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Investigating the Relationship Between Tourism and Artificial Coral Reefs in New Providence, Bahamas

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INVESTIGATING THE RELATIONSHIP BETWEEN TOURISM AND ARTIFICIAL CORAL REEFS IN NEW PROVIDENCE, BAHAMAS

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ABSTRACT

In this study, I qualitatively investigated perceptions of Conservation Managers, Dive Tour Operators, and Dive Tourists surrounding the use of anthropogenically modified underwater environments to benefit marine conservation through tourism. Using the Sir Nicholas Nuttall Coral Reef Sculpture Garden off of the island of New Providence in The Bahamas as a focal point, this study explored the similarities and differences in perception relating to (1) experiences of underwater environments and activities, (2) knowledge of the Sculpture Garden goals and uses, (3) understanding and development of sustainable tourism, (4) the use of an underwater Sculpture Garden as a means of promoting marine conservation through tourism, (5) understanding and thoughts regarding marine debris and marine pollution, and (6) knowledge of policies relating to the marine debris and marine pollution. These topics were the focus in order to evaluate the success of the goals of installing this Sculpture Garden which were to promote marine conservation and sustainable tourism and educate on marine debris and marine pollution. Overall, it was determined that perceptions generally align between tourists, Dive Tour Operators and Conservation Managers; however, some respondents were more educated than others on certain topics, causing gaps in information and missed educational opportunities. All three groups agreed that the Sculpture Garden would benefit from increased educational and promotional materials; but, it was also discovered that the main reason the Sculpture Garden has not been fully utilized for marine conservation education was that it is also a site of unpredictable oil pollution. All groups agreed that policies

surrounding marine debris and marine pollution in New Providence need to be better enforced and publicized. In conclusion, it was determined that the oil pollution must be addressed before the Sculpture Garden can truly be used as an effective tourism-based marine conservation tool. Due to the alignment of the tourism and conservation sectors pertaining to this issue, there is an excellent opportunity for them to work together to lobby the government and energy industry to clean up the oil pollution and improve policy enforcement, improve the conditions of the Sculpture Garden site, and create more extensive educational opportunities surrounding the Sculpture Garden.

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CHAPTER 1: INTRODUCTION

Marine Conservation Managers and Dive Tour Operators aspire to utilize anthropogenically modified underwater environments as a means of protecting marine environments and promoting marine conservation via marine tourism (Stolk, Markwell and Jenkins, 2007). It has been argued that tourists may practice better environmental behavior after having a positive experience in a marine environment. This can even transfer back to better environmental practices in their own lives, especially when a positive experience is coupled with a good explanation by a tour guide (Biggs, Ban and Hall, 2012; Zeppel and Muloin, 2008). In order for anthropogenically modified underwater environments to work effectively as a means of marine conservation promotion and education through tourism, Dive Tour Operators and Conservation Managers must recognize tourists' perceptions and understanding of such environments to ensure they are properly appealing to the tourists they hope to reach. They must also understand tourists' relationships to coral reefs and tourists' knowledge of coral reef management to create and maintain effective tourist sites that also benefit coral conservation. While the most prominent threats to coral reefs are generally considered to be effects of climate change, such as ocean acidification, sea temperature rise, and sea level rise, these are not the only pressures with which conservation managers are concerned (Hoegh-Guldberg et al., 2008; Hughes et al., 2003). In The Bahamas, prominent threats to coral reefs which conservationists hope to reduce include marine debris and marine pollution (Gregory, 2009; Sheavly and Register, 2007). It is therefore also important to gain an understanding of how tourists view these issues.

This case study qualitatively investigates the relationship between marine tourism and marine conservation in a specific area of New Providence, Bahamas. It uses the Sir Nicholas Nuttall Coral Reef Sculpture Garden, the location of which is depicted by a red box in Figure 1, as a site of interest through which Conservation Managers hope to promote the ideals of marine conservation and sustainable tourism to tourists as well as Bahamian citizens. Sustainable tourism is defined by the World Tourism Organization as "tourism that takes full account of its current and future economic, social, and environmental impacts, addressing the needs of visitors, the industry, the environment, and host communities" (UNWTO, 2005). Successful sustainable tourism would be considered providing opportunities and activities for tourists which do not cause any negative effects on the natural environment or deplete economic resources of the host communities. Local Dive Tour Operators also use the Sculpture Garden as a destination for tourists participating in shallow water marine excursions, such as snorkeling or underwater subs, as well as beginner SCUBA diving courses. According to a basic internet search, there are four dive centers on New Providence; however, this study only used one due to its close proximity to the Sculpture Garden compared to the others. This local dive center uses the Sculpture Garden as a destination for these specific activities as a means of keeping tourists who may be less confident in the water away from sensitive coral reef habitat while still showing them a meaningful underwater environment. One goal of both the dive center and conservation organization is to increase the quality of sustainable diving in The Bahamas. Sustainable SCUBA diving is an example of sustainable tourism. When providing sustainable diving opportunities, the interactions of divers with the

environment must be taken into account as well as what impacts those interactions may have on the underwater environment (Lucrezi et al., 2017). It is also important to look at the perceptions divers have of the environment in which they are diving and increase their understanding and willingness to participate in marine conservation (Lucrezi et al., 2017). Some ways of improving divers' sustainability are by teaching them about the negative impacts they can have when touching the reef, taking souvenirs from the reef, or stirring up sediment.

Figure 1: A satellite view of New Providence, Bahamas with the location of the Sir Nicholas Nuttall Coral Reef Sculpture Garden shown by a red box. Map image obtained from NASA 2013/Landsat 8.

A sculpture garden is a unique environment and the Sir Nicholas Nuttall Coral Reef Sculpture Garden is only one of its kind in The Bahamas, making it of great interest to Conservation Managers and Dive Tour Operators. There are five other underwater sculpture gardens throughout the world in Mexico, Grenada, the Canary Islands, and two in England. The Grenada sculpture garden alone has drawn millions of dollars of publicity to the island and benefitted the sustainable tourism market (Caribbean: Sustainable Tourism - Don't be afraid to stand out, 2010). This shows that the Sir Nicholas Nuttall Coral Reef Sculpture Garden also has the potential to be an excellent tourist attraction with the improvement of educational and promotional

materials regarding its meaning, construction, and value as an artificial reef habitat. Its potential and uniqueness in The Bahamas made the Coral Reef Sculpture Garden an ideal site for a pilot study exploring promoting marine conservation as well as perceptions and relationships between the three distinct groups of Dive Tour Operators, Conservation Managers, and Dive Tourists. The methodology developed here can be used with future research in unique sites and can also be generalized for research regarding tourism being used to promote conservation efforts. This case study aims to understand the differences and similarities in perceptions of Conservation Managers, Dive Tour Operators, and Dive Tourists concerning the marine environment and marine conservation. While this study took place at a very specific time and location, the results will be valuable to the marine tourism industry in New Providence, Bahamas in general.

The overarching research question addressed in this study is:

What is the role/potential of the Sir Nicholas Nuttall Coral Reef Sculpture Garden in conservation education in a tourism dependent island economy?

The sub-research questions that inform this study are:

1. Do Dive Tour Operators and Conservation Managers understand the interests and expectations of tourists participating in dive tourism activities?
2. Is the Sir Nicholas Nuttall Coral Reef Sculpture Garden attaining its intended goals of promoting marine conservation and sustainable tourism, educating on marine debris and marine pollution, and providing habitat for marine organisms?

3. If the Sculpture Garden is not yet effectively achieving its intended goals, what can be done to increase its success?

This thesis sets the scene for the research done by explaining the importance of coral reefs in general as well as in New Providence, Bahamas specifically. It then goes into further detail about the Coral Reef Sculpture Garden, artificial reefs, and threats to reefs in general and specifically in New Providence, Bahamas. Methods are explained, followed by summaries of the raw results. Discussion regarding the similarities and differences in results between the three groups comes next, and finally a conclusion will summarize the most important points of the study and provide suggestions for future research while re-emphasizing the primary conclusions of the study.

The first conclusion of this research is that Dive Tour Operators and Marine Conservation Managers appear to have a good understanding of tourists' desires in terms of what environments they want to see and what will appeal to them. Secondly, it seems that the Sir Nicholas Nuttall Coral Reef Sculpture Garden could be a valid means of marine conservation education and management; however, it is being de-valued by substantial oil pollution in the area. All groups also agree that the Sculpture Garden requires more education and promotion surrounding it in order for it to be successful in its mission. The final conclusion is that marine debris and marine pollution are looked upon negatively by tourists, Conservation Managers, and Dive Tour Operators and that, in The Bahamas, there is a huge lack of enforcement surrounding these detriments to the environment.

CHAPTER 2: BACKGROUND

2.1 Importance of coral reefs

Coral reefs are home to a wide range of species. The biodiversity of corals, fish, and invertebrates make reefs extremely complex and sensitive ecosystems (Abelson, 2006; Fisher et al., 2015). Coastal areas that have reefs nearby benefit from the economic value of the reef-based fisheries, tourism, and sometimes goods - such as medicinal products (Barker and Roberts, 2004; Broad and Sanchirico, 2008). Coral reefs also provide protection from coastal storms and erosion due to their ability to reduce wave energy (Barker and Roberts, 2004). Unfortunately, the health of coral reefs around the world is deteriorating due to climate change, overfishing, coastal development, pollution, and other human activities (Chavanich et al., 2015; Hoegh-Guldberg et al., 2007; Jackson et al., 2001). Worldwide, about 90% of corals are in danger due to these stressors (Grottoli et al., 2014).

2.2 The Bahamas

The archipelago of The Bahamas is made up of approximately 700 islands, 30 of which are inhabited (Buchan, 2000; CIA Factbook, 2017). They are sub-tropical, and are exposed to a hurricane season running from August through October (Buchan, 2000). When Christopher Columbus “discovered” The Bahamas for the Western world in 1492, the Bahamian islands were inhabited by the indigenous Lucayan Arawaks. Shortly thereafter, most of the indigenous people were sold into slavery and the islands were virtually uninhabited for 200 years (Kjellmark, 1996). In 1718, The Bahamas was claimed as a colony by the British and the islands did not gain their independence until 1973 (Buchan, 2000; Craton and Saunders, 1998).

The present total population is a little over 327,300 people, 90% of whom are black, descended from African slave populations. Two thirds of that population live on New Providence Island where Nassau, the capital, is located (CIA Factbook, 2017). International tourism is the main source of income for the Bahamian economy, making up between 75-80% of the total gross domestic product (GDP). Tourism also employs approximately half of Bahamian workers, either directly or indirectly (CIA Factbook). In 2015, The Bahamas had over 6 million tourists visiting by either air or sea and over half of these tourists stayed in Nassau or on Paradise Island, both of which are a part of New Providence (Ministry of Tourism, 2015).

Through experiencing The Bahamas and speaking with residents and tourists, it was clear that the majority of tourists come via cruise ship or they stay in resorts. They come mostly to have a relaxing vacation and a certain subset of these tourists find underwater adventures to be a vital part of taking a Caribbean vacation. It was also recorded that over half of tourists going to The Bahamas cited their attraction as being beautiful ocean views or marine tourism activities (Buchan, 2000). Marine tourism seen by the researcher in New Providence consisted of jet skiing, powerboating, fishing, sailing, snorkeling, underwater SUBS, and SCUBA diving. The Bahamian economy relies on coral reef ecosystems to support its marine tourism industry as well as to supply food in the form of fish, spiny lobster, and conch for tourists and citizens (Buchan, 2000).

Due to this reliance on reefs and the desire to keep the reefs healthy, there are three major non-governmental conservation organizations in New Providence. Two focus on reef conservation while the third incorporates land conservation as well.

Marine conservation by these organizations includes creating marine parks to protect certain areas and coral restoration. Coral restoration is an effort taken to improve the "ecosystem structure and function" of reefs that have been degraded (www.reefresilience.org, 2016). Organizations find coral restoration to be important because the reefs are vital to their economy and livelihoods, yet are also rapidly declining. The organization used for this study put the Sir Nicholas Nuttall Coral Reef Sculpture Garden into place as a means of marine conservation education and as an artificial reef. They also have a coral nursery nearby the Sculpture Garden, both of which are maintained regularly. This organization was used for this study because of its close ties to the Coral Reef Sculpture Garden.

It is also important to this research that The Bahamas was hit by Hurricane Matthew on October 6, 2016. Upon reaching New Providence, the hurricane was a category 4 with maximum sustained winds of 140mph. Low lying areas were evacuated and the airports were closed from October 5th through October 8th (The Bahamas Weekly News Team, 2017). There were no deaths in New Providence; however, there was some extensive property damage and the Sir Nicholas Nuttall Coral Reef Sculpture Garden site was greatly affected. When the researcher visited in mid-December 2016, there was debris all around the historic park with shore access to the Sculpture Garden. There was also debris along the beach and under water in the area. While the three main sculptures stayed in place, the reef balls, which previously formed a "snorkel trail" tourists could follow out to the main sculptures, were moved by the hurricane. The "Lucayan face" was also covered in sand and the informational kiosk on land regarding the Sculpture Garden and its meaning were destroyed.

2.3 Coral Reef Sculpture Garden and its proposed usefulness as a conservation education and management tool

2.3.1 Purposeful artificial reefs vs. accidental artificial reefs

An artificial reef is defined as a manmade structure that has been lowered to the sea floor purposefully to simulate features of a "natural reef" (Baine, 2001). Artificial reefs can be put into place for various reasons, such as to increase coral recruitment in the area, improve fishery production, and create areas of interest for recreational SCUBA divers (Baine, 2001). However, manmade structures that have sunk to the seafloor accidentally are also often referred to as artificial reefs. These can consist of shipwrecks, plane wrecks, cars, and many other materials that have been lost to the ocean environment. The difference between purposeful and accidental artificial reefs is that the latter are not necessarily placed for maximum reef recruitment potential. A second difference between the two is that materials used for purposeful artificial reefs are cleaned of all pollutants and dangers before they are placed, while accidental artificial reefs still contain all the oil, gas, and other pollutants contained in a working ship, plane, or car (Leeworthy, Maher, and Stone, 2006).

2.3.2 Artificial reefs vs. transplanting corals

There are two main routes that coral restoration can generally take. The first is coral transplantation from existing coral reefs or coral nurseries to selected restoration sites; and, the second is building artificial reefs that work by recruiting corals on their own (Abelson, 2006). These two methods are sometimes also combined to have corals from nurseries transplanted onto artificial reefs. Coral nursery and restoration research is still being done to determine how much coral restoration benefits reefs, how quickly and substantially each technique produces healthy corals, and, ultimately, which is more effective, or if they should be used jointly. Coral transplantation is done by taking live coral fragments, often grown to the appropriate size in underwater coral nurseries, shown in Figure 2, and attaching them with cement or zip ties to a reef that has had reduced recruitment. Coral nurseries have been shown to be effective in growing over 86 different coral species at increased rates and with very little mortality (Rinkevich, 2014). Some of the benefits of coral transplantation as a type of restoration are: instant increase in coral cover, more recruitment to the area, and immediate shelter for reef-important organisms (Abelson, 2006).

