

The Effects of Participatory Beach Clean-ups on Attitude and Awareness towards Marine Biodiversity and Conservation at the Destin Jetties

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Abstract

Today, with ocean pollution on the rise, many are looking for ways to mitigate pollution while increasing awareness on ocean health and anthropogenic influence on marine life. Northwest Florida's Emerald Coast provides a unique study area to this topic. This study sought to understand the effects of a participatory beach cleanup on the participants' attitude and awareness toward marine biodiversity and conservation of the East Jetties in Destin, Florida. This pilot research surveyed beach cleanup participants and non-participants at the study site, about the public's knowledge on marine biodiversity, anthropogenic influence, and conservation behaviors at the East Jetties location. This revealed differences between the beliefs of cleanup participants versus non-cleanup participants, specifically that cleanup participants had a greater understanding of the biodiversity of the area. By understanding how cleanups influence the public's understanding of local marine life and associated anthropogenic issues of a popular beach area, this research is instrumental to local community leaders and conservation management, to influence future marine conservation events throughout the community.

Keywords: Beach cleanup; Marine conservation; Biodiversity; Awareness; Emerald coast

Introduction

The Emerald Coast is approximately one hundred miles of coastline on the Gulf of Mexico where emerald clear waters and white sand make a great "home" to many wildlife, residents, and tourists alike (Emerald Coast, 2016). Recent studies show over fourteen million tourists visit the area annually, an increasing trend over the past several decades [1].

Florida's Emerald Coast is defined by its natural resources, particularly the marine environment, with tourism and fisheries being leading contributors to local economy [2]. The natural beauty and diverse marine ecosystems of the Emerald Coast make it a unique place where many can connect with nature while benefitting from the many marine resources it supplies.

The Emerald Coast is located directly on the Gulf of Mexico, which is home to twenty-eight species of marine mammals [3]. These animals are protected under the Marine Mammal Protection Act of 1972 [4]. Additionally, six of the twenty-eight species are endangered and protected under the Endangered Species Act (sperm, sei, fin, blue, humpback, and North Atlantic right whales) [3]. The Florida Manatee also thrives in these waters and is currently listed and protected as a Threatened Species as well [4]. Five species of sea turtles inhabit the Gulf's water, including the Loggerhead, Green, Kemp's Ridley, Hawksbill, and Leatherback, all of which are threatened and/or endangered and are under federal protection [3]. Native and migratory marine birds, a plethora of bait and reef fish, sharks, rays, and many invertebrates all play a role in the marine ecosystem in the Gulf of Mexico [4]. Marine wildlife has been increasingly impacted by human encroachment over the last several decades and implications such as bycatch, entanglement, and ingestion of marine debris are a major concern for the sustainability of many species [4].

With ever increasing numbers of visitors to the Emerald Coast annually, one can only imagine the implications of human life on the environment and wildlife that thrives there [5]. Marine debris is defined as natural or manmade solid waste material that enters the water and/or ocean, including materials such as plastic, wood, glass, and rubber [6]. A study from Rosevelt et al. reported that over two hundred and sixty

species are directly affected by marine debris around the world today [7]. This includes over forty percent of the world's seabirds, over forty percent of the world's marine mammals, and over eighty percent of the world's sea turtles. Entanglement in marine debris is a leading cause of the decline in sea turtle populations in the United States and worldwide [5]. Additionally, it is estimated that ninety percent of seabirds have ingested plastic today [8]. With statistics such as these, it is evident that marine debris is a major problem worldwide and further research should be conducted to understand best practices for reducing marine pollution on a local and global scale.

Around the world, environmental groups have searched for ways to increase community awareness about the need for localized marine conservation efforts. One organization, known as The Ocean Conservancy, created an assertive platform and annual event known as International Coastal Clean Up Day, where community groups from around the globe pledge to clean up a coastal area in their own backyard [9]. Everyday citizens aid with simple data collection to reveal the quantity and quality of marine debris, highlighting the major components of the marine debris, specific areas where debris build up, and overall ocean health [9]. This is an effective example of a community-based conservation effort through participatory research, similar to what Mulrennan et al. studied [10]. In that 2012 study, Mulrennan and associates found that participatory research at the community level can aid sustainable conservation practices, helping build culture. Additionally, Kudryavtsev et al. illuminated the importance that a "sense of place" or the connectivity to community places of intrinsic value, stating it is fundamental in environmental

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education and conservation at large. Ultimately, participatory beach cleanup events can engage a community, increase awareness toward an environmental issue, foster a sense of responsibility for a place of value, all supporting a conservation initiative throughout a community [11].

