

Is Whale Watching a Win-Win for People and Nature? An Analysis of the Economic,  
Environmental, and Social Impacts of Whale Watching in the Caribbean

by

Bonnie Jean Raschke

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Approved October 2017 by the  
Graduate Supervisory Committee:

Ann Kinzig, Chair  
Kathleen Andereck  
Leah Gerber  
Ben Minter  
Charles Perrings

ARIZONA STATE UNIVERSITY

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## ABSTRACT

Whale watching has been hailed by environmental non-governmental organizations like Greenpeace and the International Fund for Animal Welfare as a responsible form of tourism that has the potential to enhance conservation outcomes for cetaceans, while also supporting the economic development of coastal communities. Tourism research suggests that while it is possible for whale watching to provide these benefits, it may also have considerable costs to members of host communities and cetaceans. My dissertation sought to gather data on the economic, ecological, and social impacts of whale watching in the Caribbean in order to evaluate the industry's performance in the region. My project thus took the form of three sub-projects. The first used an ordinary least squares analysis to examine the relationship between Caribbean country characteristics and whale watching expenditures. This analysis showed that a country's level of development changes the strength of correlations, that mass tourism development is negatively associated with whale watching profits, and that cetacean biodiversity and whale watching regulations designed to protect cetaceans both had positive relationships with the whale watching industry. In the second sub-project, I developed an index of Caribbean cetacean vulnerability to the negative impacts of whale watching with a traditional literature review informed by systematic methods. The index illustrated that both target and non-target species had vulnerabilities, and that regulations addressing these issues in the Caribbean were lacking overall. Considerable gaps in data were also identified. Finally, I used qualitative interviews in Dominica and the Dominican Republic to gather information on resident perceptions of whale watching.

This analysis revealed overall positive perceptions of the industry in both countries, but also uncovered considerable levels of social conflict surrounding whale watching. Taken together, the results of my study suggest that better regulatory structures, investment in the local community, and efforts to maximize cooperation are needed in order for the Caribbean whale watch industry to better serve local communities, while mitigating its impacts on cetaceans.

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## GLOSSARY OF TERMS

**Conservation:** Throughout this dissertation I used this term to specifically denote biodiversity conservation.

**Ecotourism:** Ecotourism is here understood to be a form of nature-based tourism with the following primary components: (1) it is managed in an environmentally friendly way and supports conservation, (2) it supports local communities in an equitable, economically sustainable manner, and (3) it provides environmental education to visitors (Bottrill & Pearce, 2009; Buckley, 1994).

**Integrated conservation-development projects (ICDPs):** ICDPs include a variety of different projects with a common goal of linking social and economic development with conservation in protected areas (Wells & Brandon, 1992).

**Sustainability:** Sustainability is used as a general term in this dissertation, indicating resource use that allows for long-term viability of that activity. I use the terms economic sustainability, environmental sustainability, and social sustainability to parse out the specific ways in which a human use for a resource can be sustainable in addressing industry, community, and ecological impacts.

**Target cetaceans:** These are cetacean species that are specifically targeted for viewing and interaction by the WW industry, and are exposed to the direct impacts of WW. The

most popular species in the Caribbean are the humpback whale, sperm whale, and bottlenose dolphin. Likewise, non-target cetaceans are those species that are not sought out, but may be viewed opportunistically, and/or suffer indirect effects of the industry.

**Tourism Leakage:** The concept of leakage in research concerning tourism is the counterpart to the multiplier effect, in which money spent on tourism in a certain area is not available for use in that area. Common causes of tourism leakage are imports and foreign workers, and the colonial legacy of the Caribbean (Chirenje, Chitombe, Gukurume, Chazovachii, & Chitongo, 2013; Lacher & Nepal, 2010).

**Whale watching (WW):** WW is the activity of observing or interacting with cetaceans in their natural habitat, and is most commonly done from boats, but can also be experienced from land or aircraft (Hoyt, 2001).

## LIST OF ABBREVIATIONS

CEBSE = Center for the Conservation and Eco-Development of Samaná Bay and its

Surroundings

DR = The Dominican Republic

E-NGO = environmental non-governmental organization

GDP = gross domestic product

ICDP = integrated conservation-development project

IFAW = International Fund for Animal Welfare

IUCN = International Union for Conservation of Nature

IWC = International Whaling Commission

NGO = non-governmental organization

OLS = ordinary least squares

PA = protected area

PES = payments for ecosystem services

SET = social exchange theory

SIDS = small island developing states

SVG = St. Vincent and the Grenadines

USD = US dollar

WW = whale watching

WWO = whale watching operator

## INTRODUCTION

### **A. Context of the Study**

Whale watching (WW) is a nature-based tourism industry that developed in the United States during the 1950s, and which is based on the viewing of cetaceans (whales, dolphins, and porpoises) in their natural habitat (Hoyt, 2009). While there is some debate as to whether or not WW can be considered a form of ecotourism (Stamation, Croft, Shaughnessy, Waples, & Briggs, 2007), its proponents (including operators, and some environmental non-governmental organizations) assign it many characteristics that relate it to ecotourism, and to conservation projects designed to connect social and economic development with biodiversity protection. WW is believed to have benefits for both the environment and people (Greenpeace, 2004; IFAW, 2013; WDC, 2016), but the industry is also faced with many of the same problems and complexities that challenge other social-ecological conservation methods. These include issues like balancing trade-offs between profiting from nature while at the same time protecting its well-being, working closely with stakeholders with varying degrees of power within the local community, and avoiding economic incentives that promote overuse (Carlsson & Berkes, 2005; A. P. Kinzig et al., 2011; Silva, 2015; Wells & Brandon, 1992). My project sought to investigate some of WW's human and environment impacts in order to examine those areas in which it does benefit people and cetaceans, and how it might be improved in order to enhance its ability to provide economic support to coastal communities while also protecting cetaceans. To help motivate this study, I will here examine WW's relation to conservation, and then explore its benefits and costs.

Modern efforts to conserve biodiversity (especially species and ecosystem diversity) have led to a variety of different strategies, but most common is the establishment of protected areas (PAs) around the world, which limits human uses for the land to varying extents (West, Igoe, & Brockington, 2006). As of 2014, according to the United Nations Environment Program, PAs cover 15.4% of the Earth's terrestrial and inland water area, and 8.4% of marine areas within national jurisdictions (Juffe-Bignoli et al., 2014). In many of these places, human habitation is not allowed, but visitation by tourists is encouraged (W. M. Adams & Hutton, 2007; West et al., 2006). Described as a "fines and fences" approach, this form of biodiversity protection has led to conflict in many countries, where conservationists are pitted against impoverished locals when they access protected areas to attain the resources they need to survive (Dowie, 2011; Wells & Brandon, 1992). Due to these conflicts, new conservation strategies that link human and environmental needs have been developed, such as Integrated Conservation-Development Projects (ICDPs) and payments for ecosystem services (PES) (Alpert, 1996; A. P. Kinzig et al., 2011). Ecotourism, which WW can be in certain circumstances, was not developed for the purpose of conservation but it can still be considered a tool for achieving conservation outcomes because it links human economic development with certain aspects of an intact environment (Bottrill & Pearce, 2009; Christensen Jr., 2011; Coria & Calfucura, 2012). It is hoped that strategies linking human well-being and conservation will enhance the long-term viability of conservation projects in areas where local people were undermining protection efforts (Gossling, 1999; Wells & Brandon, 1992).

WW's major proponents, such as environmental NGOs like the International Fund for Animal Welfare and Whale and Dolphin Conservation, see similar potential for WW,

as it can support coastal communities while creating economic incentives for the protection of cetaceans and their environment (IFAW, 2013; WDCS, 2013). As of 2010, whale watching tourism provided 2.5 billion USD and 15,000 jobs worldwide, and there is a strong potential for future growth of the industry in developing countries (Cisneros-Montemayor, Sumaila, Kaschner, & Pauly, 2010). Due to this economic potential, WW may incentivize the protection of whales and dolphins through the non-consumptive value that it has created for living target animals. This industry can further support cetacean conservation through serving as an alternative economic activity to whaling. Although large cetacean hunting has largely been stopped due to collapses in cetacean resources and the International Whaling Commission's (IWC) international moratorium it remains problematic due to a few countries' continued whaling and ongoing efforts to lift the moratorium (Burns, 1997; Hoyt & Hvenegaard, 2010). Many other threats to cetaceans are not well understood, due to the expense of cetacean research and the highly mobile lifestyles of many cetaceans. In fact, as of 2008 there were so little data available on cetaceans that more than half of them were classified as Data Deficient by the International Union for Conservation of Nature (IUCN) (IUCN, 2016). Whale watching may serve as a partial solution to this problem by providing alternative research platforms for cetacean researchers (Alie, 2008; Hoyt, 2005b). With properly designed educational programs, WW can also play an important role in educating locals and visitors about cetaceans and their conservation needs (J. Higham, Bejder, & Williams, 2014b; M. B. Orams, 1997b). In addition, there is some evidence that WW had an emotional/effective dimension that can connect people to nature, with potential implications for broader conservation attitudes and behaviors (Clayton & Myers, 2015).

Much like other conservation tools that link biodiversity protection and human development, WW is not a simple win-win strategy. The industry poses risks to cetaceans and their environment, especially in the case of boat-based activities. Some common detrimental effects that have been observed in connection with WW include the following: cetacean behavioral changes resulting in less resting, feeding, and socialization; shifts in habitat use; disruption of cetacean communication by boat noise; and exposure to increased levels of chemical pollution (Parsons, 2012). Although many of these impacts are short-term, there is concern that high and growing levels of WW may make many of them persistent enough to have long-term, population-level effects on target species (Arcangeli, Crosti, del Leviatano, & Rome, 2009; Bain, Trites, & Williams, 2002; R. Constantine, Brunton, & Dennis, 2004). There are also considerable conflicts of interest between whale watching operators' (WWOs) short-term economic goals, and the welfare of the cetaceans. Many WWOs assume that tourists want to get as close to the animals as they can but this increases the intensity of WW's disturbance of target cetaceans (Parsons, 2012). Competition between WWOs may also encourage aggressive boat maneuvering that is known to disturb cetaceans (Garrod & Fennell, 2004; M. B. Orams, 2000; R. Williams, Bain, Ford, & Trites, 2002). As with other forms of tourism, mismanaged whale-watching industries can also have negative social consequences, restricting local people's use of marine areas, and in some cases, streaming revenue out of the local community to foreign investors and international tourism companies (Lacher & Nepal, 2010; Peterson Jr., 1993).

It is clear that conservation in general, and WW specifically, involve closely tied human and natural systems. Conflicts of interest between these systems make the

economic, social, and environmental success of ecotourism like WW uncertain, and at times the industry can even be counterproductive for conservation and/or local development (Blane & Jaakson, 1994; Bottrill & Pearce, 2009; Boyle & Samson, 1985; Coria & Calfucura, 2012). Due to these shortcomings, many researchers have rightfully called for more precautionary measures (e.g. the development of better guidelines/regulations with systems of enforcement at the industry or national level, caps on WW activity, etc.) (J. Higham et al., 2014b; Parsons, 2012; Wiley, Moller, Pace III, & Carlson, 2008). However, WW should not be entirely ruled out as a strategy for cetacean conservation and human development. In regions such as the Caribbean, studied here, tourism is a vital part of many national economies, and WW can offer an opportunity for local people to start their own businesses and utilize skills from other professions (such as fishing) to their advantage (Hoyt, 2005b). Without proper management, however, WW can be a threat to the cetaceans it relies on, it may fail to develop and utilize effective educational tools, and it may not be economically or socially sustainable. There remain substantial gaps in the research being done on WW, as many studies have focused on the immediate impacts on cetaceans and visitor experiences (J. Higham et al., 2014b). In order to improve WW's impact, it is essential to develop a more holistic understanding of the industry, and its effects on both humans and cetaceans.

## **B. Problem Statement**

Since the 1950s, WW has developed and intensified rapidly, as the public's interest in and love for cetaceans has grown. In some WW areas, this growing popularity has increased the density of WW boats, so that vessels may accompany target cetaceans



for the entire duration of the day during the height of WW season(J. Higham et al., 2014b). Regulations have been shown to be useful in lessening disturbance, but many countries don't enforce them or lack rules altogether (Carlson, 2012; Garrod & Fennell, 2004). Together, this industry intensity and dearth of industry controls may cause WW to become a significant threat to some cetacean species. Furthermore, it is unclear whether the industry is providing the hoped-for benefits to local people, which are especially needed in developing areas. It is this uncertainty that makes my investigation of WW's human and environmental effects so relevant.

This examination is further necessary due to gaps in knowledge about key impacts of WW. There is a considerable body of research on the negative impacts of WW on cetaceans, but these studies are primarily focused in developed countries and on a very small sub-set of cetacean species which limits our understanding to those contexts and those impacts that are consistent across the board. This means that the specific impacts by this industry in developing countries are not well understood, even though these are the areas expected to see the most WW growth in the future(Cisneros-Montemayor et al., 2010). The impacts on many target cetaceans are also unknown, and few studies have considered non-target species, which may still experience indirect effects. Those studies that have analyzed the social-economic side of WW also have a fairly limited focus. Economic studies have looked at the direct and indirect revenue produced by WW around the world, the value of living whales in relation to WW, and they have compared WW and whaling. None examine the relationship between country characteristics (e.g. size and kind of tourism, population, development, etc.) and the economic success of WW in depth, which is an important consideration as developing nations attempt to develop the

industry. This information will be valuable in terms of allocating scarce resources to development, and balancing trade-offs between coastal development and the protection of marine wildlife. Social studies have focused on the impact of WW on tourists, examining what aspects of a WW experience may increase a visitor's satisfaction, and looking at the effect of WW education programs on environmentally friendly behaviors. Few have looked at local perceptions of and experiences with the industry, so it is unclear what specific social impacts WW may have in host locations. Finally, there are few studies that integrate the social and ecological data that are essential for a fuller understanding of this ecotourism industry.

In light of this, my dissertation seeks to fill several of these gaps in the scientific knowledge of WW using the Caribbean as a case study. The information developed here can assist in the enhancement of WW for both humans and cetaceans by providing suggestions for improvement informed by ecological, economic, and social data. I studied the relationship between country characteristics and WW revenue in order to gain an understanding of what countries may be well-suited to attain the economic benefits of WW. I examined the vulnerability of Caribbean cetacean species to both the direct and indirect impacts of WW in order to provide insight into precautions that may need to be taken in order to protect them from WW's negative effects. I also interviewed residents in Dominica and the Dominican Republic to gather information on their perceptions of and experiences with WW and associated conservation efforts. My dissertation considers the implications of this social and environmental information in order to provide an integrated understanding and evaluation of the industry and its potential effects within the Caribbean with the use of the restrictive ecotourism framework.

### **C. Aim and Overview of the Study**

The aim of my PhD project is to build an interdisciplinary understanding of whale watching impacts on cetacean conservation and human well-being in the Caribbean.

Following this introduction, my dissertation is organized into four primary sections. Chapter One will expand on the context described here, delving into the current economic understanding of WW, impacts of the industry on cetaceans, and past research on the social impacts of WW. This chapter also highlights current theories and debates concerning each component, highlight the relevant gaps in scientific knowledge. The core of my dissertation follows, which is structured as three separate chapters for each component of my investigation: Chapter Two covers the relationship between Caribbean country characteristics and WW revenue, Chapter Three discusses the vulnerability of Caribbean cetaceans to the negative impacts of WW, and Chapter Four examines the resident perceptions of WW in Dominica and the Dominican Republic. Each chapter is organized in journal article format with a short introduction, methods, results, and discussion. My concluding chapter briefly synthesizes the results of my substantive chapters and also examines Caribbean WW through the lens of Buckley's (1994) restrictive ecotourism framework and environmental ethics.

### **D. Research Questions**

Primary Question: What are the consequences of WW development on cetacean conservation and human well-being in the Caribbean, with a particular focus on the Dominican Republic and Dominica?

Sub-Question #1: How are the economic benefits of whale watching related to the political and environmental characteristics of Caribbean countries?

Sub-Question #2: What Caribbean cetacean species may be resilient or vulnerable to the impacts of WW due to behavioral and life history characteristics?

Sub-Question #3: What are the local perceptions of the whale watching industry and associated cetacean conservation?

### **E. Scope of the Study**

My dissertation focuses on WW in the Caribbean region. As mentioned previously, most WW research has been conducted in developed countries, and so a study of the industry within developing nations will fill some important gaps in our knowledge of this industry. The focus on the Caribbean allows for a depth of investigation that would otherwise be impractical if done on a global scale. Furthermore, although the Caribbean is home to a variety of unique cultures, most of its countries and territories share similar colonial pasts, and many of their economies rely heavily on tourism (Jayawardena, 2002; Pattullo, 2005). Thus, comparing the social and economic characteristics of WW within the region is both methodologically coherent and highly valuable, as it may reflect different solutions to similar problems. Despite this geographical focus, my study will provide data valuable to other small island developing states (SIDS), as many of these countries have similar limits on their resources, and face similar challenges due to their size and shared struggles with colonization (S. Teelucksingh, Nunes, & Perrings, 2013). Generalization to other developing nations will be more limited, but this investigation will highlight some of the work that needs to be

done globally if WW is to serve as an effective tool for enhancing cetacean conservation and the development of coastal communities.

The economic portion of my dissertation will examine the relationship between WW expenditures and country characteristics for destination countries only, and will not be addressing the comparison of WW and whaling revenue. While many studies seeking to investigate the deterministic characteristics of international tourism demand include information concerning both destination and origin countries (Crouch, 1994; Eilat & Einav, 2004), I looked only at destination characteristics because those have the potential to be influenced by Caribbean countries. I recognize that comparing WW and whaling is a common interest due to the Caribbean's involvement with whaling through the IWC, St. Vincent and the Grenadines' aboriginal subsistence permit, and through the opportunistic small cetacean hunts that are common in the region, but this is outside of the primary aim of my study. My work here is meant to focus on the direct impacts of the WW industry only on people and cetaceans, and WW has its own suite of potential problems that need to be addressed as it grows around the world. Finally, my model should not be considered predictive, due to its exploratory nature; but it is useful as a way to look at some key relationships between country attributes, conservation, and the WW industry.

My cetacean vulnerability analysis only includes Caribbean cetaceans due to the depth of information that I need for each species. Limiting the scope of this section of my project also makes it more applicable to the study as a whole, as the social and economic studies will only be examining the Caribbean. The social component of my research examines perceptions of local residents, WWOs, and government officials in WW destinations such as Dominica and the Dominican Republic. While the experience of

visitors is important to the economic and environmental sustainability of WW, local people have widely been left out of the research on this industry. Residents have a profound impact on conservation success in their own countries, and ethical conservation projects must consider their well-being. In order for WW to benefit local people, as it is often claimed to do, local experience with this industry must be understood.

### **F. Significance of the Project**

My project and its components will have several important implications for the current understanding of WW through inclusion of local people, focus on developing region, and an interdisciplinary synthesis of my results. It will contribute data to the overall research effort to understand and improve WW and ecotourism ventures, and it will provide insight into determining solutions for problems of attaining social and economic benefits while protecting cetaceans.

While economic research focused on deterministic country characteristics of tourism has been a common part of general tourism research, this has not yet been carried out for WW. Tourism has the potential to provide substantial resources to developing countries. These benefits are also relevant to WW, which many developing countries have begun to invest in despite the uncertainty of attaining these benefits, and the risk to local cetaceans of non-regulated growth and operator behavior. My research identified country characteristics that are important to WW expenditures, and this information can then be used to identify areas that are well suited to the industry, or locations that may serve as sanctuaries for cetaceans from WW. This will also be useful for countries

looking to develop their WW tourism so that they can address and identify characteristics that may threaten the success of the industry.

My study also utilizes ecological theory and previous WW studies to identify vulnerable/resistant cetacean species and provide guidance for WW self-regulation and government policy. Previous WW impact research has focused on only a few cetacean species, in a few key research locations, but as the industry's growth is outpacing research, it is imperative that we develop knowledge and decision-making tools that will assist in mitigating the negative impacts of this industry on both people and the environment. In part, synthesis can play a role in this (Turner et al., 2003). The precautionary principle also calls for quick action regarding to these impacts (Kriebel et al., 2001), especially in light of the fact that little is known about the indirect effects of WW or impacts on non-target species.

The social component of my project gathered data on prevalent social themes concerning resident perceptions of the whale watching industry and the perceived connections between WW and cetacean conservation policy in the Caribbean. While investigations of resident perceptions are common in general tourism research, this work has not yet been carried out for WW. Local people and WWOs are key players in the success and overall sustainability of WW, and beginning to understand their experience with, and opinions of the industry and its regulations will assist in identifying successful and problematic strategies for coupling economic and conservation success through WW. This will also support efforts to make WW more equitable. Furthermore, my qualitative data can be used to form the basis of further quantitative research, and give interested governments and WW operators a better understanding of the current relationship

between local people and the whale watching industry and any associated cetacean conservation efforts.

Each of my project's components, and the resulting interdisciplinary synthesis of the information gathered during the course of this study will support the development of new solutions to balancing the needs of humans and cetaceans in relation to WW. The history of conservation has clearly taught us that such trade-offs need to be considered (e.g. when are they appropriate to make, who should decide, etc.), and interdisciplinary studies such as this is necessary to understand and address those trade-offs (Leader-Williams, Adams, & Smith, 2011; Wells & Brandon, 1992). My study will offer a fresh look at the WW industry, and provide unique data that can be used to address issues that have rarely been discussed for this form of marine tourism. It will also begin to involve WW stakeholders in both research and solution-building in ways not previously done. The welfare of humans and the environment is tightly intertwined and research acknowledging that is essential to addressing the problems being highlighted by field-specific studies.



## CHAPTER ONE: LITERATURE REVIEW AND BACKGROUND

### **Section One: Introduction**

#### **A. Importance of Cetaceans to Humans and Threats to Cetaceans**

Cetaceans, or whales, dolphins, and porpoises, have been figures in the cultural and historical existence of humans for centuries, where they served as food, saviors, partners, and sometimes, individuals warranting their own rights (S. J. Allen, 2014; P. Corkeron, 2014). They are currently some of the world's foremost charismatic megafauna, heading conservation efforts since the precipitous decline of baleen whales during the era of whaling (Clapham et al., 2007; Mulvaney, 2003). They have become an economic force in the form of whale watching (WW) tourism around the world, and regarding both their conservation and this global form of tourism, it is clear that they have considerable nonmarket, existence value for many people (J. Higham et al., 2014b; O'Connor, Campbell, Cortez, & Knowles, 2009). Besides this, cetaceans are a key part of the healthy marine ecosystems that most people in the world rely on in order to survive; they are part of the ocean's nutrient pumps, they are linked to higher levels of fisheries yields, and they can shape their ecosystems as keystone species (Roman & McCarthy, 2010; Roman et al., 2014). In all of these ways, it has become clearer over time that cetacean conservation is a key part of marine conservation, and a central part of functioning oceans that humans need to survive.

There are several threats to cetaceans worldwide, including pollution, ship strikes, climate change, and continued whaling, among others (IUCN, 2016). The International Union for Conservation of Nature (IUCN) has determined that almost a

quarter of cetacean species are currently threatened<sup>1</sup>, with insufficient data for nearly half of the species making it difficult to determine their conservation status (IUCN, 2016; Simmonds & Elliott, 2009). Historically, over-harvesting was the greatest threat to these marine mammals (Burns, 1997; Mulvaney, 2003; Stoett, 1997). In fact, it is estimated that there were nearly 4 million whales in the oceans before industrial whaling developed in the nineteenth century. By 1975 the collective population had declined to just over 2 million. Baleen whales, such as blue whales and fin whales, suffered even greater losses, with some species in the Antarctic seeing more than a 90% drop in their numbers since the industrialization of the whaling industry (Burns, 1997; IUCN, 2016). In response to the concern that the global whale fishery was headed towards collapse, the International Whaling Commission (IWC) was formed and charged with the management of whaling stocks in 1946 (Burns, 1997; Perry, DeMaster, & Silber, 1999). Despite efforts to regulate the industry, the commission was forced to declare a moratorium on commercial whaling in 1986, when many whaling species hit population levels low enough to constitute commercial extinction. This moratorium was originally meant to last only a decade, but has remained active due to the inability of IWC nations to agree on a new whaling management system, as well as a shift in public opinion against whaling (Burns, 1997; Clapham et al., 2007).

Although the moratorium has significantly lessened hunting pressures on whales, several IWC member nations, including Norway, Japan, and Iceland, have continued to harvest cetaceans through various means. Iceland and Norway objected to the

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<sup>1</sup> Including IUCN categories of Near Threatened, Vulnerable, Endangered, and Critically Endangered.

moratorium shortly after it was declared, and legally they were not required to cease their whaling activities. Japan has continued to grant itself whaling quotas through the IWC’s scientific whaling policy, which allows a country to harvest large cetaceans for scientific purposes, although it has faced continuous international opposition to this program due to its connection with whale meat sales (Burns, 1997; Mulvaney, 2003; Stoett, 1997).

Aboriginal subsistence whaling permits have also been issued by the IWC to various communities in the United States, the Caribbean, Greenland, and Russia. These permits grant IWC-approved, non-commercial whale catches in order to preserve whaling traditions key to cultural identity in select communities (J. E. Adams, 1971; Gillespie, 2001; Reeves, 2002). Finally, small-cetaceans are widely hunted throughout the world, but these hunts are not regulated by the IWC, and there is lack of data on the scale and impact of this activity (Burns, 1997; Hoyt & Hvenegaard, 2010; Kasuya, 2007).

Table 1.1: Whaling by IWC Member States Since the Moratorium (International Whaling Commission, 2016)

<b>Whaling Types:</b>	<b>Primary Countries Involved:</b>	<b>Cumulative Whale Takes Since 1985-2015</b>
Objection to the Moratorium	Iceland, Norway	25,225
Scientific Whaling	Japan	16,755
Aboriginal Subsistence Whaling	Greenland, Russia, St. Vincent and the Grenadines, U.S.	10,471

Since the whaling moratorium, some cetacean species have had the opportunity to recover, but whaling has become a secondary concern to environmental threats, such as pollution and climate change. An overall lack of data makes it difficult to fully understand the impacts that these environmental changes are having on cetaceans, but there is a growing body of evidence illustrating the detrimental effects of these stressors

(Simmonds & Elliott, 2009). There are three primary forms of pollution impacting cetaceans: chemical pollution, plastic debris, and fishing gear (both derelict and in-use). In terms of chemical pollution, run off from urban and agricultural areas introduce toxins into the marine environment. Persistent organic compounds and heavy metals are some of the particularly concerning form of pollution for cetaceans as these have been connected to higher occurrences of cancer, immunological abnormalities, endocrine disturbance, and birth defects. For some species it has been found that mothers transfer as much as 96% of the persistent organic pollutants in their blubber to their offspring through lactation, which exposes developing cetaceans to such pollutants throughout the earliest stages of their growth (Reijnders, Aguilar, & Borrell, 2002). Plastic debris, which makes up 60-80% of all marine debris, is also ingested by many cetacean species. Consumption of plastic can compromise feeding enough to be fatal in some cases, and is another source of toxic chemicals (Reijnders et al., 2002). Finally, cetaceans also become entangled in both active and derelict fishing gear regularly enough for this to be a threat to some of their populations. From 1990-1999 there was a total of 30,288 cetacean bycatches in the US fisheries alone, which is one of the few places where there is data on these fatalities (Baulch & Perry, 2014; Reynolds, Perrin, Reeves, Montgomery, & Ragen, 2005).

Climate change is also projected to have considerable negative impacts on the marine environment and on cetacean species, although there is significant uncertainty concerning the extent and intensity of these impacts (Gambaiani, Mayol, Isaac, & Simmonds, 2009; Hoegh-Guldberg & Bruno, 2010; Intergovernmental Panel on Climate Change, 2014; Simmonds & Elliott, 2009). It is likely, however, that climate change will cause shifts in cetacean food supply due to changing temperatures, ocean acidification,

and changing ocean salinity. Furthermore, many cetacean species utilize high latitude environments, which will be heavily impacted by climate change due to this habitat's particular vulnerability to increasing temperatures; the Southern Sea, for example, supports nearly 1/5 of the known cetacean species (Simmonds & Elliott, 2009). In the case of the Scotia Sea and the northern Antarctic Peninsula there has already been nearly an 80% decrease in krill since the 1970s. It is possible that climate change's effect on habitat quality will also increase the occurrence of pathogens, change migration patterns, and due to the potential decrease in prey, increase competition between humans and marine mammals for food (Gambaiani et al., 2009). In light of the considerable levels of uncertainty regarding these threats and the complex regulatory requirements of the marine environment, many tools and strategies will be required to protect cetacean species into the future, one of which may be whale watching.

### **B. Whale Watching as Tool for Cetacean Conservation and a Threat**

Whale watching (WW), or "the human activity of encountering cetaceans in their natural habitat," is most commonly done from boats, but can also be experienced from land or aircraft (Hoyt, 2001). As of 2010, 2.5 billion USD and 15,000 jobs worldwide were provided by WW tourism, and there is a strong potential for future growth of the industry especially among developing countries (Cisneros-Montemayor et al., 2010). The potential benefits of this industry don't just end with economic support for coastal communities, however, as there are several potential avenue for WW to enhance cetacean conservation as well. Due to the industry's reliance on living cetaceans, it is thought that operators and governments alike may be incentivized to support the protection of these

species (Carlson, 2012; Gero, 2008; IWC, 1996). Furthermore, environmental non-governmental organizations (e-NGOs) and other WW proponents have made claims that WW is an important conservation tool due to its potential to educate tourists and local people about cetaceans, as well as the political and financial support that it can garner for cetacean conservation (Greenpeace, 2004; IFAW, 2013; WDCS, 2013). WW can also serve as a valuable research tool when operators help expand current knowledge on whale and dolphin distribution, abundance, and behavior, or host researchers on their boats (Alie, 2008; Hoyt, 2005b).

WW isn't without its costs, however, and it often poses risks to cetaceans and their environment, especially in the case of boat-based activities. Some common detrimental effects that have been observed in connection with this form of tourism include the following: behavioral changes resulting in less resting and feeding, shifts in habitat use, disruption of cetacean communication by boat-caused noise pollution, and exposure to increased levels of chemical pollution (Parsons, 2012). The severity of these impacts is influenced by the species affected, industry structure and regulations, and the environmental characteristics of the area (Bejder & Samuels, 2006; Duffus & Dearden, 1990; Lusseau & Higham, 2004; Steckenreuter, Harcourt, & Moller, 2012; Steckenreuter, Moller, & Harcourt, 2012). Mismanaged whale-watching industries can also have negative social consequences, as with other forms of tourism. For example, it may create conflict with fisheries, or in the cases of destinations with a whaling history it may also conflict with local, traditional norms (Peterson Jr., 1993; Ris, 1993). If whale watching is to be a conservation-oriented (specifically regarding the maintenance of biodiversity) solution to the various threats facing cetaceans, it must be developed and regulated so

that balanced trade-offs can be made to protect both human and cetacean well-being. A comparison of the benefits and costs of WW are listed in Table 1.2 below.

<b>Potential Benefits for Cetacean Conservation</b>	<b>Potential Costs for Cetacean Conservation</b>
Increased international support for cetacean conservation through whale watching visitor education, and cetacean experiences.	Harassment of cetaceans: changes in feeding and resting behavior, shifts in habitat use, increased aggression, etc.
Increased local support for cetacean conservation through the economic support of the whale watching industry, and cetacean experiences.	Harassment of cetaceans: changes in habitat use, abandonment of areas frequented by whale watching boats, etc.
Alternative economic activity to whaling.	Noise pollution: interruption of cetacean communication.
Platform for cetacean research.	Negative impacts on cetacean habitat: garbage, debris, and oil from whale watching boats, etc.
Encouragement of political support for cetacean and marine conservation.	Negative effects on local cultures (e.g. commodification, misrepresentation, etc).

## Section Two: Study Region Background and Importance

### A. The Caribbean Region



**Figure 1.1: Map of the Caribbean**

The Caribbean is a varied region containing 13 sovereign island nations, 17 dependent territories, and 11 developing nations on the mainland. Since it is utilized by many cetacean species, has a vibrant tourism industry in many of its countries, and exhibits a variety of cultural and historical characteristics, it is a dynamic and relevant study site for my analysis looking at WW as a tool for conservation.

The culture of the Caribbean is highly varied, shaped by a mix of European, African, and native traditions. This has resulted in an area with several different languages including French, English, Spanish, Dutch and several creole languages



(Figueredo & Argote-Freyre, 2008). The indigenous settlers of the Caribbean moved up from the South American continent starting in the 6th-Century BC, when the island of Trinidad was colonized. After this, the region underwent several north-moving waves of indigenous settlement, which resulted in the Caribbean being home to three primary, indigenous cultural groups at the time of Columbus' arrival to the Bahamas in 1492. These groups were the Guanahatabey of Cuba, the Taino of the Western Caribbean, and the Carib people of the Eastern Caribbean (Higman, 2011). When Europeans arrived, the region quickly became the gateway to the "New World", and in conjunction with its rising agricultural importance after Western colonization, the region was heavily contested among European powers (Honychurch, 1998). The colonies in the Caribbean were also the destination for many African slaves brought to work on plantations, most famously, the sugar plantations that dominated the Caribbean until the 20th Century. The influx of people from all over the world, early in the Caribbean colonial history led to the development of a unique and varied cultural atmosphere.

This colonial system continued late in the region's history, and in some capacity still remains today in the territories maintained by England, the United States, France, and the Netherlands. This, combined with the resource limitations posed by small islands, has led to continuing developmental struggles in the region (Figueredo & Argote-Freyre, 2008; Higman, 2011). Furthermore, poverty, high levels of tourism reliance, and the drug trade have created heightened levels of crime (Ayres, 1998). As of 2014, Latin America and the Caribbean had the highest homicide rates in the world. Of the countries included in this study, Honduras had the highest homicide rate with ~60-70 homicides per 100,000 people; Venezuela (~50-60 homicides per 100,000 people) and Jamaica (~30-40

homicides per 100,000 people) had particularly high violence statistics (Gagne, 2015). For comparison, as of the UN's Global Study on Homicide in 2013, the average homicide rate, globally, was 6.2 people per 100,000 (UNODC, 2013). While the region suffers from these challenges overall, some countries are faring better than others. For example, historically Haiti has the lowest per capita GDP in the hemisphere, while other countries, such as the Bahamas, are relatively well-developed.

Many Caribbean countries currently rely on mass tourism (all-inclusive resorts, cruise ships, sand/sun/sea tourism, etc) to stimulate and support their economies (Duval, 2004). The high levels of foreign exchange facilitated by the tourism industry hold economic promise, in the form of jobs and development. However, many of these jobs are limited to low-level work, and development may benefit tourists more than local people (Harrigan, 1974; Slinger-Friedman, 2009; Weaver, 1993). Furthermore, a high proportion of the money spent by tourists in Caribbean countries is lost to foreign investors, imports, or expat employee. In fact, the average level of this loss, otherwise known as tourism leakage, in the Caribbean has been estimated to be as high as 80% (UNEP, 2013b), and this phenomenon lessens the beneficial economic impact that tourism can have for local people (Slinger-Friedman, 2009). Furthermore, tourism can increase local exposure to Western culture, which can provide opportunities for meaningful cultural exchanges, but can also shift local consumption to Western foods and products, leading to increased importation and loss of national revenue (Duval, 2004). Cultural tourism can provide incentives to preserve traditional culture, but may also lead to its commodification.

Economic impacts aren't the only consideration when it comes to tourism, and in many Caribbean countries, rapid tourism development has also had considerable impacts on the terrestrial and marine environments. While the tourism industry also allows for infrastructure improvement that may benefit local people, this can also further endanger sensitive environments and native species (Duval, 2004; Lundberg, Krishnamoorthy, & Stavenga, 1995; Pattullo, 2005). Finally, some nations lack the infrastructure to deal with heightened levels of waste produced by large numbers of visitors, which can lead to untreated waste being dumped into the ocean (Bottrill & Pearce, 2009; Wong, 1998). The tourism industry has the potential to provide a wide array of benefits to local people, however, the type of tourism that is developed and the ways that the industry is regulated will be integral in determining whether those benefits outweigh the costs.

Mass tourism (e.g. large numbers of tourists in relatively isolated tourism complexes such as all-inclusive resorts and cruises), the most common form of tourism in the Caribbean, is often considered to have significant problems with revenue leakage and unsustainable development, and this imbalance of costs and benefits has caused many Caribbean nations to begin developing alternative tourism, such as ecotourism. The small-scale nature of alternative tourism may lessen the physical impacts of tourism, and this also makes it easier for local people to become business owners (Duval, 2004). Furthermore, nature-tourism's emphasis on natural areas rather than developed compounds has the potential to market individual Caribbean islands, unlike mass tourism such as cruise ship tourism, which often markets regional characteristics rather than country-specific attributes. Attractions specific to individual countries also incentivizes

the protection of biodiversity (Harrison, Jayawardena, & Clayton, 2003; Jayawardena, 2002; T. Larson, 1995; Moreno, 2005).

Besides being one of the most popular tourism destinations in the world, over 30 of the known ~88 species of cetaceans utilize the Caribbean at some time during the year (Hoyt, 1999), which makes the Caribbean an important region for cetacean diversity. Furthermore, these species play varying roles for local people in the region. Small cetacean hunting is known to be widespread in the Caribbean (particularly in the east), but the exact number of takes has not yet been quantified (Sutherland, 2001). Thus, the impacts of this activity are unknown, and it is unregulated on an international scale by the IWC (Hoyt & Hvenegaard, 2010; Mulvaney, 2003). In many cases, cetaceans are also an important component of the Caribbean tourism industry; the region received 301,616 whale watchers in 2008, 2% of the world total (O'Connor et al., 2009). As was mentioned above, this inclusion of cetaceans in WW tourism is believed to encourage interest in ensuring that local cetacean populations remain healthy because the industry relies on them (J. Higham et al., 2014b; IFAW, 2013). WW is also a form of harassment, however, and has been found to have a variety of different negative impacts on the cetaceans that are targeted by it (Parsons, 2012). Within the Caribbean, there are several different forms of WW, including traditional, observation-only (from boats and aircraft), swim-with tours, feeding opportunities, and even interactive situations that are connected to new age spiritual beliefs. Due to this, the characteristics, WWO aims, and the impacts of WW vary from country to country (O'Connor et al., 2009), which makes the region a valuable, complex study site.

Different uses of and values for whales, dolphins, and porpoises throughout the Caribbean, make it likely that conservation goals for cetaceans will vary from country to country. There are also considerable differences in human capacity and resources available for conservation in the Caribbean. For example, the region has islands like Guadeloupe and Martinique, which are parts of France, and thus have the conservation potential of a powerful European country, as well as poor countries like Haiti, which has struggled to provide food, shelter, and healthcare for its citizens. These differences can have major impacts on marine/migratory species that rely on healthy habitats in many different jurisdictions and may be subject to different human pressures as they pass through different countries. Furthermore, an effort by one nation to protect its cetaceans may be completely undermined by a lack of action, or intentional harvesting in other states. The geopolitical characteristics of the Caribbean, which has exclusive economic zones that are relatively small and dense compounds this problem, as there are many different regulatory structures affecting cetaceans in the Caribbean and very few areas of international waters (CAR-SPAW, 2012). Due to these things, regional cooperation will be necessary for successful protection and study of the many cetacean species that utilize this region (Hoyt & Hvenegaard, 2010), and WW, with its regional presence, may be able to help incentivize and organize such an effort. There has been historical precedents for this in the past including the CaribWhale group in the eastern Caribbean.

The Caribbean is an ideal study site for my project for many reasons, including its importance to cetaceans, its complex tourism industry and marine conservation needs, its premier WW industries, and due to the fact that we know much less about WW impact in developing regions. Furthermore, the data resulting from this study will be beneficial to

Caribbean governments, WWOs, and e-NGOs working in the region. Data on influential country characteristics and WW revenue will assist countries looking to develop new WW industries or grow the industry that they already have, while also assisting NGOs in locating areas, which may serve as good WW refuges for cetaceans due to low economic viability. The index developed to identify differing vulnerabilities of Caribbean cetaceans to the negative impacts of WW will likewise serve as a tool for improving WW regulations/guidelines. Finally, information on resident perceptions of the industry will shed light on the WW industry's relation with local people in the Caribbean as well as ways to improve those relationships in order to maximize local benefits from the industry.

## B. Dominica

Table 1.3: Summary Information for Dominica

<b>Country Area:</b>	751 sq km (CIA 2013)
<b>Population (2013):</b>	73,543 (The World Bank, 2016)
<b>Per Capita GDP (USD; 2013):</b>	\$7,011 (The World Bank 2016)
<b>Official Language:</b>	English (CIA 2013)
<b>% Literary (2013):</b>	94% (CIA 2013)
<b>Labor Force:</b>	Agriculture (40%), industry (32%), and services (28%) (CIA 2013)
<b>Tourist Arrivals (2012):</b>	79,000 (The World Bank 2016)
<b>Whale Watchers (2008):</b>	14,500 (O'Connor et.al. 2009)

Dominica has been strongly influenced by both French and English colonists, as well as the African cultures introduced through slavery, and the remnant of indigenous culture represented by the Carib settlement on the island. The legacy of the French culture is most strongly seen in the architecture of Dominica's cities, and the names of its landmarks, but as England was the last European power to control the island, English is the official and primary language of the island. Dominica is also unique in the Caribbean

for being the last home of the Carib or Kalinago people, who were removed from other Caribbean islands by European colonizers. Dominica provided these people a safe haven due to its steep mountains, which made agriculture across much of the island difficult, and made the island unappealing for European colonization for many years. When such colonization did occur, it was in connection with conflict between Britain and France, which struggled over ownership of the island for many years before Britain eventually laid final claim to Dominica in the decades before its independence (Honychurch, 1998).

Currently, Dominica has a small population with only 72,000 people in 2013. The country is highly reliant on small-scale agriculture, and about 40% of the population works in this sector (CIA, 2015). Due to this, Dominica's economy has struggled when their primary markets modify international policies impacting their exports. Most recently, they have begun to specialize in organic agriculture, which has been fairly successful but still results in an mono-sector economy, reliant on the countries that they export to for its well-being (DiMatteo, 2007; Honychurch, 1998). Dominica's fishing industry is fairly small, with an average of 1,526 fishermen from 2003-2009, or about 2% of the population (Food and Agriculture Organization of the United Nations, 2012). Fishermen in this Eastern Caribbean country are known to opportunistically hunt small cetaceans for food (Culik, 2002; Honychurch, 1998; Mulvaney, 2003). In terms of development, 81% of Dominica's population has access to improved sanitation (World Bank 2013), an average life expectancy at birth was 75.5 years (LeDuc, 2014), a 1.13 Unified Democracy Score (on a scale of -2.5 being less democratic, and 3.5 being the most) (Pemstein, Meserve, & Melton, 2010), and a homicide rate of 11.3 per 100,000 people (UNODC, 2013).

As of 2004, nearly 25% of Dominica's GDP was attributed to the tourism industry (European Commission, 2005). From 2002-2003, Dominica captured less than 1% of Caribbean tourists, but it also experienced the highest increase in visitor expenditures in the entire region (Slinger-Friedman, 2009). Much of the country's tourism revenue comes from cruise ship arrivals, while over-night visitors are a relatively smaller segment of the industry, partially due to Dominica's lack of a large international airport (Discover Dominica Authority, 2013; Honychurch, 1998; Slinger-Friedman, 2009). This country experiences one of the lowest levels of leakage among Caribbean nations, however, due to its political emphasis on local ownership of tourism businesses, and its lack of all-inclusive resorts (Patterson, Gulden, Cousins, & Kraev, 2004). Dominica's largest tourism market is the French West Indies (29%), with 18% of their visitors originating in the rest of the Caribbean, 26% from the US, and 15% from Europe (Caribbean Tourism Organization, 2014).

Due to the unspoiled nature of Dominica's forests, its pristine dive spots, and a variety of native charismatic species, the country has made a concentrated effort to market itself as "The Nature Island." It has also developed a system of comprehensive, nation-wide ecotourism experiences (Crask, 2007; Discover Dominica Authority, 2013; Honychurch, 1998; Slinger-Friedman, 2009; Weaver, 1991). In order to promote itself as The Nature Island, Dominica has created several protected areas, including three national parks, the Central Forest Reserve, and two marine protected areas (Crask, 2007; Honychurch, 1998; Wood, 2007). In total, 21.7% of Dominica's terrestrial area and 28.6% of its territorial waters were protected as of 2012 (The World Bank Group, 2014).