Figure 2: Divers maintaining a coral reef nursery put in place by the local dive center. Photo from Stuart Cove's Dive Bahamas.

Artificial reefs, an example of which is seen in Figure 3, are man-made structures (either built for the purpose or repurposed) that have been sunk in order to mimic coral reef characteristics and attract growth (Baine, 2001). The main benefits of this type of restoration are that human activities, such as diving, are diverted away from real reefs and there is immediate refuge and sheltered habitat for other reef adapted organisms (Abelson, 2006).

Figure 3: Divers around artificial reef created by an old sunken ship. Photo by Stuart Cove's Dive Bahamas.

2.3.3 Underwater sculpture gardens

An underwater sculpture garden is described as a group of sculptures placed under water in a single area to attract divers and assist in coral conservation (Perdomo, 2012). The English artist Jason deCaires Taylor (also a self-described conservationist) has pioneered the idea of putting large-scale art beneath the sea (Perdomo, 2012). He has done 6 underwater installations throughout the world in The Bahamas, Grenada, Mexico, the Canary Islands, and two in England. Grenada was the first installation, completed in 2006 with 500 life-sized sculptures. The Canary Islands has the most recent installation, completed in 2016 and the first to include large architectural works such as a botanical garden (Taylor, 2017). In an interview with a Canadian reporter, deCaires Taylor stated that he sees his sculptures as an artificial reef created to draw humans away from the natural reefs while teaching them about living in harmony with

the ocean. Luring people away from natural reefs reduces damages such as fragmenting corals with hands or fins, stirring up sediment around reefs, or leaving trash on reefs. He sees many of his sculptures as a way of showing that we can have a "sustainable future" (Perdomo, 2012; Taylor, 2011). The sculptures have succeeded in at least one of his goals – providing a protective environment for growth of certain reef species on sculptures, made possible by his homemade mixture of pH neutral cement, and other ocean organisms (Perdomo, 2012; Taylor, 2011). After only three years of being underwater, deCaires Taylor's first set of sculptures in Grenada became covered in seaweed and some species of sponges, seen in Figure 4; and, while they are not at all full coral reef ecosystems, they do show how human life and sea life can be integrated (Perdomo, 2012).

Figure 4: One of the statues from deCaires Taylor's Grenada installation after being colonized by corals and algae. Photo from website of deCaires Taylor: www.underwatersculpture.com.

In 2014, the Bahamian marine conservation organization contracted deCaires Taylor along with two Bahamian artists to create the first sculpture garden in The Bahamas. It is described by the conservation organization as "a perfect fusion of art, education, and marine conservation" ("Coral Reef Sculpture Garden," 2014). The Sculpture Garden is located on the western side of New Providence Island with land

access through a local historic park and marine access via the Southwest New Providence Marine Managed Area. There is a path of reef balls which can be followed out to the three main statues. The first statue, seen in Figure 5, is the Lucayan face, flat in the sand, which was put in place out of tribute to the indigenous Bahamian people. The next statue one comes across is "Virtuoso Man," depicting an older man with a beard and a hunched back holding out a torch to the third and largest statue, "Ocean Atlas." Ocean Atlas, the largest single underwater sculpture in the world, reaches a little over 16 feet, weighs 60 tons, and depicts a young Bahamian girl holding the ocean on her shoulders (Taylor, 2017). The goal of these two statues was to show the older generation, depicted by "Virtuoso Man," handing the torch of marine conservation to the younger generation, "Ocean Atlas." These statues have yet to recruit any coral growth; but, there are fish, rays, and other marine

Figure 5: Lucayan face showing tribute to the indigenous Bahamian people is the first of the three main statues in the Sir Nicholas Nuttall Coral Reef Sculpture Garden. Picture from www.bahamasweekly.com.

Figure 6: Researcher with "Virtuoso Man" who is holding the torch of conservation and ready to pass it on to the younger generation. Photograph by Mallory Mediodia Raphael.

Figure 7: A snorkeler above "Ocean Atlas" is a young Bahamian girl holding the ocean on her shoulders. Picture from deCaires Taylors website www.underwatersculpture.com.

creatures in the area that Conservation Managers see while doing routine maintenance of the site.

The main goals the conservation organization hoped this Sculpture Garden would achieve were to promote sustainable tourism and marine conservation, educate about marine debris and marine pollution, and provide habitat for marine organisms in an area that was previously barren.

2.3.4 Environmental education

Environmental education is a means of teaching people about aspects of the environment in order to reach five objectives. These objects are to increase awareness, give an understanding of the environment and the issues it faces, improve attitudes towards the environment, provide skills with which individuals can identify or solve environmental issues, and provide opportunities to participate in benefitting the environment (Hungerford and Volk, 1990). Unfortunately, these objectives are not achievable by following any sort of linear path. There are many factors that go into instilling "responsible environmental behavior" in an individual through the use of environmental education (Hungerford and Volk, 1990). One component to creating effective environmental education is to teach individuals how interrelated the environment truly is and ensure they understand how different parts of the environment affect each other. Some other critical components include providing opportunities to observe in-person how sensitive the environment truly is, providing in-depth knowledge and understanding of problems the environment faces, and providing skills for understanding environmental problems that are then applied within the educational program (Hungerford and Volk, 1990). It is also extremely important to provide repeated opportunities to engage in environmental education and carry out

responsible environmental behavior. Having a single source of information with no further reinforcement is not practical or effective in promoting improved environmental behavior (Hungerford and Volk, 1990).

In relation to reef conservation education specifically, it was found that nearly 90% of tourists felt it is "sensible" to provide environmental education courses through dive centers and to give briefings on proper snorkeling and diving behavior in order to protect the sites being visited (Hannak, et al., 2011). Slightly under 89% also felt it was "sensible" to have well trained guides with snorkelers and divers in order to ensure proper environmentally friendly behavior. Approximately 78% of tourists agreed that it would be beneficial to business for dive centers to offer environmental education courses. Another study found that divers are more likely to participate in environmental clean-up or monitoring activities once they have experienced a need for these activities during a dive (Dartwell and Dulvy, 1996; Hodgson, 2000; Dearden, Bennett and Rollins, 2007).

2.4 Threats to New Providence, Bahamas coral reefs: Marine debris and oil pollution

2.4.1 What is marine debris and what are its impacts?

Marine debris is any solid anthropogenic waste that has been discarded, purposefully or accidentally, into the marine environment (Derraik, 2002; Sheavly and Register, 2007). Annually, around 6.4 million tons of marine debris is put into the ocean with generally 80% coming from land-based sources and 20% coming from sea-based sources (Baulch and Perry, 2014; Eryaşar, Özbilgin, Gücü, and Sakınan, 2014). Underwater debris as well as beach debris are collected by worldwide clean ups and grouped into various categories such as plastic, metal, rubber, clothing, glass, ceramics (Katsanevakis and Katsarou, 2004). These materials endanger many aquatic species

through entanglement, ingestion, and chemical leaching. They can also cause severe physical damage to vessels as well as coral reefs, such as scraping or fragmenting the corals (Abu-Hilal and Al-Najjar, 2009; Baulch and Perry, 2014; Derraik, 2002; Katsanevakis and Katsarou, 2004).

2.4.2 Oil pollution in New Providence and its effects

Oil pollution was found to be a huge topic of conversation when speaking with both Conservation Managers and Dive Tour Operators during this research. The researcher was informed that for about 30 years there have consistently been oil leaks emanating from the main power station on the island of New Providence, Bahamas which greatly impacts marine life and corals on the southwestern side of the island as well as the Coral Reef Sculpture Garden. Oil pollution in this area has been noted by experts in the past, such as members of Save the Bays and Waterkeepers Bahamas, as a significant problem causing stress to the coral reefs. While the experts attempted to petition the government to take action against the destruction caused by this oil pollution, there has been no sign of improvement ("Clifton tour shows threat of oil pollution to Bahamian waters," 2016). One expert stated that the government often hides their actions from the public to avoid accountability. He felt it the job of these environmental groups was to help inform the people so they could create transparency in the government ("Clifton tour shows threat of oil pollution to Bahamian waters," 2016).

Unfortunately, months after these experts made note of the oil pollution, Dive Tour Operators and Conservation Managers told the researcher it was still a huge problem. One respondent stated that the government had sold the power plant to an American company so that they could state the oil pollution was not caused by them,

although, this claim could not be backed up by any further reputable sources. Some of the Conservation Managers and Dive Tour Operators mentioned that the Coral Reef Sculpture Garden had actually been placed where it is in order to draw more local and tourism attention to this oil leak and push the government to take action toward remediation.

No matter who is responsible for the oil pollution, it continues to negatively impact the marine environment. Since the 1980's, the detrimental effects of oil pollution have been known as substantially decreasing colonization by reef-building corals, reducing the viability of colonies existing in areas, damaging the ability of corals to reproduce in a multitude of ways, decreasing life expectancy of coral larvae, lowering coral growth rates, damaging coral tissue, and increasing bacterial growth on corals leading to their destruction (Loya and Rinkevich, 1980; Etnover et al., 2016; Negri et al., 2016).

Oil pollution is often treated by dispersants as a way of breaking up the oil into droplets, effectively spreading it into the water column and down to the seafloor (Epstein, Bak and Rinkevich, 2000). The oil pollution in New Providence is treated this way. While this practice can be successful in keeping oil offshore, it makes the oil and dispersants more readily available to pelagic and benthic organisms (Epstein, Bak and Rinkevich, 2000). Dispersants alone are not toxic to invertebrates or fish; but, some studies suggest dispersants cause stress to corals and other cnidarians (Studivan, Hatch and Mitchelmore, 2015). Therefore, oil pollution treatment can cause further negative impacts on coral reef health.

2.4.3 Marine debris and oil pollution: Physical and emotional effects on humans

Marine debris and oil pollution pose many hazards to marine organisms; however, they can also be detrimental to humans. Beach debris can injure people by causing lacerations as well as promoting bacterial infections due to decreased water quality (Tudor and Williams, 2008). Oil pollution can cause a plethora of health problems for humans as well, especially those who have prolonged exposure. Volunteers cleaning up the *Hebei Spirit* crude oil spill in Korea showed symptoms including back pain, skin lesions, headaches, vision problems, dizziness, vertigo, and respiratory distress (Hong et al., 2014). Residents nearby have had increased anxiety, depression, fatigue, nausea, shortness of breath, and various other symptoms. These symptoms are caused by the large number of toxic constituents of oil including benzene, toluene, xylene, and polycyclic aromatic hydrocarbons (Hong et al., 2014).

Emotional tolls on people range from feeling negatively about an environment with debris or pollution present to becoming worried and annoyed just by knowing they are near the site of potential pollution (Nriagu et al., 2016). Beachgoers find beach and marine debris to be offensive, especially when it is comprised of things they perceive to be dangerous, such as medical waste (Tudor and Williams, 2008). Debris on beaches also tends to decrease the economic value of the area because tourists are not as interested in going to beaches that are not aesthetically pleasing and trash diminishes aesthetics (Jang, Hong, Lee, Lee, and Shim, 2014). In the Niger Delta of Nigeria, residents tended to be worried and annoyed by local oil production due to the potential physical damage they could be exposed to through spills and oil pollution (Nriagu et al., 2016).

Debris and pollution also have an impact on underwater users such as tourist divers and snorkelers. Musa, a researcher on the island of Sipadan in Malaysia, did a questionnaire and discovered that divers were concerned due to observing cans, plastic bags, coral damage, and traces of oil in the water. Divers were shocked and dismayed at what they saw (Musa, 2002).

2.4.3 Relating artificial reefs and underwater sculpture gardens to marine debris

Even though marine debris is described as any anthropogenic material that has made its way to the ocean environment and artificial reefs are manmade structures that have been placed in the marine environment, there is no research on whether people perceive a connection between the two. They are defined very similarly; however, marine debris has a negative connotation while artificial reefs, even accidental ones, have a positive connotation. What makes a shipwreck an artificial reef rather than marine debris? The answer to this question may merely be a question of people's perceptions. However, one clear difference between the two is that materials purposefully placed for use as artificial reefs are first cleaned thoroughly and any material that poses a potential hazard is removed (Leeworthy, Maher, and Stone, 2006). However, when there is an accidental wreck, it is, not cleaned or prepared in any way. And yet, both intentional and unintentional wrecks are sometimes considered artificial reefs. On the other hand, some marine debris becomes integrated into the ocean environment and provides an effective surface for growth and habitat for sea life, yet, it is still considered marine debris (Donohue, Boland, Sramek, and Antonelis, 2001). Because perception seems to play a large role in determining whether anthropogenic influences are considered helpful or destructive, the perception of

sculpture gardens is a very important part of deciding how effective these gardens are as a conservation tool. Different anthropogenic materials may shape perceptions and therefore the value of these underwater sites in a marine tourism context.

2.5 The relationship between tourism and coral conservation

2.5.1 Uses of artificial reefs

Artificial reefs are used for various reasons around the world. In Japan, they are mostly used to benefit fisheries by providing habitat and shelter for juvenile species. In the United States, artificial reefs are often used as recreational dive sites and dive tourist destinations (Baine, 2001). In 2013, it was estimated that the United States and its territories gets $202 million annually from coral reefs, half of which comes from tourism (NOAA, 2011). Throughout Europe, artificial reefs are erected to prevent put a stop to trawling in areas where it should not occur (Baine, 2001). While this is how artificial reefs are often used in each of these geographic locations, it is not the only way they are used. Artificial reefs are located throughout the world and have multiple uses in each location.

Many of these worldwide artificial reefs are used for dive tourism, which has continued to grow as an industry. For example, diving has become extremely popular in Thailand. One small island, Koh Tao, provided the second highest number of SCUBA certifications in 2011 and is overflowing with more than 60 dive schools and some artificial reef sites that attract and involve tourists in their creation (Meyers, 2016). In Dubai, a company called Reef Worlds is working to build a sustainable underwater tourism site that will be one of the biggest artificial reef sites in the world. The company says that divers and increased tourism will only be a byproduct of their true goal which is creating a large marine sanctuary (Donahue, 2016).

In terms of marine tourism, it has been seen that accessibility and positive experiences with an artificial reef site are the biggest factors in the amount of use it gets (Ditton et al., 2002). It was also found that the diversity in species at a site was not as important to visitors, unless the diversity was correlated to the number of most "desirable" species seen (Ditton et al., 2002). Even if there is a small number of species at an artificial reef site, divers will still be pleased as long as the species they are most interested in seeing are present, as this constitutes the sites value for them (Rudd and Tupper, 2002). Other factors that were important to tourists in choosing an artificial reef site to visit were that it should be relatively shallow (less than 100 feet), and it should contain a sunken vessel (Milon, 1989).

As a site for fisheries, it was found that diversity of species also did not matter, as long as the species most desired for fishermen were present on the reef (Rudd and Tupper, 2002). It is not possible to compare natural and artificial reefs while controlling for reef size, age, or degree of isolation because artificial reefs are most often lesser in all three categories (Santos, Oliveira, and Cúrdia, 2012). A study was therefore done by comparing a natural reef and artificial reef which were comparatively isolated and had the same general height above the sediment (Santos, Oliveira, and Cúrdia, 2012). It was demonstrated that the total number of reef species and the average density of fish present was comparable between the sites using these two constraints (Santos, Oliveira, and Cúrdia, 2012). The most notable difference between the two was that natural reefs had more benthic organisms because they have greater rugosity and therefore more spaces in which to take shelter (Santos, Oliveira, and Cúrdia, 2012). Since both types of reefs have the same general composition and

abundance of species, artificial reefs can be assumed to be as beneficial to fisheries as natural reefs are.