This project sought to understand the positive effects of a participatory beach cleanup on the participant's awareness and attitude toward marine biodiversity, conservation, and anthropogenic influence of the study area when compared to those not involved in the beach cleanup event. Supported by the ideals of Eastman Hidalgo-Ruz et al. and the success of their marine debris cleanup project which they found increased environmental awareness, my predictions included that those involved in the beach cleanup would show increased awareness to biodiversity and marine conservation issues in the study area over those who did not participate in the beach cleanup [12]. The East Jetty and Beach Cleanup Fall 2016 event took place on Saturday, October 1, 2016, and was located on a popular beach and jetty area known as the Finger Jetty and East Jetty in Destin, Florida, on the Emerald Coast (Figure 1) in Northwest Florida.

Methods

Surveys

This study was conducted throughout the months of September to November in the fall of 2016. It was open to all members of the public in the study area, resident or tourist, and age was not restricted. Surveys were distributed to two different groups. Group 1 was those who had not participated in the beach cleanup event, and Group 2 was those who had participated in the cleanup event. The study area included Osteen Public Beach Access, the Finger Jetty, and the East Jetty and the surrounding waters located off of Gulf Shore Drive in Destin, Florida (Figure 1). For the survey, the Destin Jetties was defined as "the marine environment and the animals that live there, including the beach, rocks, and reef."

A 10-question anonymous survey was constructed to understand the participant's (1) knowledge on the biodiversity of marine life at the study area, (2) knowledge of the level of human influence on the wildlife and the marine environment there, and (3) knowledge and participation in marine conservation and conservation behaviors. The survey remained the same for both survey groups. Please see Appendix for survey questions.

To survey Group 1, who had not participated in the beach cleanup, written surveys were distributed by hand to those individuals who were involved in and / or visiting the study area. This group was surveyed before the beach cleanup took place throughout the month of September 2016. 59 individuals participated and included beachgoers, boaters, boat and charter captains, snorkelers, divers and fisherman, both local and tourists (N=59). To survey Group 2, those who had participated in the beach cleanup event, surveys were distributed onsite after the cleanup event commenced. Surveys were also sent out online to those who indicated they would rather answer the survey virtually. 15 individuals participated in onsite survey while 29 participated in the online survey, for a total of 44 participants in Group 2 who had participated in the cleanup (N=44).

Beach and jetty cleanup event

The beach cleanup event took place on Saturday October 1, 2016 from nine in the morning to noon. Over 60 participants participated, and an estimated 1.5 tons of marine debris was collected from the beach and jetty area. Participants of the beach cleanup participated on

their own will and at their own risk. Several environmental and school groups participated, all of which had adult leaders to supervise group participation.

Destin Snorkel provided a boat, personnel, and snorkel supplies. An educational lesson on local marine life and conservation issues and safety briefing were given at 9:00 am. Supplies such as trash bags, gloves, mesh bags for underwater trash storage, and fishing line and rope cutters (toe nail clippers and dive knives) were dispersed among team leaders. Shoreline operations sent teams along dunes, mid-beach, water's edge, and on the jetties (rocks along shore). Underwater operations moved as a team along and around the jetties. Certified divers from Destin Snorkel patrolled the deeper levels of the jetties. Snorkelers patrolled surface level of jetties. Snorkelers worked above the divers and aided by hauling debris to shore when the divers' and snorkelers' small personal bags were full. Safety patrols were stationed on top of the jetties to watch underwater participants. A boat captain remained on the boat for an emergency exit situation. The city lifeguards and fire departments were notified of the event and had pertinent contact information in case of an emergency.

