* *No*
If you answered "Yes" to question #3, skip to question #5.

4. (Non-Locals ONLY) *What is your primary reason for your visit to Brevard and/or Indian River County* (Non-Locals ONLY) *What is your primary reason for your visit to Brevard and/or Indian River County* _____

5. To assess the economic impact of the 2014 sea turtle nesting season, we need your help in determining the approximate amount of money you and your group have/will spend in Brevard and/or Indian River County (see map). Please give the best estimate you can for each category. Your responses are very important to the UCF Marine Turtle Research Group as well as the future of sea turtle conservation.

○ **(Instructions for Non-Locals) DURING THE COURSE OF YOUR VISIT TO BREVARD (and/or) INDIAN RIVER COUNTY, WHAT IS (OR WILL BE) THE APPROXIMATE AMOUNT OF $ THAT YOU AND YOUR IMMEDIATE GROUP WILL SPEND IN EACH OF THE FOLLOWING CATEGORIES:**

○ **(Instructions for Locals or Seasonal Residents*)* DURING THE COURSE OF YOUR OUTING TONIGHT, WHAT IS (OR WILL BE) THE APPROXIMATE AMOUNT OF $ THAT YOU AND YOUR IMMEDIATE GROUP WILL SPEND IN EACH OF THE FOLLOWING CATEGORIES:**

ESTIMATED SPENDING AMOUNTS (*to the nearest $10*)

A.	**EATING & DRINKING (RESTAURANTS, CONCESSIONS, CAFES, ETC.)**	**$_____.00**
B.	**LODGING (HOTELS/MOTELS, CONDOS, TIMESHARES, ETC.)**	**$_____.00**
C.	**RETAIL SHOPPING (SOUVENIERS & GIFTS)**	**$_____.00**
D.	**GASOLINE PURCHASES**	**$_____.00**
E.	**GROCERIES**	**$_____.00**
F.	**TURTLE WALK**	**$_____.00**
G.	**ALL OTHER EXPENSES NOT LISTED ABOVE**	**$_____.00**

6. What is your gender? *Male* *Female* *Other*

7. What is your age? _____

8. What is your highest level of education achieved [circle best answer]?
No High School Diploma *High School Diploma/GED* *Some College/Equivalent* *Bachelor's Degree* *Graduate Degree(s)*

9. In what range is your annual household income?
$24,999 and under $25,000-49,999 $50,000-74,999 $75,000-99,999 $100,000 and above

10. Which of the following best describes your attending group/party [circle best answer]?
Single Adult *Couple* *Friends* *Immediate Family* *Extended Family*

11. What is the age of everyone, beside yourself, within your attending group/party? _____

12. How much knowledge do you believe you have about threats to marine turtles [circle best answer]?
None *Limited* *Extensive*

13. If you are willing to participate in a follow-up survey about marine turtle policy please give your email_____

14. How did you hear about the Turtle Walk? [Circle all that apply]

Word of Mouth *Newspaper* *Government Website* *Social Media* *Educational Outreach Program* *Other*_____

APPENDIX B: SURVEY DISCLOSURE AND INSTRUCTIONS

Hi Everyone!

The survey being distributed tonight is part of a study trying to estimate the economic impact of marine turtle tourism on the Brevard and Indian River County region. Kendra Cope, a master's student at the University of Central Florida, and a project manager for the UCF Marine Turtle Research Group would like your help in determining the approximate amount of money you and your group will or have already spent in the local area.

Participation is completely anonymous and your responses will be kept confidential. The survey will ask where you live and how much you're spending while in the Brevard and Indian River County region. The survey will also ask about demographic characteristics like gender, age, education level, annual household income, size of your associated group, and your current knowledge on sea turtles. You must be 18 years or older to participate. If you are attending the event tonight as a family, only the head of household should complete a survey. If you are attending the event tonight in a non-family group, every adult individual should complete a survey, unless expenditures are shared during the length of the group's trip to the area. The results may be used at the local and state level to improve marine turtle conservation efforts and management decisions related to our coastal environment. Your participation is voluntary, but would be greatly appreciated.

If you choose not to participate in the survey, please pass the stack of surveys on to the next person.

Thank you very much!

APPENDIX C: CONTINGENCY TABLES FOR ORGANIZATIONAL IMPACT COMPARISONS

Table 15: Turtle walk participant residency classification by organization

Count # Residency % Organization %	Local	Non-Local
CBI	485 9.95% 62.34%	29 4.79% 37.66%
FWS	31 6.19% 28.44%	78 12.87% 71.56%
SISP	134 26.75% 52.55%	121 19.97% 47.45%
STC	94 18.76% 35.61%	170 28.05% 64.39%
STPS	194 38.72% 48.26%	208 34.32% 51.74%

Table 16: Group type by organization

Count # Group % Organization %	Couple	Extended Family	Friends	Immediate Family	Single Adult
CBI	25	4	13	28	7
	11.11%	3.39%	5.38%	6.75%	5.88%
	32.47%	5.19%	16.88%	36.36%	9.09%
FWS	23	7	20	42	16
	10.22%	5.93%	8.97%	10.12%	13.45%
	21.30%	6.48%	18.52%	38.89%	14.81%
SISP	53	34	52	93	21
	23.56%	28.81%	23.32%	22.41%	17.65%
	20.95%	13.44%	20.55%	36.76%	8.30%
STC	53	23	62	94	32
	23.56%	19.49%	27.80%	22.65%	26.89%
	20.08%	8.71%	23.48%	35.61%	12.12%
STPS	71	50	76	158	43
	31.56%	42.37%	43.08%	38.07%	36.13%
	17.94%	12.56%	19.10%	39.70%	10.80%

Table 17: Primary reason for visiting the region by organization

Count # Reason % Organization %	Disney Vero Beach Resort	Recreation	Turtle Walk	Vacation	Visit Family	Visit Friends	Work Trip
CBI	2	0	17	4	4	0	0
	8.70%	0.00%	5.70%	2.99%	4.35%	0.00%	0.00%
	7.41%	0.00%	62.96%	14.81%	14.81%	0.00%	0.00%
FWS	5	0	48	8	13	1	1
	21.74%	0.00%	16.11%	5.97%	14.13%	9.09%	7.14%
	6.58%	0.00%	63.16%	10.53%	17.11%	1.32%	1.32%
SISP	3	10	52	26	21	3	3
	13.04%	43.48%	17.45%	19.40%	22.83%	27.27%	21.4%
	2.54%	8.47%	44.07%	22.03%	17.80%	2.54%	2.54%
STC	13	5	89	41	17	4	0
	56.52%	21.74%	29.87%	30.60%	18.48%	36.36%	0.00%
	7.69%	2.96%	52.66%	24.26%	10.06%	2.37%	0.00%
STPS	0	8	92	55	37	3	10
	0.00%	34.78%	30.87%	41.04%	40.22%	27.27%	71.43%
	0.00%	3.90%	44.88%	26.83%	18.05%	1.46%	4.88%

APPENDIX D: EDUCATIONAL AND BEHAVIORAL IMPACTS OF MARINE TURTLE-BASED ECO-TOURISM: A FOLLOW-UP STUDY

Introduction

Eco-tourism is a unique service that promotes environmentally responsible travel to appreciate and learn about nature, its accompanying cultural features, and how to conserve it, while also having a low visitor impact, involving local peoples and economically benefiting the community (Ceballos-Lascuráin, 1993). If carefully managed and delivered, eco-tourism activities are meant to connect participants with nature while learning about the environment, sustainability and natural resources, and ways they can help protect and conserve wildlife. Kals et al. (1999) demonstrated experiences with nature can lead to nature-protective behavior. Other studies have found that guests participating in eco-tourism activities receive significantly positive educational experiences (Tisdell and Wilson 2005, Ballantyne et al. 2009, Ballantyne et al. 2011).

Marine turtle-based eco-tourism has been an extremely popular activity in Australia since the 1990's through an event called a turtle walk (Tisdell and Wilson 2002). These walks each consist of guests viewing a nesting marine turtle as she lays her eggs, covers her nest, and returns to the ocean after receiving an educational presentation about sea turtle life history, threats to survival, information about their protection, and how to get involved in sea turtle conservation. This type of eco-tourism activity has grown in popularity in Florida, U.S. since the early 1990's (FWC *unpub. data*), specifically in the region near the Archie Carr National Wildlife Refuge (ACNWR). This area is federally protected and known primarily for its extremely dense nesting loggerhead (*Caretta caretta*) population (Meylan et al. 1995, Ehrhart et al. 2003, Ehrhart et al. 2015) making it an ideal location for turtle walks.

Over 150 individual turtle walks are currently held in southern Brevard and Indian River Counties along the east central coast of Florida (Figure 2). There are six organizations conducting walks in different areas around or within the high density nesting area of the ACNWR, which vary in their ability to find nesting turtles and in presentation content. For example, the nesting density in a specific group's location can have an effect on how quickly scouts on the beach are able to find a nesting loggerhead for a group of guests to view. These organizations make their own PowerPoint presentations, and each organization presents the required Florida Fish and Wildlife Conservation Commission (FWC) information differently. As a result of differences in presentation layout and likelihood of discovering a nesting loggerhead within the state-mandated three-hour limit, there are likely differences in the quantity and quality of educational information being presented.

Few studies have previously examined either the educational benefit of sea turtle eco-tourism activities, or behavioral change in participants after attending an activity (Tisdell and Wilson 2005, Ballantyne et al. 2009, Ballantyne et al. 2011). Here, I examine the long lasting educational and behavioral impacts of turtle walk experiences from the central east coast of Florida, the first of its kind in the U.S. This study had three objectives:

1) Determine turtle walk guests' post-walk level of knowledge and concern about threats outlined in Florida's turtle walk guidelines after completing the walk;
2) Identify whether guests' believe their perceptions about sea turtles and conservation-based behaviors changed after attending a turtle walk; and

3) Examine the possible educational impacts on guests based on different walk organizations and residency classifications.