2.5.2 Reef based tourism

Many tropical countries throughout the world have economies that are increasingly relying on coral reef tourism, and The Bahamas is no exception (Andersson, 2007). In order to have a symbiotic relationship between tourism and the marine environment, the health of reefs must be taken into account. When reefs begin to decline, it becomes a relationship in which tourism is being exploitive rather than educational or productive. Without proper planning and regulations, many forms of marine tourism can threaten reefs. Reefs can be used by tourists who want to snorkel, SCUBA dive, swim, kayak, fish, and wade in shallow waters (Hannak, Kompatscher, Stachowitsch, and Herler, 2011; Juhasz, Ho, Bender, and Fong, 2010). Damage often occurs when branching corals are fragmented due to contact with tourist bodies or massive corals are covered by stirred up sediment from tourist movement in the water (Chabanet et al., 2005; Hannak et al., 2011). While local people may participate in the same activities, it has been found that tourist beaches (where the majority of beach goers are tourists rather than local residents), especially those with more people visiting them, have more damage to corals (Juhasz et al., 2010).

2.5.3 Bahamian tourism and importance of sustainable tourism

Tourism in the Bahamas began in the 1920's during the winter season and began to flourish year-round in the 1950's and 1960's after World War II (Bounds, 1972). In 1997, the Bahamas had 1,617,595 visitors coming from the U.S., Europe and Canada (Buchan, 2000). In 2015, 6 million tourists visited The Bahamas by either land or sea (Ministry of Tourism, 2015). Over 50% of these visitors came for the coastal

and marine environments, citing their main attraction was to the beaches or water sports including SCUBA diving and snorkeling. Due to this influx of tourists, the Bahamas has seen large increases in coastal development (Buchan, 2000). Some of the detrimental impacts caused by this development have been deforestation, wetlands destruction, sand mining, and increased pollution causing a decrease in water quality (Buchan, 2000). However, the Bahamian Prime Minister stated that "tourism is the lifeline to the Bahamas" (Moore, 2016). Therefore, it is important to find an appropriate balance between the benefits and detriments tourism creates.

It has been proven that human activities over the past couple of hundred years have had a huge effect on the planet Earth; and, this time period, in which we continue to live, has been informally deemed the Anthropocene (Crutzen, 2002; Moore, 2015). The recently presented idea of the Anthropocene, along with attention to anthropogenic global change in the form of climate change and other changes like biodiversity loss, has given rise to more social awareness of the effects humans have on the environment, causing more focus to be put towards sustainability (Moore, 2015). This focus can even be seen in tourist dependent regions, including The Bahamas, through the increase in sustainably branded tourism. Caribbean tourism has typically been dominated by foreign owned resorts with little consideration for the spread of tourist wealth within island communities. A shift to local forms of sustainable tourism could potentially mean promoting more equitable economic growth in the area while preserving natural resources. However, tourists in The Bahamas are often said to be looking for the typical all-inclusive resort atmosphere,

which may complicate the local efficacy of the sustainable tourism economy (Moore, 2015).

The sustainable tourism industry generally aims to incorporate its resorts and attractions into the beautiful environment that surrounds them and improve tourists' relationships with that environment (Moore, 2015). This is exemplified through the earlier examples of Reef World's underwater tourism site and, in The Bahamas, the Coral Reef Sculpture Garden. The sustainable tourism industry begins with the premise that if given a chance, people would like to limit their impacts on the marine environment. Sustainable tourism destinations and products are designed to give visitors the ability to appreciate the complexity of the ocean system. The Sculpture Garden is intended to allow this appreciation while also incorporating knowledge of how unsustainable practices are affecting the oceans and depictions of the important role Bahamians have in protecting their vulnerable coral reef environments (Taylor, 2017).

2.6 Using public perceptions research to benefit marine conservation through tourists

This study explores public perceptions to interpret how relevant audiences view the marine environment and marine conservation. Public perceptions research is a method of social science that can give insight into the heterogenous environment that makes up human feelings and interactions with the ocean in order to find common themes (Jefferson et al., 2015). Once these varying perceptions have been analyzed, it makes it possible to create education and promotion initiatives that focus on the main aspects brought up by the involved parties. Perceptions research can be used to look at both positive and negative aspects of marine conservation, such as what marine environments people are interested in and what issues people are concerned about,

respectively (Jefferson et al., 2015). As used here, perceptions of three groups were taken into account in relation to marine conservation and tourism. Determining differences and similarities between these three groups can provide valid insight into how marine conservation can be benefitted by tourism, and vice versa (Jefferson et al., 2015).

2.7 Bringing it all together

Coral reefs are incredibly complex and sensitive ecosystems which support coastal areas economically, as well as physically; and, a majority of these ecosystems around the world are deteriorating (Abelson, 2006; Rinkevich, 2014; Sanchirico, 2008). A controversial argument is that underwater sculpture gardens and artificial reefs are new methods of drawing anthropogenic-related dangers away from coral reefs. This argument will remain controversial in New Providence because there has been no research done to prove people visiting The Bahamas are visiting coral reefs less merely because there are more anthropogenic structures to see. A less controversial argument is that underwater sculpture gardens and artificial reefs provide visual information and educational opportunities for sustainable human interaction with the ocean environment (Taylor, 2011; Perdomo, 2012). However, this leads to another question as to whether or not these anthropogenically modified structures can truly educate tourists about a natural reef environment.

In addition to intentional anthropogenic interventions to aid coral environments, such as sculpture gardens and artificial reefs, marine debris can also be found in the marine environment. While artificial reefs, sculpture gardens, and marine debris are all defined as anthropogenic materials placed or discarded into the marine environment, they are not found in the literature as being seen with the same

connotation (Derraik, 2002; Sheavly and Register, 2007). This study investigates how Dive Tourists, Conservation Managers and Dive Tour Operators perceive the various environments they encounter, the importance of these environments, marine debris and marine pollution in the ocean environment, and whether artificial reefs actually create the conservation benefits that those who install them hope for.

These tourist perceptions are important because sustainable tourism is becoming a growing industry. More often, sustainable tourism destinations are incorporating artificial reefs and sculpture gardens in order to help tourists appreciate the complexity of the ocean system, while at the same time promoting coral conservation. The Bahamas has tourism sites promoting snorkeling and diving on coral reefs, artificial reefs, and its Coral Reef Sculpture Garden. However, it has not been determined how tourists perceive the artificial reefs or the Coral Reef Sculpture Garden and whether the experiences and educational initiatives are being promoted as Conservation Managers and Dive Tour Operators hope for them to be. This study describes what the goals are for these Conservation Managers and Dive Tour Operators and investigated the actual experiences of tourists. This study provides insight into gaps that exist and gives Dive Tour Operators and Conservation Managers knowledge to better maintain and develop their sites for maximal marine conservation effect within the tourism industry of The Bahamas.

CHAPTER 3: METHODS

3.1 Research design:

This research took place in The Bahamas on the island of New Providence using qualitative research methods. Semi-structured interviews were completed with Conservation Managers, Dive Tour Operators, and Tourists participating in underwater activities. The semi-structured interviews used open-ended questions allowing flexibility for each interviewee to elaborate upon the topics they felt needed further explanation, they knew more about, or they felt were most interesting (Robson 2011).

All interviews, except two, took place in person with the researcher traveling to the interviewees. One remaining interview was done over the phone and the second was done via Skype for the interviewees' convenience. Interviews with Conservation Managers and Dive Tour Operators all took place at the interviewees place of work and lasted between 30 and 50 minutes. All interviews with tourists took place at the nearby dive center and lasted between 10 and 15 minutes. These interviews were used to gauge the differences and similarities in expectations and perceptions among the three groups regarding various aspects of marine tourism. Some of these aspects included the information provided to and gained by tourists, perceptions of anthropogenic materials in the ocean environment, and expectations about underwater tourism experiences.

3.2 Data collection:

The researcher spent 10 days in The Bahamas collecting data. For Conservation Managers and Dive Tour Operators, purposive sampling was used to begin the research. The heads of a prominent coral conservation organization and dive

center were identified and contacted via email and phone, respectively, to determine whether they would be willing to participate in the study. These organizations were chosen due to their intimate ties with the Sir Nicholas Nuttall Coral Reef Sculpture Garden. The coral conservation organization put the Sculpture Garden in place and maintains it while the dive center helped with the Sculpture Garden placement and is in close proximity to it, compared to the other dive centers on the island. This proximity allows this dive center to use the Sculpture Garden as a site much more often than other dive centers. After speaking with the heads of these organizations, the snowball interview sampling method was used to determine other Conservation Managers and Dive Tour Operators that would be willing to participate. Conservation Managers were considered to be Bahamian citizens working in environmental nonprofit organizations at any level; they were not necessarily "managers" in their work environment. Dive Tour Operators were considered individuals who owned, operated, or were employed by marine tourism ventures. Both heads allowed the opportunity to interview any of their employees the researcher desired. The head of the coral conservation organization also gave suggestions of government officials associated with tourism and coral conservation management that would be beneficial to speak with. These government officials were also considered to be Conservation Managers.

For tourists, a mixture between purposive and convenience sampling was used, as defined by Robson (2011). The researcher interviewed tourists at the local dive center after they had finished with their underwater activities and were waiting on the main porch for their busses to arrive. This was convenience sampling because only

tourists who were at that dive center and had time to answer questions were interviewed before they had to take busses back to their respective accommodations. It was also purposive because the researcher chose a spot at which marine tourists would easily be found. The researcher also purposively chose tourists who were not eating or previously engaged in other activities or conversations and the researcher attempted to interview a broad range of the available tourists. The researcher also attempted to interview approximately the same number of males and females and a full spectrum of ages.

The interview protocol for all groups can be found in Appendix (A).

3.3 Data analysis:

A total of 30 interviews were done. Fifteen tourists were interviewed, which is not representative of the number of tourists that participate in activities at the dive center every year. However, time was constrained due to the rapid turnover of tourists at the dive center and the inability to interview while tourists were participating in underwater activities, getting ready to participate, or cleaning up afterwards. Seven Conservation Managers were interviewed which is representative of Bahamian Conservation Managers involved with the Sculpture Garden considering most of employees at the non-governmental organization were interviewed and it was in charge of putting in and maintaining the Sculpture Garden. It is not representative of the government participants in managing the marine environment, although two department heads were interviewed. Eight Dive Tour Operators were interviewed which is not representative of Dive Tour Operators in The Bahamas; but, it was

representative of Dive Tour Operators involved with the Sculpture Garden since this particular dive shop is so closely tied with that site.

All Conservation Manger and Dive Tour Operator interviews, which lasted between 30 and 40 minutes, were recorded and the respondent's answers were transcribed. All handwritten notes from Tourist interviews, which lasted approximately 10 minutes, were typed up in a format that allowed for easy comparison of answers. Data was read multiple times before researcher began analysis. It was ensured during this time that all answers were related to the question the researcher had asked. Each question from each group was analyzed individually to determine similarities and differences among respondents. Once similarities and difference between answers were determined, the general themes that came out in each answer summarized for every group. Succinct summaries of the data for each group were created through this secondary evaluation. Themes emerging from the secondary analysis are explained in the results section.

CHAPTER 4: RESULTS

It should be noted that not all respondents were asked every question. This was due to time constraints and human error. There are morning dive trips and night dive trips with the majority of tourists only being available directly after they dive for a maximum of about 15 minutes before they get on their busses and return to their resorts. It was therefore possible to only interview between one and three tourists after each trip and I was only able to be at the dive center for approximately 5 of the days I was in The Bahamas. Human error was also an issue because I accidentally skipped over a question with a couple of the Dive Tour Operators and Conservation Managers.

4.1 Tourists

4.1.1 Demographic

Tourists interviewed ranged in age from 19 to 57 years old and had various occupations. The majority were professionals in either white collar jobs; including two engineers, a surgeon, an operations manager, and a retired government contractor; or, blue collar jobs such as a tool maker, a boat driver, and a coal miner. Two students were also interviewed. Tourists interviewed were all foreign to The Bahamas, visiting from either the United States, Canada, or a European nation. All tourists came to The Bahamas for vacation.

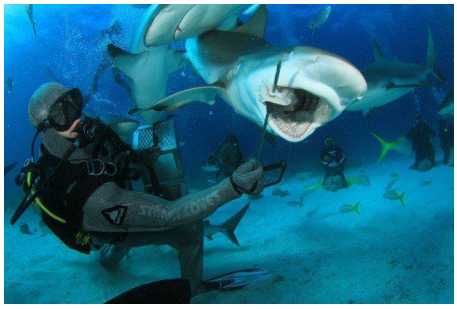
4.1.2 Underwater activities and interests

All tourists interviewed, except one, participated in underwater experiences offered through the local dive center, which is not surprising considering they had already made the decision to experience marine-based activities. Experiences are described and depicted in Table 1. The one tourist who did not participate in a marine-based activity was traveling with a spouse who participated in SCUBA diving.

Overall, the tourists encountered at the dive center experienced a multitude of underwater environments including: The Coral Reef Sculpture Garden, artificial reefs such as plane and shipwrecks, a coral nursery, real coral reefs, the wall along the Tongue of the Ocean, and "strong current environments." However, most of them experienced only a subset of these environments, rather than being able to see all of them on their visit to the center. All tourists experienced at least two of the environments, not including the tourist that did not participate in underwater activities.

Table 1. Underwater activities in which tourists participated in while on vacation in The Bahamas. Includes picture and description of each activity. All pictures by Stuart Cove's Dive Bahamas.

Type	Description	Picture
SCUBA Diving (Self-Contained Underwater Breathing Apparatus)	A tank with compressed air is attached to a vest which inflates or deflates to allow for proper buoyancy. The tank is also attached to a device which allows participants to breath from it for up to an hour or more depending on tank pressure.	
Dive Propulsion Vehicles	People participating in SCUBA activities can also use these underwater devices which propel them through the water in order to see more area in the same amount of time.	

SNUBA (Surface Nexis Underwater Breathing Apparatus)	An air supply floats on the surface while participants use a regulator attached to a long hose to breath at depth. Masks and fins are used and an instructor/guide accompanies in SCUBA gear.	
Snorkeling	Participants use a mask, fins, and a tube called a snorkel in their mouth. The tube protrudes out and up into the air allowing participant to breath while keeping his/her face in the water.	
Shark Encounters	Participants must be SCUBA certified. SCUBA gear is worn down to depth where Tour Operators feed bait to sharks allowing them to swarm in front of and near the participant.	
Underwater Subs	Participants sit and place their heads in a large glass bubble which stays filled with air via cylinders attached to the front. A buoy at the surface holds subs up while participants use controls to maneuver the vehicle.	