Data analysis

To compare survey results between the two groups, those who did not and those who did participate in the cleanup event, the Mann Whitney U statistics tests in Microsoft Office Excel software was utilized to evaluate differences between the data sets. The significance level used was 0.05 and the hypothesis was two-tailed.

Results

Survey results indicated mild differences in awareness of marine biodiversity and conservation issues in the study area between the two test groups. Surveyed individuals included 59 participants from Group 1, who did not participate in the beach cleanup event, and 44 participants from Group 2, who did participate in the cleanup event. Collectively, the majority (over 75%) of the participants surveyed in both groups indicated they lived locally. In Group 1, whom did not participate in the beach cleanup, the majority (71%) indicated their career had direct relations with the study area (such as a boat captain, snorkel and dive instructor).

Through Survey Question 1, knowledge and awareness of marine biodiversity at the study area was examined (Figure 2). The Mann Whitney U test was utilized in this data set (p-value=0.003) to reveal a significant difference between the two groups of participants. Overall trends in data from this question disclose that those who participated in the cleanup event believed there were more species at the study area than those who did not participate in the cleanup event. It is also important to understand in interpreting these results that approximately 14% of non-cleanup participants and 32% of cleanup participants were "unsure" of how many species lived in the study area. Survey Question 2 questioned whether or not humans had a significant impact on the Destin Jetties and the animals that live there (Figure 3).

Approximately 90% of non-cleanup participants and 81% cleanup participants answered "yes" to humans having a significant impact on the Jetties and its inhabitants.

Survey Questions 3 to 6 sought to understand awareness towards positive and negative anthropogenic impact on the Jetties. For Question 3 (Figure 4), approximately 41% of both test groups believed humans had a low positive impact on the Jetties. The Mann Whitney U test revealed a p-value of 0.38 between the two data sets, meaning there is no



Route in red is the area cleaned by the participatory beach and underwater cleanup. Yellow tack in the middle of the map indicates the meet up location of the cleanup event.

Figure 1: Map of study area of the Finger Jetty, East Jetty, and beach in Destin, Florida.

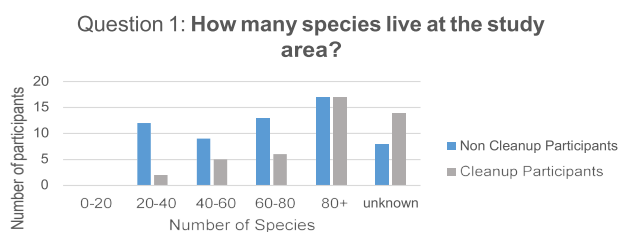


Figure 2: Results from Survey Question 1.

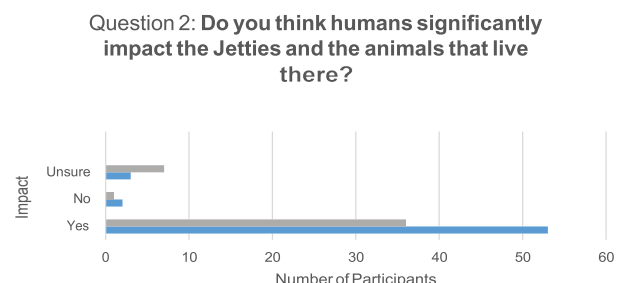


Figure 3: Results from Survey Question 2.

statistical difference between Group 1 and 2, non-cleanup participants versus cleanup participants. When asked the opposite in Question 5 (Figure 5), to what level do humans negatively affect the animals that live at the Jetties, the majority of participants answered humans have a high negative affect (47% in Group 1 non-cleanup participants and 67% in Group 2 cleanup participants). The Mann Whitney U test revealed no statistical significance (p -value=0.26) between Group 1 and 2 in Question 5.