Dominica's whale watching industry fits in well with its image of The Nature Island, and it has even been coined "The Whale Watching Capital of the Eastern Caribbean." In fact, the country's WW industry, first established in 1988, is one of the oldest in the region. In 2008 they hosted 14,500 whale watchers with a direct expenditure of \$585,000 USD and an indirect expenditure of \$1,200,000 USD (O'Connor et al., 2009). There are four primary WWOs in Dominica, representing both seasonal and year-round operations, and several of the largest operators on the island are owned and run by local families (Alie, 2008). This WW destination is unique in that the country has access to a resident group of sperm whales (*Physeter macrocephalus*), and its WWOs have recently begun offering lucrative swim-with tours that target these animals. Furthermore, Dominica's goal to develop itself as a comprehensive ecotourism destination motivated the island nation to stop its pro-whaling support of Japan in the IWC in 2008 (Caribbean News Now, 2011; Greenpeace, 2010; Slinger-Friedman, 2009). The country partnered with IFAW to develop WW guidelines (Carlson, 2012), but as of 2014 these guidelines were not in use as was described by WWO interviewees during the process of this investigation.

### C. The Dominican Republic

<b>Country Area:</b>	48,670 sq km (CIA 2013)
<b>Population (2016):</b>	10.65 million (The World Bank 2016)
<b>Per Capita GDP (USD; 2013):</b>	\$5,826 (The World Bank 2013)
<b>Official Language:</b>	Spanish (CIA 2013)
<b>% Literary (2013):</b>	90.1% (CIA 2013)
<b>Labor Force (2013):</b>	Services (63.1%), industry (22.3%), and agriculture (14.6%) (CIA 2013)
<b>Tourist Arrivals (2016):</b>	5,959,300 (The World Bank 2016)
<b>Whale Watchers (2008):</b>	28,000 (O'Connor et.al. 2009)

The Dominican Republic is home to the oldest continually inhabited city in the New World, Santo Domingo, which was founded in 1498 by Christopher Columbus' younger brother Bartholomew Columbus. This is indicative of the fact that the island of Hispanola was the site of La isabela, the first European colony in the New World, which was founded in 1493 (Roorda, Derby, & González, 2014). Hispanola, or "Hayti" as it was called by the native Taino people, had been inhabited for thousands of years (Rouse, 1993). In fact, the island was one of the most highly developed islands in the Caribbean upon the arrival of European explorers(Pons, 2010). Its strong indigenous roots, as well as immediate European interest in its resources led to intense conflict between the Taino people and Spanish colonists. Taino men were also captured and forced to work in the Spanish mines, which disrupted agricultural patterns, and lead to famine among the native people. At the same time, continued exposure to exotic, Europeans pathogens led to rapid and disruptive population loss. By 1519, a third of the Taino population had been decimated by smallpox alone, and by 1530, the people were all but wiped off the landscape (Poole, 2011).

While the Dominican Republic shares characteristics with the rest of the Caribbean in terms of the arrival and often violent colonization of the region by Europeans, as well as the mixing of native, African, and European cultures, it is unique in many respects. Due to the early colonization of the island, and the collapse of the Taino population base that the Spanish had hoped to use as forced labor, importation of enslaved Africans began in the Dominican Republic earlier than in the rest of the Caribbean, making its African roots particularly deep. While plantations were established within the colony, however, they were not the mainstay of the early economy as in many Caribbean locales; rather, ranching and logging formed the back bone of the Dominican economy. These characteristics shaped social organization in the Dominican Republic, making it much less hierarchical than many other Caribbean nations, although it still suffers from high levels of inequality (Roorda et al., 2014).

With a population of ~10 million in 2009, the year of the last global WW inventory, the Dominican Republic was the most populous island nation in the Caribbean after Cuba. It's total GDP in 2009 was ~48 billion USD, making it the 5<sup>th</sup> largest GDP in the region after Venezuela, Colombia, Puerto Rico and Cuba. However, its per capita GDP was only 4,732 USD in this year, which was higher than only seven other countries in the region, including Jamaica, Belize, Guatemala, Guyana, Honduras, Nicaragua, and Haiti (World Bank, 2014). Many of the Dominican Republic's people live in poverty, and the nation devotes the smallest percentage of its public capital to education, health, and public safety when compared to the rest of Latin America (Cabezas, 2014). The primary economic sector in the Dominican Republic is the service sector, which employs ~63% of the population, and includes those employed by the large tourism industry in the country

(CIA, 2015). When it comes to the utilization of marine resources, the Dominican Republic had an average of ~11,000 fishermen from 2003-2009, which is only 0.11% of the population (Food and Agriculture Organization of the United Nations, 2012). In terms of development during the final period of economic analysis for this project, the Dominican Republic had a United Democracy Score of 0.67 (Pemstein et al., 2010), a life expectancy at birth of 72, and 80% of the population had access to improved sanitation (World Bank, 2014). Finally, this nation had a considerably high homicide rate, averaging at 23 people per 100,000 over the period of 2003-2009 (UNODC, 2013).

Tourism in the Dominican Republic is a vibrant and powerful component of the country's economy, with a direct GDP contribution of 4.7%, a total GDP contribution of 15.2% in 2013 (World Travel and Tourism Council, 2013). Furthermore, the Dominican Republic has one of the largest tourism market-shares in the Caribbean, and has positioned itself as a high-volume, low-cost destination, with its main markets being Europe, the US, and Canada (Caribbean Tourism Organization, 2014). Within the industry, all-inclusive resorts account for most tourism spending, but the Dominican Republic also provides a variety of other activities for visitors. As of 2006, the second most popular attractions in the country were casinos, although there are also many historical and ecological destinations (Barrera, Gjurgilova, Rabinowitz, & Suemori, 2007). Due to this, the Dominican Republic has good potential as an ecotourism destination with 75.7% of its territorial waters being protected, and 18.6% of its terrestrial area (The World Bank, 2013). Due to the high proportion of DR tourists staying in all-inclusive resorts, which typically encourage guests to stay on hotel grounds for the

entirety of their stay, many of the historical and environmental attractions of the country are under-utilized (Barrera et al., 2007).

Despite this, the Dominican Republic's WW industry is well developed despite this, and the industry relies on the nearly 10,000 humpback whales that travel to the country's waters in order to breed and calve during the winter. WW developed in the Dominican Republic in 1985, shortly before the Silver Bank Humpback Whale Sanctuary was established to protect the country's humpback whales in 1986 (Ministerio de Medio Ambiente y Recursos Naturales, 2015). The industry that has grown in and around the sanctuary includes both observational WW in Samaná Bay, as well as swim-with tours over Silver Bank itself. Furthermore, the whale watching industry in the DR is one of the largest in the Caribbean (Hoyt, 1999), and the Dominican Republic's industry attracted 28,000 whale watchers with a direct expenditure of \$5,215,000 and an indirect expenditure of \$3,712,000 (O'Connor et al., 2009).

### **Section Three: The Economic Impacts of Whale Watching**

Whale watching (WW) can have a variety of economic benefits which can, in turn, influence the industry's ability to support conservation and local people living in coastal communities (J. Higham et al., 2014b; Hoyt, 1999). These benefits have not been attained equally across the globe, and understanding what country characteristics might influence a destination's ability to attain these economic benefits can assist in identifying strategies for improving a location's chance of having a lucrative WW industry. Furthermore, this can help identify areas that are unlikely to bring in considerable amount of revenue, and which then may be good locations for cetacean sanctuaries, free from WW's negative impacts and harassment (Crouch, 1994; Eilat & Einav, 2004; Parsons, 2012). In order to build a foundation for that part of my study investigating the Caribbean country characteristics' relationship with WW expenditures, I will first examine the costs and benefits of tourism in general and their connection to the level of development and the type of tourism being examined. I will then review what is known about the relationship of country characteristics to general tourism, as this has not yet been carried out for WW in the past. I will then review the economic benefits of WW, and the limits of those benefits and conflicts that have been common to this marine industry. Finally, I will look at the importance of visitor satisfaction to WW success and review what WW characteristics are known to influence satisfaction.

#### **A. The Economic Impacts of Tourism**

Information on the economic impacts of tourism in connection with various country characteristics can assist in building an understanding the relationships between

different country characteristics and the WW industry. This is due to the fact that WW is a subsection of tourism, but also because it is reliant on the existing tourism industry (Cisneros-Montemayor et al., 2010). This examination will begin here by looking at the costs and benefits of tourism to local communities and the influence of tourism's level of development and type on the acquisition of economic benefits.

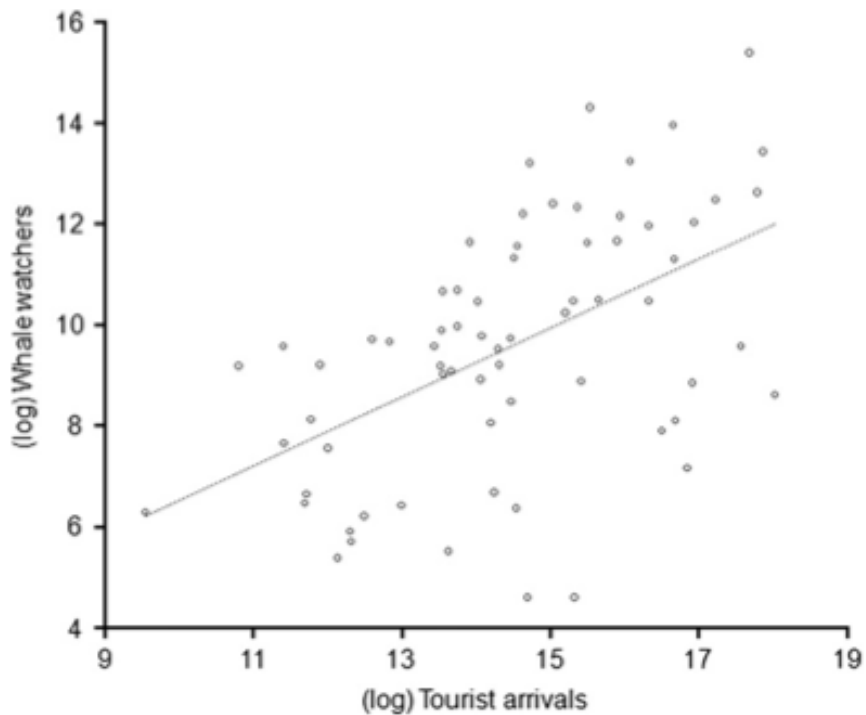
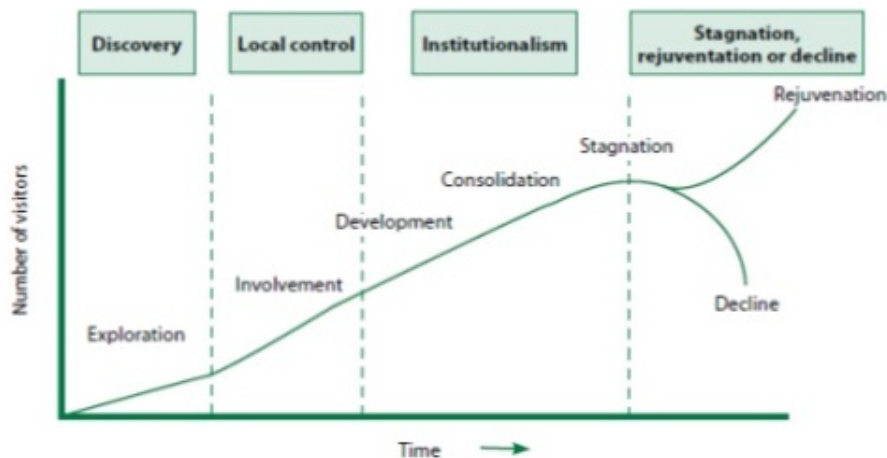


Figure 1.2: Relationship Between Tourism Arrivals and Whale Watchers (Cisneros-Montemayor et al., 2010)

Tourism has a variety of economic benefits, which are considerable enough to have drawn most countries in the world into developing their own tourism industries. Its development brings foreign money into communities around the world, creating jobs, and potentially encouraging indirect spending activity in the destination as well. Tourism can also be a driver of infrastructural and recreational investment in a destination area, and

can also assist in peace-building and conservation through educational programs and positive exchanges between locals and visitors (Collins, 1999; Crouch, 1994; Dritsakis, 2004; Garau-Vadell, Díaz-Armas, & Gutierrez-Taño, 2014). Such benefits are not always attained, however, and in many cases there are also negative impacts associated with tourism development. Tourism expenditure and jobs may be lost to foreign companies that send money out of the destination, and hire expats. Overcrowding can be a problem, as can the overwhelming of local infrastructure when tourism arrivals are too high (which is often a problem in the Caribbean, where tourists may outnumber locals on some islands). Visitors and the infrastructure associated with the tourism industry also often have a considerable, negative impact on the environment, entering into sensitive areas, taking part in destructive behavior (e.g. crushing of reefs by swimmers), and harassing wildlife, among other things. Tourism can also lead to the commodification of local cultures, increases in land prices, and higher levels of crime (Duval, 2004; Jayawardena, 2002; Lacher & Nepal, 2010; Zeppel & Muloin, 2014).



Source: Butler, R. W. (1980). 'The Concept of a Tourist Area Cycle of Evolution' Implications for Management of Resources', *Canadian Geographer*, 14, pp. 5-12

Figure 1.3: Butler's Tourist Area Cycle



All tourism is not created equal, and different levels of development can have different impacts on the communities and environments in the destination. In 1980, Butler described the Tourist Area Cycle of Evolution (Figure 1.3), in which he theorized that the characteristics of tourists in an area is connected to a destination's level of development. The most basal form of tourism development occurs in the Discovery phase, when there is little infrastructure, and visitors are typically adventurous and want to experience the local culture. While the scale of tourism is small at this point, local people are better equipped to host these visitors, and thus jobs and money remain in the community. If a destination develops beyond this, the Discovery phase transitions into the Institutionalization phase as the popularity of an area grows, and infrastructure improves. This is also the point at which large tourism companies begin investing in an area; they have the resources to support more visitors, but these companies also tend to stream a high proportion of their revenue out of the community. In this phase, tourists requiring some level of comfort and separation from the local culture often become the norm. This level of tourism development also involves loss of some control by the local community as it grows in scale, but provides more jobs (Duval, 2004; Khan, 1997). After institutionalization, Butler predicted three possible outcomes for tourism along the development scale, stagnation, rejuvenation, or decline. Stagnation is the state in which the industry neither maintains its previous growth nor declines, decline is a loss of visitors, and rejuvenation implies adaptation, potential rebranding, and future growth (Butler, 1980). As an industry, tourism is prone to going through trends in terms of the kinds of experiences that travelers are looking for, the destinations which are popular, and natural disasters and shifts in political stability can undermine formerly lucrative

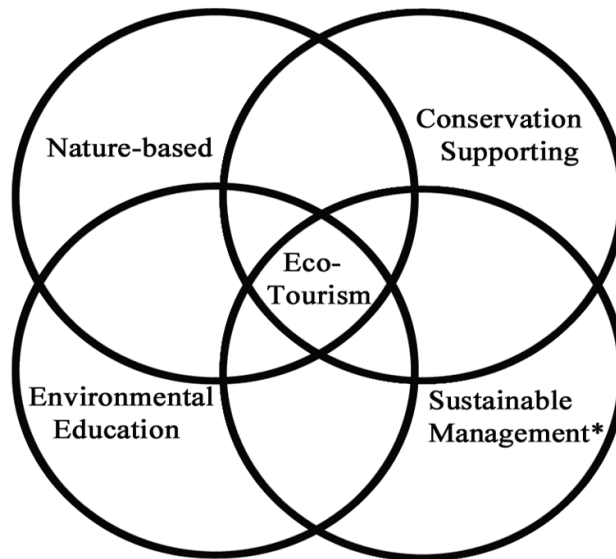
industries. Thus, governments and companies looking for long-term economic sustainability must seek to adapt to these changes, and communities may also strive to recapture some control of the industry in light of the negative impacts that it can have on residents (Andereck, Valentine, Knopf, & Vogt, 2005; Andriotis, 2001; Britton, 1982; Sharma & Dyer, 2009).

In conjunction with the level of tourism development, the type of tourism can influence the kinds of impacts that the industry has on the local people. Mass tourism, the most common form of tourism in the Caribbean, caters to large numbers of tourists with package tours, cruise ships, and all-inclusive resorts. This kind of tourism characterizes the Institutionalization phase of the tourism development cycle, and it is designed to capture as much revenue for the tourism company as possible by providing for all of the clients needs with the goal of limiting contact with the local community. It is thus common for more low level jobs to be provided to residents, but mass tourism is also known to minimize the indirect economic benefits that tourism has the potential to provide (Duval, 2004; Khan, 1997; Pattullo, 2005). The increase in traffic associated with this form of tourism can also cause physical damage to the destination, overwhelm local infrastructure, and commodify resident cultures (Jackson, 2006; Khan, 1997; McDavid & Ramajeessingh, 2003; Ryan, 2003; Uddhammar, 2006).

Alternative tourism, which includes industries such as ecotourism, has developed to improve the local community's ability to control tourism and capture its benefits, as well as provide a wider array of experiences for travelers (Conway & Timms, 2010; Duval, 2004). In many cases, these forms of the travel industry are at a smaller scale than mass tourism, and do not isolate tourists from the destination population to the same

degree as mass tourism. Thus, while alternative tourism usually brings in less money, it suffers much lower levels of revenue loss from the community, tends to preserve the local culture and environment better, and is often more attainable for local people in developing countries to become involved with as business owners (S. Larson & Herr, 2008; Silva, 2015; Zambrano, Broadbent, & Durham, 2010). Of these, ecotourism has the most relevance for nature-based, sustainable WW. This form of tourism is defined by tourism researchers as an environmentally and socially sustainable form of nature tourism that is meant to provide environmental education, and support both local communities and conservation efforts. Its proponents seek to develop tourism businesses that are less harmful to the environment, and which develop at scales that lessen revenue leakage from the community and include local people (Brohman, 1996; He et al., 2008).

**CHARACTERISTICS OF ECOTOURISM  
(RESTRICTIVE DEFINITION)**



\*Ecological, social, and economic sustainability.

Figure 1.4: Restrictive Definition of Ecotourism; Modified from Buckley 1994

The characteristics of a destination can also influence the benefits attained by residents of tourism communities. For developing countries, the building of infrastructure is particularly important to creating a successful tourism industry, because many tourists, especially in the case of mass tourism, expect a certain level of familiarity and luxury no matter the destination (Butler, 1980; Lundberg et al., 1995). General development in an area plays an integral role in determining the extent of the economic and ecological impact. In areas with less development, a relatively small amount of tourist spending (such as that of the Discovery phase tourism, and ecotourism, etc.) can equate to a considerable increase in local income (Andriotis, 2001; Ryan, 2003). On the other hand, more developed areas are better equipped to benefit from tourism revenue flows, because they don't rely as heavily on material and skilled labor imports in order to support tourists, which create substantial loss of revenue and indirect economic benefits for the community (Lacher & Nepal, 2010).

### **B. Destination Characteristics and Tourism Demand**

The acquisition of economic benefits is reliant on tourism demand, and the study of the deterministic characteristics of tourism demand have attempted to inventory and understand what country attributes may account for this. For leisure tourism, things like price of travel, destination safety, levels of regional competition, marketing, and biodiversity are have been found to influence a destination's attractiveness to tourists (Crouch, 1994; S. S. Teelucksingh & Watson, 2013). Attributes of origin countries of also influence demand (Crouch, 1994), but these will not be considered here because my study focuses on decision-making in destination countries. Despite this, it is important to

note that demand is influenced by partnered attributes in both the tourist origin countries and the destination countries, and it may be this complexity that makes the outcomes of tourism demand research so variable.

The price of travel is considered by most tourism researchers to be the primary determining variable in terms of the destination itself. Despite its importance, however, it is not clear what data type is the most representative of tourism prices around the world, although rates of inflation and exchange rates have commonly been used. Exchange rates indicate the worth of tourist currencies in a destination, which is key to the purchasing power of travelers. Inflation rates, on the other hand, play a role in determining national price levels in-destination. While it is likely that both play a role in demand, researchers often utilized exchange rates due to the assumption that tourists have better access to information on this and this can act on it more directly. Thus, travelers will prefer destinations with favorable exchange rates and thus potentially lower, relative costs (Crouch, 1994). A 2004 study utilizing a panel analysis of global tourism data found that exchange rate was primarily important for travel to developed countries. Demand for travel to developing countries, on the other hand, did not appear to respond to price fluctuations. This may be due to the increased importance of other factors in developing nations, such as safety, distance from origin, and language, among others (Eilat & Einav, 2004).

Other country characteristics that are known to impact demand are political stability, travel restrictions, and economic recessions, all of which influence tourists' perceptions of safety in a destination (Eilat & Einav, 2004; Karagiannis & Madjd-Sadjadi, 2012). One particularly important variable among these is political stability,

which is a potential proxy for the probability of travel restrictions, economic struggles, and perceived risk involved in travel to a location. In support of this, the 2004 panel analysis of global international tourism showed that the political environment is more important to demand than the exchange rate in developing countries (Eilat & Einav, 2004). In the Caribbean, Haiti serves as a qualitative example of the impact that political/social upheaval can have, as in the years before the Duvalier regime, the country was a premier destination in the region. However, since that era in Haiti's history, the country's tourism industry has almost entirely disappeared, and despite improvements to its political situation, its tourism industry has not recovered (Kolbe, Brookes, & Muggah, 2013).

Marketing and competition are also key to tourism demand, but due to the difficulties associated with data collection for these attributes they are rarely included in studies. Even so, marketing effort is believed to have a direct effect on tourists by enhancing knowledge of potential destinations that may incentivize travelers to select particular countries or tour packages (Babin, Lee, Kim, & Griffin, 2005; Crouch, 1994; Duval, 2004). In the case of marine tourism, marketing has been qualitatively observed to play a major role in the growth of the industry as well as the increasing involvement of tourists in emerging marine activities such as WW (M. Orams, 1999). However, quantitative results concerning this variable and its relation to tourism in general have been inconclusive. Finally, competition between locations was rarely investigated, but most studies assumed that all countries were competitive destinations (Crouch, 1994). This assumption will be maintained here, and competition will be discussed in the

coming sections as a limiting factor for WW development (Moyle & Evans, 2008; Mustika, Birtles, Welters, & Marsh, 2012).

For the Caribbean studies examining tourism in other SIDS can provide further insight to the unique limitations that island nations must overcome. One such study utilized a panel analysis to determine the influence of marine and terrestrial biodiversity on tourism demand for SIDS, and found that these biodiversity indicators were significant. Thus, there was an association between higher levels of biodiversity and increased tourism activity in the studied nations (S. S. Teelucksingh & Watson, 2013). In the Caribbean, this diversity draws millions of people into the region each year, as they seek beautiful beach destinations complete with vibrant marine and terrestrial life for their observation (Pattullo, 2005). This means that if they wish to maintain their tourism industries in the long-term, it is likely that they should also protect their biodiversity. In the case of WW, cetacean biodiversity also gives travelers a more varied experience, which is known to increase visitor satisfaction (M. B. Orams, 2000). This further supports the idea that WW should encourage the protection of cetaceans.

As informative as these investigations of the connections between different destination characteristics and tourism demand are, there are limitations to all of these studies. First, data are often difficult to obtain, especially when developing countries are included in the analysis (Crouch, 1994; Eilat & Einav, 2004). In many cases, this lack of data can limit the scope and applicability of studies as they may prevent the analysis of certain variables or nations. In other cases, proxies are used, but it can be difficult to determine just how effective these substitutes are, especially where researchers have used different proxies to explain the same underlying variable (Crouch, 1994; Eilat & Einav,

2004). Finally, many studies have opposing results, illuminating the complexity of the relationships between potential deterministic characteristics and international tourism demand (Crouch, 1994). These weaknesses limit the applicability of the results for predicting and understanding tourism demand, but when coupled with data on WW itself this knowledge-base can be very informative.

### **C. The Economic Benefits of Whale Watching**

There is a considerable body of literature focusing on the economic benefits of WW as well as its limitations. Some of the interest in this industry's economic performance stems from rapid growth and success around the world, as well as the belief that it can serve as an economic alternative to whaling (J. Higham et al., 2014b). Erich Hoyt carried out the first popular study of WW economics in 1991, when he looked at the global extent, as well as the direct and total expenditures of the industry on a country-by-country basis. This report and the reports that followed in 1995, 1999, and 2009 utilized surveys of WWOs, tourism officials and researchers to produce information on direct expenditures (ticket prices only in this case) and indirect expenditure. In 1991, only 31 countries had WW industries, with 4 million WWers, and total expenditures of global WW was \$317.9 million USD (Hoyt, 2001). By the final report in 2009, there were 13 million whale watchers, with WW businesses in 119 countries, and a total expenditure of \$2.1 billion USD. At this time there were 3,300 WW operations, and 13,200 people were employed by the industry. WW also had an annual growth rate of 3.7% in 2008, compared to the 4.2% growth rate of tourism in general. Within Central America and the Caribbean, however, this growth was even stronger, at 13% per year from 1998-2008



(O'Connor et al., 2009). Currently, the latest data on WW comes from 2007-2008, so there is no post-recession information available for the global industry to suggest what the most recent trends may be. Another limitation to these investigations is that they do not provide insight into where WW expenditures, or the levels of tourism leakage.

Despite these constraints, these data are essential in order for an economic understanding of the industry to be developed. Similar evaluations need to be continued on a regular basis if claims that the industry supports local, coastal people are to be informed and evaluated.

Other economic studies of WW have been regional or site specific, but this small-scale research has highlighted WW's economic potential. Such investigations have shown that WW can become a major component of the tourism industry in developed countries, and can have considerable monetary impact on local communities on its own. In 2005, an economic analysis of WW in California found that it accounted for ~20 million USD gross revenues and between 4-9 million USD net revenues. While this is a small part of California's tourism expenditures, it is a key component of the state's coastal tourism product, cetaceans feature widely in coastal tourism marketing, and it may help enhance the non-use values of cetaceans as well (Pendleton, 2005). Another study utilized a simple model that divided the WW revenue of three different WW locations in Australia over the size and lifespan of local whale populations to estimate the worth of individual whales to WW in different locations. This method indicated that the worth of single, target whale ranged from ~\$25,000 USD in the case of Broome, a new WW location with a large whale population, to ~1 million USD in Warrnambool, which had a large and well-established WW industry based on a relatively small whale population (Knowles &

Campbell, 2011). While the above study does not really address the value of individual whales in a manner that is complex enough to make its results robust in an economic sense, these numbers do illustrate that the monetary contribution of WW in the communities studied was considerable.

It is apparent from the above that WW can and has provided direct economic benefits to developed countries where it has developed, and there are also indirect benefits. WWers increase the beneficial economic impact of the WW industry by staying in local hotels, purchasing food, taking local transport, and partaking in other activities or services in the area (Cisneros-Montemayor et al., 2010; Hoyt, 2005b). The profits generated by WW can be further supplemented by sales of related products, such as cetacean souvenirs, which are often quite popular (Findlay, 1997; Warburton, 1999). Furthermore, marine tourism in general can benefit from marketing the possibility of seeing cetaceans on snorkeling or dinner cruises. For example, in the western, coastal region of Scotland, it was found that as much as 12% of tourism income came from activities that were whale-related. Furthermore, 72.4% of the WW operations in this region were owned by locals, thus enhancing the contribution of this industry to the economic prosperity of the region (Woods-Ballard et al., 2003). In Hawaii, surveys of WWOs and ocean cruise operators, coupled with an analysis of marketing materials, determined that direct revenue from WW was ~11 million USD in 1999, while direct revenue from WW and those ocean tours that used whales in their advertising was ~16 million USD in that year. Utilizing the 1992 Hawaii State Input-Output model, the indirect revenue was determined to be 19 million USD for WW alone, and ~27 million USD when including more general marine tours (B. Barr, Utech, & Hoagland, 2000).

While these benefits cannot be guaranteed, it is clear that the WW industry has the potential to enhance the economic prosperity of coastal communities in developed countries, particularly in communities without previous mass tourism development (as the following analysis will illustrate).

As of the last worldwide study of WW economics in 2009, it was estimated by Cisneros-Montemayor et. al. that there was a further 413 million USD annually to be made on WW in coastal countries not currently participating in the industry, and an additional 5,700 jobs. Together with the current WW industries of the time, it was then estimated that the total value of the WW industry could amount to 2.5 billion USD annually. Interestingly, this study also predicted that nearly half of these economic benefits could be captured by developing countries (Cisneros-Montemayor et al., 2010). While it is not clear that this potential development has occurred, since no global WW investigation has been carried out since the 2009 IFAW study, regional studies have shown that this industry may play an important role in supporting coastal communities in developing regions just as it has in developed countries. In Vava'u, Tonga direct expenditures from WW in 2009 was ~600,000 USD, and indirect expenditures was estimated to be 4 million USD. Annual foreign exchange earnings in Tonga in that year was 42.64 million USD, making WW a considerable contributor to the country's economy. Furthermore, by coupling data from a 1999 study of WW in Vava'u, it was apparent that the industry grew ten times as large in the decade between 1999 and 2009, and that there was an increase in the percentage of visitors that came to the country because of WW (M. Orams, 2013). In Bali, Indonesia, local fishermen have been able to participate in WW on an opportunistic basis, using their fishing boats to bring visitors out

to view dolphins. This industry has become so successful that as of 2012 60% of the visitors to the location came in order to dolphin watch, 9 million USD in direct expenditure was produced, and there was very little estimated revenue leakage in the region due to high levels of local ownership(Mustika et al., 2012). Boat-based WW isn't the only lucrative form of WW in developing countries, however. In South Africa, shore-based WW on the Western Cape in Hermanus produced R5 million in expenditures in the local community, even without the use of entrance fees. It was also found that 46% of the domestic visitors, and 73% of international visitors came to see the whales, so this shore-based attraction was integral to tourism in this destination (Findlay, 1997). These studies provide some support for the E-NGO claims that WW can and does support coastal communities in both developed and developing countries.

#### **D. The Economic Limitations and Industry Conflicts of Whale Watching**

The WW industry cannot produce the same amount of economic benefits for every operator that starts a business, nor for every community that becomes host to this form of tourism. Not only are there destination characteristics that can influence and limit these benefits, but there are also potential conflicts that can arise in conjunction with the growth of this industry. Characteristics such as the seasonal nature of many WW industries, regional competition, tensions among WWOs, and conflicts between the WW industry and the community or other industries in the community will all be discussed below as key limitations to the beneficial effects of this industry.

WW's own seasonal characteristics can impact economic benefit acquisition. The industry is often a only active for part of the year, depending on the weather of the

location and the life history of the animals that are being targeted. Seasonal jobs, in turn, pose challenges to the people who hold them, as they may not provide full-time equivalent income, and the communities hosting these jobs only benefit from them for part of the year (O'Connor et al., 2009; M. Orams, 1999). In western Scotland, where WW has become integral to the tourism industry, most WW businesses only supported 5 or less full-time equivalent jobs (Woods-Ballard et al., 2003). Similarly, the largest WW industry in the Caribbean, based in Samaná Bay, Dominican Republic, is based on the presence of humpback whales, and is only functional between January and March each year. People who work in this industry must find other lines of work for the rest of the year (Ministerio de Medio Ambiente y Recursos Naturales, 2015).

As has been discussed in previous sections of this chapter, the characteristics of a destination play an integral role in defining the extent of economic benefits in a specific location. The same is true of WW as the industry likely requires locations with enough infrastructure to host clients, it must be accessible and WW may suffer from higher or lower levels of revenue leakage depending on the attributes of the host country as well (M. Orams, 1999). The remote, Pacific island nation of Tonga is a good example of just such limitations. This country saw considerable growth in their WW businesses between 1999 and 2009, but it is likely that further growth will be highly constrained by the size of the tourism industry in this country, as well as regional competition for a relatively small group of tourists (Cisneros-Montemayor et al., 2010; M. Orams, 2013). Other island nations, such as those in the Caribbean are faced with similar limits to the potential economic benefits of the WW industry (Cisneros-Montemayor et al., 2010; Ministerio de Medio Ambiente y Recursos Naturales, 2015). This is due to the fact Caribbean countries

are often sold as a single, regional tourism product and some islands are harder to reach due to their geology and the politics of airline coverage in the region (Duval, 2004; Honychurch, 1998; Jayawardena, 2002; Pattullo, 2005).

Economic success can come with its own problems as well, for both conservation and the long-term sustainability of the industry. If local operators find that WW is has sufficient economic benefits, and entry is relatively easy, as in Bali and the Azores where locals already owned boats that could be used, oversaturation is likely. This can cause an overcrowding of boats, which is unpleasant for tourists, and can cause considerable disturbance to the cetaceans being observed (Mustika et al., 2012; Neves-Graca, 2004). Furthermore, in these situations, it is common for operators to avoid regulations in hopes that they can acquire as many economic benefits as they can before their behavior is limited (Reeves, Smith, Crespo, & Notarbartolo di Sciara, 2003). Of course, this sort of behavior can cause cetaceans to abandon areas of high WW activity (Bejder, Samuels, Whitehead, Finn, & Allen, 2009), thus endangering both the animals being observed and the ability of the industry to maintain itself. Down the line, in cases of oversaturation and high levels of inter-operator competition, further conflict can result when regulations are being developed. This has happened in the Azores, due to the tensions between different groups of WWOs, including those with local, whaling roots, and those foreigners that started businesses on the islands. While each had a stake in maintaining target cetacean populations in the area for the sake of their businesses, they argued for alternative rules based on their differing understanding of the cetaceans and their environment, which undermined support for the guidelines (Neves-Graca, 2004; Silva, 2015). The situation in the Azores has shown that while disagreements concerning regulations are inevitable to

some extent, such intense competition is likely to prolong the process of negotiation, and alienate some WWOs from the process, thus making compliance more unlikely and endangering the target cetaceans.

WW does not always have a harmonious existence with other industries in an area, which may also be essential to the economic well-being of coastal communities, or the community itself. In Maine, for example, concerns surrounding the impact of fishing on cetacean distributions caused enough of a political stir to help motivate trawling bans in certain key harvest areas (M. Y. Lee, 2010). While this may be beneficial to marine conservation, because trawling is a destructive fishing strategy (Jones, 1992), a model of the impact of the ban on fishers and WWOs showed that the economic loss to fishers was higher than the losses prevented to WW businesses (M. Y. Lee, 2010). If support for coastal communities is to be a claim that can be made for WW (IFAW, 2013; Neves, 2010; WDCS, 2013), then the dynamics of the industry within the community and among it many economic activities must be understood, and it is likely that the characteristics of different locations will influence these relationships. There may also be conflicts between the WW industry and local people. In Hermanus, South Africa, shore-based WW was the mainstay of cetacean-based tourism in 1997, and it was found that local people were opposed to the development of boat-based WW in their area. In this case, locals considered the whales to be an important part of their environment, and they were concerned that in-water WW would cause the animals to leave the area (Findlay, 1997).

WW has considerable potential, but economic success is neither guaranteed, nor does it necessarily mean that conservation goals or long-term industry sustainability is attainable. Furthermore, there are cases in which boat-based WW is not appropriate for a

community despite economic potential due to the perspectives of the community and the other industries that residents rely on. Further work is needed in order to weigh different options for the use or non-use of cetaceans, and this information is crucial to countries that are considering WW, as resources for development are often limited, and this can also cause challenges for the development of effective methods for controlling WWO behavior. That being said, WW has high potential for resident involvement in destination communities, as fishermen have historically led the development of the industry (J. Higham et al., 2014b). So, while WW cannot cater to the number of guests that mass tourism can, it may be very beneficial to coastal communities in terms of the multiplier effect, and through its ability to enhance a location's overall appeal to alternative tourists.

#### **E. Visitor Satisfaction and Elements of Success for Whale Watching**

There are some specific attributes of WW industries are likely to influence their economic success, and an understanding of what these are can be gained from examining industry attributes that influence visitor satisfaction. This is integral to the long-term, economic sustainability of WW, because return visitors and word-of-mouth (WOM) marketing are important draws for most forms of marine tourism (M. Orams, 1999). WOM is an integral part of decision-making for consumers of tourism in general, because it is so difficult to evaluate a tourism product before purchase without feedback from other users (Litvin, Goldsmith, & Pan, 2008; Ye, Law, Gu, & Chen, 2011). The importance and integration of this form of information in making decisions about tourism destinations and activities has only increased with the rise of websites like Tripadvisor and Yelp, which allow users to access reviews of nearly all aspects of a tourism



experience. Thus, maintaining high visitor satisfaction can avoid detrimental reviews, and produce positive feedback that is a powerful and cheap advertising tool (Babin et al., 2005; Litvin et al., 2008). As an activity that cannot be fully represented through marketing photos, WW is likely to rely on WOM, and visitor satisfaction is likewise important to the economic success of this industry (Matsuda, Shirakihara, & Shirakihara, 2011; M. Orams, 1999; Warburton, 1999). Furthermore, if e-NGO claims about WW's potential to influence visitor behavior for the benefit of cetacean conservation are to materialize, it is likely that visitor satisfaction with WW must remain high.

The primary factor in determining visitor satisfaction on WW trips is the observation of cetaceans (Finkler & Higham, 2004; M. B. Orams, 2000; Valentine, Birtles, Curnock, Arnold, & Dunstan, 2004). In fact, a survey of tourists to New Zealand in 1996 found that WW had one of the lowest satisfaction scores of the various activities and attractions due to trips in which cetaceans were not sighted (Danaher & Arweiler, 1996). This is a potential problem for any WW business, as sighting cetaceans is never guaranteed, but shaping expectations can help alleviate this problem. If clients are aware that chances of seeing cetaceans is not assured, then it is likely that they will be less disappointed if their trip fails to locate the target animals (Andersen & Miller, 2006; Neil, Orams, & Baglioni, 1995; Valentine et al., 2004). Areas with healthy and diverse cetacean populations, as well as healthy cetacean habitat are also less likely to have problems because many guests will enjoy seeing any cetacean species, as well as learning about different aspects of the environment that they have been immersed in on their WW trip (B. Barr et al., 2000).

There are also many other aspects of a WW trip that can influence visitor satisfaction. For instance, Orams found in 2000 that one of the primary responses to the open-ended question, “what do you think could have made today’s whale watch more enjoyable?” was interesting whale behaviors. Conditions on the boat were also of concern to the respondents in more than one study of WW visitor satisfaction; things such as less people on the boat, less overcrowding of boats on the water, and calmer seas could have made the trip more enjoyable (Andersen & Miller, 2006; Matsuda et al., 2011; M. B. Orams, 2000). In places such as the Azores and the Dominican Republic there were also some concerns by the tourists about the apparent prevalence of foreign WWOs; in these cases, the visitors wanted their money to go to local people rather than foreign companies (Draheim, Bonnelly, Bloom, Rose, & Parsons, 2010; Neves-Graca, 2004). Interestingly, in Valentine et.al.’s study in 2004, it was also found that almost ¼ of the respondents expressed concern about the impact of the swim-with WW program on the cetaceans (Valentine et al., 2004). This finding is supported by another study in Western Australia, which utilized a questionnaire to survey participants in dolphin swim-with tours at the Dolphin Discovery Center in 2000. This study found that ensuring that no harm came to the dolphins was the number one thing contributing to visitor enjoyment of their experience (O'Neill, Barnard, & Lee, 2004). This suggests that WWO and peer behavior is an important aspect of visitor satisfaction, and protective WW regulations that are successfully followed by WWOs may increase satisfaction levels when they are explained to clients.

There is some disagreement in the literature about certain aspects of WW trips that may be important to visitor satisfaction. Proximity to the animals is a characteristic

of WW that is of particular concern in these studies, due to the evidence that getting closer to cetaceans can increase the chances of negative impacts on target animals (Goodwin & Cotton, 2004; Jahoda et al., 2003; Janik & Thompson, 1996; Schaffar, Garrigue, & Constantine, 2010). Several WW visitor satisfaction studies have found that participants rank proximity to the cetaceans as one of the key aspects of their satisfaction with a WW trip, meaning that they were more satisfied the closer the boat got to the target animals (Foxlee, 2001; Muloin, 1998; Zeppel & Muloin, 2014). However, a study which surveyed WW tourists during the 1996 WW season in Tangalooma, Australia found that being closer to the whales was only mentioned by 4% of study participants as a potential way to improve their WW trips (M. B. Orams, 2000). Although this study seems to contradict others showing proximity to be important to tourists, this investigation used open-ended questions rather than provided options, so it is possible that when tourists are asked to come up with their own list of WW elements that are important to them, distance to the whales is not something they would list. As Orams himself mentions, this may also indicate that his participants were content with the proximity attained during their trips, rather than it not playing a role in visitor satisfaction (M. B. Orams, 2000). In either case, there are situations in which visitors will want things that are not good for target cetaceans, but there are ways to get clients to support protective regulations. One method that can help accomplish this is simply educating visitors about why it is important to not crowd the animals (Andersen & Miller, 2006; O'Neill et al., 2004; Valentine et al., 2004).

Despite the fact that the ability of WWOs to influence visitor satisfaction is limited in some respects, an understanding of the relationship between country

characteristics and the economic impact of tourism is important for WW for several reasons. First, this industry has experienced rapid growth in the past few decades, especially in developing countries. It is clear that people from many different nations are interested in taking advantage of this particular tourism niche (O'Connor et al., 2009). However, this growth and the lack of effective regulations in some areas has led to negative impacts on the cetaceans that the industry depends on (Parsons, 2012). Due to this, it may be necessary to identify areas that will experience more or less WW success, and then determine in which locations the economic benefits are likely to outweigh the costs to cetaceans and residents. Furthermore, many small, coastal communities with accessible cetacean populations hope to benefit from WW, but unfavorable country characteristics may make for disappointing results (Mustika et al., 2012; M. Orams, 1999). There are potential ways for destinations to modify some of these characteristics in order to promote WW and other marine tourism industries. The information developed by my study will highlight some characteristics that can potentially be modified by governments and industry leaders in order to make a location more appealing to visitors. It will also shed some light on the relationships between WW, the tourism industry, and conservation efforts.

## **Section Four: Estimating the Vulnerabilities of Caribbean Cetaceans to Whale**

### **Watching**

It has been known for some time that the WW industry is not simply beneficial to the cetaceans that it utilizes, but rather, that there are a wide variety of negative effects that we are working on understanding (Parsons, 2012). These impacts have been studied in detail for several species including killer whales (*Orcinus orca*) and bottlenose dolphins (*Tursiops truncatus*), and on multiple occasions in places such as Sarasota Bay, FL and Vancouver Island, Canada. This research has allowed for a much greater insight on the potential consequences of unregulated WW, and helped refine suggestions for effective industry controls. However, due to a lack of resources and the difficulty of studying many cetaceans, there are some species, like sperm whales (*Physeter macrocephalus*), that are currently targeted by WW but without a sound foundation of research examining the impact of this attention. Furthermore, the indirect impacts of the industry on both non-target and target cetaceans have been all but unstudied. WW is growing around the world, outpacing research and potentially compounding with other threats such as climate change. Thus, it is the goal of my second research chapter to carry out a qualitative analysis of WW impact research, and cetacean life history and ecology research in order to evaluate the vulnerability of different Caribbean species to the industry's direct and indirect impacts.