The variety of environments available reflected the tourists' interests. Interests of tourists are described in Table 2. Seven of the tourists were interested in seeing live

corals, six were interested in seeing marine life, one specifically stated being interested in "big megafauna like sharks, rays, turtles, or small and unique things like seahorses or lobsters," and five were interested in seeing some sort of wreck or artificial reef. Only one of the tourists specifically stated being interested in seeing the Coral Reef Sculpture Garden and another was interested in seeing the Tongue of the Ocean, which is the oceanic trench between two Bahamian islands reaching over 6,000 feet deep. Most tourists stated one or two interests; therefore, these responses overlap to a degree.

Table 2: The environments tourists at the dive center were most interested in seeing on their underwater excursions. All pictures by Stuart Cove's Dive Bahamas except Sculpture Garden by Rosie Poirier and Tongue of the Ocean by www.smallhope.com.

Environment	Description	Picture
Coral Reef	Underwater ecosystems created by hard corals made of calcium carbonate and covered filled with other soft corals and algae to make a home for a plethora of marine organisms.	
Marine Life	Any organism living with the ocean environment. Participants namely mentioned wanting to see charismatic megafauna, as seen here, or small, unique creatures like seahorses.	

Wreck/Artificial Reef	Remnants of a boat sunken either by accident or on purpose are wrecks. These, and other types of structures, stay in the marine environment long enough to allow for coral growth and accumulation of marine life similar to a coral reef, without a calcium carbonate backbone. Through this, they become artificial reefs	
Sir Nicholas Nuttall Coral Reef Sculpture Garden	Underwater sculptures made from pH neutral cement and put in place to attract marine life, promote coral growth, and educate tourists about marine conservation. Researcher seen here next to one of the three main statues, “Virtuoso Man.”	
Tongue of the Ocean	The 6,000-foot-deep oceanic trench, separating Andros Island from New Providence and the Exuma Cays, on the side of which live many corals and marine organisms. Divers are taken down along it for deep dives and to see live coral reefs.	

4.1.3 Sir Nicholas Nuttall Coral Reef Sculpture Garden

Eight of the tourists had never heard of an underwater sculpture garden while seven had. Eleven of the tourists did not know about the Coral Reef Sculpture Garden in The Bahamas. Four tourists had heard of the Bahamian Coral Reef Sculpture Garden. Seven of the tourists did not know the reasons behind the construction of the Bahamian Coral Reef Sculpture Garden while four speculated reasons as to why it was constructed, such as memorial purposes, regrowth of coral, or "environmental reasons." One tourist just stated that he/she did know the reasons why it was put in place.

Eight of the tourists had not seen any promotional or educational materials regarding the Coral Reef Sculpture Garden while they had been in The Bahamas or previously. Three of the tourists stated they had seen educational or promotional materials. One of these tourists had learned about it previously through National Geographic and Facebook while the same tourist and a second also saw promotional materials on the dive center bus that had transported them there. The third did not specify where promotional or educational materials were observed or what the materials were. These three tourists stated that they did read the materials, and in some cases even searched for more information regarding the Coral Reef Sculpture Garden. One of them also mentioned that the promotional video playing on the dive center bus seemed to intrigue other tourists; but, this was not observed directly by the researcher. One tourist stated the instructor on the dive boat provided some education about the Coral Reef Sculpture Garden. When asked what educational or promotional materials would interest tourists in learning more about the Sculpture Garden tourists mentioned the following:

Promotional/Educational Materials Suggested:

- Video
- Picture Book/Poster
- Pamphlet/Brochure
- Dive Center Briefing
- Nothing (*tourist felt nothing could interest him/her in learning more)

Of these suggested materials, some videos, posters, and dive center briefings already exist. Videos are mainly provided on the dive center buses and have are occasionally shown on some of the cruise ships, while also being available on the internet. There is a poster of the Sculpture Garden at the conservation organization headquarters; but, the poster at the dive center blew away during Hurricane Matthew. Pictures of the Sculpture Garden are also available at the dive center and online; however, a book of pictures has not been put together.

4.1.4 Marine debris and marine pollution

Eleven of the fifteen tourists had heard the phrase "marine debris," while 14 had heard the phrase "marine pollution." Three of the tourists had not heard the phrase "marine debris," and one was not asked about either of these phrases due to a lack of interview time. Five of the tourists had seen some sort of marine debris while participating in Bahamian underwater activities. One of the tourists had seen marine pollution and two of the tourists had seen both marine debris and marine pollution while in The Bahamas participating in underwater activities. Five of the tourists had not seen any marine debris or marine pollution while in The Bahamas. Figure 8 gives a visual representation of the number of tourists who saw marine debris, marine pollution, marine debris, or neither. According to this case study, the tourists

interviewed had slightly over a 50% chance of seeing marine debris or marine pollution while in The Bahamas.

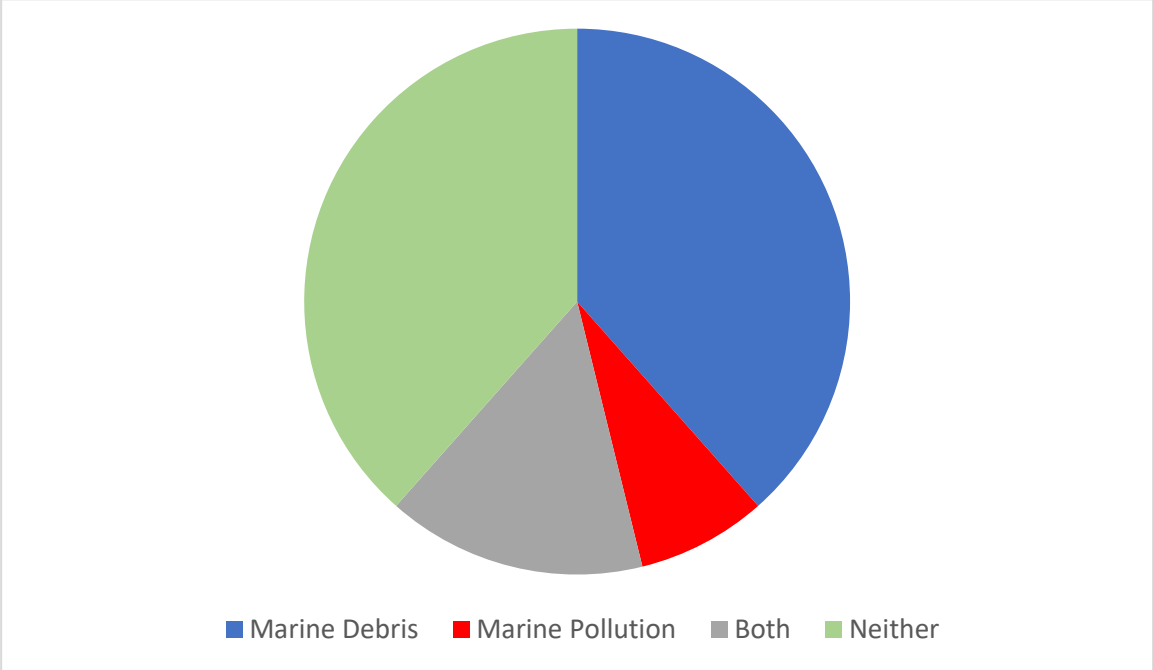


Figure 8: Percentage of tourists that saw either marine debris, marine pollution, both, or neither while vacationing in The Bahamas.

Nine of the tourists stated that seeing marine debris or marine pollution made them sad. One tourist said that marine debris and marine pollution "take away the authenticity and preservation" of the environment." Five tourists, three of whom also stated feelings of sadness, specified feeling angry when they observed debris and pollution. Three other tourists stated feeling bad, feeling that people should clean up debris and pollution, or feeling disgusted.

Eight of the tourists had heard of an artificial reef and two tourists had not heard of an artificial reef. The tourists that had heard of an artificial reef had various thoughts about what an artificial reef is for. Some thoughts regarded a place for corals to live, an attraction for fish and wildlife, and a form of protection.

When asked whether shipwrecks should be considered marine debris or artificial reefs, six of the tourists felt that wrecks could be considered either, "depending on whether it was purposefully or accidentally placed" or "depending on the environment." Five of the tourists considered ships to be only artificial reefs and two of the tourists believed shipwrecks could be only considered marine debris.

Regarding benefits of human-made materials being in the marine environment, two tourists felt that materials can be beneficial, as long as they are providing habitat for marine organisms. One stated human-made materials are beneficial "if it's put there to encourage coral reef" growth. Five tourists felt human-made materials in the marine environment can be beneficial or detrimental, depending on the material and context. Four tourists felt that human-made materials can never benefit coral ecosystems, while one tourist was unsure about the effects.

All 12 tourists asked about whether human-made materials can harm coral ecosystems stated they felt negative impacts could come from these types of materials. Four of them felt that the amount of harm correlated with the type of material released into the environment. Overall, it was stated that litter and pollution, especially in the form of oil, cause negative impacts on coral reef ecosystems.

Only five tourists were asked how human-made materials affect coral ecosystems either because of time constraints or because they had answered the question previously through other questions. The tourists that were asked this question all had specifically different answers, but generally the same feeling towards human-made materials in coral ecosystems. They felt that human-made materials contaminate and damage reef ecosystems and can even cause them to smell. One tourist felt certain

human-made materials could benefit a coral reefs habitat diversity, but that others would just destroy coral and marine life surrounding it. The overall list of materials that tourists felt were acceptable in the marine environment consisted of biodegradable materials, concrete, wood, metal, and plastic. However, two tourists specifically felt that plastics should not be allowed in the marine environment due to the way they photodegrade. One tourist had general statements such as the material should be "non-toxic and not harmful to animals." When asked who was qualified to make the distinction of what is allowed in the marine environment, tourists gave combinations of the following: scientists, engineers, marine biologists, government agencies, "trained people," marine fisheries people, and individuals, meaning average citizens. Some tourists felt that scientists and government needed to work together, while others felt that only one of those groups should be in charge. Only one tourist felt that this could be determined by individuals.

Only seven of the fifteen tourists had time to answer the question regarding knowledge of existing policies surrounding marine debris and marine pollution in The Bahamas. Six of those seven had no knowledge of any specific policies surrounding these topics. The seventh tourist did not know any specific policies; but, had seen signs stating no glass allowed on certain beaches which correlated to reducing glass debris.

When asked about the importance of the Bahamian coral reef system, seven tourists stated generally that they felt coral systems related to sustaining marine life, fish health or habitat, and the ecosystem. Four tourists had more specific thoughts about the importance of coral systems. Some of these specific thoughts included of

coral reefs being important for tourism, economy, coral ecosystems, protection, and food supply, such as fish and lobster.

4.2 Conservation Managers

4.2.1 Demographic and training

A total of 7 Conservation Managers were interviewed. The Conservation Managers ranged in age between 34 and 62. One 19-year-old student was also interviewed as a conservation manager due to a previous internship position at one of the local non-profit conservation organizations. Besides this student, the Conservation Managers were all professionals in a career dedicated to marine conservation in The Bahamas. Four worked for a Bahamian non-profit marine conservation organization and two worked for the Bahamian government in two separate departments. All Conservation Managers held at least a bachelor's degree from a college located in the United States. Four of these managers held degrees in a field relating to environmental studies or marine science specifically. One of the managers has a master's degree in economics, and a second is working on a master's degree. The student interviewee is working on a bachelor's degree at a university in Canada. This shows that all people interviewed as Conservation Managers were well educated.

The Conservation Managers had all been in their current positions for at least two months; however, some of them had been in their current position for years longer than this. Eleven years was the longest that one of the managers had been in their current position. Another had been in the current position for 5 years; but, had worked in the same department for a previous 16 years. Each position had specific training that went along with it. Some of the training was outside their organization, such as working as a manager for a wastewater engineering company in the United States or

Climate training from Oxford. Other training was done in-house, such as educational content training on what the non-profit organization hoped to convey to those they educated.

4.2.2 Sustainable tourism

All the Conservation Managers interviewed felt positively about the idea of sustainable tourism in The Bahamas; but, also believed that it could improve from where it is currently. The Managers each gave their own thoughts on how sustainable tourism could be improved, such as creating an open market for tourism by having more experiences that have an "intimate feel" instead of only the "resort feel" so that tourists can choose what experience they want, educating Dive Tour Operators further so that they can pass along knowledge to tourists, or increasing monitoring and surveillance of fishing practices. One Manager felt that ecotourism has increased in The Bahamas; but, that it is not necessarily sustainable. Another Manager felt tourism has become sustainable; but, that there will always be room for improvement.

Conservation Managers were asked what they think tourists get out of seeing various aspects of the marine environment in terms of enjoyment, experience, and education, when participating in marine activities related to the coral reefs, artificial reefs, and the Coral Reef Sculpture Garden. Most of the Managers regarded the Sculpture Garden as being an artificial reef rather than considering it to be a separate environment. Three of the Conservation Managers noted the beauty of the marine environment and the clear water as a source of enjoyment for tourists. Two of the Managers spoke of tourists gaining beneficial experiences with marine life and marine ecosystems through participating in marine related experiences. Two other Managers pointed out the oil pollution from the nearby power plant as being a negative

experience for tourists regarding the Bahamian marine environment. Only one of the Managers discussed feeling as though tourists as well as locals should learn more about specifically fishing regulations in The Bahamas.

When asked what they hoped for tourists to gain from underwater experiences, three stated they hoped for a further "awareness" of either the marine environment or environmental issues such as debris and oil pollution. Overall, six Conservation Managers asked this question hoped underwater experiences would improve tourists' knowledge of the marine environment and that they would use this knowledge in future endeavors. One of them stated they hoped tourists would "gain understating of the complexity of the ocean environment." One Conservation Manager felt tourists were gaining exactly what s/he hoped they would gain.

4.2.3 Artificial reefs

All Conservation Managers seemed to designate the Coral Reef Sculpture Garden as an artificial reef rather than a separate type of habitat. All responses were positive about the importance of coral reefs in terms of being food and shelter for marine organisms, protection for the coastline, enticement for tourists, a source of fisheries, habitat for juvenile organisms, and a source of medicine and various other resources. Managers felt the biggest difference between natural coral reefs and artificial reefs was the time it takes for them to evolve. The second difference noted was that "natural reefs tend to have more intricacies, cracks, and crevices than artificial reefs." They also felt that artificial reefs provided better habitat when they were created with more crevices in a similar fashion to natural reefs. Artificial reefs were seen positively by all conservation managers as a way to reduce pressure on natural reefs. One Manager felt there were no differences between natural and

artificial reefs because they "all enhance experiences of the marine environment." This was under the assumption that the artificial reefs did not contain materials harmful to the environment, such as oil.

Managers varied in their opinions on the benefits of tourists visiting certain underwater environments. Four Managers felt tourists visiting artificial reefs was the most beneficial because that reduces diving pressure on and damage to natural reefs. One Manager felt tourists benefit from seeing a variety of sites rather than just one. One Manager felt seeing either created the same impact of experience and the last Manager felt that there was no difference in seeing one environment over another.