Methods

Sampling Strategy

As described in Chapter 2, this Master's thesis primarily consists of a study conducted in 2014 on the central east coast of Florida which defined the socio-demographics of participants at marine turtle tourism activities and examined economic impacts of turtle walks on the local economy (Chapter 2). During June and July, a one-page paper survey was distributed to guests at 147 turtle walks within the Brevard and Indian River County region, which encompasses the Archie Carr National Wildlife Refuge. These educational tours were conducted by six different organizations: the Sea Turtle Preservation Society, Sea Turtle Conservancy, U.S. Fish and Wildlife Service/Friends of the Carr Refuge, Sebastian Inlet State Park, the Disney Resort (only employee walks are included in study), and Coastal Biology Incorporated (Table 3). On the economic impact survey was an open-ended question asking guests to provide their email address if they were willing to complete a follow-up survey about educational gains and personal changes since the turtle walk. After participating in the voluntary economic impact survey, guests continued with the planned turtle walk activities, including an FWC-regulated informational presentation (FWC 2006) and viewing a nesting turtle. The information included in the presentation covered 16 topics that affect marine turtles and their survival (Table 18).

Table 18: Impacts to marine turtles and conservation concerns outlined in FWC's turtle walk guidelines

Beach Related Impacts	Marine Related Impacts	Other
Coastal Development	Propeller/Boat Injury	International Trade (CITES)
Beach Armoring	TEDs (Turtle Excluder Devices)/Shrimping	FWC's "Hands Off" Management Strategy
Beach Nourishment	Other Fisheries (gill net, longline, etc.)	Natural and Exotic Predators
Poaching	Marine Debris	Non-Nesting Turtles (False Crawls)
Human Activity on the Beach	Fibropapillomas (Paps)	Archie Carr National Wildlife Refuge
Beachfront Lighting		

Follow-up Survey

In January 2015, six months after the turtle walks concluded, an online follow-up survey was distributed via email to guests who voluntarily gave their contact information on the economic impacts survey. The survey was approved by the Internal Review Board (IRB# SBE-14-10849) at the University of Central Florida for dispersal to 2014 turtle walk survey participants. This online survey (Appendix F), created using Qualtrics (ucf.qualtrics.com), consisted of two groups of questions. The first group contained questions intended to investigate why individuals participated in a turtle walk, evaluate their level of knowledge and concern about the FWC guidelines' topics (Table 18) after completing the walk, and determine if their perceptions about threats to marine turtle survival and conservation-based behaviors changed after the walk. The first group of questions included a mixture of multiple-choice questions with fixed answers, ranking questions with scales from level 0 (least) through 5 (most), and free-

response questions. These data were used to determine if guests were knowledgeable about the information FWCC requires be included in turtle walk presentations, what their average levels of concern about these topics were, and if the information learned at the turtle walk resulted in conservation-based behavioral changes.

The second group of questions consisted of an additional six questions to collect information on the participant's socio-demographics, location of residency, and the organization that led their turtle walk. These were formatted as multiple-choice questions with fixed answers from which to choose. These data were used to characterize turtle walk participants and to statistically compare differences in levels of knowledge, concern, and behavior changes among the organizations and between local residents and tourists using an ANOVA.

Survey Implementation

A total of 503 people who had participated in the previous economic impact survey, willingly gave their email to complete a follow-up survey. The survey, consisting of 26 questions in total, was sent out on January 16th, 2015. The email included an online survey link which, when activated, brought the participant to a one-page, standardized disclosure of the study description and instruction clause. This was created to reminded participants of how their contact information was collected and outlined the turtle walk they attended six months prior. It also explained the types of questions found in the online survey and the potential

contribution of their responses to marine turtle research, protected resources policy and management, and future conservation efforts (Appendix E) before moving on to the survey questions. Participants were given one month to complete the online survey. A reminder email was sent out to people who had not responded to the survey email within 15 days of original distribution. To determine the survey response rate, the number of surveys completed after the one-month period was simply divided by the total number of surveys successfully sent out via email.

Analyzing Impacts

To gain a better understanding of guided turtle walks' educational effects have on guests, summary statistics of participant responses (including frequency distributions, averages, and standard deviations) were derived from questions that asked guests to rank what they believe to be their level of knowledge and concern (e.g., 0-5, 0-none, 5-extremely concerned or extensive knowledge). These questions were divided into two sections: threats facing marine turtles on the nesting beach and threats in the marine environment. Summary statistics were also derived from responses to questions asking guests to rank their willingness to perform actions that can help protect marine turtles (e.g., 0-5, 0-not willing, 5-very willing), how much they have changed their actions since attending the turtle walk (e.g., 0-5, 0-no change, 5-significant change), if their level of perception about threats facing marine turtles changed since

attending the turtle walk (yes or no), and if yes, how large of a change in perception (e.g., 0-5, 0-no change, 5- significant change).

To examine whether differences in turtle walk participants' level of knowledge and concern about these topics existed among the organizations conducting these activities, an ANOVA was conducted on the ranked survey responses, with a statistical significance level of $p<0.05$*. Additionally, the proximity of guests' location of residence to the study area/beach may influence their reaction to the educational information presented to them during the walk. For example, guests who do not live by the beach may think picking up trash will not affect marine turtles, whereas those who do live by the beach may feel a sense of ownership to the area. To better understand if these assumptions exist, ANOVA was used to compare changes in perception of threats and behaviors since the turtle walk was conducted between local residents and non-locals. Survey responses collected from participants who attended a turtle walk conducted by Coastal Biology Incorporated were not included in analyses comparing organizations due to a low number of survey responses.

Results

Survey Response Rate

A total of 1,167 economic impact surveys were voluntarily completed during the 147 turtle walks led in 2014. Of those, 503 participants (43%) provided contact information to participate in a follow-up survey. In January of 2015, a request was sent to these 503 email

addresses asking turtle walk participants to partake in a voluntary follow-up survey before mid-February (exactly 30 days after the first request was sent). Of these, a total of 283 individuals responded to questions on the survey, representing a response rate of 56%. Each question on the survey could either be answered or skipped, and for that reason there are different quantities of responses for each question. Information from these survey responses revealed that 88 individuals considered themselves local residents of the study region, while 172 of the individuals referred to themselves as non-locals, representing a 1:2 ratio of local to non-local responses.

Each organization led a different number of total walks throughout the summer, based on the availability of trained volunteers. The Sea Turtle Preservation Society generated the highest number of follow-up surveys (85), largely due to a higher number of walks led throughout the summer, while Coastal Biology Incorporated had the lowest number of responses (7), as seen in Table 19. The response rate was affected by the willingness of tour guests to participate in the email survey and the likelihood the email was received and viewed.

Table 19: Follow-up survey response rate separated by organization

Organization	Walks Conducted	Survey Responses	Response Rate
SISP	41	48	52%
STPS	39	85	55%
STC	36	38	38%
FWS	14	36	65%
CBI	13	7	19%
DISNEY	4	27	84%

Turtle Walk Experience

The most common reason for people to attend a turtle walk was an initial interest in marine turtles (49%). These are people who wanted to learn more about conserving turtles and wanted to be able to view a nesting loggerhead (Figure 8). As seen in Figure 8, the majority of participants (65%) ranked the turtle walk experience as extremely satisfying (Level 5), with an average response value of 4.48 and standard deviation (SD) of 0.85. Additionally, 99% of survey participants said they talked to others about their experience and of those individuals, and 181 (68%) said they told 5 or more people about their experience at the turtle walk (Figure 9).

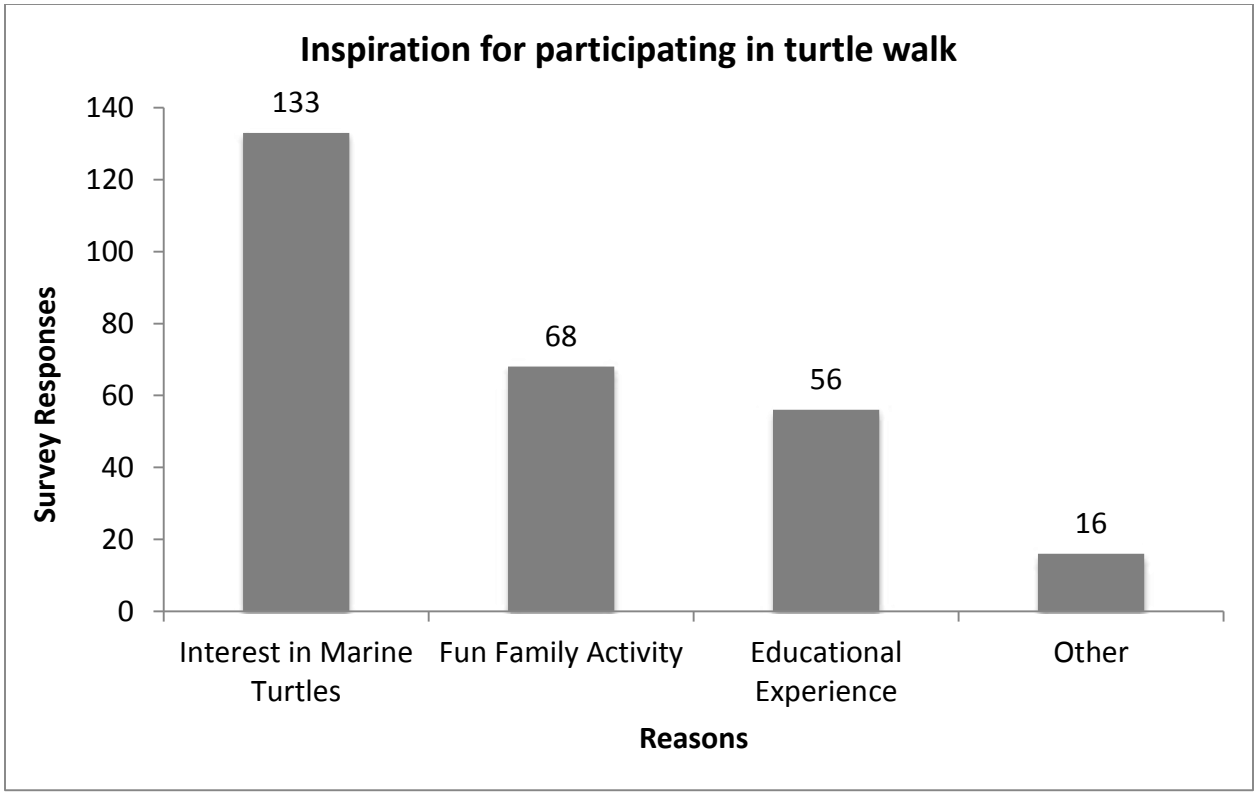

Figure 8: Reasons that inspired people to participate in the 2014 turtle walks (n=273)