Table 1.5: Examples of Direct and Indirect Impacts of Whale Watching on Cetaceans

Examples of Direct Impacts	Examples of Indirect Impacts
<ul style="list-style-type: none"> <li>- Harassment of cetaceans by boats (improper approach vectors, high boat densities, close proximity, etc).</li> </ul>	<ul style="list-style-type: none"> <li>- Increased exposure to coastal development impacts associated with the growth/development of the whale watching industry (land reclamation, construction noise pollution, increased dumping of waste into the ocean, etc).</li> </ul>
<ul style="list-style-type: none"> <li>- Exposure to pollution from boats (oil, cleaning chemicals, plastic debris, etc).</li> </ul>	
<ul style="list-style-type: none"> <li>- Exposure to noise pollution from whale watching boats.</li> </ul>	<ul style="list-style-type: none"> <li>- Increased boat traffic associated with coastal development, or whale watching vessels.</li> </ul>

Table 1.6: Summary of Target and Non-target Cetaceans for the Caribbean Whale Watching Industry (O'Connor et.al. 2009)

Caribbean Whale Watching Target Cetacean Species	Caribbean Non-target Cetacean Species
<ul style="list-style-type: none"> <li>- Atlantic Spotted Dolphin</li> <li>- Blainville's Beaked Whale</li> <li>- Blue Whale</li> <li>- Bottlenose Dolphin</li> <li>- Bryde's whale</li> <li>- Clymene Dolphin</li> <li>- Costero</li> <li>- Cuvier's Beaked Whale</li> <li>- False Killer Whale</li> <li>- Fin Whale</li> <li>- Fraser's Dolphin</li> <li>- Gervais' Beaked Whale</li> <li>- Humpback Whale</li> <li>- Long-beaked Common Dolphin</li> <li>- Melon-headed Whale</li> <li>- Orca</li> <li>- Pantropical Spotted Dolphin</li> <li>- Pygmy/Dwarf Sperm Whale</li> <li>- Risso's Dolphin</li> <li>- Short-finned Pilot Whale</li> <li>- Sowerby's Beaked Whale</li> <li>- Sperm Whale</li> <li>- Spinner Dolphin</li> <li>- True's Beaked Whale</li> </ul>	<ul style="list-style-type: none"> <li>- Minke Whale</li> <li>- Pygmy Killer Whale</li> <li>- Rough Toothed Dolphin</li> <li>- Sei Whale</li> <li>- Short-beaked Common Dolphin</li> <li>- Striped Dolphin</li> </ul>

### **A. The Direct Impacts of WW on Cetaceans**

WW as an industry emerged in the 1950s, primarily to observe right whales as they migrated past California twice a year. Eventually, the practice spread to New England, where researchers and industry professionals paired up in order to offer a comprehensive and educational experience to visitors. From there, WW became popular throughout the developed world, with famous WW locations developing such as Shark Bay, Australia; Kaikoura, New Zealand; Sarasota Bay, Florida; and Vancouver Island, Canada. Growth of the industry has been rapid since then; from 1991-1998 its growth rate was calculated to be 12.1%, 3-4 times greater than that of tourism in general. Currently, this has stabilized slightly below the average growth rate of tourism, but rapid growth is still occurring in many developing countries (Hoyt & Parsons, 2014). As with tourism in general, this has presented some communities with the opportunity to benefit from new sources of income, which can be desperately needed in small coastal communities. WW also offers local people and visitors alike the opportunity to learn more about cetaceans and the marine environment, and in some cases, support much-needed cetacean research (J. Higham et al., 2014b).

WW was initially heralded by e-NGOS as a means to enhance cetacean conservation efforts because of these attributes, but it didn't take long for researchers to become concerned about the impacts of this tourism on the animals being observed. The mechanisms by which WW affects different cetaceans is not always clear, and the long-term effects of the industry on cetaceans are not fully understood. However, it is apparent

that WW often alters cetacean behavior, and in some extreme cases it has led to lower reproductive rates or the abandonment of important habitat (Parsons, 2012).

The most common behavioral changes observed in cetaceans targeted by WW are evasive maneuvers and/or changes in activity budgets. Evasive maneuvers that have been observed in connection with WW boats include a suite of behaviors also associated with predator avoidance. These consist of the following: reorientation away from the boats, increase in travel speed, shorter surfacing periods, and changes in the directness of travel. If cetaceans are reacting to WW boats as though they are predators, this could suggest high levels of stress due to observation, and at the very least, an increased expenditure of energy when these behaviors are being evoked (Lusseau, 2014; Scheidat, Castro, Gonzalez, & Williams, 2004; R. Williams & Ashe, 2007). Studies of activity budgets, or the time that animals spend on different, essential activities, with and without WW boats have found that cetaceans often spend less time foraging, resting and socializing in the presence of observing boats (Arcangeli et al., 2009; Beaubrun, 2002; R. Williams, Lusseau, & Hammond, 2006). While the short-term implications of this are certainly sub-lethal, cetaceans living in areas where feeding cannot be easily resumed, or prey resources are limited to areas disturbed by boats throughout the day may suffer long-term energy deficits, which can lower individual fitness in some populations (Lusseau, 2014).

It is likely that these behavioral changes are caused by both the physical approach of boats, and the noise pollution caused by their engines. Noise pollution itself is particularly concerning, outside of shifts in target cetaceans' energy budgets, but because many cetaceans are heavily reliant on their auditory sense (J. Higham, Bejder, & Williams, 2014a). A variety of WW studies have shown that many cetaceans react to



vessel noise, sometimes initiating avoidance maneuvers long before the boat is within visual range. There are several possible consequences of increased vessel noise in the vicinity of these marine mammals, and they include the behavioral changes mentioned above, as well as communication or echolocation masking, and hearing damage (J. Higham et al., 2014b; Richardson et al., 1995). If the noise pollution is loud enough over a long enough period of time, it is also possible for cetaceans to suffer temporary or permanent physical damage to their auditory systems (Richardson et al., 1995). In 2002, Erbe modeled zones of acoustic impacts around WW boats for orcas, and illuminated several concerning potential consequences WW noise pollution. In the short-term, WW boats could cause a temporary threshold shift, or an auditory loss of sensitivity, of 12-18 dB if the boats remained within 10m of the whales for 30-50 minutes. Furthermore, a permanent threshold shift of 2-5 dB could be expected if whales were exposed to WW noise within 1 km continuously for 8 hours a day, 5 days a week, for 50 years. While each of these appear to be extreme, in some areas of the orcas' range in British Columbia the intensity of WW has the potential to create these conditions if moderate industry growth rates are maintained (Erbe, 2002). However, a study in Maui, Hawaii examining the sound characteristics and intensity of various types of WW boats in comparison to background noise levels during the peak of the humpback WW season concluded that even as well developed as this WW industry is, the noise of the boats is unlikely to have severe impacts on the humpbacks' hearing (W. W. L. Au & Green, 2000). Of course, the likelihood of physical damage of WW noise pollution will vary by species, the characteristics of the WW observation area, the type of boats being utilized, and the behavior of WWOs.

The physical impacts of this noise pollution are not the only area of concern, because, as was mentioned above, many cetaceans rely heavily on their ability to communicate in order to maintain their social groups. In the case of orcas in British Columbia, Erbe also found that the zone of audibility, or the area within which an animal can pick up sounds for the species was only slightly larger than the zone of masking, meaning that shortly after boats were audible to these cetaceans, the noise could interfere with their ability to sense communication and echolocation signals (Erbe, 2002). This has obvious consequences for cetaceans such as orcas, which are highly social, and rely on auditory signals to maintain social cohesion as well as hunt. Likewise, species like humpback whales, which utilize their calls to obtain mates, may face direct, reproductive impacts if their calls are masked. Orcas and humpback whales are, of course, only examples that represent most cetacean species, which may use vocal signals to hunt, communicate within groups, and find mates, or do all of the above (Bain et al., 2002). In several species, it has been found that cetaceans counter the sound masking properties of WW noise pollution by adapting various aspects of their calls. These changes have manifested themselves in longer call durations, and changes in call frequencies when in the presence of WW boats. However, the long-term consequences of these changes are not well understood (Foote, Osborne, & Hoelzel, 2004; P. J. Miller, Biassoni, Samuels, & Tyack, 2000).

The severity and characteristics of the impacts described previously can be influenced by the density of WW boats in both time and space. In other words, this means that there is a trend in several of the species studied in which more boats observing cetaceans at any one time increases the chance for negative impacts. In Indo-Pacific

bottlenose dolphins (*Tursiops aduncus*), research has found that a single WW boat has almost no impact on the surface behavior of the animals, but more boats than this did cause changes in individual behavior and group dynamics (Bejder, Samuels, Whitehead, & Gales, 2006). Orcas (*Orcinus orca*) in Johnstone Strait, British Columbia increased their speed to a greater extent when more boats were present (Kruse, 1991), and when three WW boats were present, bottlenose dolphins (*Tursiops truncatus*) in the Bay of Islands, New Zealand did not rest during the observation periods (R. Constantine et al., 2004). While the reactions are different between the two species, it is apparent that an increasing number of boats can cause more agitation among observed cetaceans and heightens energy demands on the affected individuals. In *O. orca*, it has also been found that the whales will attempt to evade boats until there are so many that trying to avoid them will only result in the animals encountering more vessels (R. Williams & Ashe, 2007). At this point, individuals may appear to no longer react to the presence of boats, but it is possible that they are still experiencing internal stress responses, which in some animals have resulted in health conditions like ulcers (M. Orams, 2004). This is of particular concern because WWOs in various locations, especially where swim-with is practiced, may utilize cetacean reactions to gauge if their approaches are stressing the animals out, but if the only reactions to such approaches are internal, hormonal stress responses, WWOs will have little indication of the impacts that they are having on the animals. Cetaceans may also be forced to abandon important habitats in high-density boat conditions if the perceived risk outweighs the benefits of utilizing the area (Lusseau, 2014).

In terms of the intensity of WW impact based on the time, the length of any one observation period, the overall time that an individual spends being followed by WW boats, and the time of day that boats follow cetaceans can have implications for WW impact. For humpback whales (*Megaptera novaeangliae*), there appears to be a buffer window of about 20 minutes between the approach of a WW vessel and any avoidance maneuvers that the cetaceans may utilize. Furthermore, positive reactions such as approaching the boats happened faster than negative ones like avoidance. This suggests that boats could curb negative impacts by limiting their time with any one whale if that whale does not approach the boat on its own (Stamation, Croft, Shaughnessy, Waples, & Briggs, 2010). Hawaiian spinner dolphins (*Stenella longirostris*) and short-beaked common dolphins (*Delphinus delphis*) were also observed to tolerate WW attention for a time before trying to avoid the boats (Neumann & Orams, 2006; Timmel, Courbis, Sargeant-Green, & Markowitz, 2008).

Long-term impacts of temporal WW patterns are also apparent in several species. In Pico Island of the Azores, a large WW industry has developed around the observation of Risso's dolphins (*Grampus griseus*). It was found that 95% of the vessels in the area utilized by these cetaceans were WW boats, and that these boats were present for 42% of the research observation days. One impact of this WW intensity, was a shift of the dolphins' resting periods from a bimodal pattern of daily resting in the WW low season, to a single resting period in the middle of the day, when no WW tours were offered, in the WW high season (Visser et al., 2011). Depending on when these animals need to feed, as well as the amount of time that they require daily for rest, this change is likely to impact the energy budget of these animals negatively. Similarly, resident sperm whales

(*Physeter macrocephalus*) in Kaikoura, New Zealand were accompanied by at least one WW vessel for 50% of their daily surfacings during the WW season. This caused only minor impacts in the resident population, such as changes in blow intervals and shifts in travel directions. Less was known about the consequences of WW intensity on transient whales that pass through the area, but which have a more severe reaction to the boats (C. Richter, Dawson, & Slooten, 2006). In other popular WW destinations, similar intensities of WW observation throughout the day is common, and in some cases the target animals are being followed for more the half of the day (R. Constantine et al., 2004). The long-term impacts of this are not yet clear, but coupled with the fact that WW most often disturbs foraging and socializing, it is not a stretch to hypothesize that when cetaceans are followed for a large portion of the time periods in which they engage in these activities there will be energetic and social costs.

Other aspects of WW have also been found to affect the intensity of cetacean disturbance, including the distance maintained between the boats and the animals, the behavior of the boat, and the type of boat utilized. Several studies focusing on different cetacean species have found that cetaceans change their surface behavior most notably when boats are within 100m of the target animals (Luis do Valle & Melo, 2006; Lusseau, Bain, Williams, & Smith, 2009; Stamation et al., 2010). However, there has been some evidence that cetaceans will begin to react to vessels that are much further away. In one such study, several dolphin species were observed to have reactions to boats that were 6 nautical miles away (D. Au & Perryman, 1982). This suggests that current studies of direct impacts may not be observing all of the behavioral changes experienced by cetacean due to WW, and also highlights the potential for non-target species to be

disturbed by these vessels as well. Despite this, maintaining a minimum distance between WW boats and the cetaceans being observed appears to be an effective way to limit the disturbance that is caused by the vessels, and this has been included in some Caribbean guidelines (Erbe, 2002; Goodwin & Cotton, 2004; Matsuda et al., 2011; Stamation et al., 2010).

Boat maneuvering and speed also appear to be deterministic in many instances of cetacean disturbance by WW. For the most part, fast approaches often startle cetaceans, and initiate predator avoidance maneuvers (Ng & Leung, 2003). It has also been known for several decades that approaching cetaceans directly from the front, or pursuing them has a very high likelihood of disturbing them. Regulations preventing aggressive types of approaches have caused WWO to develop more complicated patterns of approach such as leapfrogging, or the practice of speeding up to get in front of moving pods/individuals and then stopping in front of them so that they approach the boat if they maintain their direction of travel. This behavior is also considered to have a high potential to disturb the cetaceans being pursued due to its aggressive nature and the fact that it cuts the pod or individuals off from whatever they were attempting to approach (R. Williams, Trites, & Bain, 2002). This is also partially due to the fact that this maneuver requires an increase in speed for the boat to get in front of the pod, and this increase in speed creates further engine noise and from a direction that causes high levels of cetacean communication masking (Bain et al., 2002). Essentially, boats that are quieter and more predictable cause the least amount of disturbance for cetaceans (Evans, Canwell, & Lewis, 1992).

In some cases, it appears that the type of boat can also influence the level of disturbance. This finding has not been confirmed by all studies that have looked at WW

vessel type as an explanatory variable for cetacean behavioral changes in the presence of WW boats (Kruse, 1991). That being said, it has been illustrated that noise pollution plays a central role in causing disturbance in the cetaceans, and the type of boat used for WW would certainly influence the amount of noise produced by this activity. Due to this, the shape of boat hulls was found to be explanatory in one study, which showed that plane-hulled boats created more noise and great levels of disturbance than other WW vessels in the area (Goodwin & Cotton, 2004). The type of vessel will also influence what sorts of maneuvers it is feasible for a WWO to make, as smaller, faster boats can behave more aggressively than larger, slower boats. In fact, jet skis are one of the most problematic marine vehicles due to their unpredictable movements and speed (Timmel et al., 2008).

While boat characteristics, behavior, and density play important roles in influencing the severity or characteristics of target species disturbance, there are characteristics of the cetaceans themselves that should be considered as well. Gender, group composition, and group size have also been found to influence the ways that whales and dolphins respond to WW. In the orcas of Johnstone Strait, British Columbia, it was found that males and females utilized different avoidance tactics when approached by an experimental boat. Female whales exhibited shorter dive times, increased their swimming speed, and took erratic but directional paths, while males did not change their speed or dive duration, but began to take less direct paths in order to escape (R. Williams et al., 2002). In orcas, it has also been found that females are often more sensitive to regulation violations than males are (Lusseau, 2003a). Considering the increased speed and erratic swimming pattern adopted by females during this experiment, it is possible

that female orcas suffer a from greater energy expenditure in trying to avoid WW vessels. This is particularly concerning as most researchers agree that the greatest threat that WW poses to cetaceans is a potential reduction of reproductive success (Lusseau, 2014), and among cetaceans this success, after contraception, is almost entirely reliant on female investment in young (VanBlaricom, Gerber, & Brownell, 2001).

These differences in male and female responses to WW boats are further magnified when calves are accompanying their mothers. While aggressive boat approaches can cause considerable disturbance in adults, similar approaches to groups with calves can cause general panic, which can endanger the young, and create a more severe energy deficit for mothers and their calves (Beaubrun, 2002). While travelling with their calves, if mothers do not want to abandon their young, their swim speed and vertical avoidance tactics are limited by the abilities of their developing offspring. This increases the stress of the mother when being approached or pursued by boats, and taxes the energy reserves of calves (Lusseau, 2003b; Stamation et al., 2010). WW also elicited increased whistling rates in groups of Pacific humpback dolphins with two or more calves, most likely as adults and young attempt to stay in contact despite the noise of approaching WW boats (Van Parijs & Corkeron, 2001). The sensitivity and vulnerability of mothers and calves has been shown in Hawaii as well, where these pairs have moved out of important near-shore, resting habitats due to increasing levels of human activity. This is especially concerning when mothers and calves are commonly targeted by the WW industry (P. J. Corkeron, 1995). Finally, calves are also particularly vulnerable to ship strike mortalities as they may not be fast enough to avoid oncoming vessels, and are



known to approach boats out of curiosity, bringing themselves into harm's way (Beaubrun, 2002; Stone & Yoshinaga, 2000).

Besides the presence or absence of calves, the size of cetacean groups can have an effect on the impact of WW boats. In New Zealand's short-beaked common dolphins (*Delphinus delphis*), smaller groups were more prone to experiencing the negative impacts of WW vessel attention. This makes sense, because larger groups of animals are believed to experience a dilution effect on the chance of predation, and can keep a better look out for danger as well (Neumann & Orams, 2006). The behavior of different individuals within the group can also influence overall impact levels, as spooking some animals can cause otherwise less cautious individuals to react. Furthermore, in New Zealand's sperm whales, the status of groups as either residents, or transients was an important determinant in regards to the level of disturbance. Transient sperm whales, those that pass through the area as opposed to spending much of the year in the vicinity, were more sensitive to WW disturbances, and exhibited more severe reactions to the presence of boats (Gordon, Leaper, Hartley, & Chappell, 1992; C. Richter et al., 2006). It is possible that this is due to the habituation of the resident sperm whales, but it may also be due to unrecorded abandonment of the area by those individuals that are able to move else where (Bejder et al., 2009). Besides simply influencing the impact of WW vessels on cetaceans, there are also group-level impacts of WW disturbance. During boat approaches, groups will often become more compact, and breathing synchrony will increase; these are believed to be both a predation avoidance tactic, and a way for cetaceans to continue communicating in loud and chaotic environments (Bejder et al., 2006; Hastie, Wilson, Tufft, & Thompson, 2003). In Indo-pacific dolphins, WW boats

also seemed to elicit higher levels of change in membership. This is concerning because small cetaceans are highly social, and such a disruption of their groups may have considerable impact on group dynamics and individual relationships (Bejder et al., 2006). The implications of something like this will vary by species since different types of cetaceans form different types of social groups, but close social relationships can be extremely important to many species as females will often help one another care for each others young (Gero, Engelhaupt, Rendell, & Whitehead, 2009; Gero, Gordon, & Whitehead, 2013; Mann, Connor, Tyack, & Whitehead, 2000).

Many of the impacts discussed above are short-term, and it is believed that these many small interactions between boats and cetaceans, as well as the modifications of cetacean behavior may cause long-term impacts on the populations and species being observed. This is particularly important due to the fact that cetaceans are K-selected and thus long-term impacts are more likely to become apparent in changes in female reproductive rates as opposed to adult survival. However, long-term studies focusing on the effects of WW are rare. For odontocetes, long-term impact studies have found negative effects on the target species. In bottlenose dolphins, WW seems to have caused a movement of individuals from the area of observation to a space free of WW boats (Bejder et al., 2006). For this same species in Fiordland, New Zealand WW pressure has resulted in a declining population size (Lusseau, Slooten, & Currey, 2006). However, for baleen species, the long-term effects of WW are less certain. In 2009, Weinrich and Corbelli investigating the changes to reproductive success in humpback whales in relation to WW development, and found that this human activity did not appear to have an impact on calving rates. Besides long-term impacts there is also very little understood

about the non-visible effects of this industry on cetaceans, specifically in terms of psychological stress responses in the absence of behavioral changes (Christiansen & Lusseau, 2014; Waples & Gales, 2002). In the even longer-term, it is possible that the pressures created by WW by this increase in energy usage by those cetaceans that react to the boats will create become selective, creating successive generations that are less reactive to predators (Christiansen & Lusseau, 2014).

While boat-based WW is the most common form of commercial WW and has been found to have considerable, short-term impacts on cetaceans, it is not the only form of WW. WW via aircraft and from the shore are practiced in some parts of the world, and various swim-with and supplemental feeding programs have developed also as particularly concerning offshoots of the industry. Shore-based WW, since it involves greater distances from the cetaceans, and a lack of increased noise or physical presence in the water, has no known direct effects on the target animals. While this form of WW has not been widely commercialized, it is popular in some areas such as Hermanus Bay, South Africa (Findlay, 1997), and California where migrating gray whales (*Eschrichtius robustus*) can be observed. Due to its non-existent direct impacts on cetaceans, shore-based WW may be a preferable alternative to boat-based WW in key cases of cetacean sensitivity (J. Higham et al., 2014b).

Aerial methods of observing cetaceans, including helicopters and fixed-wing planes, are typically considered to have less direct impacts on the animals than boat-based WW, most likely due to the low levels of noise pollution in the water from these vehicles (J. Higham et al., 2014b). However, compared to the amount of research that has been done on the impacts of boat-based WW, very little has been done on air-based

observation methods, likely due to the relatively rarity of this method, as well as the feasibility of such research. It is known that these aerial modes of viewing cetaceans do elicit avoidance tactics like diving or changes in direction in various whale and dolphin species. Typically, low flying planes cause more disturbances than high-flying, and helicopters have more impact than fixed winged planes, most likely due to differences in the noise detected by the cetaceans. More concerning, cetacean species for which we have very little data concerning their abundances, such as beaked whales, and pygmy and dwarf sperm whales, appeared to be much more sensitive to aerial disturbances, while some other cetacean species (e.g. Risso's dolphins, bottlenose dolphins, and short-finned pilot whales) only reacted to these disturbances less than 29% of the time (Luksenberg & Parsons, 2009). This particular trend is concerning due to the fact that overall lack of data on species such as beaked whales means that researchers will have no good indication of the long-term impacts of aerial WW on these species, and understanding is key to preventing to mitigating these impacts.

Artificial feeding and swim-with programs, often associated with one another, are the most interactive forms of WW, and have the potential to cause more substantial short-term impacts than the other, strictly observational forms of the industry. One of the most popular dolphin-feeding locations in the world is Monkey Mia, Australia, where supplemental feeding has been used to facilitate interactions between tourists and bottlenose dolphins in a shallow bay since the 1980s. Behavioral changes in the dolphins of Monkey Mia are considerable, and the area is subject to stringent rules considering the habituation of new animals to the activity (Smith, Samuels, & Bradley, 2008). However, such tourist attractions are also popping up in developing regions of the world, many of

which have very few regulations concerning this type of tourist attraction (Carlson, 2012; de Sá Alves, L. C. P., Andriolo, Orams, & de Freitas Azevedo, 2012). As has been observed in other animals, artificial feeding can increase aggression towards humans, putting animals at risk for termination due to the danger they present to tourists, or putting them at risk for physical harm from visiting humans or improper food offerings (M. B. Orams, Hill, & Baglioni, 1996; Smith et al., 2008).

Furthermore, feeding of other species has caused several concerning impacts, including decreases in home range size, increased breeding activity, abandonment of migration patterns, and changes in activity budgets, as less foraging is required to fulfill energy needs (de Sá Alves, L. C. P. et al., 2012; M. B. Orams et al., 1996; M. B. Orams, 2002a; Stockin, Lusseau, Binedell, Wiseman, & Orams, 2008). In Monkey Mia, this has also resulted in decreased vigilance by mother dolphins, increased exposure to human diseases, and the consumption of foods with sub-par nutritional value. As much as humans enjoy this activity, it is unfortunate to note that calf mortality has risen in the bay in conjunction with the development of supplemental feeding. While this is only a correlation, it doesn't take a stretch of the imagination to think that this increased mortality may be linked to the impacts listed above (M. B. Orams, 2002a). An anecdote that serves to highlight this unfortunate potential can be found in a young bottlenose dolphin that frequented a tourism-based supplemental feeding area in Florida. This individual was seen to be interacting with humans for 75% of the study's observation time, and was within 10m of humans for 55% of this time. This individual was only observed to be socializing with other dolphins on two occasions. Not only was this dolphin accompanied by an average of 4 swimmers throughout the observation time, but

also 2.6 boats and 1.3 jet skis. It was estimated that humans put this dolphin at risk every 11.8 minutes, and that the dolphin posed a potential risk to tourists every 29.4 minutes. One individual may not be the norm, but nonetheless, this finding illustrates a very concerning potential for these feeding programs to drastically alter young dolphin behavior (Samuels & Bejder, 2004).

Even without supplemental feeding, swim-with programs pose substantial risks to both the cetaceans and humans involved. As with many other animals, cetaceans that become habituated to humans may begin to seek them out, coming into contact with individuals that may be afraid of the animals, have intentions to hurt them, and these cetaceans are at higher risk for being struck by ships as they spend more time near them. Furthermore, animals that associate humans with food may become aggressive when that food is not forthcoming. In either instance, the result of these interactions may be fatal for the animals involved (M. B. Orams, 1997a). Based on interviews that I carried out in Dominica, some WWOs believe that the first sperm whale that people swam with in the area, a juvenile male who was named Scar, fell prey to just such an end. This young whale was introduced to human swimmers through a research project, and eventually served as the foundation for the swim-with industry that exists in that country currently. However, during the course of this development this young whale learned to approach humans, sometimes going so far as to place his head on the back of boats. While it is not certain what happened to this male, since adult sperm whale males migrate north, one of the WWOs who had a close relationship with this whale thought that he saw the animal with a bullet wound in his head. If this is what happened, it is likely that the behaviors

that this young individual learned during the swim with programs brought him close to other humans that were either scared of his advances or simply wanted to hurt him.

Current research has made it clear that the impacts of WW on cetaceans are both complicated and varied. While there are some indications that certain locations still have industries with minimal effects on the target animals, the potential for serious and growing impacts are concerning. WW impact research is limited, however, because studying cetaceans is both difficult and expensive due to their environment and cryptic behaviors. Furthermore, only a few species in a few key locations have been looked at extensively, and these studies have illustrated that different species, different populations, in different habitats may all be affected by WW differently (Beaubrun, 2002). Due to these limitations and complexities, precaution is needed, especially as WW develops around the world, and due to the fact that we still lack an understanding of the long-term effects of WW impacts (Coscarella, Dans, Crespo, & Pedraza, 2003).

### **B. Regulations Needed to Counter Whale Watching Impacts**

Often, the response of the WW industry and governments to the increasing knowledge of WW impacts has been the institution of guidelines or regulations that are meant to lessen the risk for the target cetaceans. In most cases, the WW industry emerges before regulations or guidelines are instituted to protect the cetaceans in the area from the harassment and the potential impacts of the industry. Modern WW traces its roots back to the California fisherman, Chuck Chamberlain, who started taking visitors out to see migrating grey whales in his fishing boat in 1955 (Hoyt & Parsons, 2014). This is not an isolated trend, as fishermen are often the earliest WWOs, because they already have boats

that can be used to bring clients out. Furthermore, since they most often work for themselves, they can be flexible which allows them to be opportunistic, either fishing or doing tours depending on the availability of resources. However, this usually means that there are few people with in-depth knowledge about cetaceans operating tours when the industry is new. Although few boats may be in the water at this early stage, considerable impacts may still accrue to the cetaceans due to a lack of understanding of the animals, and pressure to get more visitors closer (Beasley, Bejder, & Marsh, 2014).

Besides the potential consequences of unregulated WW even at a small scale, established industries are also more resistant to enforceable regulations when it becomes clear that they are needed (J. Higham et al., 2014b). In the United States, this process was initially mitigated by the fact that land-based WW was more popular than boat-based excursions during the 1950s, and due to the strong connections between some of the earliest WWOs and researchers. In New England, for example, the first operators used local cetacean researchers as naturalists and guides during their trips, and in turn served as a platform for gathering data on target species. Due to the overall lack of data about both cetacean life history and the conservation status of many species then and now, this partnership was highly valuable for cetacean conservation in general, but also allowed researchers to help insure that the animals were not harassed during the tours (Hoyt & Parsons, 2014). Unfortunately, this pattern of partnership and mutuality between WWOs and researchers has not been maintained globally, and only a small minority of current WW businesses around the world have ever supported cetacean research or involved marine biologists in the business (Hoyt, 2005b).



WW impact research has done more than simply describe the effects of the industry on cetaceans; it has also formed the foundation for both industry guidelines and government regulations designed to lessen that impact. Common regulations suggested include limitations of WW boat speed, and minimum approach distances, which serve to make boats appear less aggressive, lower the impact of noise, and give the cetaceans some control over the situation (Dans, Crespo, Pedraza, Degradi, & Garaffo, 2008; Erbe, 2002; Goodwin & Cotton, 2004; Jahoda et al., 2003; Jensen, Wahlberg, Bejder, & Madsen, 2008; Matsuda et al., 2011; Noren, Johnson, Rehder, & Larson, 2009; S. M. Nowacek, Wells, & Solow, 2001; Stamation et al., 2010; R. Williams et al., 2002). Maneuvers like leapfrogging are inadvisable as these are unpredictable, and the speed of the boats creates considerable noise (Beaubrun, 2002; R. Williams et al., 2002). Since it has been found that a lack of predictability can increase the chance for and severity of WW impacts, Lusseau also advocated for the development of industry-wide signals that can be used to give warnings to cetaceans about boat maneuvers (Lusseau, 2006).

Increasing boat density has been found by many studies to make the impacts of WW more severe, and the majority of WW studies have called for limits on the number of WWOs allowed to work in specific locations, and the number of tours that those WWOs are able to take out in a day (Arcangeli et al., 2009; Bain et al., 2002; K. Barr & Slooten, 1999; R. Constantine et al., 2004; Lusseau, 2005; Scheidat et al., 2004; Visser et al., 2011; R. Williams & Ashe, 2007). Limiting the duration of WW trips may also restrict the amount of time that cetaceans are exposed to and potentially impacted by WW (R. Constantine et al., 2004; C. Richter et al., 2006; Stamation et al., 2010). Modifying WW vessels so that their engines are acoustically isolated is a technique to lessen impacts

by lowering the noise pollution of these boats (Sousa-Lima & Clark, 2008). Completely banning feeding and swim-with programs may also be of importance, due to the severe impact that these tourism programs may have on cetaceans (Beaubrun, 2002).

Furthermore, some species such as sperm whales appear to require unique regulations due to their specialized life-styles and resulting vulnerability to WW effects (Coscarella et al., 2003).

Table 1.7: Suggested Whale Watching Regulations and the Papers That Advocate for Them

<b>Management Suggested</b>	<b>Papers Suggesting This Form of Management</b>
Limit the number of boats	(Arcangeli et al., 2009; Bain et al., 2002; K. Barr & Slooten, 1999; Beaubrun, 2002; Blane & Jaakson, 1994; R. Constantine et al., 2004; Erbe, 2002; Jelinski, Krueger, & Duffus, 2002; Lachmuth, Barrett-Lennard, Steyn, & Milsom, 2011; Lusseau, 2005; Matsuda et al., 2011; Ritter, 2004; Schaffar, Madon, Garrigue, & Constantine, 2009; Scheidat et al., 2004; Sousa-Lima & Clark, 2008; Stamation et al., 2010; Stensland & Berggren, 2007; Visser et al., 2011; R. Williams & Ashe, 2007)
More research needed	(M. C. Allen & Read, 2000; Arcangeli et al., 2009; Bain et al., 2002; Blane & Jaakson, 1994; Dans et al., 2008; Lemon, Lynch, Cato, & Harcourt, 2006; Magalhães et al., 2002; Mattson, Thomas, & Aubin, 2005; Ritter, 2004; Scheidat et al., 2004; Stamation et al., 2010; Stensland & Berggren, 2007; R. Williams et al., 2006)
Minimum Approach Distance	(K. Barr & Slooten, 1999; Beaubrun, 2002; Dans et al., 2008; Goodwin & Cotton, 2004; Jahoda et al., 2003; Jelinski et al., 2002; Jensen et al., 2008; Noren et al., 2009; Schaffar et al., 2010; Scheidat et al., 2004; Stamation et al., 2010; Steckenreuter et al., 2012)
WW Exclusion Zones or Times	(K. Barr & Slooten, 1999; Carrera, Favaro,

	& Souto, 2008; Dans et al., 2008; Duffus, 1996; Lusseau, 2003b; S. M. Nowacek et al., 2001; Steckenreuter et al., 2012; Stockin et al., 2008; Visser et al., 2011; R. Williams et al., 2006; R. Williams & Ashe, 2007)
Speed Limit	(Beaubrun, 2002; Blane & Jaakson, 1994; Erbe, 2002; Goodwin & Cotton, 2004; Jahoda et al., 2003; Jelinski et al., 2002; Jensen et al., 2008; Ng & Leung, 2003; Sousa-Lima & Clark, 2008; R. Williams et al., 2002)
Policing, Monitoring, or Experts on Board	(Arcangeli et al., 2009; K. Barr & Slooten, 1999; Beaubrun, 2002; Blane & Jaakson, 1994; Magalhães et al., 2002; Ritter, 2004; Steckenreuter et al., 2012)
Time Limit	(R. Constantine et al., 2004; Lachmuth et al., 2011; C. Richter et al., 2006; Ritter, 2004; Stamation et al., 2010)
Education/Raise Awareness	(K. Barr & Slooten, 1999; Blane & Jaakson, 1994; Delfour, 2007; Mattson et al., 2005; Stamation et al., 2010)
Increase Predictability of WW Boats	(Beaubrun, 2002; Dans et al., 2008; Lusseau, 2006; S. M. Nowacek et al., 2001; R. Williams et al., 2002; R. Williams et al., 2002)
Avoid Approaching Cetaceans in the Middle of Critical Behaviors	(Beaubrun, 2002; Jahoda et al., 2003; Steckenreuter et al., 2012; Stockin et al., 2008)
Avoid Calves or Give Extra Space	(Beaubrun, 2002; Schaffar et al., 2010; Steckenreuter et al., 2012)
Special Species Protections	(Coscarella et al., 2003; Ritter, 2004)
Engines Off When Near the Cetaceans	(Erbe, 2002; Jelinski et al., 2002)
Modify Boats to Lessen Noise	(Sousa-Lima & Clark, 2008)
Position of Boats	(Lachmuth et al., 2011)
Limit Coastal Development	(Blane & Jaakson, 1994)
Cooperation Between Stakeholders	(Steckenreuter et al., 2012)

Changing the characteristics of the WW industry itself, giving cetaceans both spatial and temporal reprieve can help mitigate and avoid many of the impacts described in the literature. In conjunction with regulations on boat behavior, identifying important

resting, feeding, and breeding areas, and then restricting the use of these areas by WW boats, may help mitigate the effects of the industry by providing cetaceans with places where they can go to escape observation and harassment (Ng & Leung, 2003; S. M. Nowacek et al., 2001; R. Williams et al., 2006; R. Williams & Ashe, 2007). Giving cetaceans reprieve from observation in a temporal sense is essential as well due to the importance of daily activity patterns. However, prescribed time periods for observation are not enough, because cetaceans will be faced with changing conditions year to year, such as prey abundances and weather patterns, and these must be taken in account, giving cetaceans reprieve from observational stressors when conditions are difficult for them (K. Barr & Slooten, 1999; Dans et al., 2008; Lusseau, 2003b; Visser et al., 2011). This can be further mitigated if WWOs attempt to only target travelling cetaceans, rather than those feeding or resting, as research indicates that travelling cetaceans suffer less negative effects than those participating in the other behaviors (Jahoda et al., 2003).

In the end, however, it is clear that there is simply not known about cetaceans and the long-term impacts of WW for us to really understand what must be done to protect whales and dolphins from this growing industry. The presence of cetacean experts on board WW boats could help improve the educational value of tours, and allow for adverse impacts to be identified early. Having outside observers on the boats can also help address the conflict of interest between those WWOs that prioritize getting clients close to the animals as opposed to preventing harassment of the animals (Arcangeli et al., 2009; Beaubrun, 2002). Furthermore, it is clear from most of the research that has been done that more information is needed, and WW boats are a potential platform for this research. Moreso, as new insights are discovered about WW and the impacts that it can

have on the target animals, the industry and its methods for controlling the behavior of the boats involved need to be adjusted to make them more effective (Arcangeli et al., 2009; Carrera et al., 2008; Lemon et al., 2006; Magalhães et al., 2002; Mattson et al., 2005; Scheidat et al., 2004; Stamation et al., 2010). Furthermore, in order to truly insure that cetaceans are not adversely affected by WW and increasing human activity, the viability and health of their ecosystems must be maintained as well (Bain et al., 2002; Mattson et al., 2005). Finally, if any regulations are to be successful in mitigating the impacts of WW, they must be properly enforced, something which is fairly rare globally (Magalhães et al., 2002; Noren et al., 2009; Sousa-Lima & Clark, 2008).

### **C. Caribbean WW Development and Current Whale Watching Regulations**

It should be clear from the literature referenced above that guidelines or regulations are necessary in order to protect cetaceans from the WW industry. WW developing in the Caribbean is often organic, beginning with fishermen or dive companies that already have the resources to bring tourists out into the water, as well as knowledge about where cetaceans can be found. Thus, the process by which particular cetacean species are selected as WW targets is similarly organic, and is most often based on the reliable presence of potential target species in accessible waters, as well as tourist interest in the species (Hoyt, 1999). While this makes sense from an economic standpoint, this also means that Caribbean industries have been established around a potentially sensitive group of cetaceans or within a critical habitat. For example, the consistent presence of a species in a particular area, such as sperm whales off of Dominica's coast or humpback whales in Samaná Bay of the Dominican Republic, may

indicate that the habitat is of importance to cetaceans there for activities such as feeding, resting, and breeding activities. All of these things, coincidentally, are also behaviors that have been found to be sensitive to negative WW impacts in multiple species (Arcangeli et al., 2009; Beaubrun, 2002; R. Williams et al., 2006). Different life stages of cetaceans also have varying susceptibility, with mothers and calves being of particular concern. However, calves are of particular interest to tourists due to their "cute" appearance and interesting behaviors. Furthermore, young cetaceans tend to be particularly curious about WW boats, while also being more at risk for vessel collisions and potentially detrimental habituation (International Whaling Commission, 2013; Laist, Knowlton, Mead, Collet, & Podesta, 2001; Stone & Yoshinaga, 2000). Finally, some of the species that WW has grown to focus on in the Caribbean, such as sperm whales, are believed to be more sensitive to the negative impacts of WW due to their biology and life history traits (Carlson, 2011; C. Richter et al., 2006). Due to this, some countries have developed special guidelines for WW of sperm whales- including short limits on observation duration, and special consideration for behavior that indicates evasive maneuvers (Carlson, 2011). While it is unlikely that the target species of different WW industries can be controlled, understanding the relative vulnerability of each species to potential negative WW impacts can assist in determining what sorts of guidelines or regulations will be necessary to prevent the manifestation of negative impacts.

As of 2009, 23 of the 33 countries included in the Caribbean region by this analysis had a whale watching industry of some sort; this is about 70% of the countries in the region (O'Connor et al., 2009). However, around this time only about 48% of these countries had WW guidelines of any sort, and only 22% had actual regulations for WWO

behavior. Of the issues covered by these guidelines, the most common is the topic of allowing swimmers into the water. Ten countries, or ~44% of those countries with WW industries, have something on their books banning swimming with cetaceans (Carlson, 2011). However, I observed during my time in Dominica that in some cases, these anti-swimming regulations are not followed, especially in the case of voluntary guidelines, and in instances of high potential economic gain for the activity (Parsons & Woods-Ballard, 2003). Stipulations on how fast to approach target cetaceans, as well as minimum approach distance were also addressed by 10 different countries, although the specific details of these guidelines vary (Carlson, 2011). Those topics that were addressed the least by Caribbean countries were the prohibition of capturing cetaceans, requirements for experienced and well-trained WWO, and the inclusion of education and research in WW activities; each of these were only addressed by 2 of the 23 countries with WW industries. Of the countries examined, Dominica, Guadeloupe, and St. Lucia appear to have guidelines or regulations addressing WW in the most detail, addressing 14 of the 25 potential topics covered by guidelines throughout the region. However, of these, only St. Lucia had actual regulations developed to back up this detailed plan for control of the industry, while Dominica and Guadeloupe only had guidelines (Carlson, 2011). Furthermore, based on my 2014 interviews with WWOs and the Fisheries Division in Dominica, many of the guidelines established there were not being followed by WWOs due to the development of a swim-with industry there. So, there is a wide range of potential controls on the WW industry in the Caribbean region; however, in-depth, on the ground investigations of these regulations may be needed, because in some cases, the

guidelines or regulations that appear to be in use based on official documents aren't actually being enforced.

It should be clear from even this overview, linked with the previous discussion of the impacts of the industry, that WW in the Caribbean needs to be more carefully controlled by both the industry and governments. Awareness about WW negative impacts on cetaceans needs to be raised among WWOs as well. There are many potential negative effects that this tourism industry can have on the animals that it focuses on, and carefully constructed systems of WWO behavior are needed to prevent and mitigate as many of these impacts as possible. If this is not done, WW can potentially threaten the species it relies on and is said to protect. Within the region, one potentially good example of a system for this control is the Dominican Republic (DR). Whale watching started here in 1985, focusing on the breeding and calving humpback whales that travel to Silver Bank, Navidad Bank, and Samaná Bay, located in the north-eastern part of the country. This WW industry is currently one of the largest in the region, boasting ~28,000 WWers in 2008, which is only less than Costa Rica and Puerto Rico in terms of visitor numbers (O'Connor et al., 2009). The DR established a protected area around this humpback whale breeding habitat shortly after WW started there in 1986. Since then, there has been a partnership between NGOs, the Ministry of Tourism, the Ministry of the Environment, and local stakeholders, like Samaná's boat owners association. Together, these groups have worked to establish behavioral guidelines for WWOs, a permitting system to limit the number of boats, and regulations that address both conservation and the concerns of the local community. These insure that local people from Samaná have a chance to



participate in the industry as opposed to foreigners, thus lessening the problems with revenue leakage.

The Center for the Conservation and Eco-Development of Samaná Bay and its Surroundings (CEBSE) also trains local students as volunteers to gather data on whale behavior from WW boats, as well as to monitor the actions of WWOs on the water from WW boats. These activities increase the likelihood that bad WWO behavior will be reported to the Ministry of the Environment, which is supported by the Dominican Republic Navy in the enforcement of its regulations. Data gathered by these students are also used to monitor for any changes in whale behavior and social aggregations over time, which could be used to identify negative impacts of WW on the humpbacks as they emerge. Finally, this NGO also educates local high school students about biology by getting them involved in a long-term project designed to protect a resource integral to their community (Ministerio de Medio Ambiente y Recursos Naturales, 2015). This system, while it has its own short-comings, has seen considerable success in the sustainable use of the humpback whales for WW purposes in the past. It has also been designed by the local people within the context of the Caribbean region, making it potentially instructive for other countries looking to find effective strategies for developing their WW industry while also protecting the resource that the industry relies on. While it is unlikely that the DR strategy for controlling this industry can be used without modification in other countries, due to the myriad of ways in which these nations are different. However, the model used here can lend insight into the methods that can be used in developing countries to couple economic development with the protection of target species. It would also likely be beneficial to see the implementation of certification

schemes that reward responsible WWOs with extra recognition (and thus perhaps preference) among visitors.

#### **D. Indirect Impacts of WW Development on Cetaceans**

Overall, while there is a fairly good amount of research on the direct impacts of WW on target cetaceans, the indirect impacts of the industry's development and the impact on non-target species is largely unexamined. However, direct impacts such as these are not the only potential pathways for WW development to have negative effects on cetaceans. As with other forms of marine tourism, WW may be accompanied by coastal development. This development is often accompanied by habitat loss, increased vessel traffic, higher levels of noise pollution, and contaminants. Changes such as these can impact both target and non-target cetaceans, which is concerning, since little is known about the long-term consequences of this human activity on cetaceans that are not directly observed.

The construction of piers and the surrounding infrastructure that makes successful marine tourism possible in most cases often causes changes in the habitat of cetaceans, both in terms of acoustics and physical quality of the environment. During coastal construction, a variety of methods are used to build platforms for human structures, create deeper areas for the passage of vessels, and even convert marine area into dry land for further building. Percussive pile driving, dredging and dumping of materials are all common during such processes, and all can have an acoustic and physical impact on the marine environment (Jefferson, Hung, & Würsig, 2009). As with WW, these impacts on the marine environment have been found to cause changes in behavior and

communication of cetaceans in the area. For baleen whales, which have low-frequency sound sensitivity, pile driving is believed to be particularly problematic, as much of its sound energy is produced below 1500 Hz. Temporary abandonment of areas near pile driving activity was noted during its use in Hong Kong, and similar changes in cetacean presence elsewhere have been observed in connection with this process (Jefferson et al., 2009; Leopold & Camphuysen, 2008). Blasting and other construction methods that produce sudden, loud sounds are also believed to have considerable levels of impact on cetaceans. In regards to baleen whales, exposure to blasting was found to be correlated with decreasing levels of return to feeding areas near construction (Borggaard, Lien, & Stevick, 1999). Sudden production of intense noise, as well as shockwaves can also cause physical trauma, especially in deep diving cetaceans. Some species of beaked whales, for instance, appear to be particularly prone to mass stranding, and there is an apparent connection between intense noise produced by anthropogenic sources, and these stranding events (some of which have been recorded in the Caribbean). In some cases, this appears to be due to rapid surfacing shortly after the production of these strong, human-caused sounds, which causes decompression sickness and disorientation in the cetaceans (Weilgart, 2007). This is particularly concerning due to the fact that very little is known about beaked whale species, and the impact of these strandings on their populations is unknown.