4.2.4 Sir Nicholas Nuttall Coral Reef Sculpture Garden

Four of the seven Managers stated that the NGO in charge of the Coral Reef Sculpture Garden provided a kiosk with information about it. The kiosk had four panels discussing species seen in the area, threats to the marine environment, how to be a sustainable diver, and an explanation of the sculptures and the story they tell. Unfortunately, Hurricane Matthew destroyed this kiosk. Managers also stated there is information about the Sculpture Garden on the NGO's Facebook page and website and it has been featured in various news articles. Two of the Managers did not know of any promotional or education materials regarding the Sculpture Garden.

The five Managers asked about further promotional and educational opportunities that have not been utilized regarding the Sculpture Garden all felt that there were opportunities available. One Manager believed the old kiosk should be updated and re-instated at the shore entrance within the park which provides shore entrance to the Sculpture Garden. This Manager also felt dive centers should hang more posters highlighting the Sculpture Garden and increase the quality of pre-dive

briefings when bringing tourists there while cruise ships should provide promotional videos to tourists highlighting the Sculpture Garden before they arrive. One Manager felt there should be a substantial plan for promoting the Sculpture Garden, especially through the park providing shore entrance to the Sculpture Garden, and another Manager wanted a program that would regularly take school groups to the Sculpture Garden. Both these Managers said that unfortunately these plans are not feasible right now due to the unpredictability of the oil pollution. Three Managers felt technology should be used more often to promote the Sculpture Garden through videos or potentially some sort of phone "app." Two of those three Managers also mentioned brochures, and one of them felt the promotions should be aimed at locals rather than tourists. This Manager felt that many of the locals, especially children, do not get the opportunity to "learn about their own backyard."

4.2.5 Marine debris and marine pollution

One Manager was not asked this question because he/she did not work directly with tourists. Another Manager said he had not heard any tourists' opinions on marine debris or marine pollution. All other 5 managers mentioned they had heard tourists negatively discuss the oil pollution surrounding the Sculpture Garden. These comments came either directly to managers or through an online forum such as TripAdvisor or Facebook. One Manager stated that in trying to bring potential donors to see the site, the wind changed and oil pollution covered them all. The donors were in disbelief that such a problem would not be taken care of by the government. Another Manager noted he/she is often unable to bring school groups to the site due to the unpredictable nature of the oil. Plastic bags being seen as marine debris were also noted as a concern by tourists.

All the Conservation Managers had either personally experienced, or heard of, marine pollution or marine debris being present at various sites. Three Managers noted oil pollution being present specifically at the Coral Reef Sculpture Garden and two of those three had also experienced dispersants in the water along with oil. One Manager stated that "from time to time there are oil spills" in The Bahamas as a whole; but, said that they were not a regular occurrence in New Providence. Two of the Managers discussed having experienced or heard of marine debris in New Providence. One Manager discussed doing a Dive for Debris and said the most common items found were fishing line, single use plastic bags, large tires, Styrofoam, and bottles made of plastic or glass. The second Manager had only heard of the department getting complaints from tourists regarding trash on the beaches.

Two of the Managers were not asked whether or not they have processes of removing marine debris from their sites because they do not go out in the field. A third Manager was not asked this question inadvertently. Two Managers mentioned they did not have a way of removing oil, the most prominent form of pollution seen, from the Coral Reef Sculpture Garden. One of those Managers, along with another mentioned either the non-profit agency or the local dive center participating in marine debris clean-ups as a way of removing debris from various sites.

When asked about policies in The Bahamas regarding marine debris and marine pollution one Manager stated that the Port Department regulates against ships discharging wastewater into Nassau Harbor. However, it was also revealed that cruise ships specifically have been seen discharging plastics, showing that the regulations are not always enforced. Two policy Managers suggested discussing this question with the

Ministry of the Environment for an accurate answer. The final Manager stated that it is definitely against the law to litter as well as dump trash from ships and if there were any further policies, they were not well-enforced enough to be notable.

Managers were asked what policies they felt were missing in The Bahamas in regard to marine debris and marine pollution. One Manager felt the most prominent issues requiring legislation within the Bahamian government were the oil pollution emanating from the local power plant, and the lack renewable energy resources to support the islands. Another Manager stated that "anything that is a protector of the marine environment is good," implying that environmental policies need to be implemented into the legislation system. This Manager also felt Bahamian citizens should have a voice in creating new legislation. Two of the Managers stated that the biggest necessity was for the government to enforce the policies that already exist. One Manager stated it was "futile to create more legislation for things that are not even being enforced in the first place."

4.2.6 Other

Six of the Conservation Managers stated they did not have any questions they were expecting which were neglected to be asked of them. The seventh Manager did not have a question regarding the interview; but, did suggest it would be interesting to ask tourists how much they would be willing to pay to see the Coral Reef Sculpture Garden and have it clear of oil.

4.3 Dive Tour Operators

4.3.1 Demographic and training

A total of eight Dive Tour Operators ranging in age from 23 to 58 and who all work in the same dive center were interviewed. Five of the eight Dive Tour Operators

were in their 30's, two were in their early twenties, and one was 58 and the dive center owner. All Operators were certified as dive instructors and some had positions that were further advanced or specified such as PADI Course Director/Head of training, PADI shark feeder trainer, and Underwater Film Production Manager. Dive Tour Operators were chosen as interviewees based on their availability and who the PADI Course Director deemed appropriate. The researcher did request to speak to instructors who were also locals and interviewed 2 Bahamian dive instructors. The dive center owner was also Bahamian while the other instructors were from various areas such as the United States, England, and South Africa. Dive Tour Operators had been in their positions for a maximum of ten years, not including the dive center owner who has been in his/her current position for 40 years. Two had been in their positions for 7 years while three had been there between 2.5 and three years.

The dive center owner began SCUBA diving at the age of five and has not had any business training. He/she stated that "business is about passion" and his/her passion is SCUBA diving and helping others realize the beauty of the underwater environment. All dive instructors went through the certification path of being Open Water, Advanced Open Water, and Rescue Divers. They then became Divemasters and Assistant Instructors before becoming Dive Instructors. One Operator further advanced by becoming a PADI Course Director. This instructor also has a degree in Sports and Recreation studies. Two of the Tour Operators went through training to become shark feeders and then one moved on to become a shark feeder instructor while the other began learning about coral restoration. The final Tour Operator that went beyond being a dive instructor had worked various film jobs relating to

underwater diving allowing him/her to become the Underwater Film Production Manager.

4.3.2 Sustainable tourism

All Dive Tour Operators had a positive outlook on sustainable tourism as a whole as well as specifically what it means for The Bahamas. They also felt that while The Bahamas has become more sustainable over the years, it could improve in the amount and quality of the sustainable tourism opportunities offered. Four of the Operators mentioned ways in which The Bahamas has become more sustainable over the years, such as creating more marine protected parks, putting a season on the Nassau Grouper, and putting protections on sharks and turtles. One Operator stated that sustainable tourism is "the only way forward" while another explained that tourists enjoy feeling that they are being sustainable and without tourists, a huge source of revenue and jobs would be lost. Some of the Tour Operators also mentioned things that The Bahamas needed to improve upon in terms of sustainable tourism. These things included becoming sustainable not only for tourists but for the local population, shifting sustainability from the charismatic megafauna to the actual reefs in general, using more of their natural resources such as wind and solar power, and creating better environmental protection enforcement policies that are widespread throughout all the islands. One Tour Operator also mentioned that the local Bahamian population needed to get on board with keeping their island sustainable and tourist friendly in order to keep the reef system healthy and beautiful.

4.3.3 Underwater activities

All Tour Operators felt that The Bahamas was an excellent place for tourists to gain enjoyment, experience, and knowledge because it offers so much variety in

underwater environments. None of the Operators suggested that one site was better than others and all considered the Coral Reef Sculpture Garden to be synonymous with an artificial reef, rather than being a separate environment. Seven of the Tour Operators noted that fish and other underwater creatures benefit tourists in terms of enjoyment, experience, or knowledge, or a combination of these elements. Three of the Operators spoke about improving tourists' knowledge of sharks specifically and helping them gain positive experiences with sharks. Five of the Operators felt that the physical environment, in terms of clarity and warmth of the water, benefits tourists' experiences and enjoyment of The Bahamas. One Operator stated that the experience that tourists get from seeing underwater environments is like "a look into a world that they do not often get to see or be a part of. Many people will go to Sea World or the aquarium and look at fish in a tank; but, they do not get to actively be a part of the environment."

Three of the Dive Tour Operators felt that tourists were getting what one would hope for them to get in terms of enjoyment, experience, and knowledge, as long as the weather is favorable, because the tourists are asked what environments they would like to see and brought to those sites. One Operator stated the tourists often smile and seem to enjoy their underwater experience; however, he/she does not necessarily know they are retaining the information one would desire in terms of knowledge of the marine environment. This Operator also expressed a desire for more tourists to learn that sharks are often misunderstood and that coral reef systems, which take hundreds of years to develop, are vital to the marine ecosystem. Two of the Operators were pessimistic in their views and felt that there was definitely a difference

between what they wanted tourists to take out of their experiences and what one would hope they would learn. One of those Operators was optimistic that this gap was closing as sources of information have become more readily available. The last Dive Tour Operator felt that tourists were absorbing information regarding sharks; but, felt the dive center should begin focusing more on the reef system as a whole. This Operator also felt that educating tourists were less important than educating Bahamian children, stating, "it's better to start at home and then spread the love."

All Dive Tour Operators noted that there is a difference between artificial coral reefs, natural coral reefs, and the Coral Reef Sculpture Garden; however, they felt it important for tourists to experience a variety of environments. That is why this particular dive center has two-dive trips and always tries to bring dive tourists to a natural reef and then some sort of artificial reef, while still taking tourists' requests into account. They are true to The Bahamas Diving Association slogan of "Discover Our Diversity." All Dive Tour Operators also felt that artificial reefs are beneficial to the underwater environment. Three of the Tour Operators stated physical reasons why artificial reefs are different from natural reefs. Some of these reasons were that natural reefs take longer to mature, it is evident that artificial structures have been placed down in the case of artificial reefs, natural reefs have more crevices for fish and organisms to hide within, and natural corals are hundreds of years old.

Two of the Dive Tour Operators mentioned the oil pollution as a factor in where they decide to bring tourists on certain days. One of those Operators said the wind and oil are the main factors and they also try to show tourists the best sites for the weather conditions. The other Tour Operator stated that the type of activity a

tourist was participating in was the main determination for which site they would be brought to see. Two of the Operators stated that the dive center had between 40 and 50 dive sites that they bring tourists to on a regular basis. Approximately 30 of those were shipwrecks purposely sunk by the dive center to create artificial reefs. Five of the Operators discussed specifically named sites or specific types of sites. The types of sites included shipwrecks, shallow reef sites, deep reef sites, especially along the Tongue of the Ocean, shark diving sites, and the Coral Reef Sculpture Garden. Experienced divers generally go on one deep "wall" dive along the Tongue of the Ocean and then are brought to one of the artificial reefs, often famous wrecks such as those used in the James Bond Movies. New divers, as well as tourists participating in activities such as subs, snorkeling, and SNUBA are generally kept in shallow areas near artificial reefs. As often as possible, these tourists were taken to the Coral Reef Sculpture Garden as it is an interesting site on which tourists were capable of doing minimal damage to real corals. The estimates on average number of tourists visiting the dive center daily varied slightly. All said that it varied on the season. The highest estimate per day was 1,000 tourists; however, the majority of Operators stated a range of closer to 300-400 per day. The estimate for rainy and off-season days was approximately 75-100 tourists daily. Two of the Operators stated an average of 60,000 tourists going through the dive center per year.

When asked if Dive Tour Operators saw any benefits to tourists visiting one site over another, all had the same general opinion even though they were clearly thinking about the question differently. Three Operators said they felt there was no benefit in seeing one site over another, meaning that they felt all sites were worth

seeing. Three of the other Operators stated they did see a benefit in seeing one site over another; but, each said it meaning that all the sites are different and tourists should experience this diversity. One Operator specifically stated that "not everyone can come out to do everything, so it is beneficial to get them to see just one of them." This Operator did also state that he/she felt there was a benefit in tourists going on a shark dive rather than a second reef or wreck dive. Two of the Operators also stated that it was best to keep novice divers near artificial reefs to keep them from doing damage to real coral reef.

4.3.4 Sir Nicholas Nuttall Coral Reef Sculpture Garden

Seven of the Dive Tour Operators stated that they do personally bring people to see the Coral Reef Sculpture Garden. While the dive center owner does not bring people there personally, he/she estimated about 6 boats per day visit that site with tourists participating in snorkeling, subs, and beginner diving activities, as long as there is no oil present. Another Operator also stated that beginner divers love seeing the Sculpture Garden; however, the amount of times they are able to bring people to the site is greatly reduced due to the oil pollution. One Operator stated that he/she has had tourists specifically request to dive the Coral Reef Sculpture Garden.

Four of the Dive Tour Operators stated they always give tourists information about the Coral Reef Sculpture Garden when they go there. Two of the Operators stated that tourists are always intrigued by the Sculpture Garden and ask for more information about it. Another two of the Operators stated they give as much information as they know to the tourists. Both of them explained the information provided which included why the sculptures were put there, who put them in place, a list of people involved in the installment, the benefits it provides to the natural reef,

and information about the artist, Jason deCaires Taylor. Another one of the Operators stated that he/she does not give information on the conservation goals of the Coral Reef Sculpture Garden, just an explanation of what the sculptures symbolize, that they are there to attract marine life, and some information on the organization that put them in place. Two of the Operators stated that they do not know much about the Coral Reef Sculpture Garden and therefore do not provide much background into it when bringing tourists to the site. One of these Operators did have a friend of the artist onboard as a customer one time and this friend helped the Operator provide information to the rest of the tourists regarding the sculptures. This was the only time that Operator provided tourists with information on the Coral Reef Sculpture Garden. The dive center owner stated that the instructors are supposed to give a briefing about the Coral Reef Sculpture Garden and that most of the other sites have "cheat sheets" with talking points about what the tourists will experience. He/she stated a similar sheet for the Sculpture Garden would be made available for the instructors; but, this has not yet been done

All Dive Tour Operators, except one, felt there were educational or promotional opportunities note yet being utilized in regards to the Coral Reef Sculpture Garden. Some educational materials suggested were creating "cheat sheets" for dive instructors with talking points about the Sculpture Garden, providing waterproof cards with information about the statues that tourists could use as a scavenger hunt, fixing the snorkel trail of reef balls leading to the Sculpture Garden, building more underwater sculpture gardens, specifically in a place without oil, and getting more local Bahamian children out to see the Sculpture Garden. The main

promotional material mentioned was videos to be put on various websites such as the one for the dive center or the one for the historic park with land entrance to the Sculpture Garden.

4.3.5 Marine debris and marine pollution

All six of the Dive Tour Operators asked about whether they had heard tourists' opinions on marine debris or marine pollution in The Bahamas mentioned the oil pollution. One Operator said that even when they avoid the site, "the wake disturbs the surface and [tourists] can see the thick brown change in color of the water as the boat drives through." Another Operator stated that it is hard to hide the oil because it smells and gets on people and the boats. Other Operators said tourists are appalled by the oil, complain about it a lot, it sometimes spoils entire vacations for people, and "they cannot understand how such a beautiful ocean environment is being destroyed without anyone trying to fix the problem." One Operator stated tourists give opinions on how The Bahamas should go about trying to fix the oil pollution issue. Three of the Operators also mentioned tourists having negative opinions about marine debris; but, they did not have as many examples of this as they did for comments regarding the oil pollution. Operators stated either oil pads or plastics as being the most common type of debris found and that tourists are given the opportunity to collect marine debris when they see it and seem to enjoy doing so.