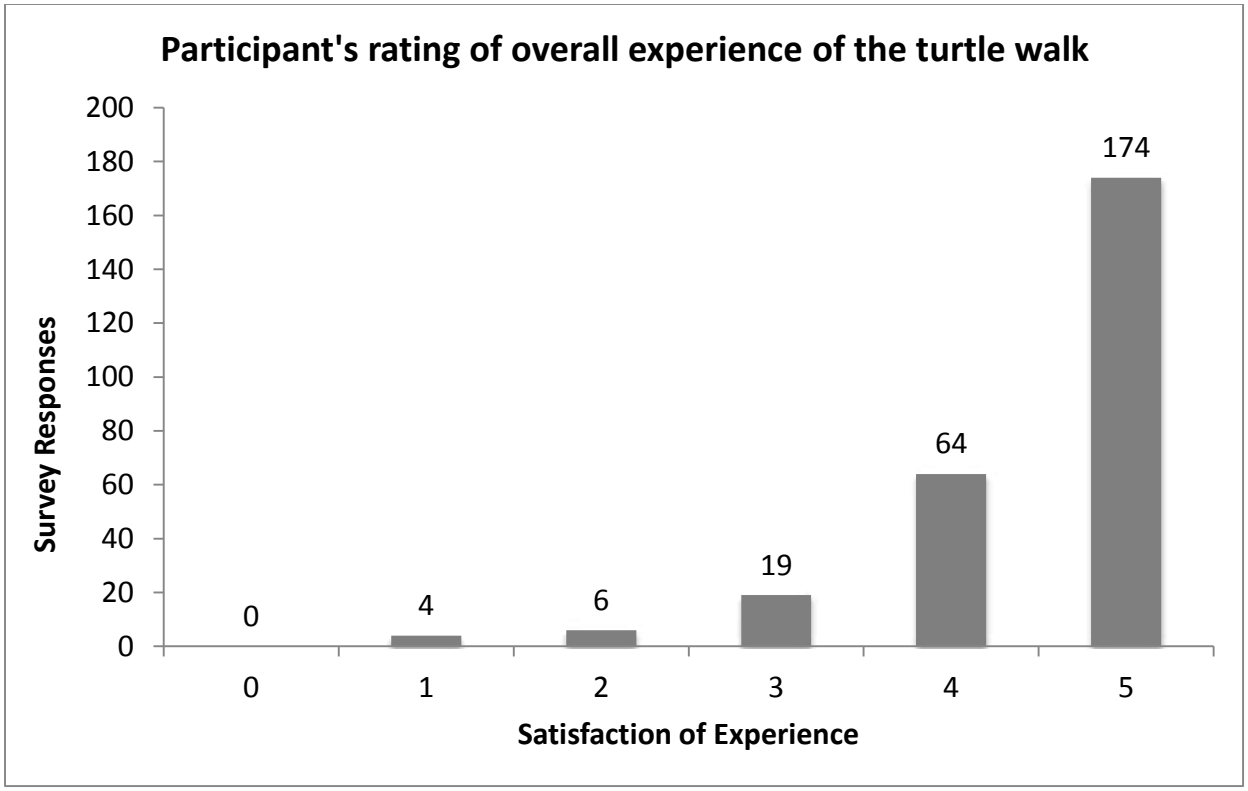

Figure 9: Participants ranking of their overall experience at the turtle walk, where: 0 = not satisfying, 5 = extremely satisfying (n=267)

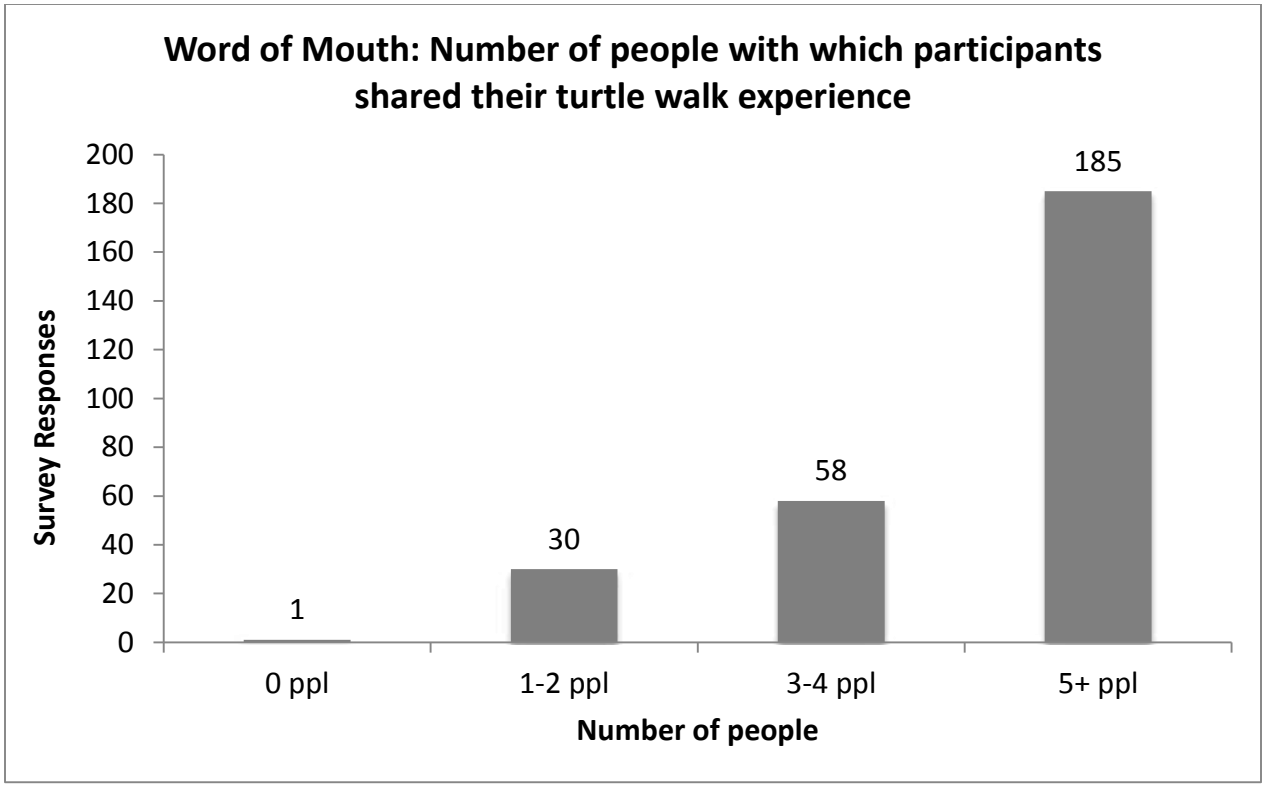

Figure 10: The number of people with whom turtle walk participants shared their experience (n=274).

Levels of Knowledge and Concern

Impacts on the nesting beach

The average self-rated knowledge level of impacts related to coastal development was 3.68 with a SD of 1.05. About 60% of surveyors ranked their knowledge level as either a 3 or 4 (Figure 10). The majority of participants (63%) ranked themselves as extremely concerned (level 5) about impacts from coastal development (Figure 11). The average response value was 4.51 with a SD of 0.73. The topic of beachfront lighting was one about which the majority (54%) said

they had extensive knowledge (level 5) with an average response value of 4.31 with a SD of 0.90. Additionally, 64% said they were extremely concerned (level 5) about the impacts it has on marine turtles and an average response value of 4.50 with a SD of 0.79. Participants' rankings on their level of knowledge about beach preservation were more evenly distributed with the most common level being a 3. The average response level was 3.25 with SD 1.30 for beach nourishment and 3.04 with SD of 1.34 for beach armoring. However, large quantities of people said they were extremely concerned (level 5) with the marine turtle impacts of beach construction like beach nourishment (average=4.10, SD=1.02) and beach armoring (average=4.20, SD=0.97).