There are a variety of ways in which construction and coastal development can degrade the marine habitat that shallow-water cetaceans rely on. The most obvious of which is the appropriation of space, and the physical transformation of the marine environment. Modifying the depth of the marine floor through dredging and land

reclamation, as well as changing hydrology of the area through coastal development, can all change the ways in which cetaceans and their prey can utilize coastal areas. In most cases, such changes will degrade the habitat for these species, rather than enhancing them (S. Y. Lee et al., 2006; Reeves et al., 2003). Increased vessel activity in an area, during construction and after, can also increase siltation in the water, which in turn can change aspects of the water quality that is important to cetacean use of the coastal, marine habitat (Chilvers et al., 2005; Jefferson et al., 2009). In the case of the Dominican Republic's humpback whales, increased levels of siltation have the potential to lessen a mother's ability to see predators and thus protect her offspring. Likewise, members of both genders need to be able to sense where potential mates or competitors are located (Ministerio de Medio Ambiente y Recursos Naturales, 2015). Finally, while the ecosystem wide impact of coastal development is not well understood, changes in hydrology, silt levels, and noise, among other things, can also impact the prey that cetaceans rely on. Any decrease in prey levels is likely to be detrimental to any predators relying on such habitats, forcing them to move to different areas to feed, or, if there are no other such habitats, forcing them to rely on a smaller food base (Dolman & Simmonds, 2010; Weilgart, 2007).

Disease, which is potentially both a direct and indirect impact of WW development, is also a concern. Overall, there are a variety of diseases that have increased in prevalence and severity in many cetacean species over the past few decades, such as cetacean morbillivirus, genital papillomaviruses, cetacean poxviruses, brucellosis, toxoplasmosis, and lobomycosis. Many of these can prove fatal to the animals infected with them, or prevent them from reproducing. While it is uncertain whether the apparent increase in prevalence of these diseases is due to human activities or simply an improved

ability to find and report these cases, there are some of these that appear to be closely linked to anthropogenic impacts on cetaceans and their environment. Cetacean morbillivirus and poxviruses, for instance, appear in association with increased competition with fisheries, higher loads of pollutants, and other human-cetacean interactions, such as WW, that cause chronic stress in cetaceans and thus compromise their immune systems (Van Bresse et al., 2009). These stressors, coupled with other changes in the environment of cetaceans has also lead to a reported increase in cutaneous lesion-causing organisms in cetaceans since the 1950s. Of these, the most common are keratinophilic fungi species, which can cause a variety of symptoms, some non-fatal, but these are also correlated with strandings and appear to play roles in cetacean fatalities (Mouton & Botha, 2012). These organisms are found in high concentrations in human sewage which increase with larger human populations and coastal development. This is of particular concern in the Caribbean, because rates of wastewater treatment in the region are low. Data from 2000 shows that of 35 Caribbean countries or territories analyzed only 4 (~11%) treated 100% of their waste water, 17 (~49%) treated 50% of their waste water or less, and 6 (~17%) treated none of their waste water (Blackman, Epanchin-Niell, Siikamaki, & Velez-Lopez, 2014). Tourism can make this situation worse through the surge in people using these systems. In some Caribbean cases, there are actually more tourists than locals, thus creating problems for infrastructure used by both groups but often only paid for by local people, as in the case of waste water treatment (Jayawardena, 2002; Pattullo, 2005).

There is uncertainty at every point of our understanding of the negative impacts of WW on whales and dolphins. There are many cetacean species that we know very little

about, lacking data on any aspect of their life history and behavior. There are WW target species that need further research, and many of the impacts that we believe exist are not fully understood. On top of that, while we know that coastal development, which may support WW or accompany tourism development, can have extremely detrimental impacts on the habitat that cetaceans rely on, there is little research on the specific ways in which these changes affect cetacean species. At the same time, WW has experienced rapid growth since the industry's beginning in the 1980s, both in economic scale and in its spread into different countries around the world. Due to this, and projections that this growth will continue for some time, it is important that the data available is synthesized to some extent in order to determine methods for protecting those species that may be impacted by this industry. In order to partially address this problem, I will be using past research to evaluate the vulnerability of different cetacean species found in the Caribbean to the direct and indirect impacts of WW.

## **Section Five: The Community and Whale Watching: Resident Perceptions**

Much of the research on WW has focused on the environmental and economic impacts of the industry. However, tourism often has social impacts that extend well beyond the economy, as it can commodify the local culture, worsen criminal activity, and cause overcrowding, among other things (Mbaiwa, 2005; Zambrano et al., 2010). In turn, residents of host communities can perceive those impacts in a variety of ways. Some of the effects of tourism may not be realized by residents, or local people may believe that they are experiencing negative or positive impacts that are not actually occurring in their community (Hunt & Stronza, 2014; Jurowski, Uysal, & Williams, 1997; Muganda, Sahli, & Smith, 2010; Sirakaya, Teye, & Sönmez, 2002). Whether these perceptions are correct or not, however, they will play a role in defining the relationship that local people have with the tourism industry in their community. An understanding of this relationship is necessary to substantiate claims that this kind of ecotourism supports coastal communities. Furthermore, for WW to be an effective tool in the long-term for either the economic enhancement for the local community or cetacean conservation, residents must support the industry (W. M. Adams et al., 2004). Without this backing locals can undermine tourism by creating circumstances that make visitors uncomfortable, and these residents can make conservation difficult by disobeying environmental protection measures and being disinterested in future maintenance of intact ecosystems (Nicholas, Thapa, & Ko, 2009). In this section, I will first discuss the importance of local support for conservation and the role of ecotourism as an incentive for such connections. Then I will review the Social Exchange Theory (SET), which has been used to help structure and understand the relationships that can form between the tourism industry and people local

to tourism destinations. Finally, I will look at what evidence we currently have on how social characteristics determine whether residents will have positive or negative perceptions of tourism, and I will review what is currently known about local relationships with WW itself.

### **A. Ecotourism: Linking Local People to Conservation**

The mainstay of modern biodiversity conservation is protected areas (PAs), or areas of land or water set aside to protect some aspect of biodiversity. The PA concept is often attributed to the invention of national parks in the United States beginning with Yellowstone in the 1870s (Spence, 1996). In the developed world, these PAs not only safeguarded natural landscapes from wide-scale development, but also created recreational areas. On the surface, this seems to be a win-win situation, and its importance to biodiversity conservation is inarguably great. In fact, the concept of protected areas is currently used around the world and is considered to be biodiversity's last line of defense by some biologists (T. R. Miller, Minter, & Malan, 2011). However, this concept has another characteristic that traces its roots back to the original American method, the removal of people from the landscape. Although alternative models that have been developed for environmental conservation, this original concept of a "wilderness" to be protected was a landscape free of a resident human presence (although visitors such as tourists were allowable, along with the associated development needed to support them) (T. R. Miller et al., 2011; Pallemarts, 1986). In order to accomplish this, those people living in the areas that were to be protected were moved elsewhere. In fact, in Yellowstone National Park, treaties were used to force native people out of the area and



into surrounding reservations, and the story is similar in many of the United States' national parks (Hirst, 2006; Spence, 1996).

America's strategy of preserving wilderness through the designation of PAs devoid of permanent human residents was eventually adopted by much of the world, and the costs and benefits of this system became more apparent over time (Brown, 2002; Buscher & Dietz, 2005; Pallemmaerts, 1986). These exclusionary PAs were often designed to be safeguarded by physical boundaries, fines, and other legal actions, and have been commonly referred to as the "fences and fines" or classic conservation approach (Brown, 2002). While the first PAs were terrestrial, marine protected areas (MPAs) began to be established in the early 20th century, primarily focusing on coastal areas (Agardy et al., 2003). Glacier Bay, the first MPA to protect important cetacean habitat, was established in 1925, and the first MPA to specifically focus on the protection of cetaceans was Laguna Ojo de Liebre which was established in 1972 to protect gray whale breeding habitat (Hoyt, 2005a).

While this system has attained worldwide popularity, there are a set of environmental and social conditions that tend to make PA's more or less successful. Areas with lower population densities have better potential as a PA because less people rely on the area of interest and therefore less people will need to be removed or change their use of natural resources in the park area after its establishment. Furthermore, places where residents have alternative resources easily available to them can lessen hardships when strict PAs are designated (Blom, Sunderland, & Murdiyarso, 2010; Wells & Brandon, 1992). Research has shown that in several instances this classic conservation approach has resulted in increased local poverty, and in many problematic cases, local

people are not afforded participation in the decision-making process either in terms of the formation of the park or its eventual management (Baral, Stern, & Heinen, 2007; Berkes, 2007; Buscher & Dietz, 2005; Newmark & Hough, 2000; Wells & Brandon, 1992). The conditions of this conservation method has resulted in resistance from local people, which can and often does undermine conservation efforts, and raises very real concerns about the ethics of biodiversity preservation at the apparent cost of human well-being (Ma, Li, Han, Chen, & Watkinson, 2009; T. R. Miller et al., 2011; Wells & Brandon, 1992).

There has been much less research on conflicts of human and biodiversity conservation interests in the context of marine protected areas. However, stakeholder support for protected areas is just as necessary for the long-term success of the biodiversity goals of marine protected areas as terrestrial. Efforts to zone MPAs for varying uses is one policy method of allowing for sustainable development in marine protected areas, and to address some of the known areas of concern in regards to social conflict for marine systems. In particular, "conflict often stems from the marginalization of artisanal fisheries by other forms of resource utilization..." (Christie, 2004). In many cases, there is the perception or reality that resource access for fishers is at risk when marine protected areas are designated (Agardy et al., 2003). In some cases, even when fishing is allowed in marine protected areas, tourism interests take precedence, and while this use is often seen as non-consumptive, there is plenty of evidence that marine tourism can damage sensitive coastal habitats, especially reefs (Brown et al., 2001; Zakai & Chadwick-Furman, 2002). That being said, marine protected areas that are properly managed can also benefit fisheries as fish stocks may become healthier when important

habitats are protected. In fact, in New Zealand, when marine protected areas were first in the process of being designated in the 1970s, there was strong opposition within the fishing community, but after a decade of successful management, the majority of fishermen supported further designations (Agardy et al., 2003).

Negative social consequences, as well as the difficulty that these PAs have faced in attaining their long-term conservation goals has led to the development of alternative forms of PAs and new methods for encouraging local support for conservation, such as ecotourism and payments for ecosystem services (Berkes, 2007; Brown, 2002; Kareiva, Chang, & Marvier, 2008; Salafsky, 2011; Tallis, Kareiva, Marvier, & Chang, 2008). Of particular interest here is ecotourism as a kind of ecosystem service, as this is the most relevant to the role that WW is said to play in enhancing cetacean conservation efforts. The framework of ecosystem services is used to ascribe human value to different aspects of the ecosystem based on the functions or services that they provide to humans. The kinds of values encompassed by this framework includes practical services like clean water and food provision as well as intangibles like spiritual and aesthetic values. The hope is that by realizing the worth of functioning ecosystems there is more incentive for the global community to preserve biodiversity (Millennium Ecosystem Assessment, 2005).

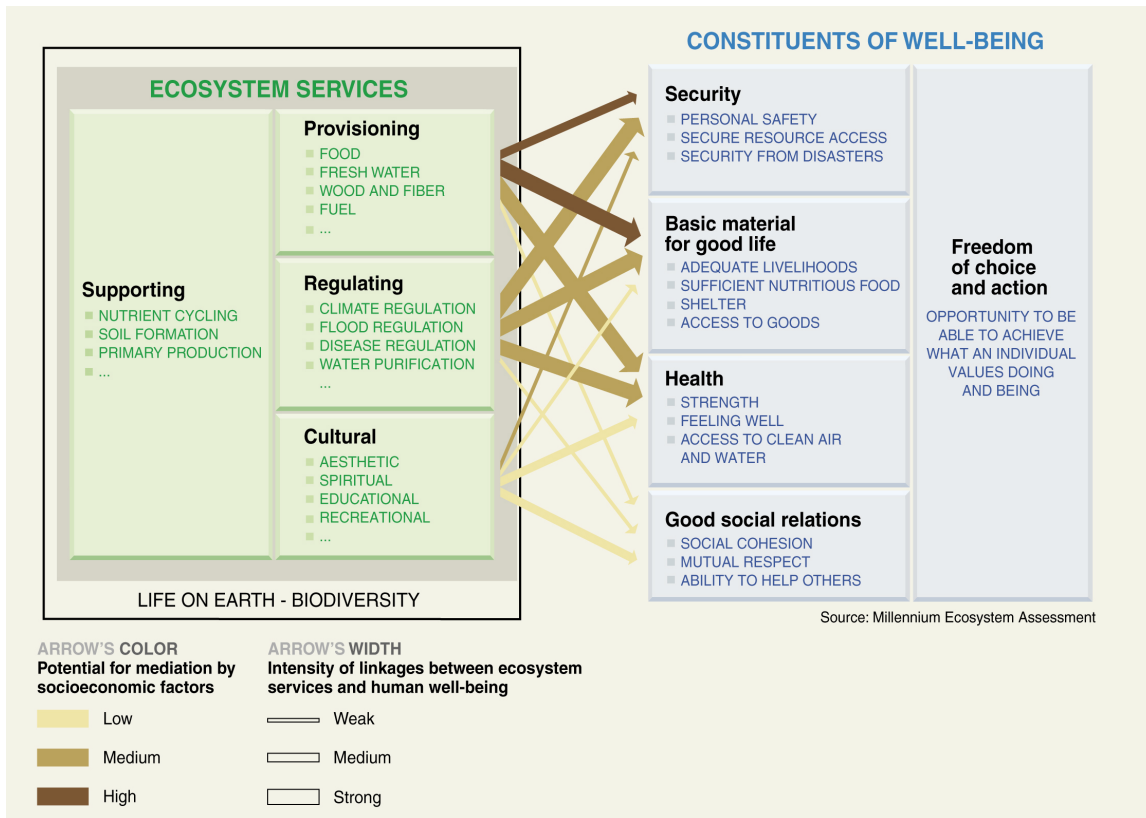


Figure 1.5: Depiction of Ecosystem Services (Millennium Ecosystem Assessment, 2005)

Ecotourism is meant to be an environmentally sustainable form of nature tourism, and it can be considered a product of the cultural services of the environment (Millennium Ecosystem Assessment, 2005). It is reliant on natural landscapes (or those landscapes built to incorporate and mimic natural beauty) and charismatic megafauna, and it needs to support both conservation and local people. WW is undoubtedly a form of nature tourism, but its benefits for the environment and host communities are less certain (S. Larson & Herr, 2008). Thus, the ecotourism framework is a valuable method of examining WW, as a tourism industry cannot be truly considered a form of ecotourism unless it attains some specific goals. Outside of its focus on nature, there are differing definitions of what ecotourism should accomplish, but there is a general consensus that it should enhance conservation efforts while involving local people in the decision-making

process and streaming benefits to the host community (Buckley, 1994; Khan, 1997; Powell & Ham, 2008; West & Carrier, 2004). More restrictive definitions of ecotourism (Figure 1.4) say that tourism ventures included in this description should also provide environmental education to tourists and residents (Buckley, 1994; Powell & Ham, 2008).

As with the other strategies described above, ecotourism is a mechanism by which it is hoped that local people will be encouraged and incentivized to support conservation due to the importance that associated natural landscapes, wildlife, etc. play in their livelihoods (Nyaupane & Poudel, 2011; Tisdell, 2012). Employment in this industry can also lessen resident reliance on the consumption of sensitive natural resources, and such employment also lessens the time that locals have for illegal activities within PA boundaries (Nyaupane & Poudel, 2011; Wunder, 2000). In cases of economic viability, ecotourism may also serve as a mechanism for advocating for nature protection through the interests of both tourists and invested residents, and as an argument opposing extractive industries that rely less on the preservation of the environment (Clarke, 1997). However, this form of tourism must be designed to lessen tourism revenue leakage by focusing more explicitly on connecting with and involving the local community, or the proposed social and economic enhancements will be limited (Wall, 1997). When ecotourism is well-planned and managed effectively there are a variety of social and environmental benefits that may be realized. These can include higher levels of local knowledge about the natural resource, higher local incomes, and increased levels of local environmental protect in ecotourism areas due to the increasing value of an intact habitats to the community (Zambrano et al., 2010).

Ecotourism has the potential to accomplish many desirable objectives, however, there is no guarantee that businesses labeling themselves as "ecotourism" are striving for or attaining these goals. As with other products marketing themselves as being sustainable or "green," ecotourism has a problem with green-washing, i.e., the practice of companies misleading their customers about the negative and positive impacts of their product on the environment (Delmas & Burbano, 2011; Honey & Stewart, 2002). Even well-managed, legitimate ecotourism confronts a variety of challenges. There are many cases in which the industry does not provide enough economic support to cover the operating costs of associated protect areas (Gossling, 1999; Muganda et al., 2010). It is not always socially or financially feasible to charge entrance fees, and usually when fees are charged, a relatively low percentage of the money made goes to conservation actions. For tourism to avoid damaging the environment, which is essential for ecotourism, tourist carrying capacities should be utilized. However, this limits the number of visitors to a site, and thus restricts the economic impact of the industry in comparison to mass tourism (Clarke, 1997; Wall, 1997). Within the community, especially in developing nations, there is often only a small group of elites that benefits the most from the tourism/ecotourism industry (Gossling, 1999; Muganda et al., 2010; Tosun, 2000). Those members of the community that are already marginalized are likely to remain so due to a lack of educational and financial resources which would allow them to participate (Coria & Calfucura, 2012; He et al., 2008; Muganda et al., 2010). These barriers to local participation often necessitate foreign expertise and money, which can further alienate residents from the decision-making processes of the industry (Coria & Calfucura, 2012; Tosun, 2000).

There are often other social consequences of ecotourism, and tourism development in general that must be considered if this form of tourism is to benefit local people and encourage support for conservation efforts. Tourism is known to increase certain kinds of crime within communities, such as prostitution and theft, and it can also create inflation and increase in property values that can exclude local people from the use of popular tourism areas (Freitag, 1994). Furthermore, although ecotourism is meant to create respect for local cultures and help preserve them, it helps spread market-based economies because its benefits are primarily monetary. While this is widely beneficial, there are some cultures, such as sharing cultures, in which monetary systems can undermine key social relationship-building practices, and thus change essential characteristics of traditional life (West & Carrier, 2004). Local people may choose to partake in the Western economic system, but neither foreign investors nor their government should force monetary benefits onto local communities as the primary benefit of any development. Western concepts of the natural world being devoid of humans also tends to encourage ecotourism-associated protected areas to remove local people from "wild" spaces (West & Carrier, 2004). Together, these economic and social limitations can impact the ability of ecotourism to garner local support for conservation, which, as discussed above, is concerning due to the integral importance of community involvement in successful biodiversity preservation projects.

Whale watching itself has been defined as a form of ecotourism by prominent WW scientists such as Erich Hoyt (2005), and many of the claims that environmental non-governmental organizations (NGOs) make about the benefits of this industry fall along similar lines to that of ecotourism (Greenpeace, 2004; IFAW, 2013; WDC, 2016).

WW is also discussed as a win-win solution to issues of both social justice and cetacean conservation efforts. However, there is extensive and growing knowledge about the negative impacts of WW on cetaceans, from noise disturbances to ship strikes (Parsons, 2012). In recent years, environmental NGOs such as Whale and Dolphin Conservation (WDC) have become more specific in their stipulations that only "responsible" WW should be supported. This indicates increasing concern for the welfare of cetaceans targeted by this industry, but describing the possible negative impacts of WW and listing some good WWOs is not sufficient (WDC, 2016). In terms of social and environmental sustainability, WW host communities should receive a considerable portion of the benefits generated by WW, as cetaceans are a local resource that may need to be actively protected in order to maintain good WW conditions (Ministerio de Medio Ambiente y Recursos Naturales, 2015; Moyle & Evans, 2008; Ris, 1993). If local communities are not well supported it is likely that WW-associated conservation actions will struggle due to lack of local support as described above. Unfortunately, information about the relationship that local communities have with the WW industry is not readily available, as research focusing on this issue is generally lacking.

### **B. Resident Perceptions of the Tourism Industry**

Social exchange theory (SET) has played a key role in research concerning the formation of relationships between local people and the tourism industry, and particularly in research concerning resident perceptions of the industry (see Appendix IV). This is due to the fact the SET allows researchers to account for the development of resident perceptions on tourism based on both tangible and intangible costs and benefits of the



industry. In a nutshell, this research seeks to understand why and how residents of host communities perceive the tourism industry to be a positive or negative force in their communities. In turn, these perceptions influence the ways in which local people interact with the industry, and can support or undermine its long-term success in a location (Ap, 1992). The findings of such research, as will be covered below, have clearly highlighted the complexities of the global tourism industry in relation to a large variety of cultures, environments, and economic situations. There are some trends in relation to demographic data, local relations to the environment and their communities, economic reliance, and power dynamics that have been discovered, but substantial amounts of uncertainty remain.

Starting with demographics, research does not agree on the influence that this has on resident perceptions of tourism, but there are several findings worth discussing. Several studies have found that women hold more negative views of tourism than men (Harrill, 2004; Mason & Cheyne, 2000), and similarly, minority groups also tend to have less positive perceptions of the industry (Harrill, 2004). Since the balance of benefits and costs is so central to the formation of positive or negative perceptions within the SET framework, it is likely that these patterns are due to the disadvantaged nature of these groups (Nicholas et al., 2009). Age can also play a role, although there are conflicting results regarding the role of this trait. Some researchers have reported that older residents had more negative perceptions of tourism than younger people (Harrill, 2004; Rasoolimanesh, Jaafar, Kock, & Ramayah, 2015). This could be due to the tendency of younger community members to interact more with visitors, so that they develop a better understanding of tourist cultures (Doğan, 1989). This may also be due to a general

openness among younger members of the community for change, as well as better opportunities for employment in the industry (Huh & Vogt, 2008). Others found that general levels of support for the industry were equal among ages, but that younger residents were more sensitive to negative environmental impacts (Látková & Vogt, 2012). Finally, there are many studies that have found demographics to be very bad predictors of either positive or negative perceptions of tourism (Johnson, Snepenger, & Akis, 1994; King, Pizam, & Milman, 1993; Lankford, 1994; Liu, Sheldon, & Var, 1987; Madrigal, 1993; McCool & Martin, 1994; McGehee & Andereck, 2004; Mok, Slater, & Cheung, 1991; Perdue, Long, & Allen, 1990; Sirakaya et al., 2002; Tosun, 2000).

The philosophies that individuals and communities hold regarding the social, economic, and environmental changes caused by tourism will influence their perceptions of the industry as well (Brida, Osti, & Faccioli, 2011; Rasoolimanesh et al., 2015). For instance, those people who value the integrity of their environment strongly (i.e., have preservationist values) will be more sensitive to the impact of tourism on the environment. By definition tourism development must have at least a baseline negative effect on the environment through the construction of buildings, destruction of natural attractions such as coral reefs, and increased access to formerly isolated areas, etc. So, studies have shown that, in general, the more concerned a person is with the protection of the environment, the more negative their perception of tourism development tends to be. That being said, most people still prioritize improvements in the local standard of living over environmental concerns (Jurowski et al., 1997; Rasoolimanesh et al., 2015).

An example of the impact of an environmental philosophy on support for tourism can be found in a 2009 study looking at the development of a world heritage site in St.

Lucia. Here it was found that a person's philosophical outlook played a significant role in shaping their perception of certain kinds of tourism development. People who had been classified as ecocentric through an analysis of their survey answers were, in fact, were statistically supportive of the development of a world heritage site surrounding the Pitons mountains. This was likely due to the fact that ecotourism was the assumed connection here, and as a world heritage site, the mountains would be afforded greater protection than otherwise (Nicholas et al., 2009). Furthermore, residents are often more supportive of tourism that can provide new recreational resources for locals (Gursoy & Rutherford, 2004; Jurowski et al., 1997; Látková & Vogt, 2012; Wang & Pfister, 2008). Attachment to the environment plays a role in determining the characteristics of resident perceptions in a location, but it is not the sole determinant.

Tourism can have a myriad of different impacts on the local social structure as well as the environment, and thus, an individual's commitment and connection to the community can shape their attitudes toward tourism. Those people that are deeply integrated into the local society (e.g. birthplace, familial ties, and long-term residence in the area) tend to view tourism more negatively. In many cases, people that value the community highly will be more perturbed by the negative impacts of tourism than those people who are less invested (Harrill, 2004; Jurowski et al., 1997; Lankford & Howard, 1994; Látková & Vogt, 2012; Rasoolimanesh et al., 2015; Sirakaya et al., 2002). It is also understood that the introduction and development of tourism in a community can change the culture of the area, and increase stratification between different social classes (Doğan, 1989). Still, as with other aspects of this body of research, there are situations in which this common trend is not maintained. The state of the local economy can play a role in

shaping positive perceptions in people closely tied to the community, because many see tourism as a way to improve the economic situation. Thus, destinations experiencing economic downturns are the most likely to contain people with strong community attachments that also support tourism development (Gursoy & Rutherford, 2004). This is supported by research in Ghana that showed that local people that were a part of community organizations were more supportive of tourism development. Although Ghana has been relatively stable and prosperous relative to other countries in the region, many of its people are still living in conditions of poverty, and thus, tourism is a potential tool for development (Sirakaya et al., 2002). The location of people in regard to such development can also make a difference, as those people that live closer to core areas of development tend to experience more tourism costs, and thus establish less positive views (Harrill & Potts, 2003; Perdue et al., 1990; Sheldon & Var, 1984; Sirakaya et al., 2002). In another example in Arizona, tourism heightened community pride, and provided an increase in knowledge about local heritage (Andereck et al., 2005). Finally, as with demographics, there have been several studies that failed to find a link between community attachment and resident support for tourism (Davis, Allen, & Cosenza, 1988; Gursoy, Jurowski, & Uysal, 2002; McCool & Martin, 1994; McGehee & Andereck, 2004). This may be due to a variety of variables including, cultural support for specific forms of tourism, overlap of tourist and local recreational activities, and community involvement in the development among other things.

These things aside, the principles of SET would tell us that one of the primary determinants of an individual's support for tourism is the extent of the benefits he or she perceives themselves receiving from the industry (Nicholas et al., 2009). Those people

who are economically dependent on some aspect of the tourism industry tend to be supportive of its presence and development within their community (Harrill & Potts, 2003; Harrill, 2004; Látková & Vogt, 2012; Madrigal, 1993; Perdue et al., 1990; Pizam, 1978; Rasoolimanesh et al., 2015). However, this support is not ubiquitous and a linear relationship should not be assumed. For example, in Arizona it was found that people who were benefiting economically from tourism were more aware of its positive impacts, but their experience of tourism costs did not appear to be different from the rest of the study population (Andereck et al., 2005). However, as should be clear from the previous discussion, culture and circumstance influence these common trends, and developed and developing countries often exhibit differing patterns. For instance, in Ghana, unemployed people were the most supportive of tourism development, because it represented the potential for future employment. In this case, the prospect of economic benefits was enough to inspire support (Sirakaya et al., 2002). In a qualitative analysis of resident perceptions of tourism in Nicaragua, it was found that employees of the tourism industry were more informed about both its positive and negative impacts, and appeared to be more critical of its structure than other people in the community (Hunt & Stronza, 2014). So, while economic benefits are important to the formation of positive or negative resident perceptions, it is once again clear that many different aspects of the situation must be considered to understand why and how these opinions form.

One key characteristic that plays a potentially important role in whether tourism perceptions are positive or negative is the power of different individuals within the community. It is most common for the more powerful members to control whether or not tourism development starts and continues, and it is they that also tend to benefit the most

(Ap, 1992; Doğan, 1989; Gossling, 1999; Muganda et al., 2010; Nicholas et al., 2009; Tosun, 2000). Power, in the case of social exchange and tourism, comes from an individual's jurisdiction over resources required by the other member of the exchange process (Kayat, 2002). So, it makes sense by the principles of SET that power should also help determine whether resident perceptions are positive or negative. Research has supported this conclusion. Demographically, as covered above, marginalized groups such as women and minorities tend to have more negative perceptions of tourism (Harrill, 2004; Mason & Cheyne, 2000; Nicholas et al., 2009). Powerful groups also tend to have a better understanding of Western tourists due to their increased ability to travel, and they have better access to education, which would allow them to learn languages common among tourists. Being able to relate to and communicate with visitors not only enhances the enjoyment of the tourism industry by the powerful, it also further positions them to start and maintain successful tourism businesses (Doğan, 1989). Perceptions of the power of the industry in relation to the power of the people also play a significant role in the development of resident perceptions. The more a community believes that the tourism industry has political power, the more negative their perceptions of the industry will be. On the other hand, if local people have the power to influence the tourism industry more positive perceptions are likely to develop (Madrigal, 1993). Due to these characteristics, the political/power structures of different countries and communities can shape perceptions by defining the ways in which tourism and the host community share power (Doğan, 1989). Once again, however, these findings cannot be considered in isolation from culture and the environment itself. Kayat's 2002 study in Malaysia found that people classified as having and not having power in the community were both equally

supportive of tourism. However, for people of the "no-power" category, tourism gave them opportunities to avoid hardship, while individuals of the "power" group were found to simply have their already acceptable situation improved (Kayat, 2002).

Finally, one of the more complex variables that play an essential role in the development of resident perceptions of tourism is time (Ap, 1992; Cropanzano & Mitchell, 2005; Jurowski et al., 1997; Ko & Stewart, 2002). The nature of tourism in any community changes as the industry matures. In cases where tourism is successful, changes in the community will become more apparent or more pervasive over time. Often, this leads to diminishing community support (L. R. Allen, Long, Perdue, & Kieselbach, 1988; Doğan, 1989). It is theorized that in the earliest stages of development, residents commonly embraced tourism, because they have high hopes about what the industry can provide. Tolerance often becomes the common response as development begins picking up. This is the stage at which costs also become more apparent, but residents are often willing to put up with these costs to maintain their access to the benefits of the tourism industry. Adjustment occurs when locals begin changing their behavior to mitigate costs. A common example of this is rescheduling activities to avoid crowds. Finally, when the industry is fully established, withdrawal can occur, in which residents remove themselves from the community on a temporary or permanent basis (Ap & Crompton, 1993; Hunt & Stronza, 2014).

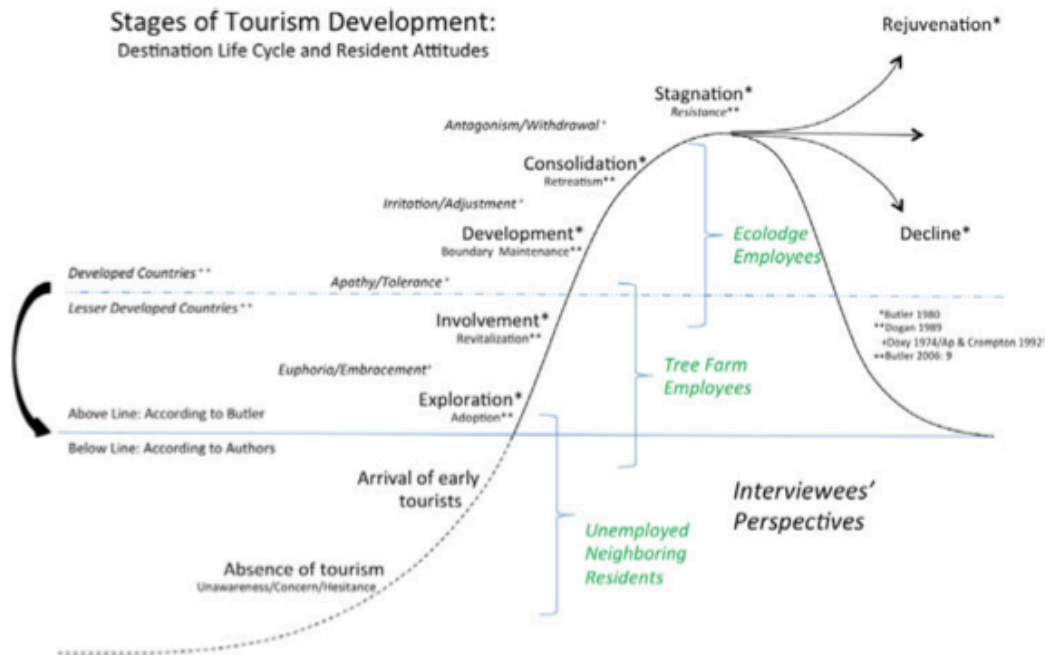


Figure 1.6: Appended Stages of Tourism Development from Hunt & Stronza 2014

Hunt and Stronza synthesize several prominent tourism stage theories, as well as their own data in order to develop a figure that hints at the complex relationship that time and development status may play in resident perceptions of tourism. The curve presented here is a clear descendent of Butler's original theory, and Ap and Crompton's continuum is apparent here as well, among other response theories. Overall, the idea that resident perceptions change over time as tourism development progresses is a common thread that has been used to bring these theories together (Doğan, 1989; Hunt & Stronza, 2014; Látková & Vogt, 2012; Upchurch & Teivane, 2000). Interestingly, growing levels of knowledge about the tourism industry is often found to have a positive effect on resident perceptions, which is counterintuitive in terms of this shift towards negative perceptions over time (Andereck et al., 2005; Brida et al., 2011; Brougham & Butler, 1981; Davis et al., 1988; Lankford & Howard, 1994). It is possible that at some point knowledge about



and experience with the tourism industry diverge, as factual information may not represent the experience of the community.

Hunt and Stronza (2014) found that different segments of the local population may be experiencing different stages of tourism development and related perceptions at the same time, depending on their role in the tourism industry. Those individuals who were more directly involved in tourism appeared to be experiencing a more advanced stage of the tourism development cycle than those who relied less on the industry (Hunt & Stronza, 2014). This appears to contradict other studies that have suggested those most directly involved in tourism are the most supportive members of the community (Harrill & Potts, 2003; Harrill, 2004; Látková & Vogt, 2012; Pizam, 1978). The findings of a 1993 study in Arizona, which compared resident perceptions in two rural cities (Sedona and Safford) with different levels of tourism development, may provide some insight here. It was found that the stage of tourism development was the most important factor in determining a resident's perception as generally positive or negative. In fact this explained "42% of the variance in negative perceptions" among the study participants, while social exchange factors, such as employment in the industry, only accounted for 4% (Madrigal, 1993). So, it may be that the tourism environment is playing a much larger role in forming resident perceptions than economic dependence on the industry, and this trait is not analyzed as often as economic dependence. A level of realistic complexity is lost when we examine these traits in isolation from one another, as they are all likely to shape perceptions to varying degrees.

There is much that has been learned about the relationship between local people and the tourism industry. However, as the discussion above should indicate, there is also

much uncertainty. There are many examples of conflicting information, and a need for a clear evaluation of environmental and cultural areas that have not been studied extensively. There are many possible variables that could create the uncertainty that has arisen in this body of research, including the type of tourism, the environment of the surrounding area (both natural and built), and the level of development in the area. I believe that there has not been enough emphasis on the characteristics of the local culture (e.g. value systems, religion, etc.) as well as the history of the tourism industry in study locations. These are both unique aspects of any destination, and both are likely to play a major role in shaping the way that tourism fits into the community. Finally, observing the changing relationships between host communities and the tourism industry over time is clearly important, although it is not always feasible.

### **C. Whale Watching Social Research**

While there is a large and growing body of research focusing on the general relations between tourism and local people, there has been little to no such work for WW. In part, this is likely since many tourism studies consider the entire industry, including WW where it occurs, but it is useful to narrow the focus of such research in this case in order to investigate the claim that WW supports local communities. What social research has been done on WW tends to focus on tourists, and very few researchers have considered local opinions about this form of ecotourism. Since visitor satisfaction has already been discussed in detail, the focus here will be on other WW stakeholders and will cover the following topics based on the research available: marine tourism's influence on local perceptions of cetacean conservation in the Caribbean, WWO

perceptions of the benefits and short-comings of WW, and several cases of social conflict owing to the value divisions between WW and whaling.

As with resident attitudes for tourism more generally, stakeholder values and the history of the area can shape specific relationships with the WW industry. In the Dominican Republic (DR), for example, the area of Bayahibe is a popular ecotourism destination. In 2002, several dolphins were captured in the area for use in the domestic dolphinarium Manati Park, which became a point of concern for local residents. Bayahibe is reliant on nature-tourism, particularly marine tourism, and its tourism industry has consistently partnered with international and domestic NGOs to maintain high standards of sustainable development. Due to this atmosphere of environmental sensitivity, local people were unhappy with the harvesting of their local dolphin population. Tourists to the area were also unsupportive of this action and expressed that they preferred to view dolphins in the wild rather than in captivity (Draheim et al., 2010). In the southern Caribbean country of Aruba, both local people and tourists were questioned about their support for marine mammal conservation in the area, and their interest in WW. Both groups of participants believed that marine mammals needed more protection in Aruban waters, and residents were very supportive of the notion. The overwhelming majority of both groups (81.5%) were also interested in marine mammal tourism in Aruba, and preferred to view these animals in the wild. In conjunction with these primary findings, it was noted that both groups of participants were not particularly well informed about marine mammals or the specific threats that these species may be facing in Aruban waters (Luksenburg & Parsons, 2014).

WWOs in the Valdes Peninsula of Argentina identified the perceived benefits of WW in a 2004 workshop. These included WW's ability to attract more tourists to the region, to provide jobs to local people, to stream revenue to companies and the government, and to promote the region by showcasing the unique WW conditions. There were also conservation benefits mentioned by WWOs, which included those benefits that are so often touted by environmental NGOs; WW provides a platform for research, it is an economic alternative to whaling, and it gives people a chance to experience whales and learn more about them. However, this study also found that the majority of WWOs in this area did not comply with regulations, and there was an emphasis on economic/tourism demands by participants over the known needs of target animals in relation to harassment and safety (Sironi, Schteinbarg, Losano, & Carlson, 2005). Based on this information, it would appear that the balance between the needs of the tourism industry and those of cetacean conservation are weighted towards tourism. This supports the need to question common claims about the benefits of this industry.

This is not the only social research to identify such problems with WW. In Tonga, a country that has become a classic study site for the economic benefits of WW and its positive impact on the tourism industry, WW has played a role in the displacement of whaling traditions. In this case, it was noted that whaling was an essential component of this culture's traditional lifestyle, and it also offered healthier food options for the local community than outside imports, which they are currently forced to rely on due to the limited resources of the island (Moyle & Evans, 2008). Furthermore, although WW experienced steady growth during the study period (M. B. Orams, 2002b), there are legitimate concerns that competition between Tonga and other Pacific island states for a

relatively small pool of tourists will limit the ability of this industry to support the community in the future. Thus, it may be concluded that WW is not an alternative to whaling, but may be more beneficial when it is a component of a diversified economy, which may still need to utilize small-scale whaling (Moyle & Evans, 2008).

In the Azores, another community that had whaled in the past and currently has a WW industry, competition for stagnant numbers of tourists was also found to limit the economic and social benefits of WW. Research here found that a clear tension existed between those WWOs viewed as foreigners and those who had family histories linked with the island (and often with whaling as well) (Neves-Graca, 2004; Silva, 2015). The rivalry that developed encouraged increasingly bad behavior among the boat captains, who used fast and close approaches to the target cetaceans to satisfy visitors (Neves-Graca, 2004). In 2011, there was insufficient implementation of regulations, and discussions about solving this problem were thwarted by competition and disagreement. Furthermore, WW in the Azores was found to only be lucrative for a small group of business owners. The industry does employ other people, but the community perceived the earnings of those employees to be low (Silva, 2015). This is in contrast with whaling, which was viewed by the community as being a more open and equal industry (Silva, 2015).

Finally, I will briefly examine a case from Norway, as it illustrates how the conflict between WW and whaling became even more poignant when a WW project openly sought to displace traditional whaling with the introduction of cetacean tourism. However, this was not culturally acceptable among the local people, and the project itself failed to employ and involve residents. In this case, WW became insular from the host

community, and thus failed to benefit the local people, while also failing to change resident attitudes toward whaling and the whales themselves (Ris, 1993). The relationships between any tourism industry and the local people has been shown to be complex and variable, but in the case of WW, this complexity is further deepened when the host community has whaling roots. Despite hopes that WW can serve as an alternative and obstacle to whaling, it appears that the community perspective on this matter is likely to disagree on which industry is preferable, or if they are mutually exclusive.

While there are several narratives from around the world being told about the role of WW in communities, there has been an apparent focus on locations that are also connected to whaling as a historic or modern practice. While this is interesting and relevant due to the posed conflict between WW and whaling, this has limited the scope in terms of what we know about the WW industry and its relation to host communities. My case study, on the other hand, will examine WW within the context of the Dominican Republic, a Caribbean country that has no strong ties to historic whaling, and Dominica, one that only engages in opportunistic small-cetacean hunts. Furthermore, I will be looking at perceptions of both WWOs and local people not directly employed by the WW industry. Not only will this shed light on the social context of WW in new environments, but it will help illustrate the differences that culture and environment can play in shaping resident perceptions of and experiences with a particular tourism industry. Finally, my data will also begin to shed light on the extent to which WW is actually supporting residents and local cetaceans.

## CHAPTER TWO: CARIBBEAN WHALE WATCHING AND COUNTRY CHARACTERISTICS

### **Section One: Abstract**

Environmental non-governmental organizations and other whale watching proponents claim that whale watching can be a valuable economic activity in coastal communities, and which provides economic incentives to protect cetaceans. Financial success and sustainability are not guaranteed, however, and general tourism studies indicate that there are likely to be characteristics that make a country more or less likely to develop a lucrative and beneficial whale watching industry (Cisneros-Montemayor et al., 2010; Crouch, 1994; Eilat & Einav, 2004). Understanding these characteristics can assist destinations in improving their whale watch industries by providing insight into the conditions that whale watching tourists prefer. They can also assist in the development of landscape-scale tourism management necessary for the environmental sustainability of the industry. In this study, an ordinary least squares linear regression was carried out on country-level data for the Caribbean from 1989-2008 in order to determine what country characteristics are most closely associated with whale watching expenditures, and how this varies with per capita GDP. The number of hotel rooms available was positively correlated with whale watching expenditures, but mass tourism development in the form of direct investment in tourism and cruise ship arrivals had a negative relationship, suggesting that only certain types of tourism development are consistent with whale watching. In regards to whale watching's connection to cetacean conservation, I found a positive correlation between whale watching, target species diversity and whale watching regulation complexity; there was a negative relationship between the dependent variable

and the number of conservation agreements that a country had signed, but it is possible that this had to do with a country's level of development. These results illustrate the whale watching is likely to have a positive relationship with small-scale tourism development like ecotourism, and that protecting cetaceans can have positive benefits for the industry.



## **Section Two: Introduction**

Whale watching (WW) has the potential to benefit coastal communities around the world, and since the late 1980s this global industry has seen considerable growth, particularly in developing countries (Cisneros-Montemayor et al., 2010). For the Caribbean, a region of coastal and island states that relies heavily on tourism, the promise of WW is very real due to the steady growth of WW throughout the 80s and 90s, the region's marine resources, and its need for economic diversification (Duval, 2004; O'Connor et al., 2009). At the time of the first global WW inventory in 1991, there were 11 Caribbean countries with a WW industry with a total direct expenditure of 1.5 million USD. By 2008, when the final, global WW inventory was conducted, 21 countries had developed WW and in total the region had a direct expenditure of 19 million USD (O'Connor et al., 2009). There is a limit to how much economic support WW can provide, and it often has negative environmental impacts (Neves-Graca, 2004; Parsons, 2012; Silva, 2015). In order to understand how WW can support communities in countries with a variety of developmental levels, what areas might see the best returns on WW investments, and under what circumstances environmental and economic trade-offs will balance out in a sustainable way, it is important to understand what country characteristics may make some countries better suited to developing a profitable WW industry than others.