Six of the of the seven Operators had experienced marine pollution at one of their sites and five of those mentioned the oil pollution from the local power plant specifically. Four of the seven Operators had seen marine debris present at their sites. Three of those four had seen marine pollution while the fourth did not mention seeing marine pollution. The Tour Operators mentioned seeing fishing line as the most

abundant source of pollution along with cans, shoes, tires, plastic, and glass bottles. Two of the Tour Operators mentioned that they generally do not see much marine debris other than fishing line.

Seven of the Operators implied they do not have a specific method of removing marine debris or marine pollution from their dive sites. Five stated that they just pick it up when they see it and throw it away when they get back on the boat. Two of those five tell customers they are welcome to do the same. Three Operators mentioned the dive center's Dive Against Debris program that takes place through Project Aware. This is an event where every few months a group of instructors, tourists, and locals go out and clean up a specific site and the sites which they visit are rotated. One Operator also mentioned that when marine debris is too large to remove by hand, they mark it with a buoy and come back with lift bags later to remove it. Two Operators also mentioned that they often pick up oil soaked pads by hand at their sites and along the docks of the dive center.

Only two Operators were aware of any policies relating to marine debris and marine pollution in The Bahamas. One stated that littering is illegal; but, there are rarely any consequences, even when people get caught. Another Operator stated that ships are not allowed to dump trash overboard. No other Operators knew of any specific policies relating to marine debris or marine pollution although one stated that he/she would like to think that some exist. This Operator along with one other stated that even if policies did exist, they were not being enforced.

Three of the eight Operators mentioned that oil leaking from the local power plant was high priority in terms of creating new policies surrounding marine debris

and marine pollution in The Bahamas. One of these Operators felt that the natural resources surrounding them should be used for energy rather than the outdated power plant. Other things missing from policy in The Bahamas were stated as being enforcement, a lack of marine parks, banning of polystyrene, and underwater police monitoring dive sites. One Operator also felt that divers should not be allowed to wear gloves underwater because this would prevent people from putting their hands down at random and possibly breaking corals. One Operator mentioned that improving policies would add economic viability to The Bahamas as the policies would help preserve the environment that tourists come to see. The Operator that mentioned banning polystyrene felt that littering was a huge issue in The Bahamas and they needed to start at home by reducing waste.

4.3.6 Other

Four of the Operators felt I did not miss any questions that they would have hoped I would ask. One Operator was surprised I did not ask about the effects of lionfish on the reef. A second Operator took this time to point out that The Bahamas is the largest national shark sanctuary in the world and felt the United States should look into having more national parks along its coast. Another Operator had been expecting a question on whether or not people try to take souvenirs during their dives such as coral or sponges. The Operator then answered the question and said tourists often do try to do this and they are asked to return the items. A final Operator did not feel any questions were missed in the interview, but took the time to re-emphasize the impact oil has on the reefs and stated that the problem has only gotten worse with the use of dispersants which cause oil to settle into the sediment and onto the corals.

CHAPTER 5: DISCUSSION

The main points of discussion that came from this study were: 1) Whether Dive Tour Operators and Conservation Managers understand the expectations of the tourists they reach. 2) Whether knowledge of the Coral Reef Sculpture Garden was reaching the desired tourist population and how this could be enhanced through promotional and educational materials provided or determined useful by Dive Tour Operators, Conservation Managers, and Tourists. 3) If Dive Tour Operators and Conservation Managers had aligning views on the importance of and use of sustainable tourism in The Bahamas. 4) How groups views aligned or differed on the use of artificial reefs. 5) How groups aligned or differed in thoughts regarding marine debris and marine pollution and policies surrounding the two. 6) The controversial role of the Coral Reef Sculpture Garden in the problem of oil pollution along the coast.

5.1 Dive Tour Operators' and Conservation Managers' understanding of Tourists' expectations

The results of this survey suggest that the Dive Tour Operators and Conservation Managers offer opportunities and information that align with the expectations of tourists. The types of environments tourists are interested in seeing as are the sites that Dive Tour Operators bring them to. This particular alignment is highly likely to do with the dive center efforts to learn what sites most interest their customers. It can also be assumed that tourists choose their site visits based on the dive center's advertisement of well-known sites, such as the James Bond wrecks.

Conservation Managers' efforts to create marine conservation oriented anthropogenic underwater environments are also in alignment with tourist interests, as Dive Tour Operators stated that tourists do request to see the Coral Reef Sculpture

Garden and ask for more information about it once they see it. A couple of the tourists interviewed also stated they were interested in seeing the Coral Reef Sculpture Garden and that knowledge of it had piqued their interest even prior to arriving in The Bahamas. Therefore, a Sculpture Garden appears to be a valid method of attracting the attention of current and potential tourists while utilizing the site as an opportunity for conservation education.

5.2 Knowledge regarding the Coral Reef Sculpture Garden and how to enhance knowledge through educational and promotional materials

The majority of tourists did not feel adequately informed about the Coral Reef Sculpture Garden. Conservation managers agreed and would like to see improvement in educational and promotional programs throughout New Providence. Only half of the tourists interviewed had heard of an underwater sculpture garden in general. Additionally, the majority did not know there is one located in New Providence, Bahamas.

This research made it clear that knowledge of the Sir Nicholas Nuttall's Sculpture Garden's existence is not being promoted effectively. Along with a lack of promotion comes a dearth of education regarding the meaning of the Sculpture Garden, the reasoning behind its placement, and the benefitting elements it provides for marine organisms. While some of the tourists speculated correctly about the reasons for the Sculpture Garden being put into place, they just used their understanding of artificial reefs, which would only be possible for people who are already intrigued by the marine environment. Even Dive Tour Operators admitted not having enough knowledge about the Sculpture Garden to be able to properly inform

tourists. This is another opportunity for Conservation Managers and Dive Tour Operators to work together to improve educational opportunities surrounding the site.

All three groups agreed that there are opportunities for promotion and education surrounding the Sculpture Garden that have not yet been utilized. The suggested ways for improving education and promotion were all similar in that they were either visual, multi-media, or used directly before seeing the Sculpture Garden, such as pre-dive briefings. The need for more informational pre-dive briefings was noted here and has also been studied by other researchers. It has been stated that generally pre-dive briefings are carried out with minimal effort even though they can create a huge benefit to educating tourists on the environmental values of a site (Dearden et al., 2007; Roche et al. 2016).

In regard to the accepted methods of instilling environmental education in tourists and visitors of the marine environment, the biggest issue thus far is the need for reinforcement (Hungerford and Volk, 1990). The dive center does provide divers the opportunity to observe the sensitivity of the marine environment and the need for action through "Dive for Debris" dives. They also provide courses providing awareness on sharks and coral restoration. These dives and courses provide on land instruction as well as experience in the environment giving in-depth information regarding the importance of marine conservation and environmentally friendly behavior. Shark awareness courses also provide an understanding of how the apex predator of a reef is intertwined into the importance of a reef system as a whole. These experiences on sensitivity, in depth instruction, and education on the interrelation of an environment are all components of Hungerford and Volk's environmental

education framework (1990). These opportunities provide an opportunity to learn about the issues facing the environment and also to participate in activities aiming to reduce those issues. The component that these dives do not speak to are the need for repetition of these experiences (Hungerford and Volk 1990).

In relation to the Sculpture Garden specifically, there is not enough education being done using the specified components of environmental education. There are not standardized pre-dive briefings related to the Sculpture Garden and there are no longer posters or educational materials around the dive shop which people can observe and get a repeated experience regarding the Sculpture Garden. While there are instructors experienced in diving leading the Sculpture Garden dives, these dive leaders tended to not be experienced in education pertaining to the Sculpture Garden. This, again, leads to the need for standardized pre-dive briefings and better education of dive instructors so that they can then pass on that knowledge to tourists before, during, and after a dive experience in order to maximize the repetition of knowledge (Hungerford and Volk, 1990). However, dive instructors are providing briefings on how to be a sustainable diver, which is an excellent step towards increasing environmental education of divers (Hungerford and Volk, 1990; Hannak et al. 2011).

The conservation organization that put in the Sculpture Garden also needs to improve the experiences of tourists visiting the Sculpture Garden in order to maximize the environmental education benefits it could provide. Re-installing the kiosk the informational kiosk lost during Hurricane Matthew is the biggest step in this process. This kiosk provided various information on the environmental education on the goals of the Sculpture Garden, reef species in The Bahamas, reef conservation, sustainable

diving and sustainable snorkeling. This kiosk plus the experience of actually observing the Sculpture Garden and potentially see it in the action of achieving its goals are examples of strong, repetitive information that has the possibility of sticking with tourists after they leave the site (Hungerford and Volk, 1990; Hannak et al., 2011).

5.3 Comparison of sustainable tourism views between Dive Tour Operators and Conservation Managers

Views of Conservation Managers and Dive Tour Operators on sustainable tourism were very similar. Both groups overall felt that The Bahamas has become more sustainable in the tourism industry; but, more improvements can be made. The main difference in responses came from what environment was being discussed. Conservation Managers spoke more about tourism on land with suggestions about creating smaller tourist destinations with an intimate feel rather than large "cookie cutter resorts." Dive Tour Operators were more concerned with the marine environment stating that conservation efforts need to start looking at the reefs in general, rather than the charismatic megafauna living on the reefs. This shows that there really are multiple ways and places in which sustainable tourism has the opportunity to flourish and benefit the Bahamian environment and economy. At least one person from each of these two groups also mentioned that sustainability should be done to benefit the people of the nation first, and then tourism should follow. Along these lines, it was also suggested that Bahamian children do not get enough opportunity to learn about the marine environment that surrounds them every day.

5.4 Views on Artificial Reefs

Overall, all three groups had a relatively positive outlook on the concept of artificial reefs. Dive Tour Operators and Conservation Managers mostly focused on the literal differences of the two from a scientific standpoint. This is backed by Santos,

Oliveira, and Cúrdia who found that natural reefs have a greater rugosity than artificial reefs (2012). The study also discussed that due to natural reefs developing over a much longer time period than artificial reefs, it is not possible to compare the two in terms of time period under water (Santos, Oliveira, and Cúrdia, 2012). The characteristic of time to develop a reef was also discussed by Managers and Operators as a literal difference between the two types. They also seemed to believe that the main benefit of artificial reefs in the context of tourism is that they can take diving pressures away from natural coral reefs. This suggests that the main goal of the dive center in creating more artificial reefs is more to attract divers rather than to increase coral reef growth in certain areas. While it has been previously found that composition and abundance of fish can be comparable to natural reefs, it is probable that the Sculpture Garden specifically has been beneficial most effectively in a marine tourism context (Santos, Oliveira, and Cúrdia, 2012). This is due to the oil pollution which reduces the opportunity for the Sculpture Garden to become a successful reef habitat. While it was reported that there are more fish and marine organisms present at the site than previously when it was a sandy bottom, it was not implied that the number of fish was comparable to that of a natural reef.

Tourists had a basic understanding of artificial reefs in terms of knowing what they are and what they are for. This suggests that tourists interested in utilizing these resources may take the time to learn more about their purposes and benefits. If interest can be increased through advertisement or education, areas like the Sir Nicholas Nuttall Coral Reef Sculpture Garden may reach their full economic and conservational potential.

Tourists also had interesting thoughts about shipwrecks as artificial reefs. It seemed that overall, if a ship is purposefully placed in the marine environment after being cleaned thoroughly and removed of all possible contaminants, it is acceptable to consider it an artificial reef. However, if a ship accidentally sinks and is truly a wrecked ship, it contains contaminants and various dangers that cause it to be likened more to marine debris than a shipwreck. This shows that circumstances surrounding materials in the marine environment are very important to tourists when determining whether or not that material is acceptable in the ocean.

Overall, the previous research suggests that the Sculpture Garden has great potential to be a successful artificial reef (Ditton et al., 2002; Milon, 1989). It is easily accessible by both land and ocean, it gives the opportunity to see species considered valuable to marine tourists such as turtles and rays, and it is a shallow site.

5.5 Thoughts regarding marine debris and marine pollution and policies surrounding these issues

For the most part, Dive Tour Operators, Conservation Managers and tourists felt similarly negative regarding marine debris and marine pollution being present in the ocean environment. All tourists interviewed had strong negative feelings regarding marine debris and marine pollution and realized that human-made materials could cause harm to marine life and coral reefs. This can be attributed to the rising global awareness of the need to protect the marine environment from marine debris due to large amounts of plastics and other human-made materials entering the oceans yearly (Gregory, 2009; Sheavly and Register, 2007; UNEP 2009). Dive Tour Operators make a living by showing people a beautiful marine environment, therefore it makes sense for them to be focused on the negativity that debris and pollution bring. They clean up

their dive sites by just picking up trash as they see it and holding a "Dive Against Debris" dive every year to get tourists and residents involved. The fact that tourists also pick up trash when they see it during their dives and try to make suggestions about how to stop oil pollution shows that they also care about the environment and are willing to take a part in cleaning it. This is an example of environmental education being successful in the terms that Hannak et al. describe (2011). Conservation Managers are also of course concerned with debris and pollution because their main goal is conservation of the marine environment. Participating in Dive Against Debris clean up dives and placing the Sculpture Garden in a place to bring attention to the oil pollution show Conservation Managers are highly focused on both of these detriments to the ocean. While it would be extremely negative to have tourists physically experience the oil pollution, it may be beneficial for Dive Tour Operators to give tourists more of an opportunity to visually experience the pollution as a reinforcement of the importance of environmental awareness (Hungerford and Volk, 1990). This visual experience that there are severe environmental problems going on, even in an otherwise beautiful Bahamian marine environment, may urge tourists to have better environmental behavior in their everyday lives (Dartwell and Dulvy, 1996; Hodgson, 2000; Dearden, Bennett and Rollins, 2007). It may also urge them to take a stand with these organizations against the pollution; but, only if they are also aware of the unique Sculpture Garden site they are missing out on because of it.

None of the groups had a strong grasp on the policies surrounding marine debris and marine pollution in The Bahamas. Even those in the government referred the researcher to a different department to get an understanding of what policies exist.

Through speaking with Dive Tour Operators and Conservation Managers, it was clear that already existing laws need to be enforced before new laws are put into place. Even though not all desired policies are in place already, it would be overwhelming to try and increase enforcement and the amount of laws at the same time. Enforcement must be improved, and then more laws should be put into place. The other main issue that came up in talking with Dive Tour Operators and Conservation Managers was once again that the biggest issue is the oil pollution problem.