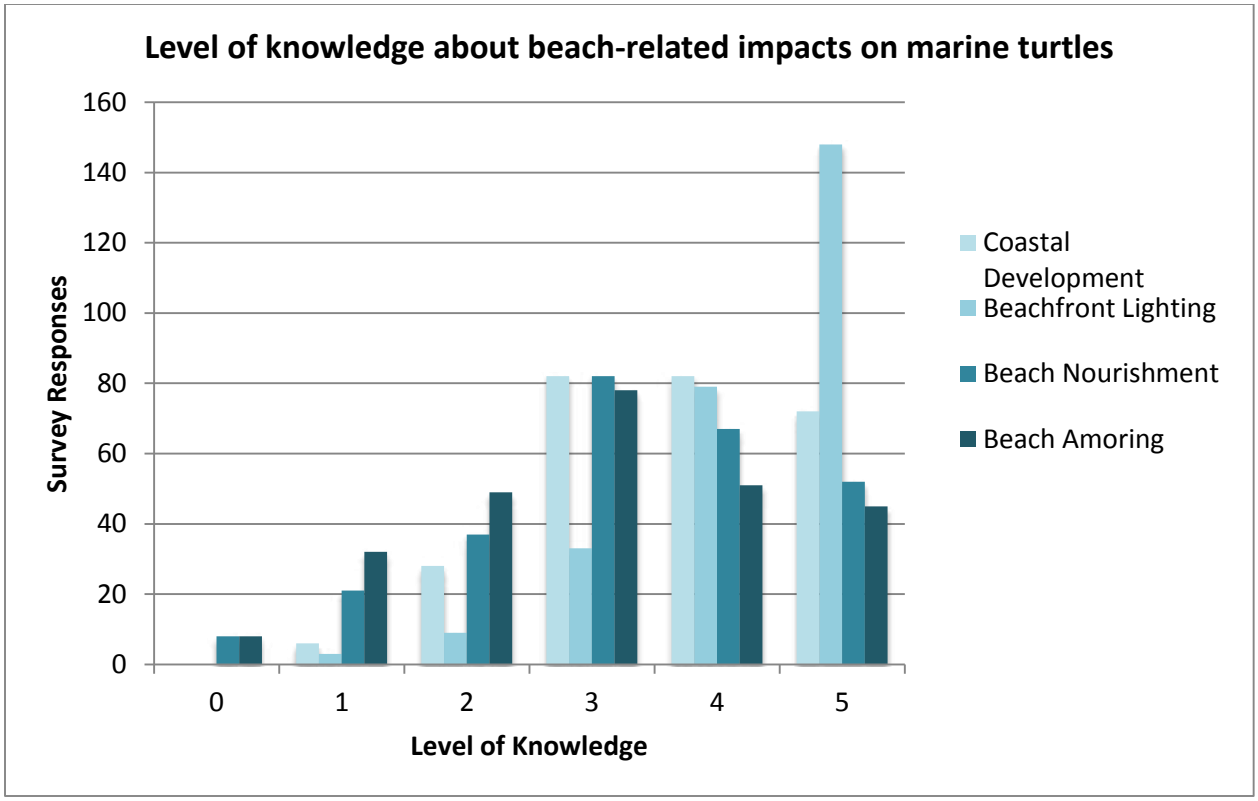

Figure 11: Participants' ranking of their level of knowledge regarding beach-related impacts six months after completing a turtle walk, where: 0 = none, 5 = extensive (Development n=270, Lighting n=272, Nourishment n=267, Armoring n=263)

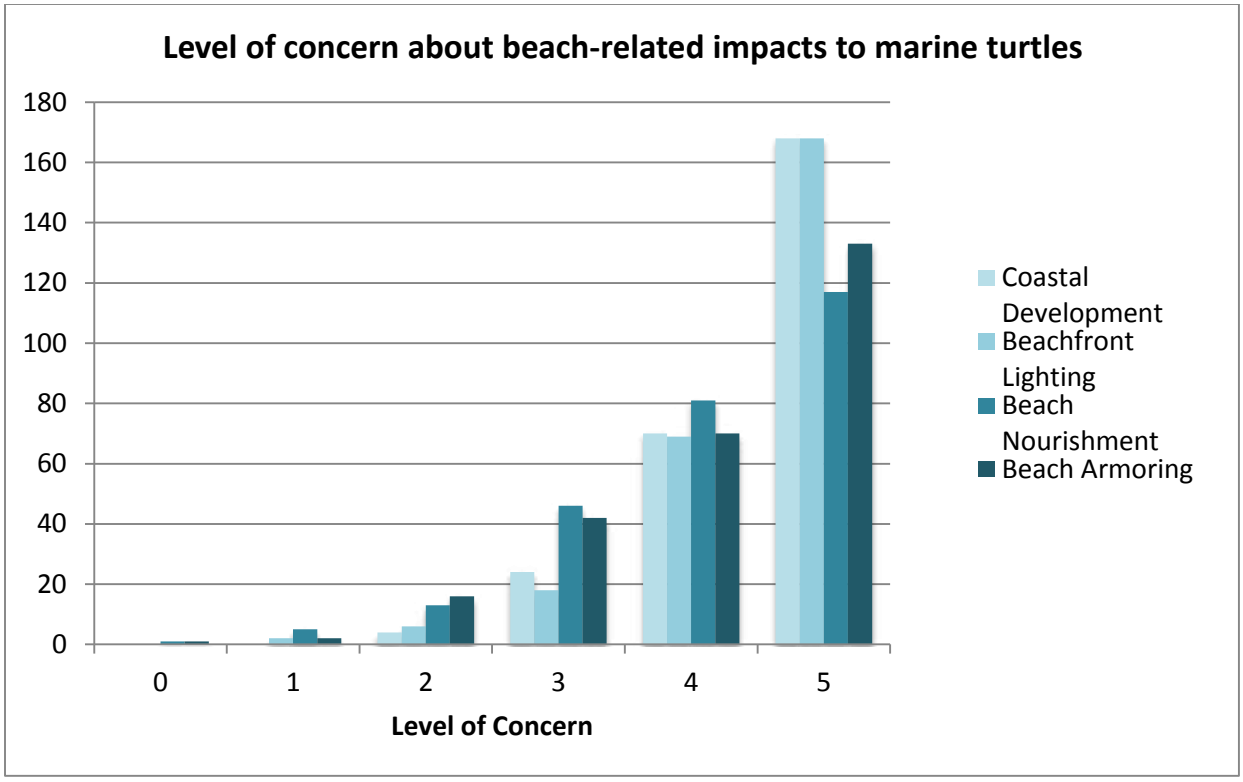

Figure 12: Participants' ranking of their level of concern about beach-related impacts, where: 0 = not concerned, 5 = extremely concerned (Development n=266, Lighting n=263, Nourishment n=263, Armoring n=264)

Impacts in the marine environment

Participants' responses for their ranking of knowledge about impacts to marine turtles found in the marine environment were more variable (Figure 12). The average response for knowledge about fishery bycatch was 3.15 with a SD of 1.35 and the average rated knowledge level about boat induced injuries was 3.56 with a SD of 1.18, but over half of survey participants ranked themselves as extremely concerned (level 5) about impacts on marine turtles from fishery bycatch (average=4.25, SD=1.05) and boat induced injuries (average=4.33, SD=0.97)

(Figure 13). The impact from marine debris was a topic many participants said they had extensive knowledge (level 5) about (average=3.87, SD=1.19), and 71% said they were extremely concerned (level 5) about (average=4.61, SD=0.77). The impact of shrimp fisherman not using TEDs while actively fishing was a topic where ratings of knowledge levels varied greatly. About 23% reported having only a knowledge level of 3, while the next highest ranking of knowledge was a level 4 with 21%. The average response for this topic was 2.9 with a SD of 1.62. However, 57% of respondents said they were extremely concerned (level 5) about shrimpers not using TEDs (average=4.14, SD=1.21).

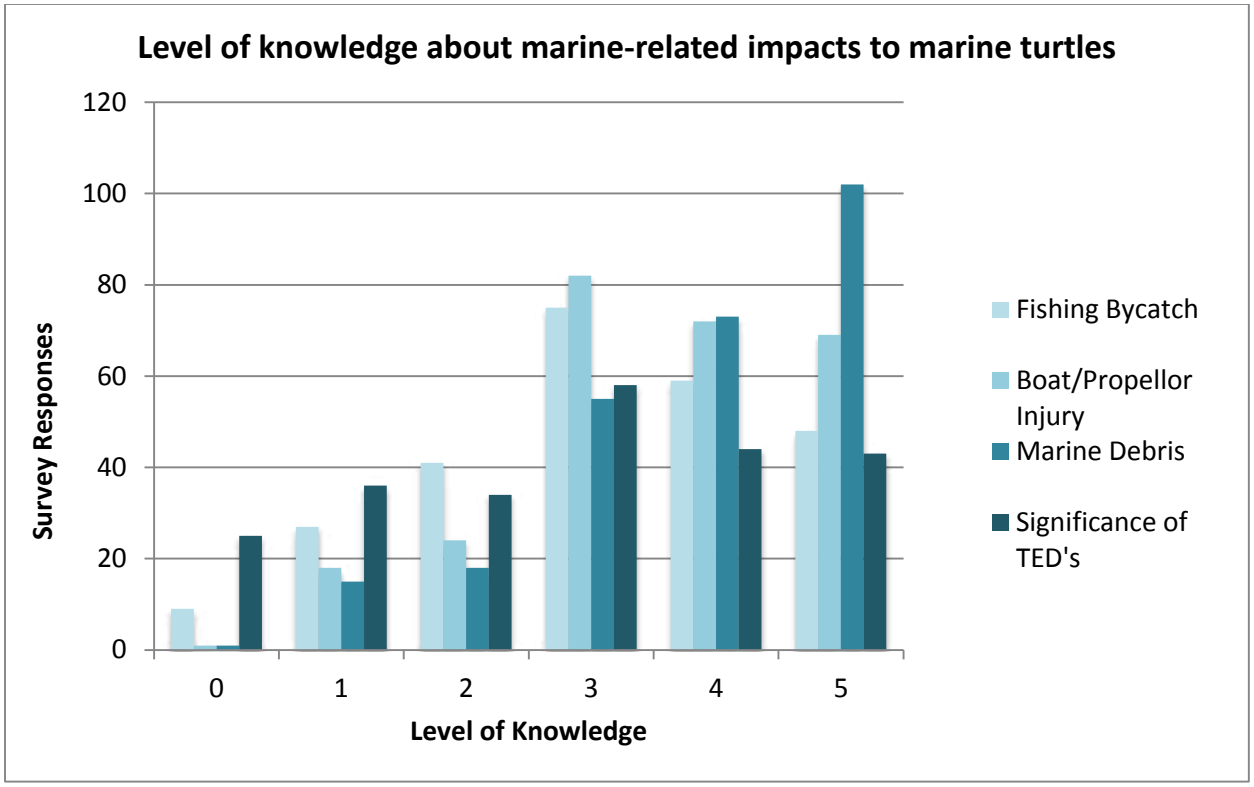

Figure 13: Participants' ranking of their level of knowledge about marine-related impacts, where: 0 = none, 5 = extensive (Bycatch n=259, Boat Injury n=266, Debris n=264, No TEDs n=250)