The WW industry provides direct economic benefits to the community through revenue and jobs, but it can also produce indirect benefits as well, enhancing an area's tourism product and stimulating more spending in the community. In 2008, the total global expenditure on WW was 2.1 billion USD with a growth rate of 3.7% worldwide,

and 13% in the Caribbean (O'Connor et al., 2009). WW clients may also use other services in the area and tourist money can induce more spending among local people, an impact also known as the multiplier effect (Hughes, 1994; Lundberg et al., 1995; Rusu, 2011). WW often enhances a destination's tourism product overall, with cetaceans becoming popular subjects for souvenirs, and marketing tools for other tours (e.g. dinner on the water, sailing tours, etc.) (Cisneros-Montemayor et al., 2010; Findlay, 1997; Hoyt, 2005b; Warburton, 1999).

While the potential economic benefits of the WW industry can be considerable, and can give monetary value to living cetaceans, there are limits to these benefits. One limitation that is common to tourism in general, and relevant to WW in the Caribbean, is termed the leakage effect. This occurs when money leaves the community through imports and income to foreigners (Lundberg et al., 1995; Rusu, 2011). This is particularly problematic in the case destinations that rely on mass tourism, because it tends to employ a high percentage of expats in high paying positions and import most of the food and materials that it requires (Duval, 2004; Pattullo, 2005). There is a practical limit to how many WWOs can run a profitable business in a single destination, as there is only so much demand and access to some WW destinations is restricted due to lower levels of tourism development (Cisneros-Montemayor et al., 2010; Neves-Graca, 2004). Furthermore, WW is often a seasonal industry, which restricts the economic impact of the jobs and indirect benefits that it provides (O'Connor et al., 2009; M. Orams, 1999). Conflict with other industries (e.g. fisheries) and between WW operators (WWOs) can create regulatory competition and negative community relations that may have a detrimental effect on client experiences. In the Azores in-fighting among WWOs has

lowered visitor satisfaction and undermined the industry's ability to address the negative effects of WW on cetaceans, thus threatening the industry's long-term sustainability (M. Y. Lee, 2010; Neves-Graca, 2004; Ponnampalam, 2011; Silva, 2015).

One method for gaining an understanding of when and why a tourism industry performs well is by gathering data on the deterministic or influential country characteristics associated with WW expenditures. There is very little information concerning the country characteristics that are correlated to WW economic activity. We may, however, gain some insights from the factors known to effect tourism more generally. One of the most important factors influencing the success of tourism is the price of travel. Exchange rate is a common proxy for this, because it can account for the value of currency in both the destination and origin countries of tourists (Crouch, 1994). A 2004 panel analysis, which analyzed data over time, found that this particular characteristic was more important for developed than developing countries. In developing countries, political stability and safety become more closely correlated with expenditures (Eilat & Einav, 2004). Infrastructure is another key characteristic, because accommodations, transportation, food, and sanitation need to be readily available to ensure visitor satisfaction (Butler, 1980; Lundberg et al., 1995; Ryan, 2003). Finally, the character of a destination plays an important role in attracting tourists (Ryan, 2003). In the case of nature-tourism, ecotourism, and destinations with distinct environmental qualities that visitors want to experience, the level of biodiversity in a locale is also correlated with tourism success (S. S. Teelucksingh & Watson, 2013). Altogether, such data can be used to gain an understanding of why tourism flourishes in some destinations

but not others, and more importantly, to assist in the planning of future tourism development, and encourage environmentally sustainable practices.

Gathering data on correlations between country characteristics and WW expenditures can assist this nature-based tourism industry in much the same way. Such information may make the limitations and potential of WW more clear, and provide some insight into where and when WW may be successful, especially in light of the detrimental impacts that this form of tourism often has on cetaceans (Parsons, 2012). This analysis can also shed light on what opportunities WW provides to Caribbean countries of various development levels. The primary aim of this chapter is to investigate the relationship between WW expenditures and various country characteristics. In order to do this, I utilized existing regional data to carry out an ordinary least squares (OLS) regression analysis on four different groupings of Caribbean countries for the time period of 1989-2009.

## Section Three: Methods

### A. Study Region Selection



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**Figure 2.1: Map of the Caribbean**

The Caribbean region is well-suited for this study because it has a thriving and varied tourism industry, contains developing countries with different levels of economic activity, and is an important habitat for many cetacean species. The region contains 13 sovereign island nations, 11 mainland nations, and 17 dependent territories both island and continental (Figueredo & Argote-Freyre, 2008). Many of these countries rely on mass tourism (all-inclusive resorts, cruise ships) to stimulate and support their economies (Duval, 2004). Other forms of tourism (e.g. ecotourism, cultural tourism, etc.) have also

been introduced in the Caribbean, but their prevalence in any destination depends on national tourism goals as well as the characteristics of the location (Duval, 2004).

Besides being one of the most popular tourism destinations in the world, the Caribbean is also utilized by over 30 of the known 88 species of cetaceans. Some of the Caribbean-utilizing species remain in the region throughout the year, while others migrate through it, and some, such as humpback whales (*Megaptera novaeangliae*), use the Caribbean as a reproductive habitat (Gero, 2008; Hoyt, 1999; Mann et al., 2000). Cetaceans are also an important resource in the region, providing food in the Eastern Caribbean (Sutherland, 2001), and forming the basis of WW (Hoyt, 1999; O'Connor et al., 2009). So, the uses and values of cetaceans vary from country to country, and government capacities and conservation goals are often different from one nation to the next.

From a conservation perspective, cooperation between countries is necessary to protect cetaceans in the Caribbean due to the international nature of the marine habitat, as well as the distinct lack of international waters within the Caribbean Sea (Hoyt & Hvenegaard, 2010). A deeper understanding of the potential benefits of WW in the region will have important implications for future cetacean conservation, because of the potential that this industry has to both benefit cetaceans and endanger them (J. Higham et al., 2014b). Given this need for cooperation throughout the Caribbean Sea, I included island Caribbean states/territories, as well as Central and South American countries on the Caribbean Sea in my analysis. These included the following: Anguilla, Antigua & Barbuda, the Bahamas, Barbados, Belize, Bermuda, the British Virgin Islands, the Cayman Islands, Colombia, Costa Rica, Cuba, Dominica, the Dominican Republic,

Grenada, Guadeloupe, Guatemala, Guyana, Haiti, Honduras, Jamaica, Martinique, the Netherland Antilles, Nicaragua, Panama, Puerto Rico, St. Kitts & Nevis, St. Lucia, St. Vincent and the Grenadines (SVG), Suriname, Trinidad & Tobago, Turks and Caicos, the US Virgin Islands, and Venezuela (33 countries/territories). Three island groups, Guadeloupe, Trinidad & Tobago, and Turks & Caicos, were dropped from my study due to limited data availability. So, the final number of countries/territories sampled in this analysis was 30 (see Table 2.1 for the final list).

### **B. Model Design and Analysis**

My project examines the impact of a variety of country characteristics on WW direct expenditures, in order to see what aspects of a country are associated with the economic success of the WW industry. Most variables had longitudinal data for three different time periods, 1988-1995, 1996-2002, and 2003-2009. More specifically, I gathered information for each country for the period of 1989-2009, because WW data is only available for 1991, 1994, 1998 and 2008 (O'Connor et al., 2009). I then split 1989-2009 into three time periods (1989-1995, 1996-2002, 2003-2009), and averaged data within each of these time windows due to the limited availability of data for many Caribbean countries. A detailed discussion of the variables and my selection process is included in Part C.

To test the influence of different factors on WW, I examined three different groupings of countries as follows: higher income, lower income, and those countries with a WW industry in at least one of the time periods (WW Only). I did this because (a) tourists demand different amenities from higher vs. lower income countries (Dritsakis,

2004; Eilat & Einav, 2004), and this may influence the characteristics that allow for successful whale watching (higher vs. lower); and (b) the factors that influence the level of WW may differ from those that influence presence or absence (WW Only model) (Neves, 2010; Silva, 2015). Furthermore, I used this method of estimating four models as opposed to adding a development dummy value into a single regression, because I was interested in seeing the changes in variable significance among the different countries as grouped by development. See Table 2.1 for the countries included in these groups.

A country's economic development was represented in my study by per capita GDP in 2003-2009 (standardized to 2014 currency values). While GDP is not the only indicator of a country's economic or social well-being, it is a value that has been used extensively in studies the past, and it retains some ability to reflect the reality of the difference in conditions between countries (Coyle, 2015). The average per capita GDP across the 30 study countries in the final time period of 2003-2009 was 14,506 USD; the country/territory with the highest per capita GDP was Bermuda with 81,312 USD, and the lowest was Haiti with 520 USD. There was a "natural break" in the GDP values between Venezuela (7,256 USD) and St. Kitts and Nevis (12,137 USD). I utilized this break to group countries as higher and lower per capita GDP; creating sub-groups with the average as the cutoff would have made the Higher income group sample size too small and would have placed similar nations into different categories.



Table 2.1: Study countries/territories grouped by economic development (per capita GDP) and WW development

<b>Full Group</b>	<b>Higher Income</b>	<b>Lower Income</b>	<b>WW Only</b>
Anguilla	Anguilla	Belize	Antigua & Barbuda
Antigua & Barbuda	Antigua & Barbuda	Colombia	The Bahamas
The Bahamas	The Bahamas	Costa Rica	Belize
Barbados	Barbados	Cuba	Bermuda
Belize	Bermuda	Dominica	British Virgin Is.
Bermuda	British Virgin Is.	Dominican Republic	Colombia
British Virgin Is.	Cayman Is.	Grenada	Costa Rica
Cayman Is.	Martinique	Guatemala	Cuba
Colombia	Netherland Antilles	Guyana	Dominica
Costa Rica	Puerto Rico	Haiti	Dominican Republic
Cuba	St. Kitts & Nevis	Honduras	Grenada
Dominica	US Virgin Is.	Jamaica	Guatemala
Dominican Republic		Nicaragua	Jamaica
Grenada		Panama	Martinique
Guatemala		St. Lucia	Nicaragua
Guyana		St. Vincent & the Grenadines	Panama
Haiti		Suriname	Puerto Rico
Honduras		Venezuela	St. Lucia
Jamaica			St. Vincent & the Grenadines
Martinique			Suriname
Netherland Antilles			US Virgin Is.
Nicaragua			Venezuela
Panama			
Puerto Rico			
St. Kitts & Nevis			
St. Lucia			
St. Vincent & the Grenadines			
Suriname			
US Virgin Is.			
Venezuela			

I also established a model excluding the eight countries/territories that did not have WW in any of the three time periods, which left four primary country groups to be tested and

compared. These included (1) a full group with all countries (Full), (2) the higher per capita GDP group (Higher), (3) lower per capita GDP group (Lower), and (4) the group excluding countries with no WW (WWOnly).

I carried out an OLS linear regression in Stata 13.1 on all four of these groups using the same model. I initially used a linear panel regression due to the fact that I had data for the three different time periods described above. The sigma u and rho values for two of the models were 0, however, indicating that none of the variance in the data was due to the differences across the panels, in other words, none of the variance was due to the difference between time periods. This meant that there was no need for a panel analysis, and a pooled OLS regression could be utilized instead (Maddala & Mount, 1973). To double-check this conclusion, I ran the Breusch-Pagan Lagrange multiplier (LM) test on the models. In this case, all but the Lower model showed that pooled OLS was more appropriate than a panel analysis. The Lower model's rho value indicated that only 7% of the variance was due to the difference between panels. Furthermore, the results of the panel and OLS analysis for the Lower model were highly similar when compared, so I determined that pooled OLS was appropriate for all models.

Table 2.2: Diagnostic results of the linear panel analysis suggesting pooled OLS was appropriate

	<b>Full Model</b>	<b>Higher Income Model</b>	<b>Lower Income Model</b>	<b>WW Only Model</b>
<b>sigma_u</b>	8.796	0	21.464	0
<b>rho</b>	0.021	0	0.077	0
<b>LM Test Chi2</b>	0.278	1	0.049	1

I assessed the assumption of normality by utilizing the following diagnostic tests: a kernel density plot with a normal density overlay, standardized normal probability plot,

plot of the quantiles against the quantiles of a normal distribution, the inter-quartile range test, and the Shapiro-Wilk  $W$  test for normality. These tests showed that there were only minor deviations from normalcy, and all models passed the inter-quartile range test (having no severe outliers), as well as the Shapiro-Wilks test ( $p$ -values listed in Table 2.3). Diagnostic tests for the linearity of data indicated that logarithmic transformation would be beneficial for most of the variables, but the linear fit remains imperfect, in part, due to the large number of small values for many of the variables, as illustrated in Figure 2.2.

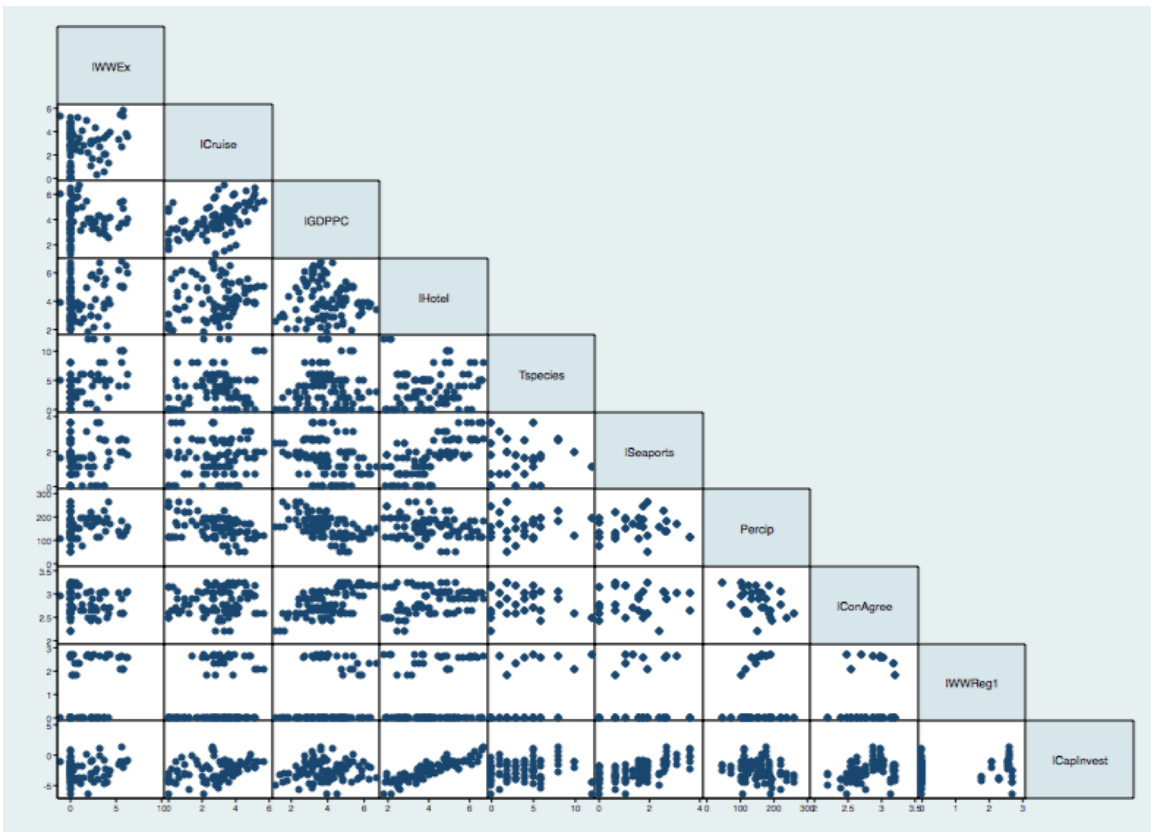


Figure 2.2: Matrix of component-plus-residual plots, which illustrates a fairly random spread of values, with some exceptions. Of particular interest is the first column because its dependent variable is WWEx (direct WW expenditures). Here, random spread is apparent to the right, as is a grouping of low values along the left-hand side of the plots.

The Cameron & Trivedi's decomposition of IM-test showed that all models but the Full model satisfied the assumption of homoscedasticity, however the Breusch-Pagan/Cook-Weisburg test indicated a potential problem with the Lower model as well (see Table 2.2). The Lower model's residual vs. fitted plot (Figure 2.3 and 2.4) has a clustering of values along a negative cut-off line on the left side of the data. While the plot indicates the necessary randomness in values to the right, the overall pattern is problematic showing evidence of non-linearity and heteroscedasticity.

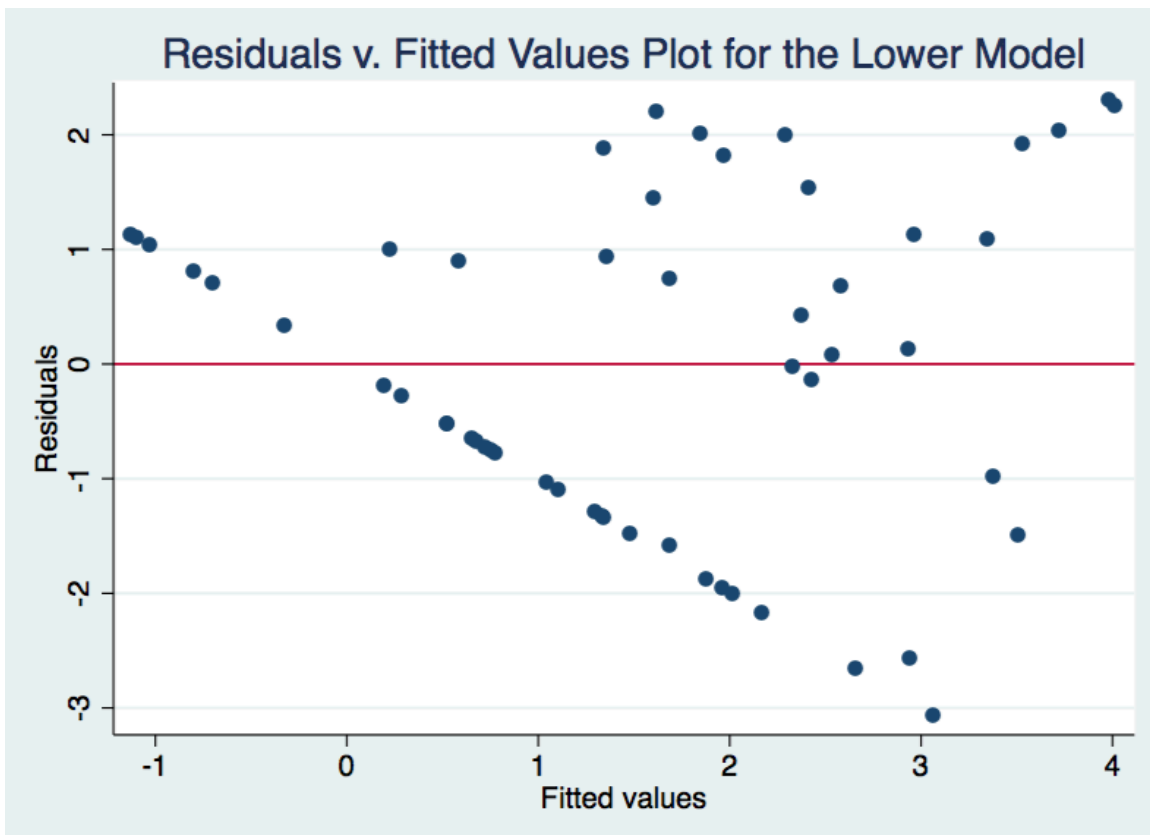


Figure 2.3: Residuals vs. fitted values (estimated responses) plot for the Lower model, which shows a negative line pattern along the lower left of the plot. This indicates non-linearity and heteroscedasticity as a random pattern is expected if both of these assumptions are true.

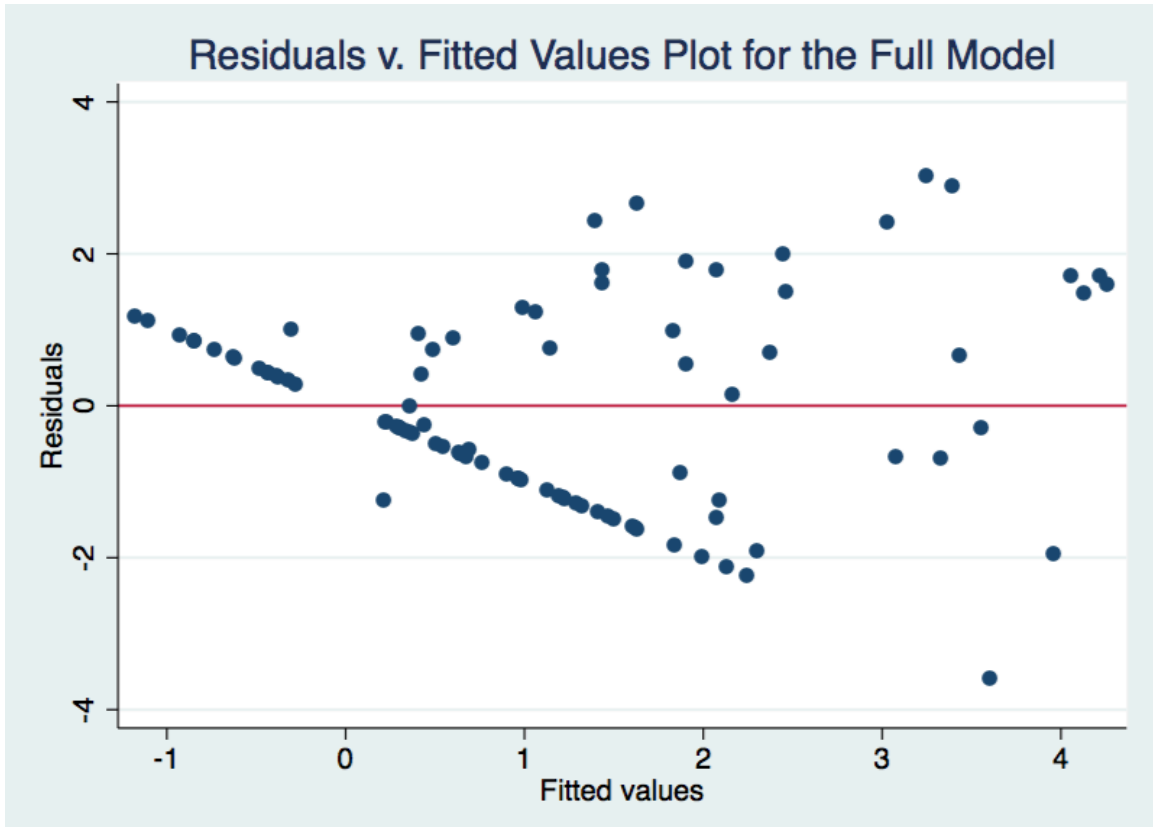


Figure 2.4: Residuals vs. fitted values (estimated responses) plot for the Full model, which shows a negative line pattern along the lower left of the plot. This indicates non-linearity and heteroscedasticity as a random pattern is expected if both of these assumptions are true.

Finally, I used a specification link test for single-equation models (linktest) and a regression specification error test for omitted variables (ovtest) to see if there were issues with missing independent variables. These tests did indicate specification errors, but testing the models with the other potential variables identified did not resolve the problem. This suggests that there are other characteristics outside of those considered here that are relevant, and which need to be investigated further in the future.

Table 2.3: Diagnostic outcomes for primary model assumption tests

Diagnostic Test	Full	Higher Income	Lower Income	WW Only
Shapiro-Wilks test (swilks)	0.08851	0.27767	0.10403	0.36468
Decomposition of IM-test (imtest)	0.0349	0.4215	0.3927	0.3812
Breusch-Pagan/Cook-Weisburg test (hettest)	0	0.3885	0.0097	0.1393
Mean variance inflation factor (vif)	3.14	3.56	3.73	3.64
Specification link test (linktest)	0.001	0	0.009	0.011
Regression specification error test for omitted variables (ovtest)	0.0037	0	0.0045	0.0818

### C. Variable Selection

This section will explore the specific variables utilized for my analysis. As discussed in the previous section, most data for the models utilized had longitudinal data for the time periods of 1988-1995, 1996-2002, and 2003-2009, although there were some fixed variables as well. I initially selected a large suit of independent variables (the full list of initial variables is available in Appendix II), but it was necessary to identify a smaller subset of variables for use in the final models because not all variables had significance, and some were collinear with others. The same variables were utilized with all four country groups so that the results could be compared between them. I identified variables with high levels of collinearity using the variance inflation factor test, and worked on reducing this collinearity by removing the least relevant variable in the collinear pairs/groups, based on tourism and WW research. I also tested different combinations of collinear variables until the most significant combination was produced

without collinearities, and containing those variables that the literature suggests is most important. Finally, I utilized a backwards stepwise elimination to remove some of the least significant variables, and for this I used a threshold of 0.3 p-values, because a 70%+ chance of nonrandom correlation is relevant to policy-making (A. Kinzig & Starrett, 2003). I validated the results of this process by adding removed variables back to the model after the list had been narrowed down to see what effect they had on significance. Those that improved the significance of the model and were not collinear were then retained.

The dependent variable utilized in this study as a proxy for the economic success of WW is direct expenditures, as reported by Hoyt in 1991-1998 and the International Fund for Animal Welfare (IFAW) worldwide WW study in 2009. These were selected because they contain the only country-scale data available for the Caribbean. Two different values were produced by these studies, indirect ("the expenditure into the local economy that can be attributed to the person participating in the whale watch activity") and direct ("expenditure on tickets and items directly related to the [WW] trip itself") expenditures (O'Connor et al., 2009). It would be valuable to utilize the indirect expenditure value due to the fact that indirect expenditures take into account money brought into the country through WW when visitors stay in hotels, take a taxi, buy food, etc. Reliable multiplier values, however, which are used to calculate increased spending after an initial purchase in the case of tourism and are necessary in order to produce accurate indirect expenditure values, are not available for much of the Caribbean. This makes the indirect expenditure values less certain than those of direct expenditures, and because of this I selected the direct expenditure data for use in my analysis.

The country characteristics that I hypothesized might influence direct expenditures (or the “independent variables” in my analysis) included the following variable categories: (1) WW characteristics, (2) tourism indicators, (3) conservation indicators, and (4) other (see Table 2.4 and Appendix II). The WW characteristics included in my study include the number of target species and WW regulations (which I also consider to be a conservation indicator). General tourism indicators are important since the magnitude of WW success is partially due to the size of the tourism industry in a destination (Cisneros-Montemayor et al., 2010). The tourism-based indicators included in the final model are capital investment in tourism, cruise ship arrivals, and number of hotel rooms. Conservation proxies were included because E-NGOs have claimed that WW can enhance cetacean conservation through incentivizing WW operators to protect the resource that their livelihood relies on, and by providing a non-consumptive economic use for whales, dolphins, and porpoises (IFAW, 2013; Neves, 2010; WDCS, 2013). Furthermore, an investigation of the role of biodiversity for tourism in small island developing states (SIDs), such as those in the Caribbean, found that biodiversity levels are positively correlated with tourism expenditures (S. S. Teelucksingh & Watson, 2013). Thus, the relationship between various conservation indicators and WW expenditure is of interest, and this is included in my analysis through the following proxies: involvement in international conservation agreements, and specificity of WW regulations. Other variables considered were per capita GDP, precipitation, and number of seaports. All data utilized in this study was acquired from those sources listed in Table 2.4 and Appendix II; specific details on each of the variables listed in table 2.4 below will be discussed in detail in Part C which follows.



Table 2.4: Variables retained in the final models with descriptions and data sources; a table including all variables initially considered is included in Appendix II.			
<u>Data</u>	<u>Units</u>	<u>Importance</u>	<u>Source</u>
		<b>Dependent Variable</b>	
WW direct expenditure (WWE <sub>x</sub> )	USD	Indicator of money flow into local economies from WW.	(O'Connor et. al. 2009)
		<b>Independent Variables</b>	
		<b>WW Characteristics</b>	
# of target species (T <sub>species</sub> )	Count (fixed)	Number of cetacean species noted to be targeted by the WW industry in a specific country.	(O'Connor et. al. 2009)
		<b>Tourism Indicators</b>	
Capital investment in tourism (Cap Invest)	USD 2011	This variable signifies the investments made in the tourism industry in a specific nation.	(World Travel and Tourism Council, 2013)
Cruise ship arrivals (Cruise)	Count	Annual number of cruise ship passengers to arrive in a country.	(WTO, 1992; WTO, 1997; WTO, 2001; WTO, 2003; WTO, 2007; WTO, 2008; WTO, 2012)
# of hotels (Hotels)	Count	The number of hotel rooms in a country; indicator of tourism infrastructure.	(WTO, 1992; WTO, 1997; WTO, 2001; WTO, 2003; WTO, 2007; WTO, 2008; WTO, 2012)
		<b>Conservation Indicators</b>	
Conservation Agreements (ConAgree)	Count (fixed)	This counts the number of international, biodiversity conservation-related agreements that a country has entered into force, ratified, or	(FAO, IUCN, & UNEP, 2013; IMO, 2015; International Whaling Commission,

		become a member of (depending on the agreement). Meant to serve as an indicator of conservation action.	2015; The Nature Conservancy, 2016; UNEP, 2013a; UNEP, 2015; UNEP, The Caribbean Environment Programme, 2015a; UNEP, The Caribbean Environment Programme, 2015b; UNEP/CMS Secretariat, 2015; United Nations, 2016; United Nations Statistics Division, 2016)
WW regulations/guidelines (WWReg)	Count (fixed)	This is a count of the number of different WW operator behaviors that have a regulation or guideline addressing them in a specific location.	(Carlson, 2011)
		<b>Other</b>	
Per capita GDP (PCGDP)	USD 2014	Indicator of economic development with the size of a destination's population taken into account.	(World Bank, 2014)
Precipitation (Precip)	Mm (fixed)	Indicator of general weather patterns.	(Weatherbase, 2016)
# of seaports (Seaports)	Count (fixed)	Indicator of maritime development.	(World Port Source, 2016)

## **C. Hypotheses**

### **WW Characteristics:**

Target Species (TSpecies)(+): I hypothesized that the number of WW target species would be positively related to WW expenditures. This variable is important for two reasons. First, more target species means that WW has a higher variety of cetaceans that may be seen on a tour, and alternative species for viewing if primary targets (e.g. humpback whales in the DR) cannot be located. The primary reason for low visitor satisfaction in WW is not seeing any cetaceans, and having several potential target species can help avoid this (Danaher & Arweiler, 1996; M. B. Orams, 2000). Furthermore, having a higher variety of sightings enhances the experience of WW clients, and thus visitor satisfaction and expenditures (B. Barr et al., 2000; M. B. Orams, 2000). Second, the number of target species can also serve as a rough proxy for the cetacean biodiversity of a destination. This is an environmental characteristic this is likely to be related to the success of tourism in SIDS such as those in the Caribbean (S. Teelucksingh et al., 2013).

### **Tourism Indicators:**

Capital Investment (CapInvest) (+): I hypothesized that higher levels of capital investment in tourism would be positively correlated with WW expenditures. Capital investment in tourism is an indication of the tourism industry's maintenance and development, and depending on the goals of individual governments and businesses, this investment can take a variety of forms (e.g. mass tourism infrastructure, enforcement for ecotourism areas, etc.) (World Tourism and Travel Council 2013). Tourism investment in general should result in higher WW revenues due to the increase in supporting

infrastructure, thus making the location more appealing to a larger group of potential clients (Butler, 1980; Lundberg et al., 1995).

Cruise ship arrivals (Cruise)(-): I hypothesized that there was a negative relationship between cruise ship arrivals and WW direct expenditure. The cruise industry can degrade cetacean habitat (Tyack, 2008; Weilgart, 2007). And while cruise ships bring in more potential WW clients, this form of mass tourism is not likely to be preferred by ecotourists (Wight, 2001). Furthermore, cruise companies take cuts of excursion tickets, which can lower WW expenditures for local operators (Duval, 2004; Pattullo, 2005).

Number of Hotel Rooms (Hotel)(+): I hypothesized that the number of hotel rooms was positively correlated with WW expenditures, because a higher level of tourism infrastructural development is likely to support a larger tourism industry and thus more potential WWers (Cisneros-Montemayor et al., 2010; Lundberg et al., 1995). A lack of hotel rooms can also limit the size of a destination's tourism industry, due to a lack of accommodations for visitors (Neves-Graca, 2004).

#### **Conservation Indicators:**

Conservation Agreements (ConAgree)(+): I hypothesized that there would be a positive relationship between a destination's involvement in conservation agreements and WW expenditures. This is because the claims of E-NGOs that WW can enhance cetacean conservation through education and linking livelihoods to healthy cetacean populations (IFAW, 2013; WDCS, 2013). As mentioned previously, higher biodiversity has also been found to enhance visitor satisfaction, and the goal of many conservation agreements is to preserve biodiversity through a variety of different strategies (M. B. Orams, 2000; S. S. Teelucksingh & Watson, 2013).

Whale-watching regulations/guidelines (WWReg)(+): I expected a positive relationship between WW regulations/guidelines on WWO behavior on the water and WW expenditure. In order for the claim that WW enhances cetacean conservation to be true, economically successful industries must act in one way or another to prevent negative impacts on cetaceans (Mustika et al., 2012; Reeves et al., 2003). Furthermore, there is evidence that WWO compliance with WW regulations/guidelines can enhance visitor satisfaction (Draheim et al., 2010; O'Neill et al., 2004), which can, in turn, have a positive influence on WW expenditures.

**Other:**

Average Annual Precipitation (Percip)(-): I hypothesized that precipitation would have a negative relationship with WW expenditures. Rain and other inclement weather can interrupt travel activities, and impact WW visitor satisfaction by creating conditions that may cause sea-sickness (M. B. Orams, 2000; Pattullo, 2005).

Number of Seaports (Seaports)(-): I hypothesized that there would be a negative relationship between the number of seaports and WW expenditures, because coastal development can disturb cetaceans and degrade near-shore marine habitats, in some cases, causing cetaceans to abandon certain areas (Tyack, 2008; Weilgart, 2007).

GDP per capita (GDPPC)(+): I hypothesized that WW expenditures and GDP per capita would have a positive relationship, because more developed countries are easier to access, provide greater comforts for tourists, and supply familiar levels of utility provision (Lacher & Nepal, 2010; Lundberg et al., 1995).

Note for Variables Removed from the Models: Appendix II includes hypotheses for all variables not included in the final model, as well as information about why each one was removed from the model set.

## Section Four: Results

### A. Descriptive Statistics

The summary statistics in Table 2.5 show that the Caribbean region saw an increase in the number of countries with WW industries, rising from only 11 countries in the first time period to 21 in the final time period. It appears that growth accelerated between the second and third time periods for the region as a whole, and nearly all of the growth came from lower-income countries.

Table 2.5: Presence of Whale Watching in Higher, Lower, and Full models over the three study periods; as shown by direct expenditure data.

	Full			Higher			Lower		
	1989-1995	1996-2002	2003-2009	1989-1995	1996-2002	2003-2009	1989-1995	1996-2002	2003-2009
# of countries in group with WW	10	11	21	4	4	7	6	7	14

Information on WW spread throughout the Caribbean region reveals some interesting trends for this industry in regards to higher and lower per capita GDP groups (Table 2.5 and 2.6). Countries in the Lower model experience a steady growth throughout the time periods examined, jumping from a maximum country-level WW expenditure of \$510,000 USD in 1989-1995 to 5.3 million USD in Costa Rica in 2008. The countries in the Higher income model are led by the Bahamas, which has by far the largest WW industry in this group with direct expenditures of 3.4 million USD in 2008, but which is notably smaller than the WW industry in Costa Rica, which is grouped with the Lower Income countries. Throughout the course of the study period, the overall trend is towards WW growth throughout the region, although not all industries were successful in this

time, with some nations like Cuba losing their WW industry by 2008. Furthermore, there are some countries with opportunistic WW, and that data is not represented in this analysis. Countries that do not have a WW industry during any of the study periods include Anguilla, Barbados, the Cayman Islands, Guyana, Haiti, Honduras, the Netherland Antilles, and St. Kitts & Nevis.

Table 2.6: Summary statistics for the dependent variable (WW direct expenditures) over the three time periods for the Full, Higher, and Lower models in USD ('0,000).

Full Model	Mean	Min	Max
1989-1995	17.6	0	375
1996-2002	19.5	0	270
2002-2009	68.9	0	532

Higher Model	Mean	Min	Max
1989-1995	31.4	0	375
1996-2002	22.8	0	270
2002-2009	29.5	0	343

Lower Model	Mean	Min	Max
1989-1995	8.4	0	51
1996-2002	17.2	0	230.7
2002-2009	95.1	0	532

From the WW Only group it is apparent that WW expenditure increased throughout the three time periods, with a particularly large increase between 1996-2002 and 2003-2009 (Table 2.7). The difference between the minimum and maximum values also increased over time, indicating an increasing disparity between high and low earning WW businesses. The minimum for this model is 0 for all three time periods, due to the fact that the WW industry was still gaining global traction in the earlier time periods.



The zero minimum in 2003-2009 is due to Cuba having had a small WW industry in 1989-1995 but then losing this industry in the final time period (O'Connor et al., 2009). Finally, in looking at the maximum values, the Bahamas dominated with the highest WW expenditure in the region for the first two time periods, but the final max value is from Costa Rica.

Table 2.7: Summary statistics for the dependent variable (WW direct expenditures) over the three time periods for the WW Only model in USD ('0,000).

WW Only Model	Mean	Min	Max
1989-1995	25.12	0	375
1996-2002	27.79	0	270
2003-2009	98.38	0	531.85

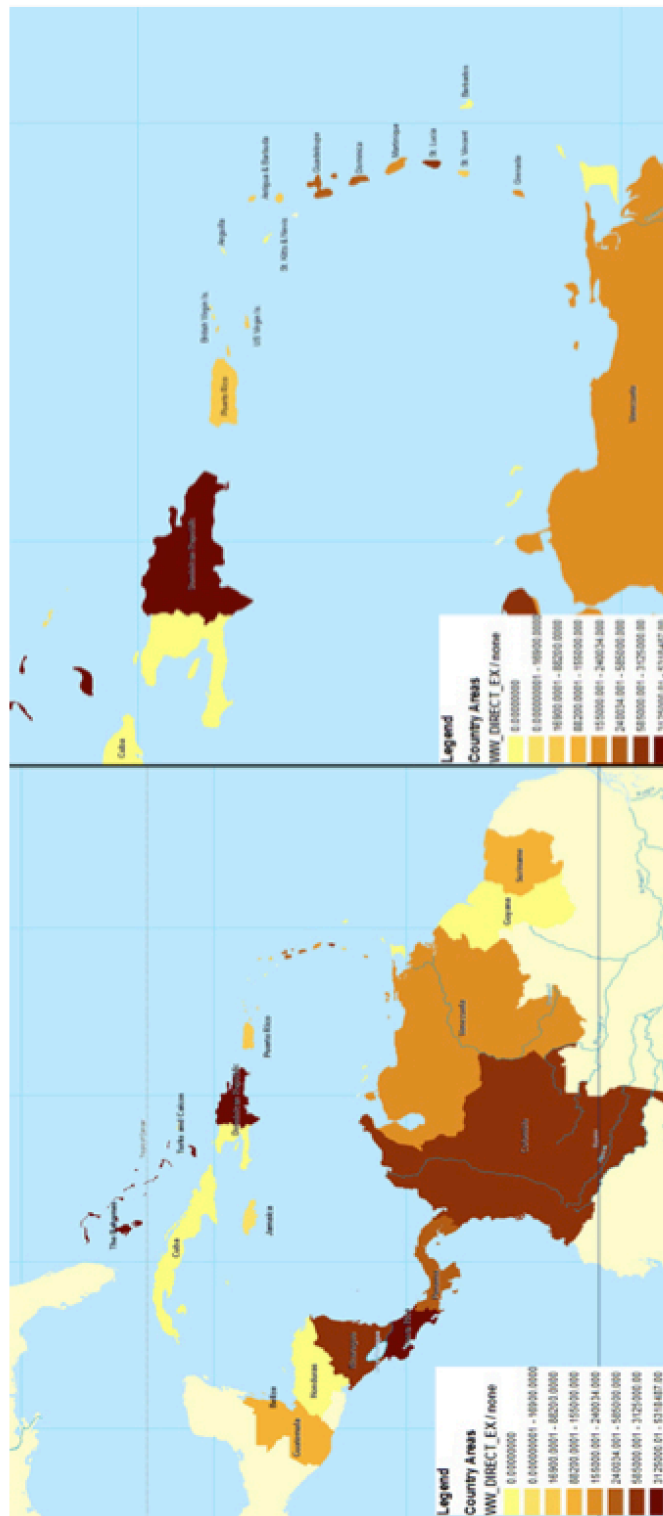


Figure 2.5: Map of WW direct expenditures in 2008 in the Caribbean region; countries with darker colors have more WW direct expenditures in the final time period. The Dominican Republic, Bahamas, and Costa Rica are shown to have the highest direct expenditures in the region. Eastern Caribbean islands between Guadeloupe and St. Lucia have strong WW industries as well, as do Central American countries between Nicaragua and Colombia.

Table 2.8: Summary of descriptive statistics for independent variables as used in the analysis; log transformed variables are indicated with a \* and log transformed descriptive statistics are included in parentheses.

	<b>Mean</b>	<b>Min</b>	<b>Max</b>	<b>SD</b>
<b>Cruise Ship Arrivals*</b> <b>('0,000)</b>	40.12 (2.84)	0	308.23 (5.73)	55.22 (1.50)
<b>Per Capita GDP (USD 2014)*</b> <b>('00)</b>	99.17 (3.96)	3.25 (1.18)	813.12 (6.70)	144.52 (1.23)
<b># of Hotels*</b> <b>('00)</b>	132.29 (4.05)	6.04 (1.80)	836.02 (6.73)	186.88 (1.32)
<b># of Target Species</b>	3.73	0	12	3.07
<b># of Seaports*</b>	8.17 (1.56)	1 (0)	12 (6.64)	9.41 (1.05)
<b>Precipitation ('0 mm)</b>	154.16	48.9	262.40	48.30
<b># of Conservation Agreements*</b>	17.33 (2.82)	9 (2.20)	25 (3.22)	4.59 (0.27)
<b># of WW Regulations*</b>	3.30 (0.73)	0	14 (3.22)	5.34 (0.27)
<b>Capital Investment in Tourism*</b> <b>(USD 2011 '000,000,000)</b>	0.24 (-2.64)	0.0014 (-6.55)	3.28 (1.19)	0.52 (1.61)

Overall, what is the most striking about these summary values (Table 2.8) is the apparent disparity between Caribbean countries for several key variables. Per capita GDP has a large range with a minimum value of 325 USD and a maximum of 81,312 USD. Since this is a pooled OLS utilizing longitudinal, panel data these values represent not only differences between countries but differences over time as well. The minimum here is Haiti's average per capita GDP from 1989-1995, and the maximum is Bermuda's average in the time period of 2003-2009. Even so, countries in this region vary widely in terms of GDP, which is partially why I explored the patterns of correlation between WW expenditure and countries characteristics through the lens of economic activity via income groups. The number of hotel rooms also varies widely between the minimum average of 6.04 in Dominica (1989-1995) and the maximum of 836 in Colombia (2003-2009). The difference in the level of tourism development throughout the region is

apparent in other variables as well, such as cruise arrivals and capital investment in tourism. In terms of WW regulations, the min of 0 is representative of countries without a WW industry, although there are also many Caribbean countries/territories with WW that have no recorded regulations or guidelines, including Belize, Grenada, Guatemala, Jamaica, Martinique, Nicaragua, Panama, SVG, Suriname, US Virgin Is., and Venezuela (Carlson, 2012).

### **B. OLS Model Results**

The OLS analysis illustrates that grouping countries by per capita GDP does have an impact on the strength and significance of the relationships between WW direct expenditures and the independent variables. The only instance of a sign change among the results was for precipitation, which had a positive coefficient in all models but for the Higher income model, where it was negative. The following section will examine the results for each group of countries.

When the model was run with all 30 Caribbean countries included in this analysis, eight variables were found to be significant (Table 2.9). Using a p-value threshold of 0.05, significant variables comprised the number of hotel rooms, the number of target species, the number of conservation agreements, and the number of WW regulations. All were positively related to WW expenditures, except for the number of conservation agreements. A second group of variables significant at the 15% level included per capita GDP, the number of seaports, and capital investment in tourism. Amongst these, only per capita GDP had a positive relationship with the dependent variable. The adjusted r-squared value for the full group of countries was 0.4524.

Table 2.9: Full model OLS results; p-values with 0.05 level of significance are identified with a \*\*, and those significant at the 15% level are marked with a \*.