Questions 7 and 8 sought to understand participant versus non-participant thoughts on the amounts of trash and discarded fishing gear at the study area. Question 7 examined how much trash pollution was believed to be at the Destin Jetties. As Figure 6 displays, the majority of Group 2, those who participated in the cleanup, ranked the level of trash pollution as high (59%) and no individuals from Group 2 answered unknown. However, those from Group 1 had split answers,

42% ranked medium levels of trash pollution and 42% ranked high levels of trash pollution, while 7% answered that they did not know. Although through Figure 6, one can see differences between the two test groups' answers, the Mann Whitney U test revealed no statistical significance in the data set (p -value = 0.14). Question 8 examined thoughts about levels of discarded fishing line gear in the study area. Figure 7 displays results amongst the two groups. Cleanup participants and non-cleanup participants predominantly answered there were high amounts of discarded fishing line and gear (64% cleanup participants, 58% non-cleanup participants). There was no statistical significance between the two groups in Question 8, with a Mann Whitney U test p -value of 0.29.

Survey Questions 9 and 10 inquired about practices in marine conservation. Question 9 asked whether or not the individual practiced marine conservation while Question 10 asked whether or not the community practiced marine conservation (Figures 8 and 9). The

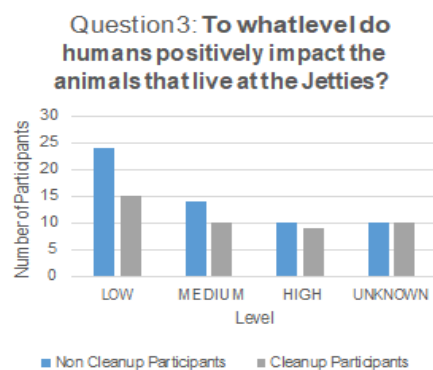


Figure 4: Results from Survey Question 3.

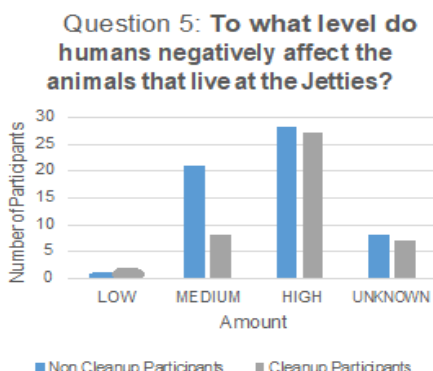


Figure 5: Results from Survey Question 5.

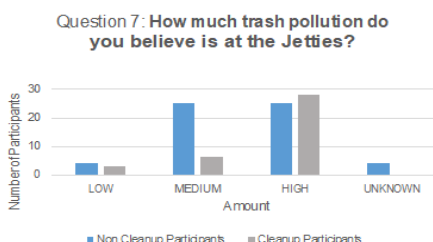


Figure 6: Results from Survey Question 7.

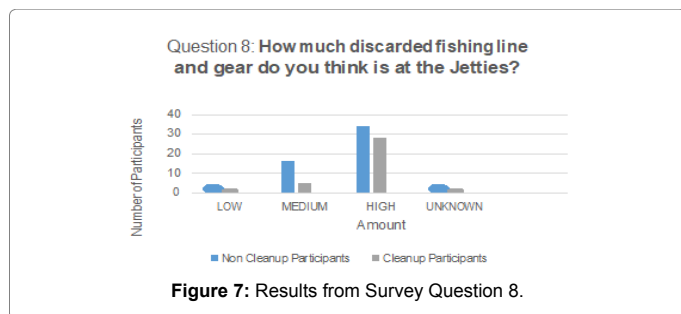


Figure 7: Results from Survey Question 8.

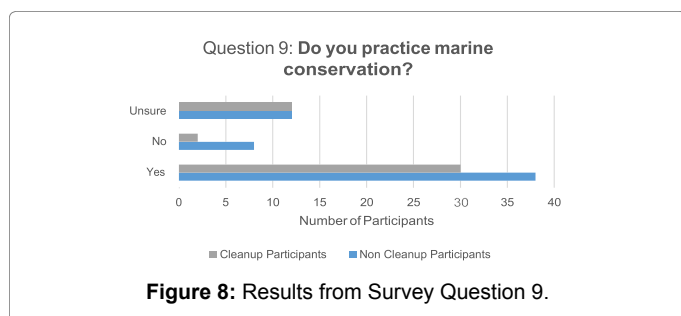


Figure 8: Results from Survey Question 9.