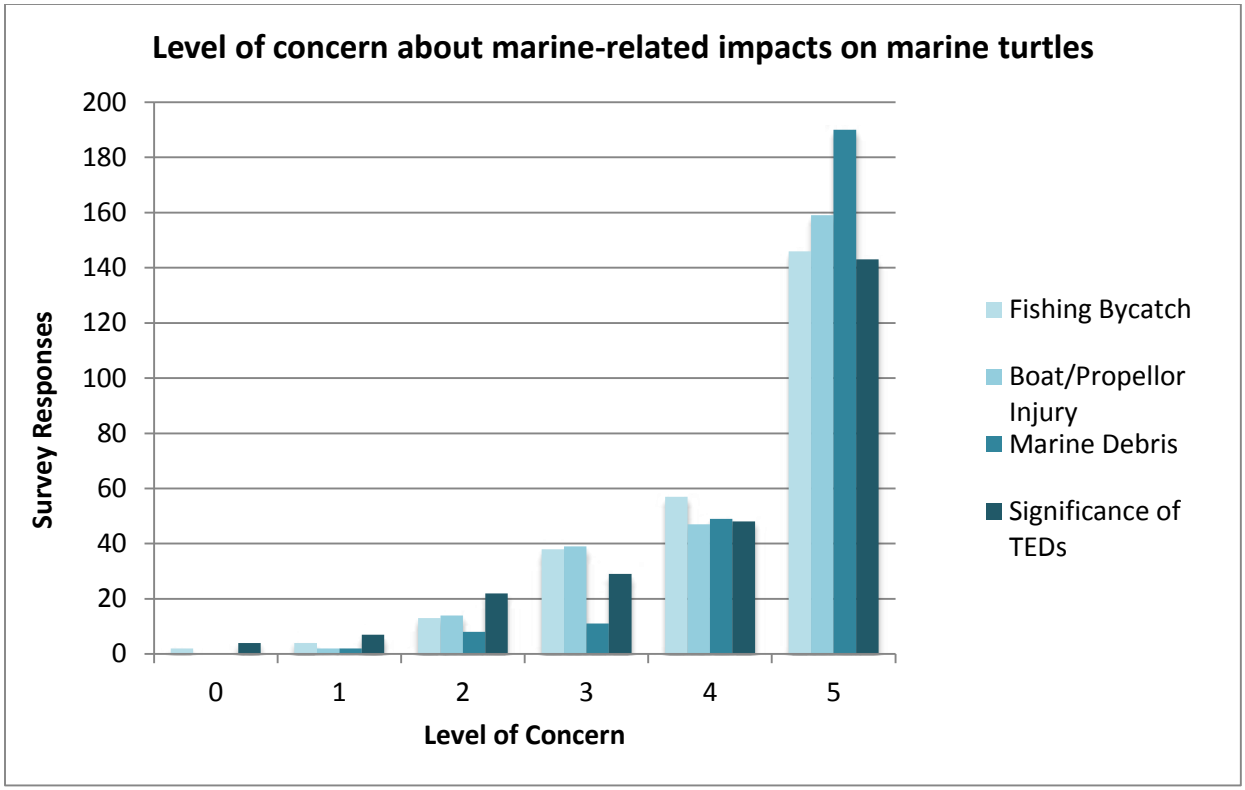

Figure 14: Participants' ranking of their level of concern about marine-related impacts, where: 0 = not concerned, 5 = extremely concerned (Bycatch n=260, Boat Injury n=261, Debris n=260, No TEDs n=253)

Changes in Perception and Behaviors

Participant perception about threats on marine turtles

A total of 261 participants responded to a question asking if their perception about threats to marine turtles changed after participating in the turtle walk. Of these responses, 202 (77%) indicated their perception had changed, ranking their level of perception change as 3.98 with a SD of 0.92 (Figure 15).

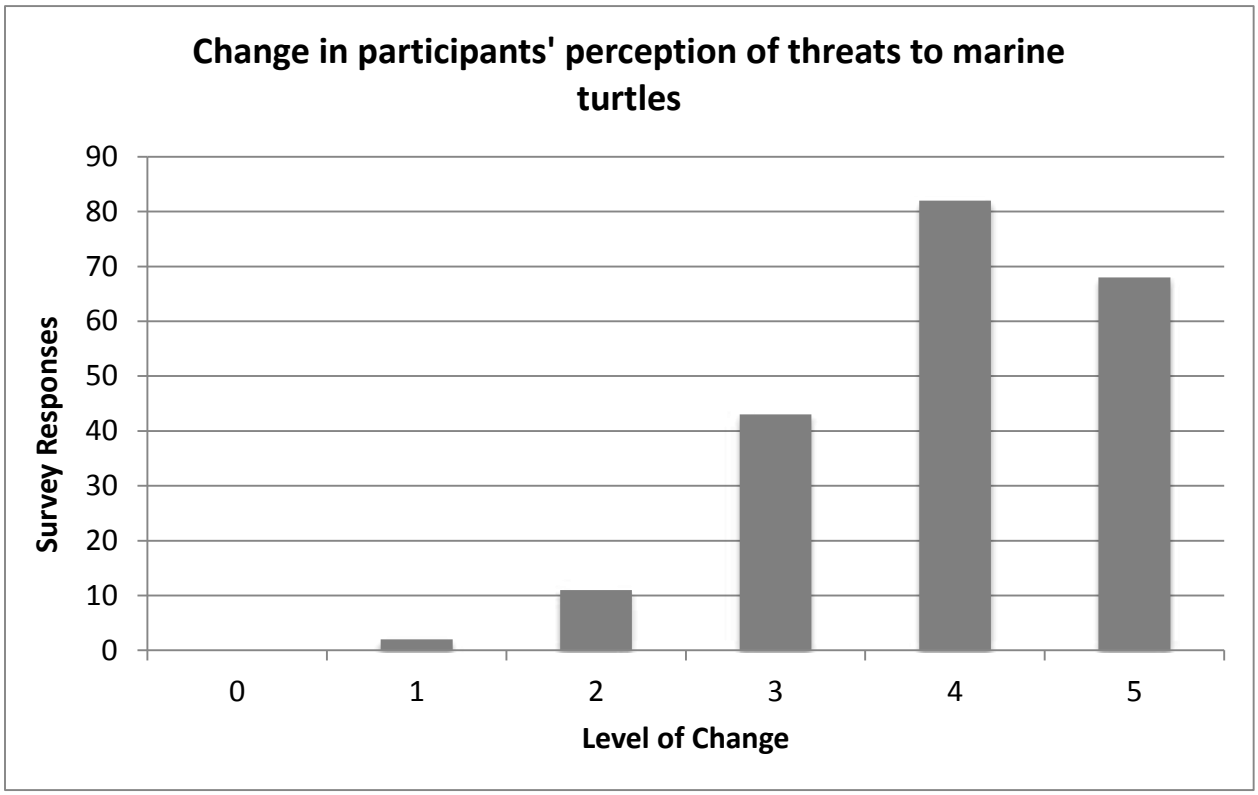

Figure 15: Participants' ranking of their change in perception about threats to marine turtles after attending a turtle walk, where: 0=no change, 5=significant change (n=202)

Participant willingness to change behaviors to conserve marine turtles:

The general willingness of surveyors to participate in activities which protect marine turtles from beach and marine-related impacts was high (Figure 16). The average self-rated willingness to recycle used objects or voluntarily pick up litter off the ground was 4.85 (SD=0.53) and 4.71 (SD=0.72), respectively. The average willingness of participants to either use paper bags at the grocery store or use reusable bags was 4.72 with a SD of 0.65. Respondents

also said they were extremely willing to use eco-friendly lawn maintenance (average=4.20, SD=1.12) and eat seafood responsibly (average=4.57, SD=0.78). Participants said they were less willing to pay a small fee to improve the management of threats (average= 3.87, SD=1.32), donate funds to sea turtle organizations (average=3.68, SD=1.38), or carpool (average=3.51, SD=1.48). Furthermore, 226 survey respondents reported what they believed was the level of change in behaviors they have truly made to protect marine turtles since attending a turtle walk (Figure 17). The average level of perceived change was 2.86 with a SD of 1.37.