	Coefficient	Standard error	z	P-value	[95% Conf. Interval]	
Cruise Arrivals	-0.1403	0.1407	-1	0.322	-0.4204	0.1397
Per Capita GDP	0.4544	0.2403	1.89	0.062*	-0.0239	0.9327
# of Hotels	1.2064	0.2923	4.13	0**	0.6248	1.7880
# of Target Species	0.1654	0.0581	2.85	0.006**	0.0498	0.2809
# of Seaports	-0.3472	0.2188	-1.59	0.117*	-0.7827	0.0884
Precipitation	0.0053	0.0042	1.28	0.205	-0.0030	0.0137
# of Conservation Agreements	-2.8877	0.8598	-3.36	0.001**	-4.5987	-1.1767
# of WW Regulations	0.5331	0.1570	3.39	0.001**	0.2206	0.8456
Capital Investment in Tourism	-0.4022	0.2254	-1.78	0.078*	-0.8507	0.04631
cons	0.7273	2.7055	0.27	0.789	-4.6568	6.1114
R-squared	0.5078					
Adjusted R-squared	0.4524					

For the higher income countries (Table 2.10), the adjusted r-squared value is 0.7244. Using the traditional 0.05 threshold, significant variables included the number of target species, the number of conservation agreements and the number of WW regulations. Of these, only the number of conservation agreements had a negative relationship with the dependent variable. Those variables significant at the 15% level include cruise ship arrivals, per capita GDP, the number of hotel rooms, and precipitation; precipitation is the only variable within this significance threshold to have a negative coefficient.

Table 2.10: Higher income model OLS results; p-values with 0.05 level of significance are identified with a \*\*, and those significant at the 15% level are marked with a \*.

	Coefficient	Standard error	z	P-value	[95% Conf. Interval]	
Cruise Arrivals	-0.4808	0.2565	-1.87	0.072*	-1.0080	0.0465
Per Capita GDP	0.5693	0.3511	1.62	0.117*	-0.1524	1.2910
# of Hotels	0.7596	0.3710	2.05	0.051*	-0.0030	1.52243
# of Target Species	0.3454	0.0654	5.29	0**	0.2111	0.4797
# of Seaports	-0.3799	0.3295	-1.15	0.259	-1.0572	0.2974
Precipitation	-0.0072	0.0045	-1.6	0.122*	-0.0164	0.0021
# of Conservation Agreements	-2.0946	0.9890	-2.12	0.044**	-4.1274	-0.0617
# of WW Regulations	0.7212	0.2143	3.37	0.002**	0.2808	1.1616
Capital Investment in Tourism	0.1481	0.2620	0.57	0.577	-0.3905	0.6867
cons	2.9595	2.8676	1.03	0.312	-2.9349	8.8539
R-squared	0.7953					
Adjusted r-squared	0.7244					

In the lower income countries (Table 2.11), the adjusted r-squared is the lowest of all four groups, at 0.3473. Using the 0.05 threshold, per capita GDP, number of hotel rooms, and number of WW regulations are significant. All of these variables have a positive relationship with WW direct expenditures. At the 15% threshold, precipitation, the number of conservation agreements, and capital investment in tourism are all negatively related to WW expenditures, except for precipitation.

Table 2.11: Lower model OLS results; p-values with 0.05 level of significance are identified with a \*\*, and those significant at the 15% level are marked with a \*.

	Coefficient	Standard error	z	P-value	[95% Conf. Interval]	
Cruise Arrivals	0.0365	0.2069	0.18	0.861	-0.3804	0.4535
Per Capita GDP	1.1161	0.4287	2.6	0.013**	0.2520	1.9802
# of Hotels	1.3573	0.4584	2.96	0.005**	0.4335	2.2811
# of Target Species	-0.0579	0.1061	-0.55	0.588	-0.2716	0.1558
# of Seaports	-0.3461	0.3424	-1.01	0.318	-1.0361	0.3439
Precipitation	0.0138	0.0084	1.64	0.107*	-0.0031	0.0308
# of Conservation Agreements	-2.4745	1.6130	-1.53	0.132*	-5.7252	0.7762
# of WW Regulations	0.6671	0.2291	2.91	0.006**	0.2053	1.1289
Capital Investment in Tourism	-0.5837	0.3362	-1.74	0.09*	-1.2613	0.0940
cons	-4.5733	4.7665	-0.96	0.343	-	14.1796
R-squared	0.4581					
Adjusted r-squared	0.3473					

For those countries that had a WW industry in at least one of the time periods (WWOnly, Table 2.12), had an adjusted r-squared of 0.4794, and many of the included variables are shown to be significant. At the 0.05 threshold, this included the number of hotel rooms, the number of seaports, precipitation, the number of conservation agreements, the number of WW regulations, and capital investment in tourism were significant. Of these, the number of hotel rooms, precipitation, and the number of WW regulations had a positive relation with WW expenditure, while the other three variables have a negative relationship with the dependent variable. The threshold of 0.15 adds in the significant variables of per capita GDP and number of target species, both of which have positive coefficients.

Table 2.12: Only countries with WW (WWOnly) model OLS results; p-values with 0.05 level of significance are identified with a \*\*, and those significant at the 15% level are marked with a \*.

	Coefficient	Standard error	z	P-value	[95% Conf. Interval]	
Cruise Arrival	0.1168	0.2078	0.56	0.577	-0.3001	0.5337
Per Capita GDP	0.6298	0.3189	1.98	0.053*	-0.0098	1.2694
# of Hotels	2.1697	0.4313	5.03	0**	1.3046	3.0348
# of Target Species	0.1386	0.0754	1.84	0.072*	-0.0126	0.2898
# of Seaports	-0.8135	0.2803	-2.9	0.005**	-1.3758	-0.2512
Precipitation	0.0123	0.0058	2.11	0.039**	0.0006	0.0240
# of Conservation Agreements	-3.9430	1.1576	-3.41	0.001**	-6.2648	-1.6212
# of WW Regulations	0.4287	0.1849	2.32	0.024**	0.0579	0.7995
Capital Investment in Tourism	-0.7409	0.3075	-2.41	0.019**	-1.3576	-0.1241
cons	-2.6976	4.3079	-0.63	0.534	-11.338	5.9429
R-squared	0.5549					
Adjusted r-squared	0.4794					

In regards to my hypotheses about the relationships between WW expenditure and the country characteristics included, many of those were supported, although there are three variables with surprising results. The direction of correlation between WW expenditures and cruise ship arrivals, number of hotel rooms, number of target species, per capita GDP, and seaports was as expected. Number of hotel rooms, number of target species, and per capita GDP all had positive coefficients, while cruise ship arrivals and number of seaports showed a negative relationship with WW expenditures. The coefficients for capital investments in tourism, involvement in conservation agreements, and precipitation did not support my hypotheses, however, particularly in the case of conservation agreements, which had a negative correlation with WW expenditures.



Table 2.13: Summary of P-values and Coefficients; only variables with a p-value of at least <0.15 are included; variables significant at the 5% level are marked with a \*.

	Full		Higher		Lower		WW Only	
	P-value	Coef.	P-value	Coef.	P-value	Coef.	P-value	Coef.
# of Cruise Arrivals			0.072	-0.481				
Per Capita GDP	0.062	0.454	0.117	0.569	0.013*	1.116	0.053	0.630
# of Hotels	0*	1.206	0.051	0.760	0.005*	1.357	0*	2.170
# of Target Species	0.006*	0.165	0*	0.345			0.072	0.139
# of Seaports	0.117	-0.347					0.005*	-0.814
Precipitation			0.122	-0.007	0.107	0.014	0.039*	0.012
# of Conservation Agreements	0.001*	-2.888	0.044*	-2.095	0.132	-2.4745	0.001*	-3.943
# of WW Regulations	0.001*	0.533	0.002*	0.721	0.006*	0.667	0.024*	0.429
Capital Investment in Tourism	0.078	-0.402			0.09	-0.584	0.019*	-0.741
Adjusted R-squared	0.4524		0.3473		0.7244		0.4794	

Table 2.14 illustrates that the ranked relation of WW expenditures to many variables (as indicated by their coefficient; log-transformed dependent and independent variables) is the same for all country groups except for the WW Only group. In all cases, the number of conservation agreements is the most influential variable, and it has a negative relationship with WW expenditures. In order of decreasing influence, WW expenditures are correlated with the number of hotel rooms, the number of WW regulations, capital investment in tourism, and the number of seaports. For WW Only

countries, number of seaports replaces number of WW regulations, which becomes the least influential.

Table 2.14: Select variables ranked by coefficient (in parentheses); due to log transformation of both the dependent and independent variables for this data, coefficients represent the percent change in WW expenditure when there is a 1% increase in the independent variable.

<b>Full Model</b>	<b>Higher Model</b>	<b>Lower Model</b>	<b>WW Only Model</b>
# Conservation Agreements (-2.89)	# Conservation Agreements (-2.09)	# Conservation Agreements (-2.47)	# Conservation Agreements (-3.94)
# of Hotels (1.21)	# of Hotels (0.76)	# of Hotels (1.36)	# of Hotels (2.17)
# of WW Regulations (0.53)	# of WW Regulations (0.72)	# of WW Regulations (0.67)	# of Seaports (-0.81)
Capital Investment in Tourism (-0.40)	# of Seaports (-0.38)	Capital Investment in Tourism (-0.58)	Capital Investment in Tourism (-0.74)
# of Seaports (-0.35)		# of Seaports (-0.35)	# of WW Regulations (0.43)

## **Section Five: Discussion**

### **A. General Trends and the Role of Country Development**

The development of this model of WW direct expenditure as a function of country characteristics illustrates (1) that the significance of the relation between variables and WW expenditures varies by per capita GDP, (2) that the variables associated with tourism in general are not always correlated with WW tourism in particular, and (3) that the relationship of most to WW expenditures are best represented by a log transformation. While per capita GDP was found to be positively related to WW expenditures for all country groupings, and furthermore, the differences in variable significance and coefficients among models illustrates countries with different sized economies have different relationships with the WW industry. Comparing the Higher and Lower income groups, it is also clear that different variables are significant in different per capita GDP; in other words, some variables are more strongly associated with WW expenditures in countries with lower per capita GDP than in countries with higher per capita GDP. This finding is supported by past tourism research which had similarly found that some variables (e.g. exchange rates) are more influential in developed countries, while things like political stability and safety are larger concerns for developing nations (Eilat & Einav, 2004).

Past research has also shown a correlation between the development of the tourism industry in a destination and its WW economic success (Cisneros-Montemayor et al., 2010), and my analysis builds on this, showing that there is a complex relationship between a country's characteristics and its WW industry. Patterns vary with a country's overall development level, and there are some relevant characteristics that can be

influenced by governments and the WW industry itself, such as number of hotel rooms and WW regulations. Model diagnostics show, however, that there is still uncertainty about what aspects of a country can influence whether or not. In order to make predictions about where WW will find economic success, better data is needed for the region, and ongoing inventories of WW expenditures such as that done by Hoyt and IFAW should be done. Furthermore, further models, considering other variables should be tested as my results indicate that there are country characteristics not included here that are influencing this system.

The best fit log model indicates we would expect growth in WW expenditures to initially increase, and then slow and “level out” in any particular destination (Cisneros-Montemayor et al., 2010; Neves, 2010). A variety of factors may influence this, including ease of access to an area, regional competition, and limits to the demand for WW, among others (Crouch, 1994; Eilat & Einav, 2004). This reality needs to be integrated into efforts by e-NGOs and others that advocate for the growth of WW worldwide, because there is a limit to the growth potential of the industry and hence the benefits it can provide to coastal communities. This leads to two insights. The first is that some countries don't have the characteristics would make them successful hosts to the WW industry. The second is that a destination may be initially successful and experience considerable growth but then see that growth diminish. Since WW also has many negative impacts on cetaceans (Parsons, 2012; Ris, 1993; Silva, 2015), it may not be sustainable in an environmental sense, and it would be beneficial to identify areas that are unlikely to see considerable economic success and refrain from WW development there.

## **B. WW's Uncertain Connection to Conservation**

The analysis shows a need for further research into the links between marine conservation and the WW industry. It is already known that there are considerable negative impacts of WW for target cetaceans around the world (Parsons 2012), but the industry is still thought to provide an economic incentive for cetacean protection, and serve as a conservation-supporting educational tool in the best-case scenarios (J. Higham et al., 2014b). While there is a positive correlation between WW regulations and the number of target species for a WW industry, potentially showing some support for the idea that there is a connection between WW and conservation, the negative correlation between conservation agreements and WW sheds some uncertainty on this relationship.

The negative relation between WW expenditure and the number of conservation agreements is interesting, as this relationship is the most significant for all country groups. There are two possible explanations. First, countries that are signatories to more agreements are typically more developed, while WW is most prominent in less developed countries, with fewer resources to devote to conservation agreements in general (Biermann, 2002; French, 1994). Second, there may be a negative relationship between the WW industry and country involvement in conservation agreements, however, this seems unlikely since none of the conservation agreements included here have direct limitations on WW (FAO et al., 2013; IMO, 2015; International Whaling Commission, 2015; The Nature Conservancy, 2016; UNEP, 2013a; UNEP, 2015; UNEP, The Caribbean Environment Programme, 2015a; UNEP, The Caribbean Environment Programme, 2015b; UNEP/CMS Secretariat, 2015; United Nations, 2016; United Nations Statistics Division, 2016).

Despite this negative correlation to participation in conservation agreements, there are some positive indications for WW relationship with conservation. The number of target species is positively related to WW expenditures, which would suggest that protecting healthy cetacean habitats is important to long-term WW success. Cetacean diversity supports more opportunities for varied experiences even in areas that rely heavily on a single species, which may maintain WW visitor satisfaction by offering more opportunities for sightings (Finkler & Higham, 2004; M. B. Orams, 2000). Thus, sightings of any species can be beneficial to WW expenditures. Similarly the diversity of terrestrial mammals enhances safari tourism (Naidoo & Adamowicz, 2005), cetacean diversity supports WW in the Caribbean—and ecotourism in SIDS in general (J. Higham et al., 2014b; S. Teelucksingh et al., 2013; S. S. Teelucksingh & Watson, 2013). For this diversity to be maintained in the long term, healthy cetacean populations will require responsible WW behavior, which does not harass target animals, as well as protection from indirect impacts that may degrade their inshore habitats (J. Higham et al., 2014b; Mann et al., 2000).

Another suggestion of a potentially beneficial relationship between WW and conservation is the positive correlation between WW regulations and WW expenditures. This is a good outcome for stakeholders looking to encourage the development of protective measures for cetaceans in regards to the WW industry, although it must be acknowledged that correlation is not causation, and the complexities of this relationship are uncertain. This positive correlation may mean that the larger WW industries have more resources for behavioral WW regulations, or that there is more industry pressure for the design and implementation of guidelines or regulations used to protect the resource

that the industry relies on. Furthermore, WW visitors have been shown to be sensitive to bad WWO behavior in the past, and thus a lack of such regulations could actually undermine visitor satisfaction in the long run (M. B. Orams, 2000). WWOs can mitigate the risk for the opposite effect (e.g. visitors wanting close, fast approaches) by explaining to clients what the restrictions are and why they are important (Ballantyne, Packer, & Hughes, 2009). Even though the cause of this correlation is unsure, this analysis illustrates that comprehensive WW regulations do not hamper the ability of this industry to perform well in terms of expenditure.

### **C. Tourism Infrastructure and WW**

While we need more data on the links between country characteristics and WW to make predictions about industry success, there are a few key take home points that this analysis can provide for e-NGOs, governments, WWOs, and other WW advocates. When considering which destinations may be well positioned to benefit from WW expenditures, it is clear that infrastructure in the form of accommodations is very important, but that WW may not be consistent with cruise ship tourism, which is negatively related with WW expenditures.

The positive correlation between WW expenditures and hotel rooms suggests that locations without accommodation options will limit the development of a WW industry. In the Azores, for example, the limited number of rooms means that there is a cap on the number of tourists that can feasibly visit the islands at any one time (Neves-Graca, 2004; Silva, 2015). More hotel rooms also means that there are more choices for guests, and there is research showing that different kinds of tourists prefer particular accommodation

types, and this more hotel options allow for a larger pool of potential WW clients (Chaminuka, Groeneveld, Selomane, & Van Ierland, 2012; Wight, 1997).

Accommodation development can also create industry pressure for infrastructure catering to visitor needs in terms of access to utilities, safety, and general atmosphere (Andriotis, 2001; Crouch, 1994; Eilat & Einav, 2004). Thus, as WW advocates seeking to assist this industry in its growth, should seek destinations with sufficient levels of accommodations.

Despite the positive relationship of WW expenditures and number of hotel rooms, the model specified a negative correlation between capital investment in tourism and WW. This may suggest that WW is not the target of larger scale tourism investments. In the case of the Caribbean, where mass tourism is common, it is likely that high direct investment in tourism targeted at mass tourism growth (Caribbean Tourism Organization, 2015; Duval, 2004; McDavid & Ramajeessingh, 2003). WW's beneficial relationship with small-scale tourism is further corroborated by the negative correlation between cruise ship arrivals and WW expenditures in the higher income group (p-value 0.072).

Furthermore, areas with high tourism development may not be particularly suitable to WW, especially when the preferences of nature-tourists and the negative impacts of coastal development on cetaceans are considered (Harwood, 2001; Jefferson et al., 2009). Thus, areas with high levels of mass tourism development, particularly when it is ubiquitous in a destination, do not appear to be prime candidates for WW industries.

All together, the model shows that there may be a preference among WW clients for a middle ground between comfort and development because, for this kind of nature-based tourism, there is often a trade-off between development and environmental sustainability. Basic infrastructure for tourism (e.g. hotels) is required, but high levels of



tourism and coastal development in the form of seaports and mass tourism infrastructure have a negative correlation to WW economic success. In general, most travelers interested in ecotourism activities prefer accommodations that fit the experience, and they have an overall preference for more rustic locations (Wight, 2001). This does suggest that WW may be a viable tourism option for those locations with a variety of small-scale hotel options, but without major, mass tourism investment.

#### **D. Study Limitations**

There are several things that I was unable to account for in my model, and which are likely to be important to the success of WW in any location. The model specification diagnostics showed that there were influential variables missing from the model. This is partially due to a lack of data, as well as continuing uncertainty concerning deterministic country characteristics for tourism in general (Crouch, 1994; Eilat & Einav, 2004). Marketing is one such characteristic that lacks data, but which is likely to play a key role in supporting the WW industry. Advertisements and discussions in guidebooks alert tourists to the potential for WW in an area, and entice them to try it (Matsuda et al., 2011; M. Orams, 1999). Word of mouth (WOM) is another characteristic not accounted for in my model, but it is very important to tourism in general and marine tourism in particular. Maintaining high visitor satisfaction cannot only encourage repeat visits, but produce positive WOM to bring in new clients (Babin et al., 2005; Litvin et al., 2008; M. Orams, 1999; Ye et al., 2011). Competition, a commonly discussed issue for the WW industry in terms of social conflict and undermining of visitor satisfaction, is another important

variable that should likely be included in future models, when data is available (Neves, 2010; Silva, 2015).

## **Section Six: Conclusion/Suggestions**

This analysis illustrates the complexities of the WW industry's relationship with the countries in which it has developed, uncertainty concerning the connections of WW and conservation, and considerations for WW advocates looking to support the development of this industry. The Caribbean is a prime region for WW, being rich in cetacean diversity, and harboring a highly developed tourism industry in many of its countries. There is evidence here that the mass tourism common in the Caribbean (Jayawardena, 2002) is not the preference of WW clients. This is especially clear for cruise ship tourism, which is associated with seaports, both of which can be detrimental to cetacean habitat. General tourism infrastructure is necessary, however, because WW guests require places to stay and appear to prefer a certain level of accommodation options. In fact, provision of hotel rooms is the second most highly correlated variable among those that can be realistically changed by stakeholders.

Economic viability is not the sole concern when it comes to WW development, however, and the ramifications of these results for cetaceans are informative in regards to the industry's environmental sustainability. WW is one of the few industries that has been heavily supported by environmental NGOs around the world, due to the belief that it is a viable alternative to whaling and captive cetacean entertainment. It is also thought to encourage visitor and local support for cetacean conservation through education and the creation of linkages between economic well-being and healthy cetacean populations (Greenpeace, 2004; IFAW, 2013; WDC, 2016). My analysis shows, however, that this relationship is not simple and does not manifest in all cases. For all country groups, the most strongly correlated variable among those that can be modified by stakeholders is

that of the number of conservation agreements, which had a striking, negative relationship with WW expenditures. It is not clear why this is the case, but this result suggests that claims about WW's positive ties to conservation need to be more scrutinized if environmental NGOs and others concerned with the well-being of cetaceans are to continue encouraging the growth and sustainment of this industry around the world. Conservation agreements are essential to international conservation efforts, and they are especially important in terms of the marine habitat, which requires international cooperation to protect (C. J. Lundquist & Granek, 2005). My analysis did find beneficial connections between conservation and WW as well through the positive correlation between WW expenditures and both target species diversity and WW behavioral regulations. WW research has indicated that more opportunities to view more species enhances visitor satisfaction and thus WW economic success (Finkler & Higham, 2004; Mustika, Birtles, Everingham, & Marsh, 2013; M. B. Orams, 2000). Such diversity relies on healthy cetacean populations and habitats if it is to be maintained in the long-term, and thus also indicates the benefit of cetacean conservation to WW (Jefferson et al., 2009). Furthermore, the positive correlation with WW behavioral regulations illustrates that limits on WWO behavior does not hamper the industry's revenue. Such limits on WWO maneuvering around target cetaceans are necessary in order to prevent harassment of the animals and mitigate the negative impacts of WW.

Finally, this analysis identifies some of the variables that WW advocates should be concerned about as they maintain and/or expand WW, including the form of tourism development in a WW destination, and efforts to limit the industry's negative effects on cetaceans. It is not prudent to develop WW without consideration of the trade-offs that it

presents, especially in terms of economic success at the expense of cetacean well-being. Where development and diversification of the economy is needed, data such as those used here can be essential in helping to guide the process of responsible, environmentally sustainable growth. This study calls for caution moving forward, but also for the continued monitoring of the global WW industry in relation to the countries that it is nested within. There are still many aspects of this industry, and others like it, that we do not understand, but if ecotourism of any kind is to be a tool for both human development and conservation, we must strive to continue learning about how it functions as a component of larger social and environmental systems.

## CHAPTER THREE: VULNERABILITY OF CETACEANS TO WHALE WATCHING IN THE CARIBBEAN

### **Section One: Abstract**

Whale watching has the potential to support cetacean conservation through education of visitors and locals, as well as through providing economic incentives to maintain cetacean populations. This industry also has a variety of negative impacts on cetaceans, however, which vary by species and location, but which have been found in one form or another in every case of whale watching studied. In the Caribbean, a biodiversity hotspot and region highly reliant on tourism, whale watching has spread among countries and grown in intensity, vastly outpacing the amount of research that has been done on the impacts of whale watching on the Caribbean's cetacean species. It is important to better understand the vulnerability of cetaceans to whale watching to ensure effective mitigation strategies for minimizing potentially negative impacts of whale watching in this region. To address this need, I synthesized available data on impacts of boat-based whale watching to identify traits that make cetaceans more or less sensitive to the effects of whale watching. I then developed an index of vulnerability using life history, behavioral, and conservation data for Caribbean cetacean species. This analysis revealed that both target and non-target species are vulnerable to the negative impacts of whale watching, and that each species has a unique combination of vulnerabilities. Current regulations and guidelines do not address either species-specific concerns or the collective potential impacts of WW, and indirect impacts of whale watching are rarely addressed by industry regulations/guidelines. Thus, it is suggested that Caribbean countries with WW instate species-specific regulations or regulations that address all

vulnerabilities for all species, and that support for cetacean research is implemented to help fill data gaps.

## **Section Two: Introduction**

Whale watching (WW) is thought by environmental non-governmental organization (e-NGOs) and other WW proponents to have the potential to provide educational, economic, and research support for cetacean (whales, dolphins, and porpoises) conservation (Greenpeace, 2004; J. Higham et al., 2014b; IFAW, 2013; WDC, 2016). But many studies have also uncovered WW's negative impacts on target animals (Parsons, 2012). The long-term effects of these direct impacts (e.g. disturbance by WW boats) may have population-level ramifications, and the industry's indirect effects (e.g. associated coastal development) are widely unstudied (J. Higham et al., 2014b). Regulations addressing both the direct and indirect impacts of WW on cetacean populations are essential to the economic and environmental sustainability of WW, and understanding the vulnerabilities of different cetacean species can assist in the development of these protective tools.

There are a variety of direct impacts of WW on cetaceans, but the most common are those of noise pollution and harassment by WW boats. WW can be done in a variety of different ways, including aerial, land-based, and boat-based, but of these, boat-based is the most common and has the greatest impacts on cetaceans (J. Higham et al., 2014b). Noise pollution is one of the WW impacts of greatest concern due to the importance of vocal communication and/or echolocation to many cetacean species (Bain et al., 2002; Mann et al., 2000). The effect of WW sounds on cetaceans depends on the kind of WW, engine type, boat shape, vessel position in relation to target animals, as well as environmental characteristics (Goodwin & Cotton, 2004; R. Williams et al., 2002). Noise becomes a problem when it masks important sounds (e.g. communication,



echolocation signals, and the sounds of predators) (J. Higham et al., 2014b; Richardson et al., 1995). When noise exposure attains certain intensity, and is maintained for a sufficient amount of time, temporary or permanent hearing damage can also result. There are some cases of WW that have been found to create such conditions (Erbe, 2002; Richardson et al., 1995).

Noise impacts can also be influenced by WW boat behavior, particularly aggressive, close approaches. Inappropriate maneuvering by WW boats around cetaceans can also cause cetaceans to invoke evasive maneuvers and change the amount of time they spend doing activities such as resting, feeding, and socializing. In the case of avoidance, studies have found that cetacean behavior around aggressive WW vessels resembles that of predator avoidance, which may indicate high levels of stress during encounters (Scheidat et al., 2004; R. Williams & Ashe, 2007). In terms of activity budgets, WW target animals are often observed to rest, feed, and socialize less when tour boats are present (Arcangeli et al., 2009; Beaubrun, 2002; Lusseau, 2014). If noise and harassment by boats is bad enough cetaceans may even abandon the WW area, which signifies significant habitat degradation (Lusseau, 2014). Risso's dolphins in the Azores adopted a bimodal resting pattern during the WW season, while a single resting period in the middle of the day was the norm before the rise of the industry and was maintained outside of the season (Visser et al., 2011). There is also some evidence of declining population sizes in association with growing WW industries, suggesting that many of the short-term impacts discussed above can translate into long-term, negative effects (Lusseau et al., 2006).

Impacts become more severe when there are more boats around target animals

over longer periods of time (Bejder et al., 2006; Bejder et al., 2006). Forms of WW that involve close encounters, such as swim-with and feeding, can have particularly bad effects, including habituation to humans, smaller home range sizes, abandonment of migration patterns, and extreme decreases in socialization (M. B. Orams et al., 1996; Smith et al., 2008; Stockin et al., 2008). Thus, WW regulations and/or guidelines are necessary to mitigate or prevent negative effects on cetaceans.

One of the most commonly suggested limitations which research indicates is necessary to protect cetaceans is a cap on the number of WW boats in both space and time (Arcangeli et al., 2009; Bain et al., 2002; Lachmuth et al., 2011; Matsuda et al., 2011; Stamation et al., 2010). Maintaining at least a distance of 100m from target animals has also been found to lessen negative impacts (Luis do Valle & Melo, 2006; Lusseau et al., 2009; Stamation et al., 2010), and approaches from the front should be avoided to prevent undue stress and predator avoidance behaviors (R. Williams et al., 2002). In the case of close encounters, the severity of impacts has led to contention among WWOs and environmental NGOs. Communities or areas that are concerned for the well-being of their cetaceans either outlaw this form of tourism entirely, or they have instituted strict rules about the number of target animals that can be habituated to this form of interaction with humans (Carlson, 2012; M. B. Orams, 2002a).

In the Caribbean, my analysis' study region, 23 of the 33 countries included had a WW industry, but only 11 of those had guidelines for WW and only 5 had regulations. Most of those nations with guidelines or regulations have rules concerning swim-with (11), stipulations about minimum approach distances (11), and approach speeds (11). Dominica, Guadeloupe, and St. Lucia had the most detailed guidelines/regulations, but of

these three only St. Lucia had regulations (Carlson, 2012). My interviews with Dominican WW operators (WWOs) indicate that the guidelines there are not followed, especially in the case of swim-with WW, which has developed in the past decade (personal communication, April 2014). This suggests a need for further regulation/guideline development and refinement throughout the Caribbean if WW is to be sustainable in the long-term.

Although the direct impacts are the main focus of my study, the indirect impacts of WW on cetaceans are of concern as well, though there is less known about these effects, such infrastructural development in coastal and inshore areas. Most coastal development creates considerable noise pollution (Jefferson et al., 2009), which has been known to cause temporary abandonment of near-shore areas by cetaceans; in some cases the shockwaves from construction and development can cause physical trauma (Borggaard et al., 1999; Weilgart, 2007). Development can also reshape the coastal habitat in ways that degrade it for cetacean use (S. Y. Lee et al., 2006; Reeves et al., 2003). One common form of degradation is increased levels of siltation, which can impact cetacean prey species, and prevent cetaceans from sensing both predators and food sources (Dolman & Simmonds, 2010; Weilgart, 2007). Increased proximity to humans, as well as increased human activity along the coast, are also linked to heightened disease loads among cetaceans (Mouton & Botha, 2012). Some of these diseases are associated with sewage, and very few Caribbean countries are able to treat their waste. Only 11% of the region's nations treated all of their sewage in 2000 (Blackman et al., 2014).

In light of the many potential impacts of WW on cetaceans, as well as the amount

of uncertainty that surrounds these impacts (Lacy et. al. 2017), existing data needs to be synthesized in new ways in order to continue improving WW regulations/guidelines, and to determine when and under what circumstances WW should be promoted as a positive pathway for cetacean conservation. The goal of this chapter of my research is to identify which Caribbean cetacean species are most vulnerable to the negative impacts of whale watching, to identify the sources of this vulnerability, and to make preliminary recommendations for appropriate policies to protect healthy cetacean populations.

### **Section Three: Methods**

#### **A. Study Site Selection and Cetacean Species Considered**

My analysis focuses on cetacean species that use the Caribbean region at some point during the year. I selected the Caribbean for this study due to its historic importance to WW, the steady growth of the industry in the region, as well as the Caribbean's importance to biodiversity. Specifically, I focus on cetaceans that utilize the territorial waters of island Caribbean states/territories, as well as Central and South American countries on the Caribbean Sea, including the following: Anguilla, Antigua & Barbuda, the Bahamas, Barbados, Belize, Bermuda, the British Virgin Islands, the Cayman Islands, Colombia, Costa Rica, Cuba, Dominica, the Dominican Republic, Grenada, Guadeloupe, Guatemala, Guyana, Haiti, Honduras, Jamaica, Martinique, the Netherland Antilles, Nicaragua, Panama, Puerto Rico, St. Kitts & Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, Trinidad & Tobago, Turks and Caicos, the US Virgin Islands, and Venezuela (33 countries/territories).

The Caribbean has one of the oldest WW industries in the world, and the industry has become an increasingly important tourism sector in this tropical region. Modern WW originated in the US in the early 1980s, and it emerged in the Dominican Republic in 1984 (Ministerio de Medio Ambiente y Recursos Naturales, 2015; O'Connor et al., 2009). Expansion of the industry into new countries continued throughout the 80s, 90s, and early 2000s when global WW inventories were carried out by Erich Hoyt and the International Fund for Animal Welfare (IFAW). At the end of 1994, 11 Caribbean countries had a WW industry, and this had grown to 13 countries in 1998 and 23 in 2008 (O'Connor et al., 2009). The region is also home to several unique WW experiences, such as swim-with

programs in both Dominica and the Dominican Republic (Ministerio de Medio Ambiente y Recursos Naturales, 2015; O'Connor et al., 2009).

In addition to its relevance to WW, the Caribbean is also a key region for cetaceans in terms of their habitat, and their interactions with humans. The region is a biodiversity hotspot, and over 30 of the known ~88 species of cetaceans utilize the Caribbean at some time during the year (Hoyt, 1999; Mittermeier, Myers, Mittermeier, & Robles Gil, 1999). These species play varying roles for local people. Small cetacean hunting is still relatively common in the Caribbean, particularly in the east (Sutherland, 2001), and as discussed above, WW is an important and growing component of the Caribbean tourism industry (Hoyt, 1999; O'Connor et al., 2009). Due to the movement of Caribbean cetaceans across territorial waters, cooperation in the region will be needed to maintain their populations, which support healthy marine ecosystems in a variety of ways (Roman & McCarthy, 2010; Roman et al., 2014). In this regard, WW may be a tool to help facilitate this cooperation, as many Caribbean countries now have economic reasons to protect living cetaceans in their waters. Such benefits can only be sustainably attained if the negative impacts of WW itself are mitigated (Hoyt & Hvenegaard, 2010).

Table 3.1: Cetacean Species Considered in the Caribbean Whale Watching Vulnerability Index (alphabetized by scientific name). Those starred (\*) are species that were not targeted by the WW industry as of the last global inventory.

Common Name	Scientific Name
<b>Mysticetes</b>	
Minke whale*	<i>Balaenoptera acutorostrata</i>
Sei whale*	<i>Balaenoptera borealis</i>
Bryde's whale	<i>Balaenoptera edeni</i>
Blue whale	<i>Balaenoptera musculus</i>
Humpback whale	<i>Megaptera novaeangliae</i>
Fin whale	<i>Balaenoptera physalus</i>
<b>Odonotocetes</b>	
Short-beaked common dolphin*	<i>Delphinus delphis</i>
Long-beaked common dolphin	<i>Delphinus capensis</i>
Pygmy killer whale*	<i>Feresa attenuata</i>
Short-finned pilot whale	<i>Globicephala macrorhynchus</i>
Risso's dolphin	<i>Grampus griseus</i>
Pygmy sperm whale	<i>Kogia breviceps</i>
Dwarf sperm whale	<i>Kogia simus</i>
Fraser's dolphin	<i>Lagenodelphis hosei</i>
Blainville's beaked whale	<i>Mesoplodon densirostris</i>
Gervais' beaked whale	<i>Mesoplodon europaeus</i>
True's beaked whale	<i>Mesoplodon mirus</i>
Killer whale	<i>Orcinus orca</i>
Melon-headed whale	<i>Peponocephala electra</i>
Sperm whale	<i>Physeter macrocephalus</i>
False killer whale	<i>Pseudorca crassidens</i>
Costero	<i>Sotalia guianensis</i>
Pantropical spotted dolphin	<i>Stenella attenuata</i>
Clymene dolphin	<i>Stenella clymene</i>
Striped dolphin*	<i>Stenella coeruleoalba</i>
Atlantic spotted dolphin	<i>Stenella frontalis</i>
Spinner dolphin	<i>Stenella longirostris</i>
Rough-toothed dolphin*	<i>Steno bredanensis</i>
Bottlenose dolphin	<i>Tursiops truncatus</i>
Cuvier's beaked whale	<i>Ziphius cavirostris</i>

## **B. Vulnerability Index Development and Model Variables**

The goal of my analysis was to produce an index of vulnerability for Caribbean cetacean species with respect to potential negative impacts of boat-based WW. This is the most common form of WW around the world, and its impacts are known to be particularly detrimental in relation to the other two types of WW (J. Higham et al., 2014a; Luksenberg & Parsons, 2009). My intent is to identify species with high overall vulnerability and help direct WW management until more research has been carried out. In order to do this, I synthesized and analyzed available data on the impacts of WW on cetaceans from a traditional literature review informed by systematic review methods. I focused my review on the potential impacts that WW can cause, as well as species characteristics that might make them more vulnerable to these impacts. While I looked at a wide range of possible impacts, limited data or contradictory information on impacts excluded many from the final analysis. I then used this data for each of the cetaceans included in this study to indicate which vulnerabilities are potentially most concerning for different species. Finally, included species were grouped by the number of High, Low, and Data Deficient characteristics that they possessed. More details are provided in what follows.

As described above, the literature review that I carried out to construct this index was a comprehensive review of research on the direct impacts of WW on cetaceans. This was a traditional review, but the methods that I utilized to carry it out were informed by systematic reviews. I utilized Google Scholar and Arizona State University's One Search as my databases, which I took all papers from that were about impacts of WW on cetaceans. My general search terms included "whale watching," "whale watching



impact," "negative effects of whale watching," "environmental impacts of marine tourism." I also used search terms focused on specific, known impacts; these include "noise pollution cetaceans," "cetaceans ship strikes," "coastal development cetaceans," "pollution impact on cetaceans." I evaluated the quality of the studies utilized based on their methodology and researcher acknowledgement of study limitations (Haddaway, Woodcock, Macura, & Collins, 2015; Haddaway & Bilotta, 2016). From this, I gathered data on the species analyzed, study locations, what the negative impacts of WW were, and what traits researchers believed to be associated with ill effects (Appendix III lists all sources used in this literature review, along with location and species data). I also reviewed current knowledge concerning indirect impacts of WW on cetaceans; these included coastal development, pollution (both chemical and noise), and increased exposure to disease. This literature review identified a variety of traits which would likely be influential on how vulnerable different species are to WW impacts, both direct and indirect. Table 3.2 summarizes these, and groups them by those able to be included in the index, those whose impact is unknown, and those without enough data to be included. I selected the six final variables (as shown in Table 3.2) for the vulnerability index based on data availability, relevance, and certainty of the direction of impact. I then organized these into three primary characteristics categories as follows: biological (age of maturity and calving interval), habitat (habitat type and overlap of breeding and WW seasons), and human pressure (IUCN status and number of WWers). A specific discussion concerning the variables utilized in the index follows, as well as details on how each component was calculated. Those variables that were not included due to uncertainty or lack of data are covered in detail in the results section.

Table 3.2: Summary of All Characteristics Initially Considered for the Whale Watching Vulnerability Index

<b>Variables Utilized</b>	<b>Direction of Impact Unknown</b>	<b>Lacking Data</b>
Age of maturity	Group size	Current whaling/hunting pressure
Calving interval	History of whaling/small cetacean hunts	Disease load/exposure
Habitat type	Migration	Impact of boat noise
IUCN status	WW research	Mortality rates
Overlap of breeding and WW seasons		Sensitivity to pollution
WWers		Ship strike pressure

Table 3.3: Final Variables Categorized

<b>Biological Data</b>	<b>Habitat Data</b>	<b>Human Pressure</b>
Calving interval	Habitat type	#WWers
Age of maturity	Overlap of breeding and WW seasons	IUCN status

**Reproductive Rate (Calving interval and age of maturity):** The literature shows that slow rates of reproduction are positively associated with higher levels of vulnerability to WW impacts, because those cetacean species with relatively slower reproductive rates will be more susceptible to long-term population impacts of WW (Davidson et al., 2012; VanBlaricom et al., 2001). This industry's effect on cetacean energy budgets is especially problematic for pregnant and nursing mothers as well as their calves. These impacts are generally sub-lethal, but there are negative implications for population growth (P. J. Corkeron, 1995; Steckenreuter et al., 2012; Weinrich & Corbelli, 2009). This is further exasperated by some indirect impacts of WW development (e.g. coastal development, increased boat traffic, etc.) which can negatively affect cetacean reproduction as well, particularly in the case of toxins being passed from

mothers to calves, and calf mortality via ship strikes (Baulch & Perry, 2014; Chilvers et al., 2005; Gillespie, 2002; Jefferson et al., 2009; Van Bresseem et al., 2009).

Traits that are associated with slow reproductive rates in mammals include the following: age to maturity, long gestation periods, long lactation periods, slow growth, small litter sizes, higher minimum ages for weaning, and long calving intervals. Of these, I did not include litter size in the resulting index because all species with data available had a litter size of one. At the same time, age of maturity and calving interval have been shown by meta-analysis to be good indicators of extinction risk, which in the absence of better data I assume to capture some vulnerability of species to sub-extinction impacts (Davidson et al., 2012; Hutchings, Myers, García, Lucifora, & Kuparinen, 2012). Furthermore, age to maturity gives some sense for how long a species will remain immature, the life stage most vulnerable to WW's effects (Parsons, 2012). Due to these things, I preferred age to maturity and calving interval for inclusion in the index, rather than length of gestation and lactation periods which tended to have less available data and were not explicitly linked to extinction risk in past research (Davidson et al., 2012; Hutchings et al., 2012).

**Data Sources:**

(1) Calving interval: (Mann et al., 2000; NOAA, 2017; Ridgway & Harrison, 1994)

(2) Age to maturity: (Mann et al., 2000; NOAA, 2017; Ridgway & R. Harrison (eds.), 1985; Ridgway & Harrison, 1994; Ridgway & Harrison, 1999; Sigurjónsson, 1995)

**Indices Calculation:**

I gathered data on calving interval (in years) and age to maturity (in years), and I used these numbers to create the 0-1 sub-index for each separately. The 0-1 value was determined with the following equation:  $y=n/MAX$  where n is the data point and MAX is the maximum value (Table 3.6).

**Habitat Type: My index considers the common use of coastal areas to be a factor in increasing cetacean susceptibility to the negative impacts of WW.** WW preferentially targets coastal cetaceans (Delfour, 2007; Lemon et al., 2006). Species that utilize coastal areas are also at risk of increased exposure to indirect impacts from coastal development (which can be driven by increased tourism). The proximity of cetaceans to the coast is important to WW for several reasons. Coastal cetaceans are easier for WWOs to find, and target animals that are further from shore require more resources to reach (S. Y. Lee et al., 2006). Longer travel times in more exposed conditions also make clients more susceptible to seasickness, a common reason for low visitor satisfaction (Andersen & Miller, 2006; Constantine, R., & Baker, C. S., 1997; M. B. Orams, 2000; Stockin et al., 2008). Due to these factors, WWOs commonly target coastal species. Cetaceans utilizing inshore waters are also exposed to the indirect impacts of WW at higher levels. Development of coastal infrastructure can change the structure of the inshore habitat, and increase noise and chemical pollution. Higher levels of human visitation to coastal areas can also increase organic pollution and the risk for disease in marine mammals utilizing waters near affected areas (Birkun Jr, 2002; Bossart, 2007; Harwood, 2001; Islam & Tanaka, 2004; Jefferson et al., 2009; Mouton & Botha, 2012; Sigler, 2014).

**Data Sources:**

(IUCN, 2016; Mann et al., 2000; Ridgway & Harrison, 1994)

**Index Calculation:**

In Mann et. al.'s book *Cetacean Societies* (2000), the following descriptive system for habitat type was developed: (1) river, (2) river and inshore, (3) inshore, (4) inshore and shelf, (5) shelf, (6) shelf/deep, and (7) deep. I utilized this system to produce my index variable. All species with habitat types of 1-3 were given a value of 1, indicating high vulnerability, because river and inshore habitats are most accessible to WW boats, and sensitive to coastal development. Inshore/shelf was given a value of 0.75, shelf was given 0.5, shelf/deep 0.25, and deep 0 in order to reflect the decreasing vulnerability of offshore and deep-water species (Table 3.6).

**Overlap of Breeding Season and WW Season: Data shows that those cetaceans with breeding seasons that coincide with the WW season in the Caribbean will be more vulnerable to the industry's negative effects.** This is because mothers and calves are considered to be the most vulnerable group in regards to the negative impacts of WW (Scheidat et al., 2004; Sousa-Lima & Clark, 2008). Mothers have high energetic needs while caring for their young, and modifications of their energy budget due to WW activity will impact both the energy-stressed adult and their dependent offspring (Stamation et al., 2010). Boats also pose physical risks for mothers and their young. Calves are slower than adults and have less experience with human vessels, so they are more at risk for ship strikes. Avoidance becomes more complex for families as well, because mothers are either restricted by their young's rate of travel or they are forced to abandon them in order to escape. Finally, calves are often curious about human activities,

which makes them susceptible to potentially dangerous habituation and ship strikes (Lusseau, 2003a; Stone & Yoshinaga, 2000).

**Data sources:**

(Culik, 2002; IUCN, 2016; NOAA, 2017; O'Connor et al., 2009)

**Index Calculation:**

I calculated values for this variable by determining the percent of a species' breeding season that overlaps with that of the WW season in a specific location. The months of WW seasons for each Caribbean country in 2008 (the year with the most recent regional data) was used for this calculation, along with information about breeding location and months of the breeding season, with an emphasis on the calving season for each cetacean species. Thus, those species that experience WW throughout their breeding season have an index of 1, which signifies the highest level of vulnerability and total overlap (Table 3.6).