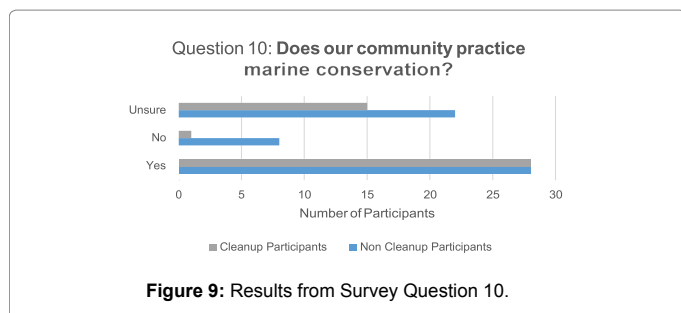


Figure 9: Results from Survey Question 10.

majority answered “yes” in Question 9 (64% in Group 1 non-cleanup participants and 68% in Group 2 cleanup participants). However, there was a substantial number of individuals who answered “unknown” (20% non-cleanup participants and 27% cleanup participants). Ultimately, there was no statistical significance between the two groups in Question 9 (Mann Whitney U test, p -value= 0.99) found. For Question 10 as well, the majority of both groups answered “yes” (47% group 1 non-cleanup participants, 64% group 2 cleanup participants). However, more participants from both groups answered “unknown” (37% Group 1 non-cleanup participants, 34% Group 2 cleanup participants) than in the previous question. The Mann Whitney U test revealed again there was no statistical significance between the two groups in Question 10 (p -value = 0.28) on community marine conservation. For both questions 9 and 10, 100% of participants that answered “yes” to both questions, all listing conservation behaviors associated with marine conservation, predominantly stating beach cleanups were the most popular conservation events in their personal and community lives (approximately 70% from both groups). In addition, education events and wildlife rescue were also listed as pertinent conservation efforts throughout the community (less than 20% in both groups).

Discussion

As evident in the estimated 1.5 tons of marine debris collected in this project’s beach cleanup, marine debris is a rising challenge for the Emerald Coast’s marine environment. Participatory beach cleanups can mitigate marine pollution, working as an interactive community-

based conservation event that increases biodiversity awareness of the local marine environment. In this study, one can see that a participatory beach cleanup in the Destin community has the ability to positively influence and increase awareness and attitudes towards local marine conservation.

The statistical significance found in Survey Question 1 about biodiversity levels at the study area supports my prediction that participating in a beach cleanup can influence awareness of biodiversity. Those who participated in the cleanup believed there was higher biodiversity than those who did not participate, the majority believing over 80 species lived at the study area (an accurate assumption). These results are similar to Wyles, Pahl, Holland, and Thompson’s 2017 study, who found that beach cleaning led to higher marine awareness [13].

Secondarily, more participants in Group 2, who participated in the beach cleanup, recognized more positive impacts that humans had on the study area and also stated more known community opportunities to aid in local marine conservation than did participants of Group 1. One cleanup participant from Group 2 even noted he/she would participate in more personal and local conservation behaviors after helping in the cleanup event. Therefore, one can recognize changes in awareness and attitude towards marine conservation after personal participation in the cleanup event. This idea is supported through a marine debris citizen science project by Eastman et al., who stated youth-based participatory cleanup projects can not only inspire conservation behaviors and environmental stewardship in children [12]. Eastman et al. also stated that participatory cleanups can be a valid tool for conservation management decisions [12]. Utilizing the community to gather information on local marine debris, such as quantity, quality, and location, such as in a citizen science capacity, could be of great benefit to community leaders and conservationists, as to plan future mitigation projects. Jambeck et al. supported this idea, as they believe in the use of citizen science as a marine debris mitigation technique [14]. In fact, the two created a mobile phone application to record and track types, amounts, and locations of marine debris collected by individuals, as to use in marine debris research. This application, known as the Marine Debris Tracker, could be a great asset to a future beach cleanup project at the Destin Jetties and even along the Emerald Coast.