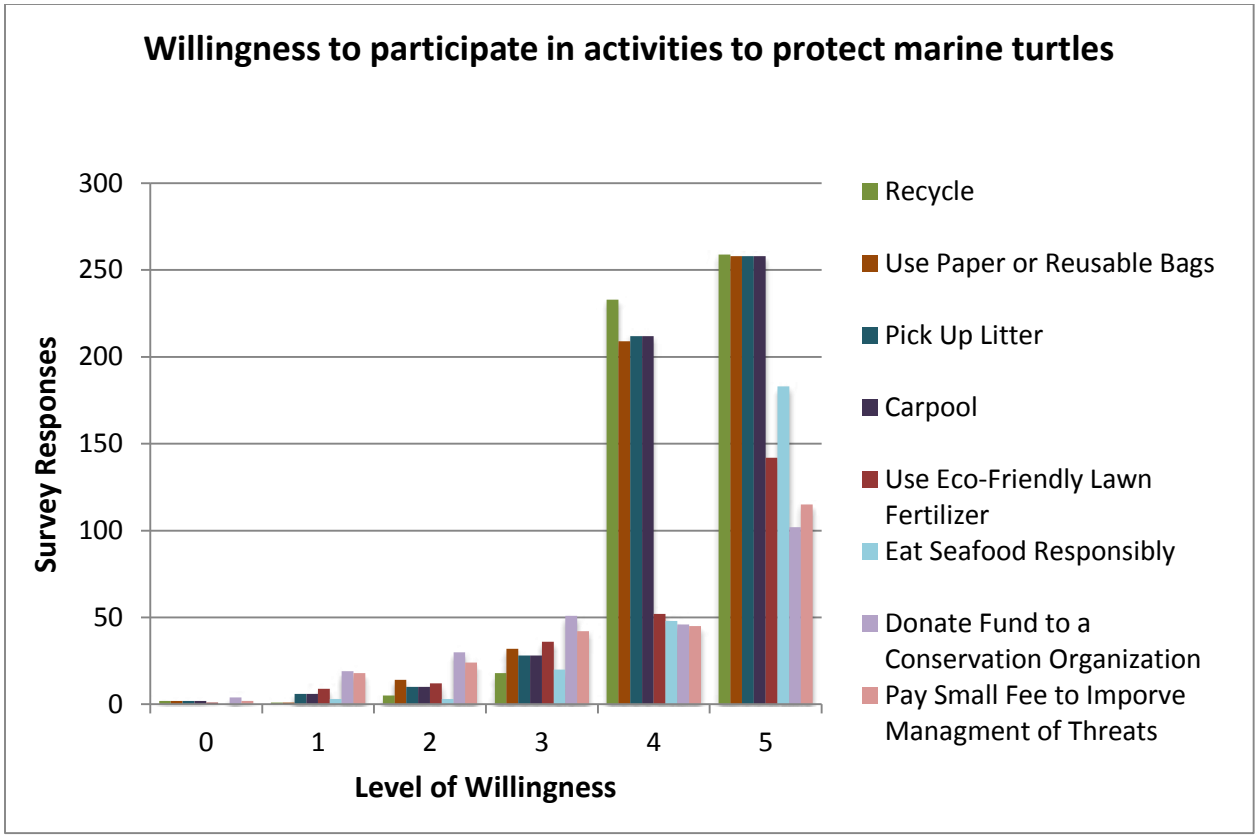

Figure 16: Surveyor willingness to participate in activities that can protect marine turtles after attending a turtle walk, where: 0=not willing, 5=extremely willing (Recycle n=258, Reusable bags n=257, Pick up litter n=257, Carpool n=235, Lawn maintenance n=251, Responsible seafood n=256, Donate n=251, Pay management fee n=245)

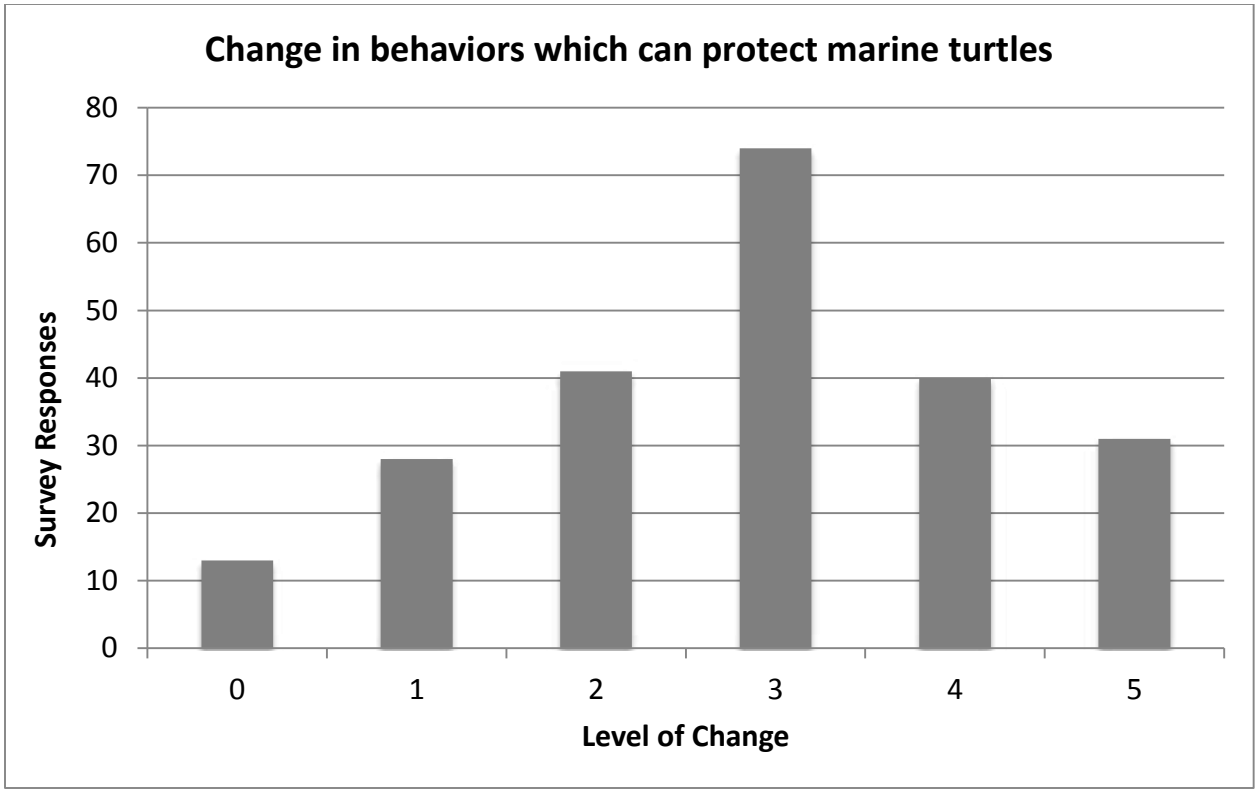

Figure 17: Participants' level of change in conservation-based behaviors which can protect marine turtles, where: 0=no change, 5= significant change (n=226)

Effects of organization on participants' educational experience

Knowledge and concern about outlined topics

No significant difference was found among turtle walk organizations for survey responses ranking levels of knowledge or concern for either beach related impacts (coastal development, beachfront lighting, beach nourishment, beach armoring) or marine related impacts (fishing bycatch, boat injury, marine debris, or the lack of using TEDs) (Table 20).

Assessment of threat perception and influences on participant behavior

No significant difference was found in participants' ranked level of change in perception about threats to marine turtle survival among organizations leading turtle walks (Table 20). Additionally, no significant difference was found in resulting behavior among participants attending turtle walks with different organizations. Furthermore, there was no significant difference among the organizations with regards to participants' willingness to conduct the eight conservation-based actions that can protect marine turtles.

Table 20: ANOVA statistics for survey responses among organizations leading turtle walks

Organizational Comparisons

Response	DF	Sum of Squares	F-value	p-value
Knowledge Level:				
Coastal Development	4	6.685	1.5690	0.1833
Beachfront Lighting	4	4.375	1.5280	0.1945
Beach Nourishment	4	7.540	1.1571	0.3305
Beach Armoring	4	0.660	0.0912	0.9852
Concern Level:				
Coastal Development	4	4.295	2.1451	0.0760
Beachfront Lighting	4	3.137	1.3373	0.2568
Beach Nourishment	4	7.317	1.7696	0.1358
Beach Armoring	4	2.983	0.7922	0.5312
Knowledge Level:				
Fisheries Bycatch	4	5.740	0.7932	0.5306
Injury From Boats	4	3.010	0.5577	0.6936
Marine Debris	4	8.466	1.6041	0.1740
Not Using TEDs	4	11.440	1.0813	0.3665
Concern Level:				
Fisheries Bycatch	4	4.496	1.0567	0.3787
Injury From Boats	4	2.779	0.7509	0.5583
Marine Debris	4	1.630	0.6861	0.6022
Not Using TEDs	4	2.370	0.4191	0.7948
Willingness to:				
Recycle	4	1.619	1.5688	0.1833
Use Paper Bags	4	0.803	0.4794	0.7509
Pick Up Litter	4	0.449	0.2159	0.9294
Carpool	4	6.270	0.6893	0.6000
Use Eco-Friendly Lawn Maintenance	4	3.867	0.7525	0.5573
Eat Seafood Responsibly	4	1.470	0.5820	0.6760
Donate to Conservation Organizations	4	11.730	1.5407	0.1912
Pay Fee for Improved Management	4	6.400	0.8941	0.4682
Change In:				
Perception of Threats to Survival	4	1.750	0.4979	0.7373
Conservation-Based Behaviors	4	7.290	0.9882	0.4150

Effects of participants' location of residency on educational experience

Knowledge and concern about outlined topics

No significant difference (Table 21) was found between local and non-local participants' rank of their level of knowledge and concern about beach and marine-related impacts to marine turtles, except for the topic of beachfront lighting impacts (Figures 18-19). Local residents of the two-county region surrounding the ACNWR had a statistically significantly higher self-ranked level of knowledge (local mean=4.50, Standard error=0.09; non-local mean=4.25, Standard error=0.06) and concern (local mean=4.64, Standard error=0.83; non-local mean=4.44, Standard error=4.32) about beachfront lighting impacts on marine turtles.

Perception of threats, willingness to change behaviors, actual changes in behaviors

No significant difference was found between local and non-local participants' self-ranked level of change in perception of threats to marine turtle survival or change in conservation-based actions (Table 21). Local and non-local responses for willingness to conduct conservation-based actions that can protect marine turtle were also not significantly different, except for one action (Figure 20). Local residents reported having a statistically significant higher willingness to use eco-friendly lawn maintenance than non-locals (local mean=4.54, Standard error=0.11; non-local mean 4.02, Standard error=0.08).