5.6 Controversial role of oil pollution problem

The oil pollution emanating from the main power plant of New Providence ended up being the main controversy surrounding the Coral Reef Sculpture Garden. It was clear that between all groups, the Sculpture Garden was though of solely as an artificial reef and means of promoting marine conservation. It was at no point likened to marine debris, meaning that its placement in the ocean in general was not controversial; but, it's placement specifically being within a site of continual oil contamination was. While Conservation Managers hoped that this site placement of the Sculpture Garden would bring awareness of the oil pollution and initiate change, Dive Tour Operators feel the Sculpture Garden would be more effective as an artificial reef elsewhere. This is the main point in which these two groups diverge in opinion. However, both see the oil pollution as being extremely detrimental to the environment as well as the economy.

The majority of respondents from these two groups brought up the problem of the oil pollution multiple times, even when marine pollution was not being discussed. The Dive Tour Operators stated that the wind and oil are the two main determining factors as to where they bring tourists. The oil spreads in the direction of the Sculpture

Garden any time the wind comes from a Southern or Eastern direction. When the wind is coming from any combination involving either of those directions, Dive Tour Operators avoid the site of the Sculpture Garden. They also stated it's nearly impossible to hide the pollution, even when they do not go to that site, because of the sheen of oil on the waves while driving past.

It is extremely difficult to create a plan for promotion and education of the Sculpture Garden when the unpredictability of oil presence can randomly make the Sculpture Garden inaccessible. If the Sculpture Garden was highly promoted, as other works of deCaires Taylor are, it would be a highly intriguing site to tourists. It could even, perhaps, increase the number of tourists visiting. However, it would mean that a conservation organization and a dive center would be promoting swimming in an area that is at times extremely toxic to humans (Hong et al., 2014). Therefore, promotion of the Sculpture Garden could actually be highly detrimental to the economy and the reputation of relaxing tropical paradise of The Bahamas. This creates a rift between the desire to use the Sculpture Garden as a tool for marine conservation and the ability to actually conserve the marine environment in this particular area. Without proper conservation, the Sculpture Garden cannot be used to its full potential; yet, without the educational benefits the Sculpture Garden can provide about the dangers of pollution and unsustainable practices, there is very little awareness or incentive for the necessary conservation to be carried out.

CHAPTER 6: CONCLUSION

6.1 Concluding points

In conclusion, this study provides evidence that, overall, Conservation Managers, Dive Tour Operators, and dive tourists in New Providence, Bahamas have similar expectations about marine driven tourism. The Dive Tour Operators at this particular dive center understand their audience when bringing tourists out on marine adventures.

Conservation Managers have also provided an alluring tourist attraction with the Sculpture Garden that can benefit marine conservation and education. However, most tourists interviewed had not heard of the Coral Reef Sculpture Garden prior to be taken to see it on their dive tour. It can therefore be concluded that Conservation Managers and Dive Tour Operators need to improve the methods of educating people about and promoting the Sculpture Garden in order for be used to its full potential as a marine conservation tool. Without the knowledge that the Sculpture Garden exists and it has these goals, tourists will not gain anything from its existence. Unfortunately, Dive Tour Operators also did not have sufficient knowledge regarding the educational significance of the Sculpture Garden. Because Conservation Managers and Dive Tour Operators value the site, Conservation Managers should help educate Dive Tour Operators and Operators should be more motivated to seek out that information from Conservation Managers so that they can in turn give better pre-dive briefings to the tourists. Giving more information regarding the Sculpture Garden during a pre-dive briefing can improve tourists' understanding of its environmental value.

Conservation Managers and Dive Tour Operators also felt that sustainability should be achieved with the Bahamian citizens in mind, not the tourism industry. This

is an interesting perspective because the economy rests so firmly on the tourism industry. While it makes sense to present Bahamian children with better education regarding sustainability, it is not always easy to influence current adults' perceptions. Therefore, starting with the ever-important tourism industry seems like the best option for sustainability in The Bahamas. However, there is no better proponent of a country than its children, so education should be expanded for Bahamian children as much as possible as well. This is also a sensitive issue due to the possibility of native Bahamians being wary of others coming into their homes. If the focus is put solely on the tourism industry, the Bahamian people will be dismayed because The Bahamas is their home and they will feel they should be profiting more from sustainability than visitors who stay only days at a time. It can be concluded that in The Bahamas, sustainability efforts should focus on improving knowledge in both the tourism industry, for the benefit of the economy, and the citizens, primarily starting with Bahamian children.

Artificial reefs seemed to be extremely important to Dive Tour Operators, mainly in terms of creating more anthropogenic areas that would attract divers. They did not talk as much about sinking ships to provide coral habitat as to lure divers away from natural coral reefs with a novel environment to explore. However, the dive center does also have multiple coral nurseries which shows that coral reefs are important to them and the end goal of artificial reefs is to remove diving pressure from sensitive coral areas. It was also seen that tourists felt the circumstances surrounding an artificial reef (meaning how and why it was put where it was) were extremely important in deeming it acceptable in the marine environment. Dive Tour Operators

can share this knowledge about reef creation and siting to increase diver's awareness of the benefits the artificial reefs they have put in place.

It is clear all three groups feel negatively about marine debris and marine pollution; however, not all tourists were properly informed about what would constitute each of these. Some said that plastics were acceptable in the marine environment, while Dive Tour Operators and Conservation Managers know this is one of the most damaging materials made by humans. Operators and Managers noted plastics as being one of the main types of debris found during clean ups and regular dives. Although tourists are aware of some dangers of marine debris and pollution, education surrounding what constitutes each and what is not harmful when put into the marine environment should be increased. Tourists participating in marine-related activities have already shown their interest in the marine environment; therefore, excursions with a dive center are a great time to educate people further with either posters around the center or discussions on the boats.

It was determined through these interviews that the oil pollution is the main issue keeping the Sir Nicholas Nuttall Coral Reef Sculpture Garden from being effectively used as a tool for promoting marine conservation via tourism. Allowing a problem with oil pollution to be so overbearing that it is a main determining factor in where tourists can dive at the most prominent dive center in the area seems irresponsible. With an economy driven by tourism, it is necessary for the tourists to be able to experience the surroundings, without the threat of being contaminated with oil. While it is important to enforce and publicize laws The Bahamas may already have surrounding marine debris and marine pollution, the oil pollution is the only problem

that should be addressed immediately. This is because if other laws start being enforced such as littering, and people still know there is oil constantly leaking out of the main power plant, they will likely not take kindly to being punished for things like littering. It would be hypocritical for a government to allow oil pollution to continue while punishing people for leaving a food wrapper on the beach.

6.2 Recommendations for Dive Tour Operators and Conservation Managers

In order to increase awareness of marine conservation utilizing the Sculpture Garden, when possible, it is the researcher's suggestion that the dive center hang more posters depicting the Coral Reef Sculpture Garden with marine life and tourists enjoying it in community areas of the center. This may the interest of tourists while they are gearing up for dives and make them more interested in going to see such a unique environment. It is also suggested that the Dive Tour Operators follow through with some of their own suggestions for increasing education, such as creating "cheat sheets" for instructors to read during the pre-dive briefing. Provided "cheat sheets" have been beneficial to instructors in providing information on other sites the dive center provides access to. Therefore, a Sculpture Garden "cheat sheet" will likely decrease the number of instructors that do not know anything about the Sculpture Garden and who instead give very vague, overarching descriptions of the sculptures.

For increased conservation education and promotion of the Sculpture Garden, the researcher also suggests that Conservation Managers add descriptions of what the statues depict on their website under the Coral Reef Sculpture Garden tab. While they have pictures of each sculpture, an understanding of their meaning will do more to help visitors understand the conservation goals, especially with "Ocean Atlas" and "Virtuoso Man." The researcher also agrees with the Conservation Managers'

suggestions to re-install the informational kiosk at the land entrance site to the Sculpture Garden. However, the kiosk should be updated to have more pictures, as it seemed from tourists' responses that visual materials are more alluring than just words. It would also be beneficial to have a meeting with Dive Tour Operators to explain the marine conservation benefits and the goals of the Coral Reef Sculpture Garden to ensure that they feel informed when approached by tourists. Conservation Managers may also help in creating the "cheat sheets" for dive instructors mentioned earlier.

For both Conservation Managers and Dive Tour Operators, more videos should be made available on social media and the internet in general to promote the Sculpture Garden.

The Coral Reef Sculpture Garden will not be as successful as a marine conservation education and management tool until the oil pollution is stopped. While Conservation Managers have fought to bring attention to this, and Dive Tour Operators fight to keep it from affecting dive tourism, it is up to the Bahamian government and the local power plant to put a stop to the pollution harming their reefs and, indirectly, their economy. The researcher urges the oil pollution to be investigated more closely so that a solution can be found. Once this happens, the Coral Reef Sculpture Garden will be truly able to flourish as an artificial reef, a marine conservation education and management tool, and an extremely unique tourist attraction for New Providence, Bahamas.

6.3 Proposed future research

This was preliminary exploratory study on the relationship between marine conservation and a unique tourist destination in New Providence, Bahamas. There is a

vast amount of research that can stem from this, as there have been no previous studies on the effectiveness of underwater sculpture gardens in promoting marine conservation. There is also a plethora of research that can continue specifically in New Providence, including further investigations into tourists' perceptions of the Coral Reef Sculpture Garden and examination of the oil pollution problem. This researcher suggests the following as topics for future research:

- How have other underwater sculpture gardens benefitted the tourism economy of other countries in comparison to The Bahamas and what materials have they used for promotion and education?
    - Research on this topic could provide further insight into the potential economic benefits of the Bahamian Sculpture Garden and influence the government and power plant to remediate the oil pollution. It would also provide the most useful promotional and educational materials that could be adopted by the local conservation organization or dive center.
- The ecological effects of the oil pollution emanating from the Bahamian power plant.
    - This research would show all the negative effects of the oil pollution and an economic costs analysis could then be conducted.
- The success of pre-dive briefings in educating tourists about unique underwater environments.
    - This research would help influence Dive Tour Operators who truly hope to make a difference in the environmental attitudes of the

tourists they take out to improve the quality of their dive briefings. It would also allow the opportunity to determine the most successful dive briefing length to keep interest and identify the key points that should be put across to tourists.

- Systematic surveys of people's perceptions on the Sculpture Garden in order to reach the opinions of a larger population of tourists.
    - The research done for this study gathered a minimal amount of perceptions because interviews are lengthier and take time away from the interviewee. Surveys could provide a broader range of perceptions in a shorter period of time and give more reliable understanding of tourist perceptions across a larger number of participants. It could also give an understanding of tourists who did not come specifically for marine tourism and see if they would could be influenced into participating once they have learned about the unique Sculpture Garden experience.
- What are tourists' willingness to pay to see the largest underwater sculpture in the world?
    - This would also give a better understanding of tourists' perceptions of the value of the Sculpture Garden and a truly unique opportunity to see the largest single underwater sculpture in the world.

- Are people visiting coral reefs less because there are more artificial reefs available, or are more people just going out on marine excursions in general?
    - This research would be beneficial all around the world to determine whether putting in artificial reefs is truly reducing the pressure on natural reefs.

APPENDIX

Appendix A. Interview Questions

Tourist Interview Questions

1. What is your age?
2. What is your occupation?
3. What is your reason for coming to The Bahamas?
4. What underwater activities have you participated in while in The Bahamas?
5. Have you ever heard the phrase “marine debris”?
6. Have you ever heard the phrase “marine pollution”?
7. What environments have you seen while participating in these activities?
8. Have you ever heard of an underwater sculpture garden?
9. Are you aware that there is an underwater sculpture garden in The Bahamas?
    a. If yes, what do you know of as the reasons behind its construction?
10. Have you seen promotional or educational materials relating to the Coral Reef Sculpture Garden while in The Bahamas?
    a. If so, did you read them? Why or why not?
11. What educational materials would interest you regarding learning more about the Coral Reef Sculpture Garden?
12. What underwater environments are you most interested in seeing while in The Bahamas?
13. Have you seen any marine debris or marine pollution while in The Bahamas?
14. How do you feel when you see marine debris or marine pollution?
15. Have you ever heard of an artificial reef?

a. If Yes, what is for?

16. Do you consider shipwrecks to be artificial reef?
17. Do you consider shipwrecks to be marine debris or pollution?
18. According to your understanding, what is the importance of the coral reef systems in The Bahamas?
19. Do human-made materials benefit coral ecosystems?
20. Do human-made materials harm coral ecosystems?
21. In what ways do human-made materials affect coral ecosystems?
22. List what types of human-made materials are acceptable in the ocean environment:
23. Who do you think is qualified to make that distinction?
24. Name or explain any policies you know of that surround marine debris and pollution in The Bahamas.

Conservation Manager Questions

1. What is your age and occupation?
2. What is your level of education and where did you study?
3. What specific training did you have for your occupation?
4. How long have you been in your current position?
5. What is your stance on sustainable tourism in The Bahamas?
6. What do you think tourists are gaining, in terms of enjoyment, experiences, and knowledge, when participating in maritime activities related to the coral reefs, artificial coral reefs, the Coral Reef Sculpture Garden in The Bahamas?

7. What do you hope for tourists to gain, through enjoyment, experience, and knowledge when visiting coral reefs, artificial reefs, and the Coral Reef Sculpture Garden?
8. What are your personal views on how coral reefs, artificial coral reefs, and the Coral Reef Sculpture Garden differ?
9. Do you see any benefits in tourists visiting one site over another?
10. What educational and promotional materials do you provide to tourists relating to the Coral Reef Sculpture Garden?
11. Are there opportunities for education and promotion surrounding the Coral Reef Sculpture Garden that you think have not yet been utilized?
12. Have you heard any tourists' opinions on marine debris or marine pollution in the marine environment?
13. Have you had any experiences with marine debris or marine pollution being present in your sites?
14. Do you have a process of removing marine debris or marine pollution from specific sites?
15. What are policies surrounding marine debris and marine pollution in The Bahamas?
16. What is missing from the current policy surrounding marine debris and marine pollution in The Bahamas?

Dive Tour Operator Questions

1. What is your age and occupation?
2. How long have you been in your current position?

3. What training or experience did you go through in order to obtain your current position?
4. What is your stance about sustainable tourism in The Bahamas?
5. What do you think tourists are gaining, in terms of enjoyment, experiences, and knowledge, when participating in maritime activities related to the coral reefs, artificial coral reefs, the Coral Reef Sculpture Garden in The Bahamas?
6. What do you hope for tourists to gain, through enjoyment, experience and knowledge, when visiting coral reefs, artificial reefs and the Coral Reef Sculpture Garden?
7. What are your personal views on how coral reefs, artificial coral reefs, and the Coral Reef Sculpture Garden differ?
8. What sites does your company bring tourists to visit? How were those sites chosen?
9. Approximately how many tourists do you have on days where it is peak tourist season and the weather is good for diving? How many tourists do you have when the weather is not as good?
10. Do you see any benefits to tourists visiting one site over another in terms of coral reefs, artificial coral reefs, and the Coral Reef Sculpture Garden?
11. Do you bring tourists to the Coral Reef Sculpture Garden?
12. Do you provide background into the creation of the Coral Reef Sculpture Garden and the conservation goals of it?
13. Are there educational or promotional opportunities that are not yet being utilized?

14. Have you heard tourists' opinions on marine debris in the marine environment around your sites or on the way to the sites?
15. Have you had experiences with marine debris or marine pollution being present at your sites?
16. Do you have a process of removing marine debris or marine pollution from specific sites?
17. What are policies surrounding marine debris and marine pollution in The Bahamas?
18. What is missing from the current policy surrounding marine debris and marine pollution in The Bahamas?