However, the lack of statistical significance through the rest of the data does not support my hypothesis, as there was no statistical support with the Mann Whitney U test for differences between the two study groups throughout the rest of the survey questions. As displayed in the results, more individuals were surveyed in Group 1 ($N=59$), those who did not participate in the cleanup event, than in Group 2 ($N=44$), those who did participate in the cleanup. This variance could have influenced the results; a higher number of participants in Group 2 may have been able to affect significance. The author plans to do a similar survey in future cleanup events with the hopes of increased participation, which could yield different results. Also, the author believes that the audience in Group 1 and 2 may have been slightly biased. In Group 1, many participants indicated they had direct ties to the study area. Group 2 was more diverse with careers and ages; however, many stated through informal interviews they frequented the study area and/or had preconceived notions of anthropogenic influence on marine environment in the community.

Perhaps, surveying groups completely unrelated to or in the physical location of the study area could yield different findings in the future.

What is noteworthy among several instances in the data is the number of participants in both study groups that answered

“unknown/unsure” to questions regarding personal or community marine conservation efforts. Referring to Survey Questions 9 and 10, approximately 20% to 40% of participants in both groups stated they were “unsure” what marine conservation entailed on a personal and community level and did not know what resources were available to inquire about opportunities to participate. This uncertainty could be influential upon presentation to community and conservation management leaders. It highlights the lack of education and outreach in current conservation management and should be utilized to plan future participatory marine conservation events in the community.

Author Action and Reflection

Throughout this project, I have become increasingly aware of the need for participatory community events that allow the public (residents and tourists) to become involved in marine conservation. As I have discovered throughout the project, there is great desire for residents and tourists to participate in conservation-based activities but no true effort to lead these outreach activities. Therefore, my next action component will be to continue the Jetty Cleanup Event as a bi-annual event, as requested by many participants and several local dive and snorkel organizations. This will provide routine cleanup to a popular beach area in need while instilling responsible action and awareness toward the marine environment. As this event gains popularity, through partnerships of local businesses and eventual funding, my hope is that community leaders will draw interest and gain understanding to the needs of marine conservation throughout Northwest Florida. This is first step in infiltrating local culture with marine conservation and can then be used to facilitate changes in marine conservation, policy, and education throughout the community.

Reflecting on this project, I have learned a great deal about conducting a cleanup event and survey-based project. What has surprised me the most from this project is the overall uncertainty of the public in what marine conservation entails on a personal, community, and global scale.

Also, I found limited resources and opportunities for marine conservation and outreach, in the community as many expressed. I believe this lack of communication and opportunity are a main reason why marine conservation is rather “unknown” throughout the community. In moving forward in planning the next cleanup event, it would be very beneficial in the future to count about specific types of marine debris and record them in the Marine Debris Tracker Application on the smartphone, to contribute to largescale data collection and have that available for studies over time.

This project has helped increase my knowledge of the life sciences by truly enabling me to understand the important link between human experience and sustainable conservation, how participatory conservation events can shape one’s understanding of the environment around them. This project is the first steppingstone for my Master Plan, to incorporate marine conservation into the culture of Northwest Florida. I am thankful for the opportunity to quite literally dive right in. It has opened my eyes to the needs of my community and allowed me to begin to bridge the gap between an environmental need and a community-based solution.

Conclusion

Throughout Northwest Florida, the Emerald Coast’s aesthetically pleasing beaches, abundant wildlife, and recent development provide unique opportunities to live, work, and vacation in a paradise infiltrated among the area’s natural resources. However, today anthropogenic influence on the marine environment and marine wildlife is increasing. Conservation managers throughout the community need to provide feasible solutions to this alarming trend, to protect and sustain the marine environment that supports the Emerald Coast’s lifestyle. As found throughout this study, participatory beach cleanup events can provide a resolution, mitigating marine debris while increasing awareness towards marine biodiversity and conservation throughout the community. Community-based beach cleanup events should be researched and planned as an active part of conservation management throughout Northwest Florida in order to increase awareness toward the state of the local marine environment. Incorporating opportunities for community-based conservation initiatives into the community of the Emerald Coast can have a positive effect on participants, mitigating marine debris while promoting participation in sustainable conservation behaviors and citizen science events, beneficial for all people, wildlife, and ecosystems that call the Emerald Coast home.

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