Table 21: ANOVA statistics for survey responses between local and non-local turtle walk guests, where *<0.05, **<0.01, *<0.001**

Residency Comparisons

Response	DF	Sum of Squares	F-value	p-value
Knowledge Level:				
Coastal Development	1	0.054	0.0498	0.8236
Beachfront Lighting	1	3.329	4.5409	0.0341*
Beach Nourishment	1	4.300	2.6398	0.1055
Beach Armoring	1	1.110	0.6144	0.4339
Concern Level:				
Coastal Development	1	0.390	0.7738	0.3799
Beachfront Lighting	1	3.882	6.8444	0.0095**
Beach Nourishment	1	2.941	2.8596	0.0921
Beach Armoring	1	0.121	0.1269	0.7220
Knowledge Level:				
Fisheries Bycatch	1	2.460	1.3324	0.2495
Injury From Boats	1	0.660	0.4796	0.4893
Marine Debris	1	0.510	0.3648	0.5464
Not Using TEDs	1	5.360	1.9957	0.1591
Concern Level:				
Fisheries Bycatch	1	0.575	0.5463	0.4605
Injury From Boats	1	0.262	0.2814	0.5963
Marine Debris	1	0.714	1.2319	0.2681
Not Using TEDs	1	0.900	0.6280	0.4289
Willingness to:				
Recycle	1	0.100	0.3875	0.5342
Use Paper Bags	1	0.001	0.0019	0.9655
Pick Up Litter	1	0.854	1.7033	0.1931
Carpool	1	0.020	0.0083	0.9275
Use Eco-Friendly Lawn Maintenance	1	13.749	11.3550	0.0009***
Eat Seafood Responsibly	1	0.083	0.1325	0.7161
Donate to Conservation Organizations	1	5.750	3.0122	0.0839
Pay Fee for Improved Management	1	5.860	3.3654	0.0678
Change In:				
Perception of Threats to Survival	1	0.022	0.0255	0.8734
Conservation-Based Behaviors	1	2.700	1.4625	0.2278

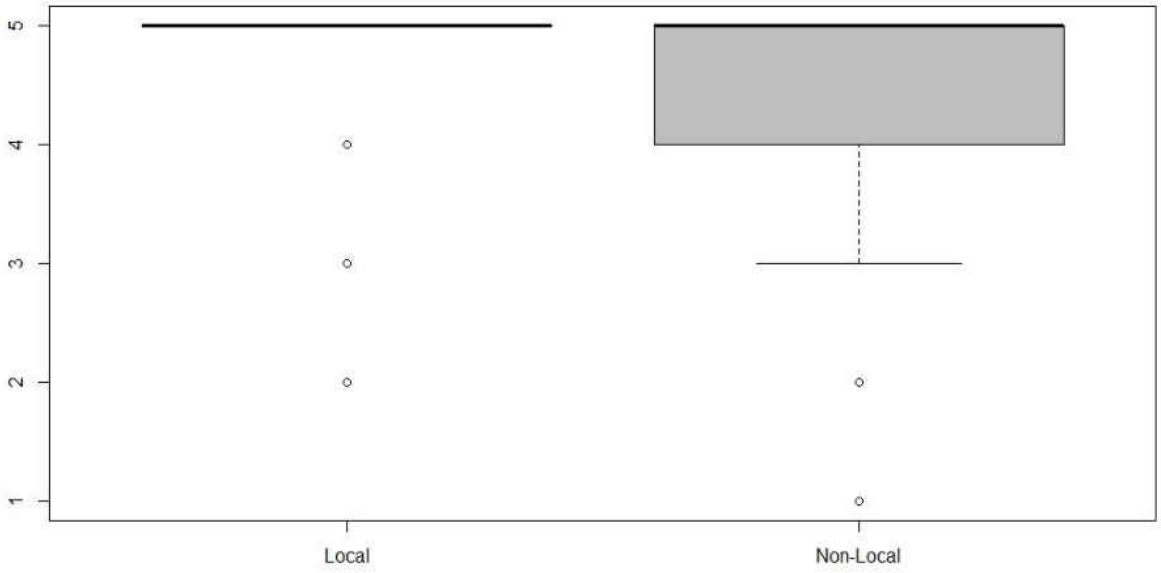

Figure 18: Survey responses between local and non-local participants' level of knowledge about beachfront lighting impacts to marine turtles (0=none, 5=extensive; mean response locals=4.50, non-locals=4.25)

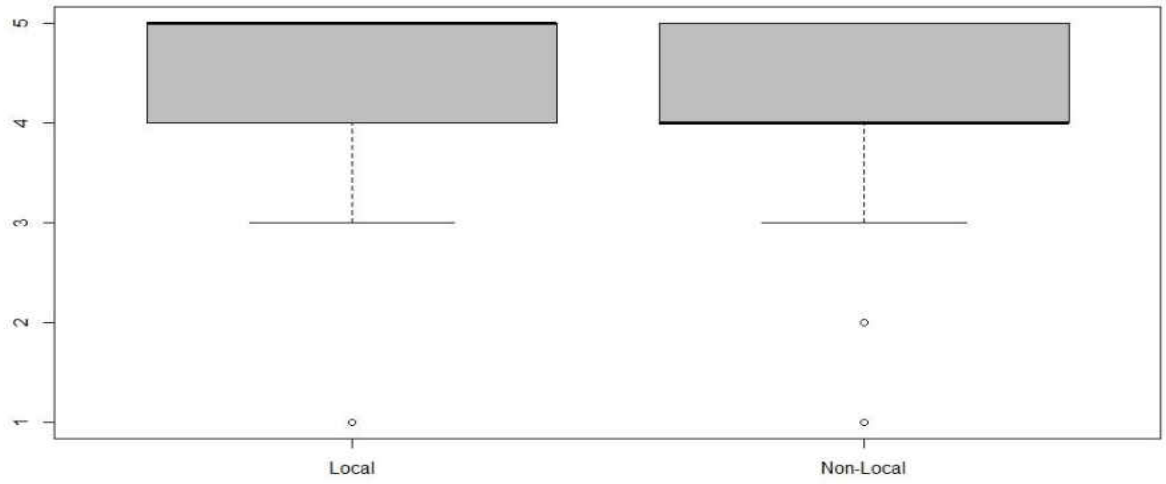

Figure 19: Survey responses between local and non-local participants' level of concern about beachfront lighting impacts to marine turtles (where: 0=not concerned, 5=extremely concerned; mean response: locals=4.70, non-locals=4.44)

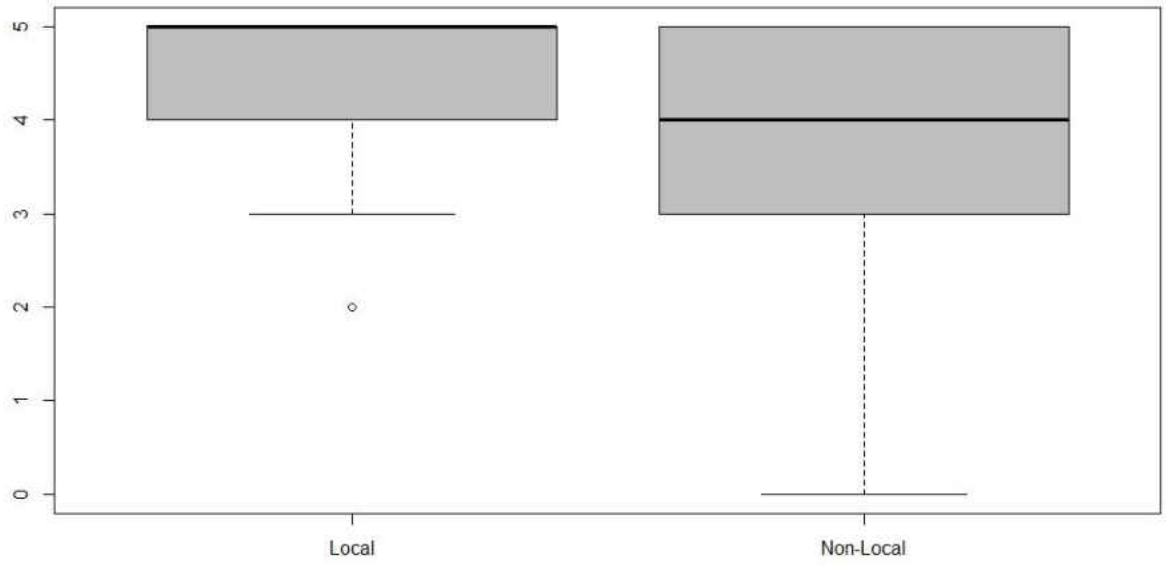

Figure 20: Survey responses between local and non-local participants' willingness to use eco-friendly lawn maintenance (where: 0=not willing, 5=extremely willing; mean response: locals=4.54, non-locals=4.02)

Discussion and Conclusion

Educational nature activities like turtle walks had significant impacts on participants' desire to conserve wildlife and their knowledge about how to protect marine turtles, especially when participants were able to successfully view a nesting female turtle (Tisdell and Wilson 2005, Ballantyne et al. 2011). Analyses and survey comments from Brevard and Indian River County, Florida support these findings from short-term studies and suggest these interactions continue to have long-lasting impacts (6-months after the experience).

More non-local residents participated in the follow-up survey than local residents, which is different than results collected in the first half of this thesis (1:1.2 ratio of local to non-local responses), but nonetheless, extreme satisfaction was indicated by almost all participants after completing the turtle walk. Based on comments from the survey, the dissatisfied participants were on a turtle walk that was not able to encounter a nesting loggerhead, due to a lack of turtles nesting in the tour area that night. In accordance with findings found in Chapter 2 of this Master's thesis, the follow-up survey supported "word of mouth" as being a powerful and useful marketing tool for this type of eco-tourism activity. All survey responders reported telling at least one person about their turtle walk experience, while most told five or more people.

The majority of respondents rated themselves as being extremely concerned about the impacts facing marine turtles in beach and marine environments six-months after completing their turtle walk. However, they did not always rate themselves as being extremely knowledgeable about each of these outlined topics (FWC 2006), except that of beachfront lighting. Instead, responders considered themselves only mildly knowledgeable about beach and marine-based impacts threatening the survival of marine turtles. It is possible the self-ranked knowledge levels about beachfront lighting were higher due to recent updates and implementations of lighting ordinances within Florida's coastal communities, to help eliminate negative impacts to nesting adult and hatchlings on beaches.