BIBLOGRAPHY

Abelson, A. (2006). Artificial reefs vs coral transplantation as restoration tools for mitigating coral reef deterioration: benefits, concerns, and proposed guidelines. *Bulletin of Marine Science*, 78(1), 151–159.

Abu-Hilal, A., and Al-Najjar, T. (2009). Marine litter in coral reef areas along the Jordan Gulf of Aqaba, Red Sea. *Journal of Environmental Management*, 90(2), 1043–1049.

Andersson, J. E. C. (2007). The recreational cost of coral bleaching — A stated and revealed preference study of international tourists. *Ecological Economics*, 62(3–4), 704–715.

Baine, M. (2001). Artificial reefs: A review of their design, application, management and performance. *Ocean and Coastal Management*, 44(3–4), 241–259.

Barker, N. H. L., and Roberts, C. M. (2004). Scuba diver behaviour and the management of diving impacts on coral reefs. *Biological Conservation*, 120(4), 481–489.

Baulch, S., and Perry, C. (2014). Evaluating the impacts of marine debris on cetaceans. *Marine Pollution Bulletin*, 80(1–2), 210–221.

Biggs, D., Ban, N. C., and Hall, C. M. (2012). Lifestyle values, resilience, and nature-based tourism's contribution to conservation on Australia's Great Barrier Reef. *Environmental Conservation*, *39*(4), 1–10.

Bounds, J. H. (1972). Industrialization of The Bahamas. *Revista Geográfica*, (77), 95–113.

Broad, K., and Sanchirico, J. N. (2008). Local perspectives on marine reserve creation in the Bahamas. *Ocean and Coastal Management*, 51(11), 763–771.

Buchan, K. C. (2000). The Bahamas. *Marine Pollution Bulletin*, 41(1–6), 94–111.

Burke, L., Reytar, K., Spalding, M., and Perry, A. (2011). *Reefs at risk: Revisited*. Washington, D.C.: World Resources Institute.

Caribbean: Sustainable Tourism - Don't be afraid to stand out. (2010). TTG, Travel Trade Gazette, U.K.and Ireland. 54. Retrieved from http://uri.idm.oclc.org/login?url=https://search-proquest-com.uri.idm.oclc.org/docview/608221204?accountid=28991

Central Intelligence Agency. (2017). The Bahamas. *In The world factbook*. Retrieved from

https://www.cia.gov/library/publications/the-world-factbook/geos/bf.html

Chabanet, P., Adjeroud, M., Andréfouët, S., Bozec, Y.-M., Ferraris, J., Garcìa-Charton, J.-A., and Schrimm, M. (2005). Human-induced physical disturbances and their indicators on coral reef habitats: A multi-scale approach. *Aquatic Living Resources*, 18(3), 215–230.

Chavanich, S., Soong, K., Zvuloni, A., Rinkevich, B., and Alino, P. (2015). Conservation, management, and restoration of coral reefs. *Zoology*, 118(2), 132–134.

Clifton tour shows threat of oil pollution to Bahamian waters. (2016). Retrieved from http://www.tribune242.com/news/2016/jul/15/clifton-tour-shows-threat-oil-pollution-bahamian-w/

Coral Reef Sculpture Garden. (2014). Retrieved from https://breef.org/public-awareness/the-coral-reef-sculpture-garden/

Cranton, M. and Saunders, G. (1998). *Islanders in the stream: A history of the Bahamian people*. Athens, Georgia: The University of Georgia Press.

Crutzen, P. J. (2002). Geology of mankind. *Nature*, 415(6867), 23.

Dartwell, W. R., and N. K. Dulvy. (1996) An evaluation of the suitability of non-specialist volunteer researchers for coral reef fish surveys. Mafia Island, Tanzania—A case study. *Biological Conservation*, 18, 259–271.

Dearden, P., Bennett, M., and Rollins, R. (2007). Perceptions of diving impacts and implications for reef conservation. *Coastal Management*, *35*(2-3), 305–317.

Derraik, J. G. B. (2002). The pollution of the marine environment by plastic debris: A review. *Marine Pollution Bulletin*, 44(9), 842–852.

Ditton, R.B., Osburn, H.R., Baker, T.L. and Thailing, C.E. (2002). Demographics, attitudes, and reef management practices of sport divers in offshore Texas waters. *ICES Journal of Marine Science*, 59, 186–191.

Donahue, M. Z. (2016). Can underwater resorts actually help coral reef ecosystems? *Smithsonian*. Retrieved from http://www.smithsonianmag.com/innovation/can-underwater-resorts-actually-help-coral-reef-ecosystems-180958190/

Donohue, M. J., Boland, R. C., Sramek, C. M., and Antonelis, G. A. (2001). Derelict fishing gear in the northwestern Hawaiian Islands: Diving surveys and debris removal in 1999 confirm threat to coral reef ecosystems. *Marine Pollution Bulletin*, 42(12), 1301–1312.

Epstein, N., Bak, R. P. M., and Rinkevich, B. (2000). Toxicity of third generation dispersants and dispersed Egyptian crude oil on Red Sea coral larvae. *Marine Pollution Bulletin*, 40(6), 497–503.

Eryaşar, A. R., Özbilgin, H., Gücü, A. C., and Sakınan, S. (2014). Marine debris in bottom trawl catches and their effects on the selectivity grids in the northeastern Mediterranean. *Marine Pollution Bulletin*, 81(1), 80–84.

Etnoyer, P. J., Wickes, L. N., Silva, M., Dubick, J. D., Balthis, L., Salgado, E., and MacDonald, I. R. (2016). Decline in condition of gorgonian octocorals on mesophotic reefs in the northern Gulf of Mexico: Before and after the Deepwater Horizon oil spill. *Coral Reefs*, 35(1), 77–90.

Fisher R., O'Leary, R.A., Low-Choy, S., Mengersen, K., Knowlton, N., Brainard, R.E., Caley, M.J. (2015). Species richness on coral reefs and the pursuit of convergent global estimates. *Current Biology*. 25, 500-505.

Gregory, M. R. (2009). Environmental implications of plastic debris in marine settings –Entanglement, ingestion, smothering, hangers-on, hitch-hiking and alien invasions. *Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences*, 364(1526), 2013–2025.

Grottoli, A. G., Warner, M. E., Levas, S. J., Aschaffenburg, M. D., Schoepf, V., McGinley, M., Baumann, J., Matsui, Y. (2014). The cumulative impact of annual coral bleaching can turn some coral species winners into losers. *Global Change Biology*, 20(12), 3823–3833.

Hannak, J. S., Kompatscher, S., Stachowitsch, M., and Herler, J. (2011). Snorkelling and trampling in shallow-water fringing reefs: Risk assessment and proposed management strategy. *Journal of Environmental Management*, 92(10), 2723–2733.

Hodgson, G. 2000. Coral reef monitoring and management using Reef Check. *Coastal Zone Management*, 1, 169–176.

Hoegh-Guldberg, O., Mumby, P.J., Hooten, A.J., Steneck, R.S., Greenfield, P., Gomez, E., Harvell, C.D., Sale, P.F., Edwards, A.J., Caldeira, K., Knowlton, N., Eakin, C.M., Iglesias-Prieto, R., Muthiga, N., Bradbury, R.H., Dubi, A., Hatziolos, M.E. (2007). Coral reefs under rapid climate change and ocean acidification. *Science, 318* (5857), 1737–1742.

Hong, S., Khim, J. S., Ryu, J., Kang, S. G., Shim, W. J., and Yim, U. H. (2014). Environmental and ecological effects and recoveries after five years of the Hebei Spirit oil spill, Taean, Korea. *Ocean and Coastal Management*, 102(PB), 522–532.

Hughes, T.P., Baird, A.H., Bellwood, D.R., Card, M., Connolly, S.R., Folke, C., Grosberg, R., Hoegh-Guldberg, O., Jackson, J.B.C., Kleypas, J., Lough, J.M., Marshall, P., Nyström, M., Palumbi, S.R., Pandolfi, J.M., Rosen, B., Roughgarden, J. (2003). Climate change, human impacts, and the resilience of coral reefs. *Science*, 301 (5635), 929-933.

Hungerford, H.R. and Volk, T.L. (1990). Changing learner behavior through environmental education. *The Journal of Environmental Education*, 21 (3), 8-21.

Jaap, W.C. (2000). Coral reef restoration. *Ecological Engineering*, 15, 345–364.

Jackson, J. B. C., Kirby, M. X., Berger, W. H., Bjorndal, K. A., Botsford, L. W., Bourque, B. J., Bradbury, R.H., Cooke, R., Erlandson, J., Estes, J.A., Hughes, T.P., Kidwell, S., Lange, C.B., Lenihan, H.S., Pandolfi, J.M., Peterson, C.H., Steneck, R.S., Tegner, M.J., MWarner, R. R. (2001). Historical Overfishing and the Recent Collapse of Coastal Ecosystems. *Science*, *293*(5530), 629.

Jang, Y. C., Hong, S., Lee, J., Lee, M. J., and Shim, W. J. (2014). Estimation of lost tourism revenue in Geoje Island from the 2011 marine debris pollution event in South Korea. *Marine Pollution Bulletin*, 81(1), 49–54.

Jefferson, R., McKinley, E., Capstick, S., Fletcher, S., Griffin, H., and Milanese, M. (2015). Understanding audiences: Making public perceptions research matter to marine conservation. *Ocean and Coastal Management*, *115*, 61–70.

Juhasz, A., Ho, E., Bender, E., and Fong, P. (2010). Does use of tropical beaches by tourists and island residents result in damage to fringing coral reefs? A case study in Moorea French Polynesia. *Marine Pollution Bulletin*, 60(12), 2251–2256.

Katsanevakis, S., and Katsarou, A. (2004). Influences on the distribution of marine debris on the seafloor of shallow coastal areas in Greece (Eastern Mediterranean). *Water, Air, and Soil Pollution*, 159(1), 325–337.

Kjellmark, E. (1996). Late Holocene climate change and human disturbance on Andros Island, Bahamas. *Journal of Paleolimnology*, 15, 133–145.

Leeworthy, V. R., Maher, T., and Stone, E. A. (2006). Can artificial reefs alter user pressure on adjacent natural reefs? *Bulletin of Marine Science*, 78(1), 29–38.

Loya, Y., and Rinkevich, B. (1980). Effects of oil pollution on coral reef communities. *Marine Ecology Progress Series*, *3*(3), 167–180.

Lucrezi, S., Milanese, M., Markantonatou, V., Cerrano, C., Sarà, A., Palma, M., Saayman, M. (2017). Scuba diving tourism systems and sustainability:

Perceptions by the scuba diving industry in two marine protected areas. *Tourism Management*, 59, 385 – 403.

Meyers, R. (2016). An aesthetics of resilience: Design and agency in contemporary coral restoration. *Resilience*. Retrieved from http://www.tandfonline.com/eprint/iknrfZuNj6XqTqhw9wVq/full

Milon, J.W. (1989). Artificial marine habitat characteristics and participation behavior by sport anglers and divers. *Bulletin of Marine Science,* 44 (2), 853–862.

Ministry of Tourism: Research and Statistics Department. (2015). Frequently requested tourism statistics report. Retrieved from http://www.tourismtoday.com/sites/default/files/frequently_requested_statistics_brochure_2015.pdf

Moore, A. (2015). Islands of difference: Design, urbanism, and sustainable tourism in the anthropocene Caribbean. *The Journal of Latin American and Caribbean Anthropology*, 20(3), 513–532.

Moore, A. (2016). Anthropocene anthropology: Reconceptualizing contemporary global change. *Journal of the Royal Anthropological Institute*, 22(1), 27–46.

Musa, G. (2002). Sipadan: A SCUBA-diving paradise: An analysis of tourism impact, diver satisfaction and tourism management. *Tourism Geographies*, 4(2), 195–209.

Negri, A. P., Brinkman, D. L., Flores, F., Botté, E. S., Jones, R. J., and Webster, N. S. (2016). Acute ecotoxicology of natural oil and gas condensate to coral reef larvae. *Scientific Reports*, 6(1), 21153.

NOAA. (2011). Summary Report: The Economic Value of U.S. Coral Reefs.

Perdomo, G. (2012, March 12). Is art better down where it's wetter? *Maclean's,* 125(9), 82.

Prevention is key to stop marine litter at source. (2014). *Food Packaging Bulletin*, 23(5), 16-17.

Restoration of coral reefs | Reef resilience. (2016). Retrieved July 2017 from http://www.reefresilience.org/coral-reefs/management-strategies/ecological-restoration/restoration-of-coral-reefs/

Rinkevich, B. (2014). Rebuilding coral reefs: Does active reef restoration lead to sustainable reefs? *Current Opinion in Environmental Sustainability*, 7, 28–36.

Roche, R. C., Harvey, C. V., Harvey, J. J., Kavanagh, A. P., McDonald, M., Stein-Rostaing, V. R., and Turner, J. R. (2016). Recreational diving impacts on coral reefs and the adoption of environmentally responsible practices within the SCUBA diving industry. *Environmental Management*, *58*(1), 107–116.

Rudd, M.A. and Tupper, M.H. (2002). The impact of Nassau Grouper size and abundance on scuba diver site selection and MPA economics. *Coastal Management*, 30, 133–151.

Sheavly, S. B., and Register, K. M. (2007). Marine debris and plastics: Environmental concerns, sources, impacts and solutions. *Journal of Polymers and the Environment*, 15(4), 301–305.

Stolk, P., Markwell, K., and Jenkins, J. M. (2007). Artificial reefs as recreational scuba diving resources: A critical review of research. *Journal of Sustainable Tourism*, 15(4), 331–350.

Studivan, M. S., Hatch, W. I., and Mitchelmore, C. L. (2015). Responses of the soft coral *Xenia elongata* following acute exposure to a chemical dispersant. *SpringerPlus*, 4(1), 80.

Taylor, J. deCaires. (2011). Swimming with sculptures. *New Scientist*, 212(2843), 48–48.

Taylor, J. deCaires. (2017). "Projects." Retrieved from www.underwatersculpturegarden.com

The Bahamas Weekly News Team. (2017). "Hurricane Matthew aftermath photos of Nassau, New Providence." Retrieved from http://www.thebahamasweekly.com/publish/new-providence-bahamas/Hurricane_Matthew_aftermath_photos_of_New_Providence50726.shtml

Tudor, D. T., and Williams, A. T. (2008). Important aspects of beach pollution to managers: Wales and the Bristol Channel, UK. *Journal of Coastal Research*, 24(3), 735–745.

UNEP, UNWTO, 2005. Making Tourism More Sustainable: A Guide for Policy Makers. UNEP-DTIE and UNWTO, Madrid, Spain.

U.S. Department of State. (2015). U.S. Relations with the Bahamas. Retrieved from http://www.state.gov/r/pa/ei/bgn/1857.htm

Zeppel, H., and Muloin, S. (2008). Conservation and education benefits of interpretation on marine wildlife tours. *Tourism in Marine Environments*, *5*(2), 215–227.