**Intensity of WW Interest (#WWers): Those cetaceans that are targeted in more Caribbean countries by more people are considered to have a higher vulnerability to the negative impacts of WW.** The popularity of different WW locations is considered here by factoring in the number of WWers per country. This is an indication of the size of a WW industry in a given area, and WW research has overwhelmingly found that larger industries have more impact (Arcangeli et al., 2009; Bain et al., 2002; Barr & Slooten, 1999; Beaubrun, 2002; Blane & Jaakson, 1994; Constantine et al., 2004; Erbe, 2002; Jelinski, Krueger, & Duffus, 2002; Lachmuth, Barrett-Lennard, Steyn, & Milsom, 2011; Lusseau, 2005; Matsuda et al., 2011; Ritter,

2004; Schaffar, Madon, Garrigue, & Constantine, 2009; Scheidat et al., 2004; Sousa-Lima & Clark, 2008; Stamation et al., 2010; Stensland & Berggren, 2007; Visser et al., 2011; Williams & Ashe, 2007). With more of a spatial spread of WW, it becomes harder for cetaceans to find spaces free of human attention, and more members of a species are affected by the industry's negative impacts. WW activity can also be seen as a form of habitat degradation (Lande, 1998; Reeves et al., 2003; Tilman & Lehman, 2001), because it changes cetacean behavior patterns (Arcangeli et al., 2009; Beaubrun, 2002; R. Williams et al., 2006), and in some cases has caused abandonment of key habitats (Parsons, 2012). The WW industry's would also be more severe for those species targeted throughout their range (Islam & Tanaka, 2004; Jefferson et al., 2009; Richardson et al., 1995; Van Bresseem et al., 2009).

**Data sources:**

(O'Connor et al., 2009)

**Index Calculation:**

For this variable, I gathered data on the number of WWers for each Caribbean country as well as data on which species were targeted by the WW industry in each destination as of the final WW inventory in 2008. Then, in order to produce the numbers utilized for this variable, I added up all the WWers for all countries in which a species was targeted. I then standardized this value by dividing all data points by the maximum value. Thus, the species with the max value had the highest vulnerability of 1, and those with lesser values have values between 1-0. While the #WWers can lead to indirect impacts on non-target cetaceans, my assumption (discussed in detail in part C below) is that direct impacts of the industry are greater than the indirect impacts.

**Level of endangerment (IUCN Status):** I assume that species that are more highly endangered (determined here using the IUCN classification system) are of a higher concern due to the dangers of compounding threats. Further stressors on already endangered animals may make them more susceptible to extinction (Delfour, 2007; VanBlaricom et al., 2001). Due to this, those species that are highly endangered may not be good candidates for WW, and if they are already utilized, they should be targeted with the outmost caution as per the precautionary principle (Kriebel et al., 2001).

**Data Sources:**

(IUCN, 2016)

**Index Calculation:**

The IUCN classifies different species based on their level of extinction threat into ten main categories as follows: extinct, extinct in the wild, critically endangered, endangered, vulnerable, near threatened, conservation dependent, least concern, data deficient, and not evaluated. Of these, only endangered, vulnerable, least concern, and data deficient were categories assigned by the IUCN to Caribbean cetaceans. Species described as endangered were given a value of 1, being the most threatened in the study group. Vulnerable species were assigned the value of 0.5, and least concern was given a value of 0 to reflect low vulnerability.

The zeroes included in the index should not be considered a true indication of no vulnerability for a particular variable, but should only serve as a tool for comparison among the species included here. Once the individual index numbers were determined for



each species (as described above), they were then assigned a label of Low, Medium-low, Medium-high, and High based on the following: (1) High was assigned to values of 0.76-1, (2) Medium-high was assigned to values of 0.51-0.75, (3) Medium-low was assigned to values of 0.26-0.5, and (4) Low was assigned to values of 0-0.25. This iteration of the index acknowledges that the relationship between different characteristics and stressors is not understood with enough certainty to integrate the numerical indicators into a comprehensive index (Crain, Kroeker, & Halpern, 2008). Rankings across variables are not directly comparable. For instance, vulnerabilities due to reproductive rate may be more severe than vulnerabilities due to habitat preference. Since these vulnerabilities, and all the others I have included, have not been analyzed relative to each other, I cannot say which variable represents a greater vulnerability, or whether they are comparable. One variable may represent significantly more vulnerability than another. Second, there is no way to know how the vulnerabilities interact with each other. Meta-analysis has shown that most stressors have a synergistic interactions, with a little under 30% having an additive effect (Crain et al., 2008). Thus, while there is still a considerable amount of uncertainty surrounding these groupings, they are still helpful for current management until more is known.

Furthermore, there is not readily available, comprehensive data on the population trends of many Caribbean cetaceans species, which makes the use of a true vulnerability analysis ill advised in this case (Gober & Kirkwood, 2010; Nelson, Adger, & Brown, 2007). More simplified systems of evaluating vulnerability, such as this one, are useful in these cases where data is lacking but relatively rapid risk assessment is needed (Le Quesne & Jennings, 2012). Once each species was assigned a level of vulnerability for

each of the six index variables, they grouped based on the labels applied to the numerical vulnerability indicators as described above. Five different groups based on these labels resulted (Table 3.4), with the general assumption of additive effects (Crain et al., 2008).

Table 3.4: Index Groups and Determining Characteristics

<b>Group Number</b>	<b>Characteristics of Cetaceans</b>
1	At least two variables with the High label.
2	One variable with the High label.
3	No High variables and less than four Low labels, or four Low and one High.
4	At least four variables with the Low label.
5	At least three variables are Data Deficient.

Table 3.5: Raw Data for the Variables Utilized in the Final Index (sources noted in the sections above)

Common Name	Calving Interval (years)	Age of Maturity (years- average female and male)	Habitat Type	Overlap of Breeding and WW Seasons	#WVWers	IUCN Status
Atlantic spotted dolphin	3	11.5	5	1	145640	Data Deficient
<u>Blainville's</u> beaked whale	Data Deficient	9	7	Data Deficient	7459	Data Deficient
Blue whale	2.5	10	5	1	106844	Endangered
Bottlenose dolphin	4	8.75	4	1	262404	Least Concern
<u>Bryde's</u> whale	2	10.5	5	0.33	70371	Data Deficient
<u>Costero</u>	Data Deficient	Data Deficient	2	1	158507	Data Deficient
<u>Clymene</u> dolphin	Data Deficient	Data Deficient	7	0.1	969	Data Deficient
Cuvier's beaked whale	2.5	9	7	0.5	38325	Least Concern
Dwarf sperm whale	Data Deficient	3.75	7	1	28073	Data Deficient
False killer whale	7	11	6	1	134917	Data Deficient
Fin whale	2	10.5	5	1	50	Endangered
Fraser's dolphin	2	7.5	7	0.44	32204	Least Concern
<u>Gervais'</u> beaked whale	Data Deficient	Data Deficient	7	Data Deficient	7459	Data Deficient
Humpback whale	2.4	5	5	1	412093	Least Concern
Killer whale	5	17.5	5	0.58	7459	Data Deficient

Long-beaked common dolphin	2	Data Deficient	5	1	9957	Data Deficient
Melon-headed whale	Data Deficient	Data Deficient	6	Data Deficient	20614	Least Concern
Minke whale	1.2	5.5	5	0.1	0	Least Concern
Pantropical spotted dolphin	3	11.75	6	1	251240	Least Concern
Pygmy killer whale	Data Deficient	Data Deficient	7	0.1	0	Data Deficient
Pygmy sperm whale	1.25	4.5	1	1	32123	Data Deficient
Risso's dolphin	Data Deficient	Data Deficient	7	0.58	7459	Least Concern
Rough-toothed dolphin	Data Deficient	16	7	0.1	0	Least Concern
Sei whale	2	8.5	5	0.1	0	Endangered
Short-beaked common dolphin	2	6	6	0.1	0	Least Concern
Short-finned pilot whale	5	11.5	6	1	134408	Data Deficient
Spinner dolphin	3	8	5	1	197489	Data Deficient
Sperm whale	5	13	7	1	79793	Vulnerable
Striped dolphin	4	11	7	0.1	0	Least Concern
True's beaked whale	Data Deficient	Data Deficient	7	Data Deficient	7459	Data Deficient

Note for Habitat Type: (1) River, (2) river and inshore, (3) inshore, (4) inshore and shelf, (5) shelf, (6) shelf and deep, and (7) deep.

### **C. Vulnerability Index Assumptions**

Assumption #1: While there are indirect impacts of WW on cetaceans, I have assumed that the direct impacts are of greater concern. This is due to the fact that the WW industry is not a major contributor to the indirect impacts considered here as compared to other human activities (Jefferson et al., 2009; Sigler, 2014; Van Bressem et al., 2009). For example, global problems, such as the growing human population, preferential use of coastal areas by people, and general tourism development are far more integral to rates of global coastal development than is the rising popularity of WW (Bulleri & Chapman, 2010; Crain, Halpern, Beck, & Kappel, 2009). Thus, while these indirect effects are considered, they are secondary to the focal impacts of WW itself.

Assumption #2: I assume that the precautionary principle is an appropriate guiding principle for this analysis. This principle is defined as the following: "when an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically" (Raffensperger & Tickner, 1999). The precautionary principle is particularly important in the case of WW because the well-being of cetaceans will face trade-offs with the WW industry, and it is not uncommon for economic needs to take precedence over environmental necessities (M. B. Orams, 2000). For WW and other industries, global regulations are often designed to favor economic development in the absence of scientific evidence proving that such development will cause environmental harm. The precautionary principle was created, in part, to counter this trend (Cooney, 2004), and WW development has continued at a rate that vastly outpaces that of research (Cisneros-Montemayor et al., 2010; O'Connor et al., 2009).

## Section Four: Results

### A. Index Results

Two tables of results are presented here, Table 3.6 contains the numerical values (0-1 index) calculated for the individual variables, and Table 3.7 represents those values as descriptive labels (High, Medium-High, Medium-Low, and Low). Both represent the same information, although Table 3.7 assigns labels to the numbers represented in Table 3.6 in order to illustrate uncertainty concerning the comparison of stressors within variables, and that we currently lack the data to combine the numerical vulnerabilities into a single value (it is unknown if there are additive, synergistic, or negative interactions, or which stressors may be the most impactful).

Table 3.6: Index of Caribbean Cetacean Vulnerability to Whale Watching Impacts. Vulnerability of cetaceans by the six variables listed below (calving interval, age of maturity, habitat type, WW/breeding overlap, number of WWers, and IUCN status) is given a value of 0-1, with 1 being the highest vulnerability and 0 being the least; Section Three details the calculation of these values. DD indicates data deficiency.

Common Name	Biological Data		Habitat Data		Human Pressure	
	Calving Interval	Age of Maturity	Habitat Type	WW / Breeding Overlap	# of WWers	IUCN Status
<b>Mysticetes</b>						
Blue whale	0.36	0.57	0.5	1	0.26	1
Bryde's whale	0.29	0.6	0.5	0.33	0.17	DD
Fin whale	0.29	0.6	0.5	1	0	1
Humpback whale	0.34	0.29	0.5	1	1	0
Minke whale	0.17	0.31	0.5	0	0	0
Sei whale	0.29	0.49	0.5	0	0	1
<b>Odontocetes</b>						
Atlantic spotted dolphin	0.43	0.66	0.5	1	0.35	DD
Blainville's beaked whale	DD	0.51	0	DD	0	DD
Bottlenose dolphin	0.57	0.5	0.75	1	0.64	0
Clymene dolphin	DD	DD	0	0	0	DD
Costero	DD	DD	1	1	0.38	DD
Cuvier's beaked	0.36	0.51	0	0.5	0	0

whale						
Dwarf sperm whale	DD	0.21	0	1	0	DD
False killer whale	1	0.63	0.25	1	0.33	DD
Fraser's dolphin	0.29	0.43	0	0.44	0	0
Gervais' beaked whale	DD	DD	0	DD	0	DD
Killer whale	0.71	1	0.5	1	0	DD
Long-beaked common dolphin	0.29	DD	0.5	1	0	DD
Melon-headed whale	DD	DD	0.25	No Data	0	0
Pantropical spotted dolphin	0.43	0.67	0.25	1	0.61	0
Pygmy killer whale	DD	DD	0	0	0	DD
Pygmy sperm whale	0.18	0.26	1	1	0	DD
Risso's dolphin	DD	DD	0	0.58	0	0
Rough-toothed dolphin	DD	0.91	0	0	0	0
Short-beaked common dolphin	0.29	0.34	0.25	0	0	0
Short-finned pilot whale	0.71	0.66	0.25	1	0.33	DD
Sperm whale	0.71	0.74	0	1	0.19	0.5
Spinner dolphin	0.43	0.46	0.5	1	0.48	DD
Striped dolphin	0.57	0.63	0	0	0	0
True's beaked whale	DD	DD	0	DD	0	DD

**Sources:**

Calving interval: (Mann et al., 2000; NOAA, 2017; O'Connor et al., 2009; Ridgway & Harrison, 1994)

Age to maturity: (Mann et al., 2000; NOAA, 2017; Ridgway & R. Harrison (eds.), 1985; Ridgway & Harrison, 1994; Ridgway & Harrison, 1999; Sigurjónsson, 1995)

Habitat Type: (IUCN, 2016; Mann et al., 2000; Ridgway & Harrison, 1994)

Overlap of WW and Breeding Season: (Culik, 2002; IUCN, 2016; NOAA, 2017; O'Connor et al., 2009)

Number of WWers: (O'Connor et al 2009)

IUCN Status: (IUCN, 2016)

Table 3.7: Index of Caribbean Cetacean Vulnerability to Whale Watching, Sorted by Vulnerability Status.

Labels: From Table 3.6 (1) Values of 0.76-1 are labeled High, (2) values of 0.51-0.75 are labeled Medium-high, (3) values of 0.26-0.5 are labeled Medium-low, and (4) values of 0-0.25 are labeled Low.

Groups: (1) High WW pressure target species have high breeding and WW season overlap as well as medium-high to high #WWers. (2) Medium WW pressure target species have high breed and WW season overlap as well as medium-low #WWers. (3) Low WW pressure target species have low #WWers. (4) Non-target species have 0 WWers recorded by O'Connor et. al. 2009. (5) Data deficient species.

H signifies High, MH medium-high, ML medium-low, L low, and DD Data Deficient.

Vulnerability Group	Species Common Name	Biological Data		Habitat Data		Human Pressure	
		Calving Interval	Mat urity	Habita t Type	WW / Breeding	#W wer s	IUCN Status
High WW Pressure Target Species	Blue whale	ML	MH	ML	H	MH	H
	Bottlenose dolphin	MH	ML	MH	H	MH	L
	Humpback whale	ML	ML	ML	H	H	L
	Pan-tropical spotted dolphin	ML	MH	L	H	MH	L
Medium WW Pressure Target Species	Atlantic spotted dolphin	ML	MH	ML	H	ML	DD
	Costero	DD	DD	H	H	ML	DD
	False killer whale	H	MH	L	H	ML	DD
	Short-finned pilot whale	MH	MH	L	H	ML	DD
	Spinner dolphin	ML	ML	ML	H	ML	DD
Low WW Pressure Target Species	Bryde's whale	ML	MH	ML	ML	L	DD
	Cuvier's beaked whale	ML	MH	L	ML	L	L
	Dwarf sperm whale	DD	L	L	H	L	DD



	Fin whale	ML	MH	ML	H	L	H
	Fraser's dolphin	ML	ML	L	ML	L	L
	Killer whale	MH	H	ML	H	L	DD
	Long-beaked common dolphin	ML	DD	ML	H	L	DD
	Pygmy sperm whale	L	ML	H	H	L	DD
	Risso's dolphin	DD	DD	L	MH	L	L
	Sperm whale	MH	MH	L	H	L	ML
Non-Target Species	Minke whale	L	ML	ML	L	L	L
	Rough-toothed dolphin	DD	H	L	L	L	L
	Sei whale	ML	ML	ML	L	L	H
	Short-beaked common dolphin	ML	ML	L	L	L	L
	Striped dolphin	MH	MH	L	L	L	L
	Striped dolphin	MH	MH	L	L	L	L
Data Deficient Species	Blainville beaked whale	DD	MH	L	DD	L	DD
	Clymene dolphin	DD	DD	L	L	L	DD
	Gervais' beaked whale	DD	DD	L	DD	L	DD
	Melon-headed whale	DD	DD	L	DD	L	L
	Pygmy killer whale	DD	DD	L	L	L	DD
	True's beaked whale	DD	DD	L	DD	L	DD

**Sources:**

Calving interval: (Mann et al., 2000; NOAA, 2017; O'Connor et al., 2009; Ridgway & Harrison, 1994)

Age to maturity: (Mann et al., 2000; NOAA, 2017; Ridgway & R. Harrison (eds.), 1985; Ridgway & Harrison, 1994; Ridgway & Harrison, 1999; Sigurjónsson, 1995)

Habitat Type: (IUCN, 2016; Mann et al., 2000; Ridgway & Harrison, 1994)

Overlap of WW and Breeding Season: (Culik, 2002; IUCN, 2016; NOAA, 2017; O'Connor et al., 2009)

Number of WWers: (O'Connor et al 2009)

IUCN Status: (IUCN, 2016)

Each cetacean in the index is faced by a different combination of vulnerabilities. Furthermore, there is a distinct lack of data concerning the life history of many Caribbean

species, especially those in the Data Deficient group. This lack of data is also apparent for the IUCN Status variable, which has 15 data deficient entries, suggesting that there is a lack of population data, life history data, and/or information on threats for these species. Cetaceans with three variables being data deficient are mostly beaked whales. As a group, little is known about beaked whales due to their use of deep-water habitats (D'Amico et al., 2009; D. P. Nowacek, Thorne, Johnston, & Tyack, 2007).

In examining the variables themselves, it is apparent that breeding and WW season overlap is a common High vulnerability and there is a relatively high potential for vulnerability due to biological characteristics. The most common occurrence of High vulnerability among variables is seen in the overlap of WW and cetacean breeding season variable, which was categorized as High for 15 of the species included in the index. Much of the biological data also shows considerable levels of potential vulnerability. Thirteen species had Medium-high to High vulnerability in terms of age of maturity. Six species had a Medium-high to High vulnerability in terms of calving interval, and 11 species were data deficient for at least one variable included in the Biological Data category. The variable with the most Low values was the number of WWers, with 21 species having relatively light WW pressure.

### **B. Variables Too Uncertain To Use**

The characteristics included in my WW vulnerability index are not exhaustive; I selected the variables used above because there was scientific certainty regarding the nature and direction of their impact. There were several variables that were excluded from the index either because there was little or no data (few studies) about the potential

impact, or because there was contradictory data. The following section will discuss these characteristics, highlighting their potential importance and examining why their impact on vulnerability to WW is unclear.

Variable	Notes
Group size	Average size of social groups
Human interest	Traits that garner human interest
Migration	Migration patterns and reliance on stored energy
Vocalization masking	Overlap of boat noise and cetacean vocalizations
Whaling history	Whaling/small cetacean hunt pressures
WW research	WW research effect on our ability to address WW impacts

#### i. Variables Lacking Data

Overlap of Boat Noise and Cetacean Vocalizations: Cetaceans with vocalizations that are easily masked by WW boat noise will be more vulnerable to negative WW impacts. Masking is the process by which one noise (in this case, engine noise) makes a sound of interest (cetacean calls) harder to detect. Cetaceans need to be able to pick up and interpret signals in order to hunt, socialize, and find mates (Mann et al., 2000; Richardson et al., 1995). Due to this, noise pollution by WW boats is often considered to be a major negative impact of WW on cetaceans. This effect is quite complex, however, and data is lacking most cases. Detailed information on the acoustics of signals being used by a species, cetacean hearing ranges, and the acoustic characteristics of a habitat are necessary to construct an accurate index. This is not available for many species and most WW locations in the Caribbean (Weilgart, 2007).

WW Research: While a tool like the one developed here is necessary in order to mitigate the impacts of an industry that is growing faster than research, studies looking at

specific species in specific locations are necessary to develop the most effective methods to avoid negative impacts (J. Higham et al., 2014b). Thus those species with the most WW research could be less vulnerable to negative WW effects due to the fact that more is known about how to mitigate and avoid impacts for these species. There is little to no information on how often such information is utilized by the industry in order to improve regulations/guidelines, and this is necessary data in order to include this variable in the index.

ii. Variables With Contradictory Data

Migration and Reliance on Stored Energy: The impact of migration is uncertain, because there are a variety of things that might make a species more or less vulnerable to WW depending on this trait. Many species of migratory baleen whales, which travel from the poles to the equator every year, do not feed during the winter, and thus they rely on stored energy that cannot be easily replaced. WW is known to increase energy use and thus has the potential to create an energy deficiency in migratory cetaceans that they cannot make up during the breeding season (D. Lundquist, Gemmill, Würsig, & Markowitz, 2013; Scheidat et al., 2004). The Caribbean is a such wintering location where feeding does not occur as breeding and calving are carried out. Furthermore, in general, species that migrate are considered to be vulnerable due to their reliance on a variety of different habitat types, which require the cooperation of many countries to protect (Wilcove, 2008). In the case of WW, this means that migrating target cetaceans will be exposed to many potential industries with a variety of regulatory/guideline structures that may or may not be effective or inclusive of potential negative impacts. It is not clear, however, whether or not this would increase a species' overall vulnerability to WW as

compared to cetaceans that are residents and thus exposed to a single industry for much of the year (Würsig, 1996). Populations that remain in a certain area may be easier for WW boats to find, a larger expanse of their habitat could be impacted by the WW industry, and their ability to make up for energy lost due to WW harassment may not be easier, especially if their hunting grounds are disturbed as well.

Size of Social Groups: There are benefits and drawbacks to different group sizes and it is unclear whether or not large or small groups make cetaceans more or less sensitive to WW's effects. As per the ecological hypothesis of the selfish herd, animals in larger groups have a lower probability of falling prey to predators (Hamilton, 1971). Similarly, larger groups of cetaceans could lessen the amount of time that WW boats will spend with any individual (Christiansen & Lusseau, 2014; Davidson et al., 2012). Furthermore, larger groups have more individuals that can serve as lookouts for WW boats, which lessens the possibility that a group will be surprised by an approach, which can increase levels of disturbance (Neumann & Orams, 2006). In contrast, cetaceans that live in larger groups are easier to find for WWOs, which increases their exposure to WW boats (J. Higham et al., 2014b; Soule, 1983). Tolerance levels may also be lower in larger groups because higher numbers of less tolerant individuals can trigger avoidance reactions more often, thus increasing the energetic costs to the group (Christiansen & Lusseau, 2014).

Among cetaceans, group size is an indication of the types of social relations that a species has. For instance, larger groups are often indicative of cetaceans living in a fission-fusion society where they adjust their group size depending on predation risk and current activities (Christiansen & Lusseau, 2014). Animals living in this social structure

have a background rate of membership change among groups, but WW is known to increase these rates of membership change, which disrupts regular patterns of membership change (Bejder et al., 2006). Other species of cetaceans form close, individual bonds with members of their groups, and they may remain in a single group for their entire life. Separation or loss of individual members of the group are thus more traumatic for members of stable social groups (Mann et al., 2000). Due to these complexities and a lack of comparative studies, it is not clear how group size would impact vulnerability to WW impacts. More directed research on the impacts of WW in connection with social group size is needed, particularly in comparing the impacts for different populations and species.

History of whaling/small cetacean hunt pressures: Those cetaceans that suffer from past and present hunting may benefit from WW, because this industry is claimed to be an alternative to whaling, and also an economic activity that cannot coexist with cetacean hunting (Clapham et al., 2007; Greenpeace, 2004; Herrera & Hoagland, 2006; Hoyt & Hvenegaard, 2010; IFAW, 2013; WDC, 2016). Examples of this potential for WW to alleviate potential or current whaling pressures in the Caribbean include both the Dominica and St. Vincent and the Grenadines. For Dominica, this involved stepping out of the IWC, where they had been voting with Japan, in order to preserve their reputation as an ecotourism destination where WW is part of their tourism product (Caribbean News Now, 2011; Greenpeace, 2010). For St. Vincent and the Grenadines, there has been strong tourist opposition to aboriginal subsistence whaling there in reaction to the killing of whales near WW boats. For a country highly reliant on tourism, this opposition has

garnered enough concern within the government to have some officials calling for the end of local whaling (McClatchy, 2012).

The true influence of WW on whaling is not established enough for this variable to be included in the index, however, as there is conflicting data in terms of whether or not these industries are really mutually exclusive (Ris, 1993; Segi, 2003). There are instances of whaling and WW existing side-by-side. Japan and Norway are both good examples of this, as each has a strong WW industry, but these are also the countries that have pushed the hardest for an end to the worldwide moratorium on whaling (Andersson, Gothall, & Wende, 2014; Ris, 1993; Segi, 2003). Furthermore, the case of St. Vincent and the Grenadines may illustrate contention between WW and whaling, or it can be posed as a situation that shows WW's ineffectiveness at stopping whaling since small scale whaling has continued in spite of tourism complaints (McClatchy, 2012).

## **Section Five: Discussion**

### **A. Target and Non-Target Species Vulnerabilities**

The species included in the index have different combinations of vulnerabilities, although the overall susceptibility of these species to negative WW impacts will depend on the ways in which these stressors interact with one another, as well as which stressors are the most impactful overall. This indicates a need for either species-specific regulations/guidelines that have the ability to address the individual vulnerabilities of these Caribbean species, or detailed regulations that address all potential vulnerabilities for all species. In examining inventories of regulations in the Caribbean, as of 2012, only Dominica had any species-specific guidelines (concerning sperm whales) (Carlson, 2012), and interviews with WWOs in 2014 revealed that these guidelines are no longer being followed (personal communication, April 2014).

While WW impact research has focused on a few key species (e.g. killer whales, bottlenose dolphins, etc.) my analysis makes it clear that all WW target species and some non-target species in the Caribbean, including those less studied, have considerable potential for vulnerabilities to this tourism industry (Table 3.9). Species targeted by the WW industry all had at least one variable listed as High, and only the Pantropical spotted dolphin had two variables with Low vulnerability, three other species had one Low variable, and the rest had none. This illustrates the importance of regulations and it calls into question those claims about the utility of WW for cetacean conservation. It is true that many hope for education of visitors to garner support for conservation efforts, but few studies have explicitly looked at WW's effectiveness in this regard (J. Higham et al., 2014b; M. B. Orams, 1997b). Furthermore, the same economic incentives that are meant



to encourage WWOs to protect cetaceans from things such as whaling are those that encourage them to behave in ways that stress target animals (Neves-Graca, 2004; Silva, 2015; R. Williams et al., 2002). WW is also associated with coastal development and tourism driven degradation of coastal habitats that many cetaceans rely on (Birkun Jr, 2002; Jefferson et al., 2009). Most countries in the region utilized voluntary guidelines rather than enforceable restrictions on WWO behavior. There is also a difference in the detail of guidelines/regulations; many countries only address a few of the WW behaviors that can endanger cetaceans (Carlson, 2012). It appears that if WW is to avoid harming the animals that it relies on, further improvement of regulations/guidelines are needed.

Table 3.9: Summary of Vulnerabilities for Caribbean Cetacean Species With Medium-low Numbers of Whale Watchers or Higher.

Common Name	Biological Data			Habitat Data		Human Pressure	
	WW Pressure	Calving Interval	Maturity	Habitat Type	WW / Breeding	#WWers	IUCN Status
Atlantic spotted dolphin	Medium	Medium Low	Medium High	Medium Low	High	Medium Low	DD
Blue whale	High	Medium Low	Medium High	Medium Low	High	Medium High	High
Bottlenose dolphin	High	Medium High	Medium Low	Medium High	High	Medium High	Low
Costero	Medium	Data Deficient	Data Deficient	High	High	Medium Low	DD
False killer whale	Medium	High	Medium High	Low	High	Medium Low	DD
Humpback whale	High	Medium Low	Medium Low	Medium Low	High	High	Low
Pantropical spotted dolphin	High	Medium Low	Medium High	Low	High	Medium High	Low
Spinner dolphin	Medium	Medium Low	Medium Low	Medium Low	High	Medium Low	DD

Note: Groups are determined as follows: Species in group 1 have at least two variables listed as High vulnerability, and species in group 2 have one variable listed as High vulnerability.

Non-target species are also shown to have characteristics with the potential for vulnerability to WW impacts (Table 3.10). Two species that were not recorded as target species in any Caribbean countries, the Sei whale and rough-toothed dolphin, have variables with High values, and the only species with only Low variables (the pygmy killer whale) is data deficient in all three other variables. Some of this vulnerability is due to sensitivity of these species to indirect impacts, but it also suggests that were they to be targeted in the future, the potential for vulnerability would be there. For the most part, it is the cryptic nature of these species that has protected them from WW up till this point, but it is possible that new technologies will open up these species for use in WW in the future. No Caribbean WW regulations addressed the indirect impacts of the industry, methods for determining which species were acceptable WW targets, or acknowledged potential impacts on non-target species (Carlson, 2012). While there a considerable amount of uncertainty surrounding these species and the impacts of indirect effects, this analysis still suggests that protecting non-target species in one way or another would be advisable, especially in light of conservation claims for WW.

Table 3.10: Non-target Cetacean Vulnerabilities to Whale Watching Impacts. Identified via O'Connor et. al. 2009

<b>Common Name</b>	<b>Biological Data</b>		<b>Habitat Data</b>		<b>Human Pressure</b>	
	<b>Calving Interval</b>	<b>Maturity</b>	<b>Habitat Type</b>	<b>WW / Breeding</b>	<b>#Ww ers</b>	<b>IUCN Status</b>
<b>Sei whale</b>	Medium Low	Medium Low	Medium Low	Low	Low	High
<b>Minke whale</b>	Low	Medium Low	Medium Low	Low	Low	Low
<b>Pygmy killer whale</b>	No Data	No Data	Low	Low	Low	No Data
<b>Rough-toothed dolphin</b>	No Data	High	Low	Low	Low	Low
<b>Short-beaked</b>	Medium	Medium	Low	Low	Low	Low

<b>common dolphin</b>	Low	Low				
<b>Striped dolphin</b>	Medium	Medium	Low	Low	Low	Low
	High	High				

Note: Groups are determined as follows: Species in group 2 have one variable listed as High vulnerability, species in group 3 either have no High variables and less than four Lows or one High and four Lows, species in group 4 have for Low variables and no Highs, and species in group 5 have at least three variables listed as Data Deficient.

## **B. Species-Specific Results and Implications for Whale Watching**

It is worthwhile to examine some species in more detail, due to the combination of information on their potential vulnerabilities from this analysis, as well as what is known about these species otherwise. Examination of individual species is important to identifying specific vulnerabilities and will illustrate how this index can be utilized in conjunction with other data about cetacean species. The species that I will inspect in further detail are humpback whales, costeros, beaked whales, and sperm whales. These species were selected due to their relatively popular use in WW as well as the other conservation concerns (or lack thereof in the case of humpback whales) that they are facing.

Humpback whales are the focus of some of the largest WW industries in the Caribbean, including that of the world-famous Silver Bank in the Dominican Republic. The index reflects the nature of that relationship here, as this species has a High vulnerability in both the number of WWers and the overlap of breeding and WW season categories. Not only does the Caribbean WW season often reflect the presence of migratory baleen whales such as humpbacks, but some WW seasons, particularly that of the Dominican Republic, are based primarily on the presence of humpback whales (J. Higham et al., 2014b; O'Connor et al., 2009). Thus, WW pressure is relatively high for this species, and they are the target of both the observational (boat-based and aircraft-

based) and the swim-with industries, which indicates that the potential impacts are varied as well (Ministerio de Medio Ambiente y Recursos Naturales, 2015; O'Connor et al., 2009). It is somewhat encouraging, however, to note that all of the other variables for humpbacks are rated as Medium-low, except for the IUCN value, which is Low. Depending on the interaction of the stressors included here, this may suggest that humpback whales are well-suited for responsible WW ventures. In particular, those industries that enforce regulations or guidelines that address issues revolving around exposing mothers and their young to WW may be truly sustainable and then have the potential to support conservation (Schaffar et al., 2010; Weinrich & Corbelli, 2009).

For the other cetaceans to be explored here, it is less certain that WW is a good fit when the well-being of the species is a priority, and this may be due to habitat preferences, lack of data, or specific physiological characteristics. For example, the index for the costero, or Guiana dolphin, shows that there is a high overlap of the WW and breeding season, which indicates the potential for high exposure of vulnerable individuals to human visitors. Unlike the other cetacean species in the index, the costero is found in both river and inshore marine habitats, and thus they are particularly vulnerable to both the indirect and direct impacts of WW (Smol, 2008). River dolphins are sensitive to human impacts in general, and two of the most endangered/extinct cetacean species are riverine (Davidson et al., 2012; Turvey et al., 2007). There is also a relatively high level of uncertainty associated with this species, as three of the variables included here are Data Deficient. Due to this lack of data and the costero's use of vulnerable habitats, extra caution would be beneficial in this case for the development of WW.

Beaked whales (family Ziphiidae) as a group also deserve special considerations,

especially in the Caribbean where they have been the subject of scientific discussion due to their apparent vulnerability to particular forms of noise disturbances. Beaked whales are an open-ocean species that deep dive in order to hunt, and there is very little known about them due to these characteristics (Mann et al., 2000). Their habitat requirements make beaked whales a rare target for WW, but three of the four species included here were grouped among those species that were Data Deficient. Furthermore, the Ziphiidae family in the Caribbean has potentially suffered several times from impacts of naval sonar exercise, which may disturb these species as they feed in the depths and then cause them to surface at a dangerously rapid rate (D'Amico et al., 2009; D. P. Nowacek et al., 2007). These species serve as a good example of those cetaceans that are not currently valuable in terms of WW, but which also have the potential to suffer from indirect impacts of the industry's growth through increases in noise pollution coupled with the unknown status of these species overall. Indirect impacts, however, are rarely discussed in WW research, and have not yet been addressed by WW regulations.

Finally, researchers have noted the potential of sperm whales to be particularly vulnerable to WW, but the limitations of this index are further highlighted by the fact that this sensitivity is not immediately apparent. According to the index, sperm whales are the most vulnerable in terms of the overlap of their breeding season and that of WW. Their reproductive rates also show some potential for vulnerability, but otherwise the variables included here don't seem to suggest a need for particular concern. When sperm whales are at the surface where they are accessible to WW, however, they are often reoxygenating their tissues in preparation for their deep, hunting dives, or caring for their young (Gordon et al., 1992; Magalhães et al., 2002; C. Richter et al., 2006). Disturbing

them during these activities is detrimental to their well-being, and this vulnerability is so considerable that sperm whales were the first to have species-specific WW regulations suggested for them by both researchers (Carlson, 2012). This illustrates, once again, the need for further research into the complexities of WW impacts as well as species-specific information that would assist us in understanding how human pressures will impact different cetaceans.

Taken together, the data from this index illustrates that e-NGOs supporting the development of WW should exercise caution as this industry grows around the world. Despite economic pressures to run WW throughout target cetacean breeding seasons, and in areas that are consistently used by cetaceans, there is a need for WW pressures to be lessened, and limiting WW in time and space may help prevent some negative impacts. The index can also help identify which species seem to have low vulnerability to WW based on the data that we have at this time (such as humpback whales), and those species that should not be targeted, or only targeted with the utmost caution (such as sperm whales). This data can also be used to show which countries may not be suitable for WW development in that case that the cetaceans (both target and non-target) in that area all show high levels of vulnerability. Finally, considering the findings of Lacy et. al. 2017 about the effect of many human stressors on cetacean populations, indirect impacts must become more of a focus, and those characteristics with unknown directions of effect need to be investigated and further understood.

### **C. Study Limitations**

There are many limitations to this study, as my discussion of sperm whales, as

well as many of the caveats highlighted throughout my analysis and discussion, should make clear. These are primarily due to uncertainty, both in terms of our knowledge of different cetacean species and our need for further understanding of the interactions among WW stressors. Many of the species included in my analysis are Data Deficient in one or more of variables, six species have at least three variables classified as Data Deficient, and fifteen species are classified as Data Deficient by the IUCN. In other words, many cetacean species require more research on their life histories and physiologies before more can be said about their vulnerabilities to many human stressors, including that of WW. My analysis here has also revealed that there is little known about the interaction of WW stressors, there are some areas of potential vulnerability described by WW research that require more research before they can be included in any tool like the index developed here, and that indirect impacts of WW are widely understudied. Due to the complexity of this uncertainty, as well as the inherent difficulties involved in the study of marine mammals, it will likely take a considerable amount of time for these things to be better understood. In the meantime, syntheses such as this can lend valuable insight into what needs to be done to protect cetaceans from WW as it grows and changes with the rise of new technologies and changing human interests.

Immediate action is needed at this time, and my index may serve as another tool for NGOs, WWOs and governments to use in this regard, but my work here also illustrates that pressing need for more research into not only WW impacts and their relationship to cetacean characteristics, but also more data is necessary on the life history of many cetacean species as well. In order to continue adapting as this industry evolves, as well as to act effectively in light of what science has already shown us, that WW can

have serious short-term impacts on cetaceans, such information is needed to open the doorway for true vulnerability analyses (Turner et al., 2003). Adopting a adaptable management framework for managing these tourism impacts may thus prove helpful, as this management structure will allow regulations to adapt with growing knowledge of these impacts as well as cetacean characteristics (Keith, Martin, McDonald-Madden, & Walters, 2011; Walker et al., 2002).



## **Section Six: Conclusions**

My results suggest that changes in regulations/guidelines are necessary to address our current understanding of WW impacts, and there is a considerable need for more research into a variety of topics related to this analysis. In terms of regulations, the index shows that based on current WW impact research, Caribbean cetacean species have different combinations of potential vulnerabilities. All targeted species had some level of potential vulnerability due to characteristics other than their use in WW, non-target species were not without the potential for vulnerability due to indirect impacts and physiology. Indirect impacts need more research and regulations to address them as they impact both target and non-target cetacean species, as well as the marine environment. Regulations/guidelines meant to mitigate or prevent negative impacts are lacking overall in the Caribbean, with only a fourth of the region having enforceable regulations as of the last inventory, and none addressing either non-target species or indirect impacts (Carlson, 2012). Thus, there is a need for either species-specific WW rules, which address areas of high vulnerability for those species most in need of them, or for rules that address all possible areas of vulnerability for all species, as per the precautionary principle (Kriebel et al., 2001; Pagiola, Bishop, & Landell-Mills, 2002).

Areas in need of further research have been discussed above, but include general life history and physiological information about cetacean species, direction and level of impact for different characteristics associated with vulnerability to direct and indirect impacts of WW, as well as further understanding of stressor interactions in this system such that a full vulnerability analysis could be carried out. This data will likely be key to our ability to protect cetaceans from a variety of human impacts, including WW, and this

will also assist in balancing industry needs and human livelihoods with the long-term health of cetacean populations. It is clear that further protective measures are necessary, and due to high levels of uncertainty, the precautionary principle may be a needed guiding philosophy. Further research, coupled with adaptive management strategies, will allow WWOs to innovate, maintain visitor satisfaction, and protect their resource in the long-term. These things will, in turn, be necessary for e-NGO claims about the benefits of WW to both people and cetaceans to manifest.

## CHAPTER FOUR: RESIDENT PERCEPTIONS OF WHALE WATCHING IN THE CARIBBEAN

### **Section One: Abstract**

There are many claims about the economic and environmental benefits of the whale watching industry, but few studies have examined this industry's relation to local people living in whale watching destinations. Resident perceptions of tourism in general (and here whale watching (WW) in particular) provide insight into potential economic and environmental sustainability issues, and are key elements in understanding and harnessing local support for an industry and conservation projects that may be essential to the long-term viability of tourism. To examine local perceptions of WW tourism in the Caribbean, I carried out qualitative interviews in the Dominican Republic, and preliminary interviews in Dominica. These studies revealed that in general residents do support WW tourism, and did not perceive many of the potential negative impacts of this industry. However, conflict between whale watching operators and regulating bodies was found to be a common trend, particularly surrounding the discussion of what whale watching behavioral regulations should be enforced.

### **Section Two: Introduction**

Whale watching (WW), or the observation of cetaceans in their natural habitat, is one of the few industries that is widely supported by environmental NGOs (Greenpeace, 2004; IFAW, 2013; WDC, 2016). This approval stems from the potential of WW to not only support coastal communities around the world, but to serve as a non-consumptive alternative to whaling. WW is also thought to enhance cetacean conservation through the

education of local people and visitors about threats to whales, dolphins, and porpoises, as well as their importance to humans (J. Higham et al., 2014b; Hoyt, 2005b; M. B. Orams, 1997b). Efforts to bridge human and environmental needs are never simple, however, as struggles to attain win-win benefits through ecotourism and conservation development projects have illustrated. Effective management and stakeholder support is needed in order to protect the biosphere while also supporting economic growth and prosperity, and there are many cases of projects failing in one or both of these categories (Nyaupane & Poudel, 2011; Wells & Brandon, 1992). Understanding local perceptions, especially resident perceptions of both the benefits and costs to them and their community, of these projects/industries can help researchers, and industry professionals to understand the extent to which these efforts are perceived as supporting the community, and what areas of support may need to be further developed or improved. Local support is also necessary for the long-term success of conservation efforts, as residents are most often impacted by regulations meant to protect the environment, and it is they who will need to maintain conservation efforts when international funding and/or interest wanes (Gossling, 1999; Nicholas et al., 2009; Tisdell, 2012; Wells & Brandon, 1992). Thus, in the case of WW, examining resident perceptions is informative in determining when and how some WW industries attain win-win benefits for both local people and cetaceans, and what failures of areas of tension are experienced by residents.

As useful as resident perception data could be for understanding the fuller social context of WW, there are relatively few social science studies on this industry, and most focus on visitors due to the importance of marketing and client satisfaction to the success of WW. Research that has examined resident and/or WW operator (WVO) perceptions

has uncovered a complex social situation in which conflicts often arise surrounding protective regulations for cetaceans, or due to competition between operators. For example, a 2004 workshop in Argentina with WWOs found that participants perceived a wide array of economic and social benefits stemming from WW, but the majority of them did not comply with rules meant to protect target animals from being disturbed by WW boats (Sironi et al., 2005). In the Azores, conflict among WWOs, which stemmed from the differing backgrounds of the operators, was found to undermine their ability to develop a system of protective guidelines/regulations (Neves-Graca, 2004; Silva, 2015). Considering the potential for such disturbances to turn into long-term impacts on cetacean populations, this outcome suggests that the Argentinian and Azorean WW industry and its benefits may be ecologically unsustainable (Parsons, 2012).

Resident perceptions surrounding WW are also known to take on another level of complexity in communities with current or previous whaling industries. In Norway, it was found that trying to establish an openly anti-whaling WW industry in an area with historic cetacean hunting was not successful, as local customs and resident involvement were not respected (Ris, 1993). There is also evidence that, in a cultural sense, WW is not equivalent to whaling, a conclusion that undermines NGO claims to the contrary (Reeves, 2002; Ris, 1993; Segi, 2003). In the Azores, local people considered the whaling industry to provide better jobs for them than WW, and also believed that the benefits of whaling were more widely shared (Silva, 2015). Finally, although the Pacific island nation of Tonga has ceased its traditional whaling, there is an acknowledgement that WW is unable to fill the cultural gap left behind. Whaling was an activity that provided a relatively healthy source of food for residents, and strengthened social bonds through the

sharing of whale meat among members of the community (Moyle & Evans, 2008). Thus, using WW as a tool to oppose whaling can result in cultural conflict and undermine the ability of WW to provide economic and conservation benefits to local people.

Understanding resident perceptions of this industry can help address these issues.

In light of what little is known about WW's specific relationship with local people, referencing the much more expansive knowledge-base of perceptions regarding to tourism in general may be informative, particularly concerning characteristics that may influence resident perceptions of local tourism industries. Social exchange theory, which posits that positive or negative attitudes towards an industry are formed through perceptions of how both tangible and intangible costs and benefits balance out, is most often used by tourism researchers to examine local attitudes towards tourism (Andereck et al., 2005; Ap, 1992; Goyder & Boyer, 2008; Rasoolimanesh et al., 2015). In connection with this, the most common variable found to explain resident perceptions of tourism is a local people's economic dependence on this industry. Social exchange theory posits that those individuals that experience more economic benefits from tourism have a more positive attitude towards it (Harrill, 2004; Látková & Vogt, 2012; Madrigal, 1993; Rasoolimanesh et al., 2015). As tourism matures in a location, perceptions of residents about the tourism industry tend to become more negative. In some sense, this may be due to growing understanding of residents about the costs or negative impacts of tourism on the community, or due to the heightening intensity of some negative effects such as overcrowding (Ap & Crompton, 1993; Hunt & Stronza, 2014). One study found that much of a variance in perceptions was due to the impact of a destination's stage of development rather than economic dependence on the industry (Madrigal, 1993).