Responders did rank themselves as having a significant change in perception about threats facing marine turtles after attending a turtle walk. Most individuals reported they

would be extremely willing to recycle, pick up trash, reuse bags, eat seafood responsibly, and use eco-friendly lawn maintenance in order to clean up and protect the environment inhabited by marine turtles. Participants were slightly less willing to pay a fee for improved management practices of these coastal areas, donate funds to conservation organizations, or share a car when traveling. These results most likely reflect the ease of incorporating these behavioral changes into their lives. Although almost all survey participants reported making conservation-based changes in behaviors to protect marine turtles, only some turtle walk guests reported making significant changes, while most respondents said they have only made what they believe to be a mild level of change. Although many conservationists hope that all participants would make significant changes to protect wildlife after having an educational wildlife experience, the likelihood that everyone would make drastic conservation-based changes in their life is low. It is important to remember the possibility that without attending a turtle walk, these changes may have never occurred.

While there are differences in the ways each organization prepares and presents educational material as well as their proximity to the ACNWR, there does not seem to be any significant effect on guests' level of concern about impacts to marine turtles, knowledge about these impacts, changes in perceptions about these threats, and willingness to partake in actions which can help protect marine turtles six months after attending a turtle walk. However, significant differences were found between people who considered themselves residents of the study area and non-locals. Locals are more concerned about the impact of beachfront lighting on nesting marine turtles and their hatchlings, and they are more willing to use eco-friendly

lawn maintenance to prevent an influx of nutrients into coastal waters, which can lead to detrimental effects on the ecosystem, and possibly directly or indirectly impact marine turtles. This may be a result of local ordinances enforcing restrictions or local outreach groups educating locals through venues other than turtle walks.

As found in other studies, eco-tourists are more open to learning new conservation information and more willing to apply conservation practices to protect wildlife than average tourists (Ballantyne et al. 2009). However, it is up to the entity conducting the educational wildlife experience to keep participants engaged so they can learn as much as possible within the short period of time reserved for the experience. This study highlights the long-term educational and behavioral impacts of turtle walks conducted on the east central coast of Florida. Based on the high levels of concern and lower levels of reported knowledge, guides should focus on finding a balance in their interactive experience to make sure participants receive all of the information outlined in the FWC guidelines. Possible approaches include:

- Starting the event earlier to guarantee all material is covered before the group is led on to the beach to view a nesting loggerhead;
- Taking guests out on the beach even if no turtle is nesting so guests can interact with the beach environment in the context of an educational experience;
- Continuing an educational presentation while on the beach using headsets or other devices as technology improves;

- Having materials or marine turtle-themed activities available for children of all ages, so they can be engaged at the same level as the parents; and
- Increasing communication between organizations leading turtle walk experiences to create a unified outreach plan and allow participant numbers in these educational experiences to be maximized.

Turtle walks serve an important role in providing a one-of-a-kind interaction with nature. This study and many others support these activities' ability to provide long-lasting education, and have major impacts on participants' behavior and willingness to protect nature or support conservation efforts.

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APPENDIX E: ONLINE FOLLOW-UP SURVEY INVITATION EMAIL

During the summer of 2014 you participated in a turtle walk on the central east coast of Florida. At this walk you learned about threats to sea turtles and maybe some ways in which you could help them through your daily life. After listening to a presentation you were most likely guided on to the beach to watch a nesting Loggerhead turtle lay her eggs, cover her nest, and return to the ocean. I hope this experience was satisfying and educational for you and your group.

The reason you have received this email, which contains a link to an online survey, is because before your turtle walk began you voluntarily participated in a study, which was trying to determine the economic impacts of turtle walks within the region. You completed a survey, and on that survey you were asked to give your email if you were interested in completing a follow up survey, and it is finally here!

This online follow up survey will ask you about your experience at the turtle walk, have you rate your knowledge and concern about certain threats to sea turtles, and ask you about behaviors in your daily life. Please answer the questions honestly and to the best of your ability. Your answers may be used to inform managers at state and local levels, and improve educational and interactive outreach programs like the one you attended this summer.

You have until February 15, 2015 to complete this survey. After this date the survey will be closed. I want to encourage you to complete this short survey at your soonest convenience.

Thank you so much for attending the turtle walk this past summer and thank you again for participating in the economic impact survey. Without you change and improvement could not be possible.

APPENDIX F: ONLINE FOLLOW-UP SURVEY QUESTIONS

During the summer of 2014 you participated in a turtle walk on the east central coast of Florida and voluntarily participated in a study which was trying to determine the economic impacts of turtle walks within the region. This short follow up survey will ask you about your experience at the turtle walk, have you rate your knowledge and concern about certain threats to sea turtles, and ask you about behaviors in your daily life. Please answer the questions honestly and to the best of your ability. Your answers may be used to inform managers at state and local levels, and improve educational and interactive outreach programs like the one you attended this summer. By continuing this survey are giving permission to use the information you provide for the follow up study. Thank you so much for attending the turtle walk this past summer and thank you again for participating in the economic impact survey. Without you change and improvement could not be possible.

Q1 What inspired you to participate in the turtle walk this past summer?

- ❍ Educational Experience
- ❍ Interest in Turtles
- ❍ Fun Family Activity
- ❍ Other _____

Q2 How would you rate your overall experience at the turtle walk?

_____ Your overall experience

Q3 Did you talk to others about your turtle walk experience?

- ❑ Yes
- ❑ No

Q4 How many people did you share your turtle walk experience with?

- ❍ 0
- ❍ 1-2
- ❍ 3-4
- ❍ 5 or more

Based on information in the turtle walk presentation please answer the following to your best ability.

All ranking questions are based off a 0-5 scale unique to the question.

Q5 In your mind, how important are the Florida nesting beaches to the U.S. population of sea turtles?

_____ Florida Nesting Beaches

Q6 In your mind, how significant is the Archie Carr National Wildlife Refuge (ACNWR) in regards to loggerhead sea turtle nesting in the U.S.?

_____ ACNWR

Q7 The following section focuses on your knowledge and concern of anthropogenic (human-caused) impacts on sea turtles.

Q8 How would you rate your current knowledge of the following impacts to sea turtles on the nesting beach?

_____ Coastal Development
_____ Beachfront Lighting (white lights)
_____ Beach Nourishment (adding sand to beach to manage erosion)
_____ Beach Armoring (adding hard structures to manage erosion)

Q9 How concerned are you with the following impacts to sea turtles in their marine developmental and foraging habitats?

_____ Coastal Development
_____ Beachfront Lighting (white lights)
_____ Beach Nourishment (adding sand to beach to manage erosion)
_____ Beach Armoring (adding hard structures to manage erosion)

Q10 How would you rate your current knowledge of the following impacts to sea turtles in their marine developmental and feeding habitats?

_____ Fisheries Bycatch (accidentally caught species)
_____ Boat and Propeller Injury
_____ Marine Debris/Pollution
_____ Not Using Turtle Excluder Devices

Q11 How concerned are you with the following impacts to sea turtles in their marine developmental and feeding habitats?

_____ Fisheries Bycatch (accidentally caught species)
_____ Boat and Propeller Injury
_____ Marine Debris/Pollution
_____ Not Using Turtle Excluder Devices

Q12 Did your perception about threats to sea turtles and their coastal environment change after you participated in the turtle walk last summer?

❍ Yes
❍ No

Answer If: Has your perception about threats to sea turtles and their coastal environment changed since your participation in the turtle walk this past summer? Yes Is Selected

Q13 If so, how much?

_____ Understanding Threats To Sea Turtles

Answer If: How much has your perception/feelings about threats to sea turtles and their coastal environment changed since your participation in the turtle walk this past summer? Is Greater Than or Equal to 3.

Q14 In what way?

Q15 Do you have any comments or suggestions for future turtle walks?

Q16 How willing are you to do the following to help protect sea turtles and the coastal environment?

_____ Recycle
_____ Use Paper or Reusable Bags
_____ Pick Up Litter
_____ Carpool
_____ Eco-Friendly Lawn Maintenance
_____ Eat Seafood Responsibly
_____ Donate funds to sea turtle organizations
_____ Pay small fee to improve management of threats

Q17 Since your participation in a turtle walk, how significantly have you changed your actions related to protecting turtles or the coastal environment?

_____ Change in Actions

Q18 Have you taken any other actions, besides ones listed above, to protect sea turtles and their coastal environment since your turtle walk?

The rest of the survey includes important demographic questions. Please answer these to the best of your ability. The information you provide will remain anonymous, but is important for the results of our study.

Q19 Would you participate in another turtle walk in the future?

- ❍ Yes
- ❍ No

Answer If Would you participate in another turtle walk in the future? No Is Selected

Q20 Why not?

Q21 With what organization did you complete your turtle walk?

- ❍ Sea Turtle Preservation Society
- ❍ Sea Turtle Conservancy
- ❍ US Fish and Wildlife Service/Friend of the Carr Refuge
- ❍ Sebastian Inlet State Park
- ❍ Disney Vero Beach Resort
- ❍ Coastal Biology Inc.

Q22 Would you consider yourself a resident of Brevard or Indian River Counties located in east central Florida?

- ❍ Yes
- ❍ No

Q23 What is your gender?

- ❍ Choose One
- ❍ Male
- ❍ Female
- ❍ Other
- ❍ Prefer not to answer

Q24 What is your age?

- ❍ Choose One
- ❍ 18-29
- ❍ 30-39
- ❍ 40-49
- ❍ 50-59
- ❍ 60-69
- ❍ 70+
- ❍ Prefer not to answer

Q25 What is your annual household income?

- ❍ Choose One
- ❍ $24,999 and below
- ❍ $25,000-49,000
- ❍ $50,000-74,999
- ❍ $75,000-99,999
- ❍ $100,000 and above
- ❍ Prefer not to answer

Q26 What is your highest level of education?

- ❍ Choose One
- ❍ No High School Diploma
- ❍ High School Diploma/GED
- ❍ Some College/Equivalent
- ❍ Bachelor's Degree
- ❍ Graduate Degree(s)
- ❍ Prefer not to answer

Thank you very much for completing this survey. Your answers will be helpful to managers at state and local levels, and may be used to improve educational and interactive outreach programs like the one you attended this summer.

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