Power and community connections have also been found to be key determinants in resident perceptions of tourism. In general, powerful members of the community often have more positive attitudes about the industry. They are more able to partake in tourism development decision-making and are in a better position via education and/or resources to benefit from the industry (Ap, 1992; Muganda et al., 2010; Nicholas et al., 2009). Likewise, the more power that a community has to shape the tourism industry, the more positive resident perceptions about it tend to be (Madrigal, 1993). Those residents who have close connections with the community through time and tradition may have a more negative attitude towards tourism, due to their sensitivity to the changes caused by tourism (Harrill, 2004; Látková & Vogt, 2012; Rasoolimanesh et al., 2015). Alternatively, in cases of destinations suffering from economic downturns, those closely connected with the community may support tourism as a method of helping address the economic hardships of the community (Gursoy & Rutherford, 2004).

Finally, environmental stances and general demographics can help shape the perceptions that local people have of the tourism industry. In general, people who are more concerned about the environment have negative perceptions of tourism, due to its impact on the biosphere, but in cases of the implementation of new protected areas for tourism purposes, people that prioritize environmental health may see tourism as an opportunity to bolster protective measures, as is apparent in NGO support for WW (Jurowski et al., 1997; Látková & Vogt, 2012; Rasoolimanesh et al., 2015; Wang & Pfister, 2008). In terms of demographics, some researchers have found that gender and age can impact resident perceptions, specifically that women and older members of the community tend to have more negative attitudes towards tourism due to marginalization

and gender/age specific interactions with tourists (Harrill, 2004; Mason & Cheyne, 2000; Rasoolimanesh et al., 2015). However, many other studies have found demographics to be bad predictors of positive or negative perceptions (McGehee & Andereck, 2004; Sirakaya et al., 2002; Tosun, 2000).

While the study and understanding of resident perceptions of tourism is complex and uncertain, it lends essential insight into the social impacts of tourism around the world. Without this support, residents may be exploited and they may undermine the industry through unpleasant treatment of visitors, or anti-tourism political action (Garau-Vadell et al., 2014; Gursoy & Rutherford, 2004; Higgins-Desbiolles, 2011). In the case of WW, resident perceptions are doubly important since this particular form of tourism can, in the right conditions, encourage people to protect cetaceans and their habitat, and such local support is key to the long-term success of conservation (J. Higham et al., 2014b; West et al., 2006). Thus, the goal of this study was to reveal the perceptions of local people in WW host communities concerning this potential ecotourism industry as well as perceptions of associated cetacean (whales, dolphins and porpoises) conservation concerns. The resulting data are therefore meant to shed light on the social and environmental sustainability of WW, looking at the balance of perceived costs and benefits to the community. This has not been examined for WW before, despite the claims that e-NGOs have made about this industry's positive impact on coastal communities. Resident experiences must be understood for these claims to be supported, and this data can also indicate if, how, and why WW might play a role in gaining resident support for cetacean conservation.



### **Section Three: Study Methods**

#### **A. Study Site Selection: The Dominican Republic and Dominica**

I carried out my interviews in the Dominican Republic with a preliminary interview-based study in the Dominica. I conducted my pilot study in Dominica in order to test my interview protocol, and also because of the role of WW in shaping that country's international whaling stance. I selected the Dominican Republic (DR) due to its prominence as a WW destination in the Caribbean, as well as its innovative management strategies.

Although WW as an industry was conceived in the 1950s along the coast of California, the world-wide industry did not begin to develop at a large scale until the 1980s (J. Higham et al., 2014b; Hoyt & Hvenegaard, 2010). WW in the DR was developed within this early period, and it established the marine mammal sanctuary of Silver Bank and Christmas Bank (Santuario de Mamíferos Marinos Bancos de La Plata y La Navidad, henceforth referred to as the "Silver Bank Sanctuary" or "Silver Bank") in 1986 for the protection of the country's primary WW target species, the humpback whale (*Megaptera novaeangliae*) (Ministerio de Medio Ambiente y Recursos Naturales, 2015; O'Connor et al., 2009). At the time of the last global WW survey in 2008, the country had 33 WWOs and 28,000 WWers, making it one of the top five largest WW industries in the Caribbean (O'Connor et al., 2009). Thus, the DR is key to Caribbean WW in terms of both its historic experience with the industry, but also the size of the WW industry, which has only grown since the global survey (Ministerio de Medio Ambiente y Recursos Naturales, 2015).

The structure and management of WW within the DR also makes this nation a prime study location. As will be discussed in more detail in the following sections, my primary informant for the sanctuary's history described the process of regulation within the Silver Bank Sanctuary to be a form of co-management. Within the environmental management literature, this means that the sanctuary and the WW within it is regulated by both the government and the stakeholders (Carlsson & Berkes, 2005). This is represented in the Silver Bank Sanctuary management plan, which notes the following in its executive summary: "The formulation of the management plan was based on broad and active participation of different actors, which... conducted 8 workshops, meetings..." (Ministerio de Medio Ambiente y Recursos Naturales, 2015). While there is some debate as to how successful relationship-building has been in this process, as will be illustrated by the interviews in the following sections, this focus on partnerships between the state and community actors is fairly unique in terms of WW regulations (Carlson, 2012), and represents a promising method of addressing conflicts between top-down and bottom-up management strategies.

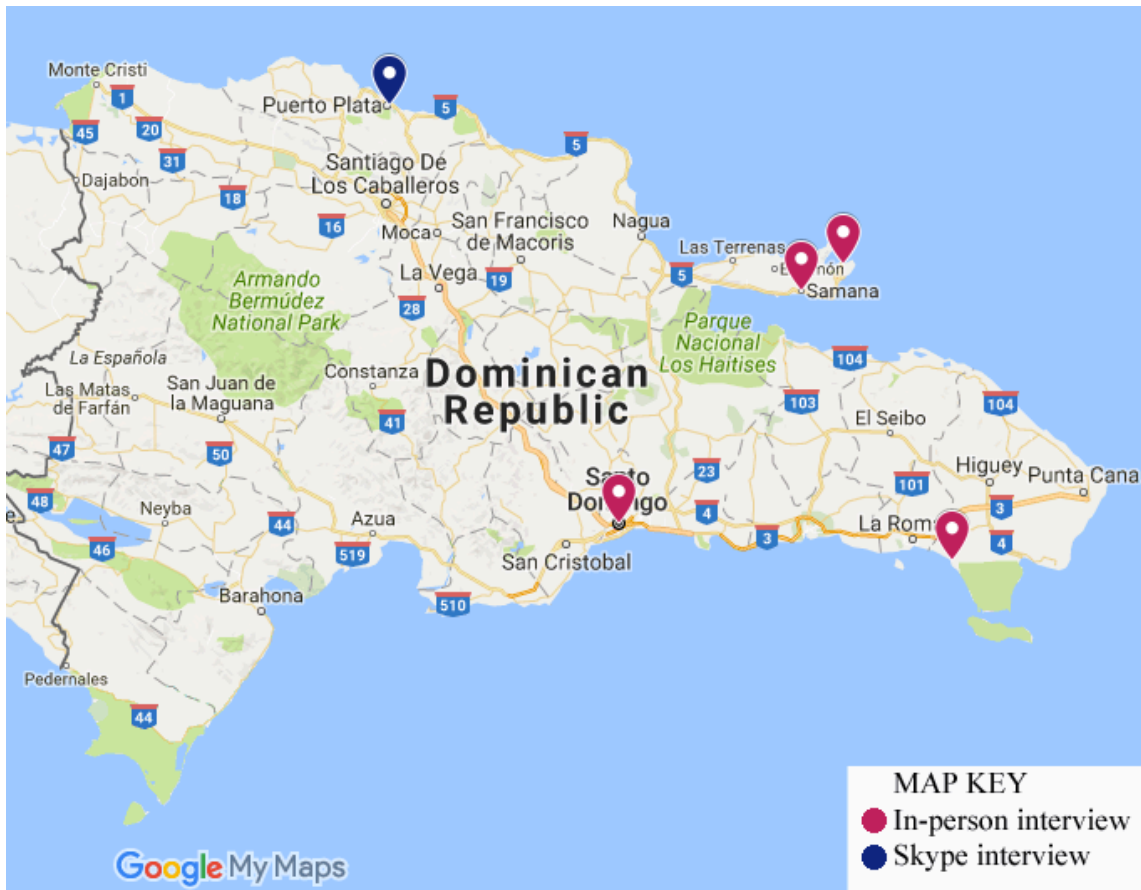


Figure 4.1: Study Site Locations in the Dominican Republic. The WW base-of-operations highlighted for my Skype interview with a Puerto Plata WWO.

Specific study locations within the DR were selected with the help of my "gatekeeper" (a person with strong connections in and knowledge of the community, who helps guide and facilitate social research (Kvale & Brinkmann, 2009)), on the basis of their importance to the WW industry in the country. My primary study site was located in Samaná Village, a community where the vast majority of WW tourists pass through for observational tours of the humpbacks that visit Samaná Bay in the winter and early spring. Local people, as well as WWOs, the Center for the Conservation and Eco-Development of Samaná Bay and its Surroundings (CEBSE) employees, and government officials from the Ministry of Tourism and the Ministry of the Environment were

interviewed on-site here. I also visited the neighboring towns of Carenero and Las Galeras for interviews with local people and small-scale WWOs of Samaná Bay. Swim-with tours are carried out on Silver Bank north of Puerto Plata, and thus I also interviewed a WWO from this part of the DR's industry, although that particular discussion was done over Skype due to time limitations during my fieldwork. Finally, interviews with my informant for the history of the sanctuary as well as ecotourism practitioners were carried out in Santo Domingo, and the Bayahibe/Dominicus area, since this is home to the marine NGO FUNDEMAR.

My preliminary study was carried out in the Eastern Caribbean nation of Dominica, due to this country's emphasis on ecotourism, its unique WW product, and the role that tourism has played in its participation in the International Whaling Commission (IWC), the international body that regulates whaling. Dominica's WW industry developed in the early 1990s, with a reported 14 WWers traveling with a single operator in 1991. By 2008 those numbers had risen to 14,500 WWers with four operators, and an estimated total expenditure of \$1.8 million USD (O'Connor et al., 2009). Dominica is also a key case study because of its government's changing stance on whaling support in the IWC. Dominican officials came to believe that whaling support was against their country's best interests, as they market Dominica as the Nature Island, the ecotourism destination of the Caribbean (Caribbean News Now, 2011; Mulvaney, 2003; Stoett, 1997). This supported the claims of environmental non-governmental organization (E-NGOs) that ecotourism like WW could serve as an incentive to withdraw support for the whaling industry (J. Higham et al., 2014b).



Figure 4.2: Study Site Location in Dominica.

Both observation-only, boat-based WW and swim-with WW is done in Dominica. While the observational tours are opportunistic when it comes to other cetacean species sighted during trips, both forms of WW rely on a unique population of resident sperm whales. WW in Dominica started as observation-only tours, but after one of the WWOs started getting into the water with a young male sperm whale and his pod, swim-with tours developed at a small scale (O'Connor et al., 2009). Regulations at the time of the interviews covered here included guidelines that were developed by the International Fund for Animal Welfare (IFAW) and Dominican WWOs (Carlson, 2011), but which interviewees indicated were not used. For Dominica, my specific study site was the capital city of Roseau, where most of the WW was carried out. Most of my interviews

were in-person here, and I also carried interviews via Skype for participants that were not available during my trip to Dominica.

## **B. Interview Protocol and Administration**

In order to gather data on the resident perceptions of the DR WW industry and associated cetacean conservation/protective measures, I designed and administered a series of semi-structured, qualitative interviews. The qualitative method was selected due to the scarcity of social research having to do with WW, especially with a focus on the host community. Qualitative interviews are particularly helpful in gathering in-depth data on little-studied subjects, while also removing some elements of researcher bias, which are inherent in survey methods (Creswell, 2013; Saldaña, 2013). These interviews were designed for three major groups of participants, (1) local people (not employed in the WW industry), (2) WW operators (WWOs), and (3) other key informants (government officials, NGO managers, historic figures, and researchers). Local people and WWOs are the focus of my analysis, because of their importance to the social and environmental sustainability of WW (Carlsson & Berkes, 2005; Wells & Brandon, 1992). Information from government as well as NGO officials and key historic figures was used to add context to the information gathered. The questions included in the interviews for each of these groups varied, but overall the key areas of focused inquiry were (1) the perceived costs and benefits of WW to the community and individuals, (2) attitudes towards cetaceans and measures to protect them from human threats (WW and otherwise), and (3) questions that sought to gather more detailed information about the structure and management of WW in each respective WW location (see Appendix VI for full interview

forms). For my results, I assigned a code to each of my participants, with L for local people (non-WWO), WWO for whale watching operators, and O for other informants; a number identifies different individuals in each group, and P is put at the beginning of Dominica respondent codes due to this being a pilot study.

I carried out my main interviews in the Dominican Republic during the spring and summer of 2016, both in person and with the use of Skype. I administered most of my interviews in Samaná village, with some others being carried out in Carenero, Las Galeras, Bayahibe, Dominicus, and Santo Domingo. I obtained participants with the help of my gatekeeper, and after an initial set of interviews, I utilized a snowball method to select further local respondents. This method was utilized because it introduced an element of randomness to the sampling that was not possible with the sole use of participant identification by my gatekeeper, because it allowed me to utilize the social networks of several people, rather than one (Biernacki & Waldorf, 1981; Kvale & Brinkmann, 2009). I carried out the interviews in Spanish or English as appropriate, and all such conversations were recorded after gaining permission from the respondents. I directly transcribed the English interviews in English, and Spanish interviews were translated and transcribed with the help of FUNGLODE. A total of 20 interviews were administered in the Dominican Republic, eight were with local people (non-WWOs), six were with WWOs, two were with NGO leaders, two were with government officials, and two were with other informants. I utilized this number of interviews and mix of interview groups due to data saturation.

My preliminary study was administered in the spring of 2014 in the city of Roseau, with additional Skype interviews being carried out afterwards when participants

were available. My method of locating participants was a similar mix of gatekeeper identification and the snowball method, and all interviews were recorded with the permission of respondents. Eleven interviews were administered in total based on data saturation and time constraints of the pilot study. Five of these were with local people (non-WWOs), two were with WWOs, and four were with government officials or other informants. All interviews from Dominica were in English, so I was able to transcribe these on my own. For both groups of interviews, I attempt to keep all participants anonymous to protect privacy and as per IRB agreements discussed with respondents.

In what follows, I present my findings relating to the Dominican Republic before those of my pilot study due to the need for comparison between these two case studies. My preliminary study was carried out in 2014, and I coded and analyzed my interviews shortly after. This was my first opportunity to code, and due to my pilot study, I was able to get hands-on experience with coding. As a result, when I began analyzing my Dominican Republic interviews, I was able to make more relevant connections and think more deeply about the information that I was pulling out of the interviews via coding. Thus, when I was finished, I decided that I wanted to re-examine my Dominica interviews in light of my findings in the Dominican Republic, because I believe that being able to compare the two case studies will lend insight into how the WW industry is faring among these two different communities. Thus, I report my preliminary findings after those of my primary study, because the results that I present here for Dominica were informed by my work with the Dominican Republic interviews.



### **C. Interview Analysis**

The data gathered in my interviews were analyzed with qualitative coding and the use of social exchange theory (SET), as a lens to understand the results of my interviews (Ap, 1992). My analysis was also informed by the tradition of phenomenological philosophy (Converse, 2012), which is helpful in aiding researchers in removing their biases from the data. Before I started the coding process, I reviewed the interviews to get an initial grasp of the narrative, and utilized word clouds to evaluate the prevalence of words in the responses of my primary study groups, local people and WWOs. For my coding analysis, I utilized descriptive coding first, which attaches an identifying code to a relevant section of interview transcript based on its content. This initial analysis helped define the narrative, and led me to the use of conflict coding (Saldaña, 2013).

The potential of social conflict can be considered a cost that the WW industry imposes on the local community, which is relevant because social exchange theory tells us that resident attitudes towards tourism are shaped by perceptions of costs and benefits (Ap, 1992; Jurowski et al., 1997; Látková & Vogt, 2012; Rasoolimanesh et al., 2015; Wang & Pfister, 2008). Such negative interactions are also important from an environmental sustainability standpoint in regards to the health of the cetacean resource, because conservation conflicts (defined here using Redpath et al's 2013 definition: "situations that occur when two or more parties with strongly held opinions clash over conservation objectives...") are to be expected, but undermine the ability of conservation projects (such as those protecting cetacean from WW impacts and other human impacts, in this case) to attain results (Redpath et al., 2013). In the case of WW, past social research has illustrated that conflict over protective measures for target cetaceans is

relatively common, and this can prevent the development and implementation of effective measures to prevent harassment (Moyle & Evans, 2008; Neves-Graca, 2004; Silva, 2015; Sironi et al., 2005). Such regulations or guidelines are integral to WW's ability to function as ecotourism, as limits on WWO behavior is key to preventing negative impacts on target animals (Dans et al., 2008; Erbe, 2002; Jensen et al., 2008; Matsuda et al., 2011; S. M. Nowacek et al., 2001; Parsons, 2012; Stamation et al., 2010). On the other hand, cooperation can be considered a social benefit of WW, and it is key to the DR's ability to utilize co-management as a means of management (Carlsson & Berkes, 2005). Due to this, I modified the conflict coding method to include both instances of conflict and cooperation. I also examined instances of these interactions not only between stakeholders, but between key concepts like biodiversity conservation, as well as some actions of interest (e.g. building a road, investing in the community).

For my third round of coding, I utilized pattern coding to help me condense my descriptive codes and conflict/cooperation codes into salient themes (Saldaña, 2013). Finally, after condensing my codes into themes, I utilized my data to construct a diagram of the WW industry's structure in the DR as described by participants, and I also created diagrams of perceived conflicts and cooperation between people, actions, and concepts (e.g. conservation, tourism, etc.) by respondent groups. Since the total number of interviews was fairly small at saturation, I included all mentions of relationships in these diagrams even if they were described only once. These visual representations were then used to further examine interviewee perceptions of relations within the DR WW industry system, and shed light on the differences in perceptions among groups, particularly residents and WWOs.

Once these tools for analysis were developed, the groups of residents and WWOs were examined the most closely to develop an understanding of resident perceptions of both the WW industry and protective measures for cetaceans. Local people were the primary focus of this inquiry, due to the role that they play in the social and environmental sustainability of any potential ecotourism venture. While regulations attempting to address the potential negative impacts of WW have emerged throughout the world, it has been found that voluntary guidelines developed by the WWOs themselves have become quite common (Wiley et al., 2008). In the case that regulations are eventually put into place, past WW social research would also suggest that the participation of WWOs in determining what these regulations are is key to their success (Parsons & Woods-Ballard, 2003; Silva, 2015). There are clearly cases in which the incentive is for WWOs to ignore such rules, due to the impression that clients want to quickly get close to the whales (M. B. Orams, 2000), but on the other hand, there are cases in which WW professionals act first to protect the cetaceans that their businesses rely on (J. Higham et al., 2014b). Operators are integral to protecting cetaceans from their own industry, and they can also enhance conservation outcomes by providing great educational opportunities, as well as research platforms (Hoyt, 2005b; Hoyt & Hvenegaard, 2010). Industry business models can also impact the ways in which WW does or does not support the community (Ris, 1993; Silva, 2015), so WWO perceptions of the industry and potential conflicts and sources of cooperation are also important when considering WW's ability to attain social, economic, and environmental sustainability.

My analysis of the preliminary interviews had two separate analysis cycles, one before the administration of my interviews in the DR, which was meant to inform the

work that I would do during my full fieldwork. My second cycle of analysis, which is presented here, was partially based on my findings from the DR. Results from my preliminary study in Dominica are not as detailed as those from the DR as my interview was not yet in its finalized form, and my preliminary study period was very short. The information produced by these studies is still worth examining and comparing to the results of the DR, however, as they illustrate similarities and differences in Caribbean WW industries.

#### **D. Researcher Bias**

The phenomenological method in social research requires that I disclose my own biases about the WW industry, in case these preconceptions impact my analysis (Converse, 2012). The first potential bias that I have as a researcher is that I have a background in ecology and conservation biology, and environmental health is a personal priority of mine. Due to this, it is possible that I prioritize biodiversity conservation more than is necessary for my question, although I actively tried to balance conservation and social questions as appropriate for my overarching question about local perceptions of WW and associated conservation methods. I have also done extensive research on the negative effects of WW, and my familiarity with these industry-caused threats to cetaceans may have shaped my interviews and my application of those interviews. Through my research, I have come to the conclusion that WW must be done in an extremely careful manner in order to insure that cetaceans aren't harassed, and that this level of precaution is rarely attained by the industry. Thus, I do have some level of skepticism when I speak to respondents that believe that WW has no negative impacts on

the community or the animals being targeted. Nonetheless, it was and still is my aim to uncover the lived experience of local people in the DR, and to follow the phenomenological philosophy, so I did attempt to keep these biases from shaping my results.

Finally, I utilized an intercoder reliability test to check my interpretation of the data with that of another qualitative researcher. This test gave an intercoder reliability score of 0.83, meaning that our codes matched 83% of the time.

## **Section Four: Main Interview Results and Discussion for the Dominican Republic**

### **A. About the Interviews**

Over the course of this study, 21 individual interviews were administered in the DR. Eight of these were with local people (not employed in the WW business), and they came from a variety of backgrounds, with jobs in a variety of fields such as science, law, education, and tourism. Half of these local respondents were directly involved in the tourism industry, however, either being employed as a guide, or a souvenir seller. Six interviews were with WWOs working in Samaná Bay, in both Samaná Village and Carenero, and one interview was done over Skype with an operator that had worked in the swim-with industry off Puerto Plata. Officials from the Ministry of Tourism and the Ministry of the Environment were also interviewed, as were representatives from the NGOs of FUNDEMAR in Bayahibe and CEBSE in Samaná Village. Other information was gathered from a scientist working on ecotourism in the Dominican Republic, as well as a central historical figure in the DR's whale watching history and development.

### **B. Word Prevalence in WWO and Local Responses**

Figure 4.3 represents all of the responses of local people in Samaná concerning the costs and benefits of whale watching to their community, as well as associated conservation. The largest word in this cloud is "whales" with 75 occurrences (108 if you count "whale" as well), and words such as "people" (46 occurrences), "think" (39), and "see" (38) were common as well. Words with positive, beneficial connotations were prevalent, as were social words, both of which are listed in the table below (Table 4.1). Words with negative connotations occurred less, with "problem" being used 10 times,

and "difficult" only 7. Environmental descriptors included "whales" (108), "environment" (17), and "protection" (5), while regulatory mentions included things such as "ministry" (10), and "invest" (9), which was described in connection with the Ministry of the Environment.



Figure 4.3: Word Cloud for Resident (Non-WWO) Responses to the Interview Protocol

Table 4.1: Summary of Positive and Social Words in Resident Responses to the Interview	
Positive/beneficial words (count)	Social words (count)
money (23)	people (46)
good (21)	Samaná (28)
pay (14)	community (14)
tourists (10)	children (11)
work (8)	everyone (9)
economic (5)	students (7)
	Dominican (7)
	industry (7)
	person (6)
	school (6)





Due to this, the summary of word occurrences includes only words with more than 5 appearances in the participants' responses. Though local people (non-WWO) and WWO interview responses should not be compared as they were asked different questions, similar categories of words were analyzed and include words in the following table with a positive connotation or indicating a benefit, words with a negative connotation, as well as social, environment and regulatory words. Several names from key leaders in the whale watching community (both operators and government officials) also showed up in the initial word clouds, but they were edited out as per IRB protocols.

Table 4.2: Summary of Word Occurrences in WWO Responses

<b>Positive/ Benefit</b>	<b>Negative</b>	<b>Social</b>	<b>Environmental</b>	<b>Regulations</b>
money (17)	nothing (9)	people (70)	whale(s) (220)	permit(s) (55)
better (13)	stop (9)	guests (30)	Environment (30)	regulations (19)
pretty (13)	difficult (8)	association (18)	calf (16)	ministry (28)
pay (11)	less (7)	everybody (15)	conservation (8)	association (18)
understand (10)	end (7)	passengers (13)	humpback (8)	season (18)
remember (10)		community (13)	shark (8)	resolution (11)
tourism (10)		operators (12)	animal(s) (13)	stay (11)
good (10)		person (11)	protect (6)	comply (10)
interesting (7)		talk (11)	threat (6)	government (7)
income (7)		business (10)	song (6)	supposed (7)
gave (7)		captains (10)		representative (6)
knowledge (6)		owners (10)		co-management (6)
together (6)		group (10)		minister (6)
nobody (6)		guy (10)		managed (6)
work (6)		operator (9)		control (6)
paid (6)		company (7)		
job (6)		members (6)		
		meeting (6)		

### C. General Themes Produced by Interviews

The coding process revealed several key areas of interest, most due to the design and focus of the interviews (such as those themes that focused on WW details and structure, knowledge of cetacean conservation, and perceived costs and benefits), but the themes concerning conflict and cooperation were emergent. The most interesting result of this first look at the themes, other than the discovery of the importance of positive and negative relationships/interactions with the WW industry, is the difference in the detail of perceived costs and benefits. The benefits of WW include environmental, economic and education themes, which support claims by environmental NGOs about the industry (IFAW, 2013; WDC, 2016). Only social and environmental costs were described, and to a much lesser extent than the benefits. The following sections will examine these themes in detail for both residents and WWOs.

Table 4.3: Themes and Sub-themes

<b>Whale Watching Themes</b>	<b>Conservation Themes</b>
<ul style="list-style-type: none"> <li>- Benefits</li> <li>- Characteristics</li> <li>- Costs</li> <li>- Stakeholders</li> </ul>	<ul style="list-style-type: none"> <li>- Actors</li> <li>- Characteristics</li> <li>- Protective Measures</li> <li>- Threats</li> </ul>

<b>Benefit Themes</b>	<b>Cost Themes</b>
<ul style="list-style-type: none"> <li>- Economic</li> <li>- Experience/Education</li> <li>- Environmental</li> <li>- Social/Cooperation</li> </ul>	<ul style="list-style-type: none"> <li>- Social/Conflict</li> <li>- Environmental</li> </ul>

#### **D. Perceptions and Knowledge of Whale Watching**

In regards to resident perceptions of WW, four major sub-themes emerged from the interviews, encompassing local knowledge about the structure of the industry, acknowledging different stakeholder groups, and finally, the benefits and costs of the industry to the community. Due to the fact that benefits and costs are also themes in and of themselves, I will discuss each in the following sections (section F for benefits and section G for costs), so I will be focusing on resident understandings of the structure of WW and stakeholders here. While the structure of the Dominican Republic WW industry is described in various forms in the literature (Carlson, 2012; Ministerio de Medio Ambiente y Recursos Naturales, 2015; O'Connor et al., 2009), interviewing WWOs and local people (as well as gathering information through supporting interviews) about its structure sheds light on the overall perceptions of the industry, as well as resident understanding of how the industry is run, which may be different from its management on paper.

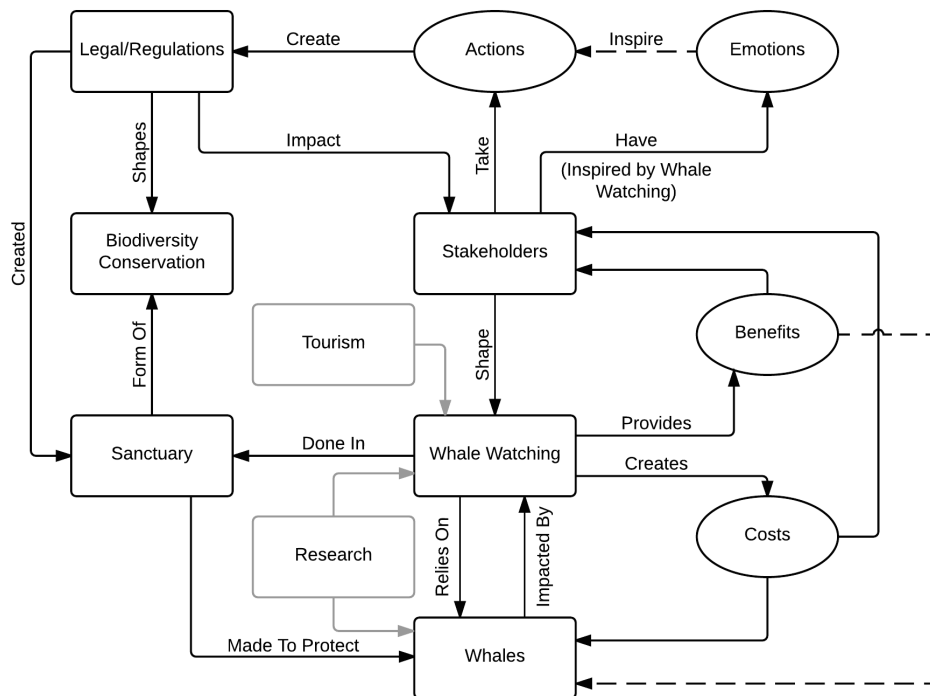


Figure 4.5: Structure of the Dominican Republic Whale Watch System as Per Descriptive Coding. Boxes represent various stakeholders in the system, and ovals include intangible influences on the system. Arrows point from the actor to the acted-upon as described by residents. Dotted lines and grey boxes represent connections that I felt were implied by respondents but not explicitly described.

Descriptive coding analysis was used to develop Figure 4.5 depicting the structure of the WW industry in the DR. The results of this exercise are not surprising, but it illustrates the relationship between different entities in the system (e.g. whales, the WW industry, stakeholders, etc.) and less tangible concepts such as costs, benefits, actions and emotions. In this case, dotted lines indicate connections that I determined based on indirect references within the interviews, as well as support from the literature, such as the benefits of WW for whales (e.g. education for tourists and serving as an economic alternative to whaling) (Hoyt, 2005b). I have also created a connection between emotion and action, as conservation psychology supports the idea that these two things are

connected (Clayton & Myers, 2015). Overall, the interviews illustrate how WW costs and benefits to both humans and whales influence the actions of stakeholders, and the roles of conservation tools utilized in the DR. Those stakeholders that were identified during the course of the interviews include the following: the community, fishermen, NGOs, the Ministry of the Environment, the Ministry of Tourism, tourists, tour operators, whales, and WWOs.

In terms of WW's history, there are two slightly different stories that were told by different respondents. The first emphasized the role of the government and of scientists in discovering and understanding the activities of humpback whales in the Silver Bank and in Samaná Bay. In this telling of the story, WW was utilized as a tool to incentivize the protection of Silver Bank, one of the first protected areas of its kind. In this case, the original guidelines for WW appear to be top-down, although co-management has long been the goal of the Silver Bank Sanctuary protected area. However, the other story told implied a bottom-up approach, because the WWOs were that they needed to create rules to prevent the harassment of target animals, due to the fear that the whales were being driven away. WWO respondents in both Samaná and Puerto Plata stressed the importance of industry involvement in the protection of the animals, which appeared to lead to both official and unofficial ways of attempting to lessen the stress that WW caused for target animals.

Since co-management seems to be the management strategy utilized in the Silver Bank Sanctuary, these two stories are not mutually exclusive and suggest that state and industry stakeholders have both felt deeply involved in the process of management (Carlsson & Berkes, 2005). The described structure of WW monitoring and regulation at

the time of my interviews also suggests that co-management has been successful thus far in the DR. Firstly, and perhaps most important when considering the potential for WW to have positive economic impacts on the community, interviews with WW professionals and the Ministry of the Environment official indicated that all WWOs in Samaná Bay (as of the time of the interviews) had to be part of the local Boat Owner's Association, and their boats had to be registered in the DR. This meant that all WWOs were local people themselves, and this strategy had thus far prevented large companies (e.g. cruise and resort companies) from running their own tours, which would lessen the indirect economic impact of the industry (Jayawardena, 2002). Since many of the tourists WW in Samaná Bay come from mass tourism areas such as Punta Cana, large tour companies and middlemen end up taking cuts of the ticket price. According to respondents, the Ministry of the Environment has established the rules with the help of WWOs (which are organized in Samaná Bay through the Boat Owner's Association), and the navy carries out enforcement. The local NGO CEBSE is also essential as it trains students from the Samaná community to gather data on whale and WWO behavior, and partners with WWOs to get these students onto WW trips where they can gather data and interact with tourists. This not only improves human capital within the community, but enhances tourist experience on the WW tours, and provides the Ministry of the Environment with data on WWO behavior on the water for potential use in enforcement.

The structure of the Puerto Plata WW industry is somewhat different, due to the way in which this WW tourism is run. Since these tours are still within the Silver Bank Sanctuary, they are subject to the same regulations, but WW here is a swim-with experience (or "soft-encounter"), rather than observational. These small tours launch out

of the town of Puerto Plata and then spend about a week on the water. Finally, WWOs working in this part of the industry are not local like those in Samaná Bay.

Table 4.4: Comparison of Local People (Non-WWO) and WWO Sub-themes for Whale Watching

<b>Local</b>	<b>WWO</b>	<b>Local</b>	<b>WWO</b>
<b>Characteristics</b>	<b>Characteristics</b>	<b>Costs</b>	<b>Costs</b>
Advertising	Attraction	Conflict	Conflict
Charge/Fee	Charge/Fee	Harm	Disturbance
Land-based	Commercial	No investment	Intrude
Price	Eco-	Over-reliance	No Investment
Season	friendly/Sustainable	Stress	Stress
Tourism	Ecotourism	Vessel Traffic	Vessel Traffic
	Fair		
	Family Business		
	History	<b>Stakeholders</b>	<b>Stakeholders</b>
	Petting Zoo	Boat Association	Boat Association
	Philosophy	CEBSE	Captains
	Schedule	Children	Community
	Season	Community	Everyone
	Tourism	Everyone	Fishermen
	Unique	Fishermen	FUNDEMAR
		Government	Government
<b>Benefits</b>	<b>Benefits</b>	Min. Environment	Guide
Beauty	Amazing	Operators	Middle Class
Cooperation	Beauty	People	Navy
Economics	Cooperation	Students	NGO
Fun	Development		Passengers
Indication	Economics		People
Secondary economic benefits	First time		Private Vessels
Jobs	Fun		Tour operators
Knowledge	Impactful		
Personal gain	Indication		
Public Awareness	Secondary economic benefits		
Research	Jobs		
Whaling (Anti-)	Knowledge		
	Money		
	Public Awareness		
	Research		
	Visitor Satisfaction		
	Whaling (Anti-)		

Four thematic categories arose from my interviews including general characteristics of the WW industry as described by participants, the perceived benefits of the industry to individuals and the community, perceived costs of WW to individuals and the community, and what groups of stakeholders were described by both WWOs and other residents. The first thing that is apparent from these sub-themes is the difference in detail between resident (non-WWO) descriptions of WW, and that of WWOs. Not unexpectedly, the professionals in this industry know a great deal about it, while local people know much less. Nonetheless, the details that do appear in the sub-themes emerging from the interviews with local people illustrate a fairly good understanding of the industry, with clear details about its costs and benefits, as well as specific characteristics and a variety of stakeholder groups. The themes concerning the costs of WW have the least amount of detail describing them, which serves as an initial suggestion that respondents perceived less costs than benefits; these themes were much less thoroughly described by participants as well. Both residents and WWO interviews produced only six themes for costs, while non-WWO interviews also only produced six sub-themes for WW characteristics, but all other groups of themes had at least 11+ entries. On the other hand, descriptions of the benefits that WW provides to the community were extremely detailed, and included all three themes (economic, environmental, and experiential) in both groups.

As it stands, resident perceptions of the WW industry appear to be primarily positive. Many respondents were emphatic about the economic support that this industry provides to the community, both directly and secondarily through other tourism businesses that visitors utilized. The word cloud from local participants shows a strong



abundance of words with positive connotations, many of which are linked to economics (e.g. money and jobs); very few negative words were common in these interviews. Overall, it appeared clear that the benefits of this industry were far more apparent than the costs, especially in terms of the common economic costs of tourism (e.g. rising property prices, increased traffic congestion, etc.) (Duval, 2004; Jackson, 2006). It is possible that this is due to the nature of the WW in the DR as evidenced by the interviews. WW in Puerto Plata caters to smaller groups of tourists, who spend most of their time off-shore, and the larger observational industry in Samaná Bay is run by local people and caters primarily to tourists that come for day trips from major destinations such as Puerto Plata and Punta Cana. This limits the potential negative impacts that WW tourism can have in the local community by decreasing exposure to tourist bad-behavior, and mitigating some level of traffic and property price increase (Duval, 2004; Jackson, 2006). Thus, through the lens of the social exchange framework, it makes sense that positive attitudes would be established for the industry overall, because local people do not perceive the costs of the WW industry, but they are well aware of both the direct and secondary economic benefits (Ap, 1992).

### **E. Perceptions of Cetaceans and Cetacean Conservation**

As has been mentioned previously, WW's long-term viability (like all forms of ecotourism) relies on its ability to be both socially and environmentally sustainable. It is clear that while there are some costs to WW (to be discussed in further detail in section G), the perception among local people is positive. However, WW can and often does have negative impacts on target cetaceans, and the only way to mitigate this is through

effective management plans(Parsons, 2012). Support for regulations among the public, and especially among WWOs is key. Furthermore, WW is believed to be a conservation tool due to its ability to teach people about the threats that cetaceans face, while also inspiring a love for these animals and providing a revenue stream dependent on the maintenance of viable populations (J. Higham et al., 2014b). This mechanism is clear for tourists, but as was discussed in this introduction, there must be local buy-in to conservation in order for it to work on-the-ground, so understanding resident perceptions of whales and their support for conservation is central to our ability to understand the role that the DR's WW industry is playing in conservation. The following section will examine local residents' perceptions of the actors involved in cetacean conservation, the characteristics of cetaceans, threats to cetaceans and potential solutions/protective measures, resident understanding of and support for cetacean conservation, and support for WW regulations.

In regards to the actors that local people (non-WWOs) and WWOs discussed as a playing a role in conservation, there is a notable difference between the two groups of respondents. Local people perceived a more diverse group of actors involved in cetacean conservation actions, including the local NGO CEBSE, the government, and the community itself. They did not, however, mention WWOs as conservation actors, although WWOs understood themselves as such. Likewise, WWOs emphasized the role of NGOs, the government, and themselves in cetacean conservation, but they did not mention the community as playing a role in protecting the cetaceans of the area.

Table 4.5: Comparison of Local People (Non-WWO) and WWOs Sub-themes for Conservation Themes

<b>Local</b>	<b>WWO</b>	<b>Local</b>	<b>WWO</b>
<b>Characteristics</b>	<b>Characteristics</b>	<b>Protective Measures</b>	<b>Protective Measures</b>
Environment Feasible Habitat Last Longer	Environment Know Better (WWO) Middle Ground	Education Monitoring Protection Public Awareness Regulations Research Respect Responsibility	Alternatives Distance Eco-friendly/Sustainable Education Management Monitoring Protection Public Awareness Regulations Research Respect Responsibility Sanctuary Vision
<b>Actors</b>	<b>Actors</b>		
CEBSE Community Cruise Everyone IWC Ministry of the Environment NGO People	FUNDEMAR IWC Min. of Environment Ministry of Tourism WWO		
		<b>Threats</b>	<b>Threats</b>
		Death Entanglement Harm Noise Pollution Predators Sediment Ship Strike Stress Whaling	Detrimental Disturbance Entanglement Intrude Noise Stress Threats Vessel Traffic Whaling

When discussing cetaceans and associated biodiversity conservation, both WW professionals and other local people described the characteristics of both conservation in the area and the community's relationship with the cetaceans, groups of people that were perceived as being involved in associated conservation, protective measures for cetaceans that respondents were aware of, and known threats that cetaceans were faced with in the

area. With respect to the whales themselves, local people felt positively when asked about what they knew about local cetaceans, what they liked about them or disliked, and the impact of these animals on the community. Respondents liked these animals and associated good things with them. They focused on the beauty of the animals in many cases, mentioning the common delight that most feel at the sight of cetaceans. One participant (L-04) said, "...every time I go to see the whales, I am... crying because for me it is beautiful." Another (L-07) explained, "...they are beautiful animals and very innocent, and they have life as we. They need something, like an institution that will defend them from anything. I really like watching them!" Here there is a reference to the innocence of whales, which were not perceived by respondents to cause conflict even though WW as well as some cetaceans themselves (particularly dolphins, rather than whales) can interfere with fishing industry (Kerosky, Munger, & Hildebrand, 2008; Mann et al., 2000). This was further corroborated with the following from L-04: "The whales... there are only benefits. They don't eat the fish in the bay; it is not a problem." However, no fishermen outside of those that may have been included in the WWO group were interviewed, so problems with resident dolphin species competing for catches would likely be under-reported here. Nevertheless, it would appear nonetheless that WW has played a role in supporting positive perceptions of cetaceans among local people, especially when residents are aware of the benefits that WW brings to the community, and the whales themselves don't require resources utilized by residents. According to social exchange theory, this again makes sense, as local people perceive the balance of costs and benefits of cetacean presence near the coast to be in their favor, with the benefits being more readily apparent.

Based on a analysis of social exchange theory and tourism research, it is expected that WWOs also have positive feelings about cetaceans, because their businesses rely on these animals, and this is exactly what my study in the Dominican Republic found. WWO-04 told me the following, "I'm a whale fanatic. Yes, and I have probably stayed in the Dominican Republic for 33 years just because of the whales." Besides this general love for cetaceans, there were specific aspects of whales that fascinated WWOs, some of which were common to the local group of respondents. WWO-06 also explained, "My own emotional attachment and love for the whales kind of progressed in that fashion. The sheer size, the strength, and then, over time, you get to see the different behaviors... they are all different, they are like people." Most of the cetacean characteristics that are commonly cited as eliciting human interest are listed here (Kalland, 1993), from physical attributes to those characteristics that make cetaceans more "human." Other operators cited the experience of getting visitors excited about the humpbacks as enhancing their fondness for the target animals, and research partnerships allowed for the identification and tracking of individuals, which may further enhance the visitor experience and connection with the animals being observed.

The threats to cetaceans listed by local people included entanglement in fishing nets, predators, increased sediment in the bay, ship strikes, and international whaling. While WW itself was not commonly cited as a problem for the whales among non-industry respondents, one interviewee (L-03) found it problematic and said the following:

The problem to me is that there are many trips at the same time when they go whale watching... [if] there are many trips at once with two or three whales and then they get scared and may have problems. ... The people instead of throwing

their trash in the trash can, they throw it in the sea. The same boats that go see the whales throw the bags in the sea instead of bringing them here.

This resident is not only concerned about the potential harassment of the whales by WW boats, but believes that WW visitors may actually make the pollution problems in Samaná worse. On the other hand, some informants were unaware of any threats to whales at all in the area. L-06 said, "Well, here in the country there's no factors; here in Samaná there are no factors that could threaten the whales." There is a need for increased education on this topic, which WW may be well-suited to do if it is made accessible to local people. While WWOs are already offering reduced prices for local students, further support for such initiatives would be beneficial for the community, the industry, and conservation as well, as long as the educational value of WW trips is maintained.

Similar threats were described by WWOs, although there were some differing concerns among professionals. Outside of the potential problems that WW itself might have for target animals, entanglement in fishing gear, noise pollution, vessel traffic, and international whaling were all discussed. These respondents did focus more on the impact of the WW industry on cetaceans to a greater extent than local people, due to having more knowledge on the subject of cetaceans using the Samaná area. WWO-05 described the following in reference to cruise ships: "The captains in Samaná have a fable, it is like when the cruise enters, the whales are very hard to see. We feel that they run away from the area when the cruise approaches." Cruise lines are not a key source of WW clients in Samaná, because the vast majority of their guests come from the all-inclusive resorts of Punta Cana. In regards to the threat of entanglement, WWO-01 expressed clear frustration that little was being done to protect the whales. "The Ministry of the

Environment has not made any effort to edit the fishing gear in Samaná Bay... The ministry did not even notify the fishermen, or make them move out of the place, or find another alternative..." There is also a realization among WWOs that their industry itself can threaten the whales, which is a positive sign in terms of willingness to act in order to protect target animals from these impacts. WWO-01 also mentioned, "I know we do, drain the whales... but when you have 8 hours of observation towards a single whale, the whale has to feel stressed at the end of the day, but that is inevitable."

When it came to actions that would need to be taken to protect whales from the threats that they described, the local people that participated in the study were supportive. WW had helped people realize that the whales of Samaná Bay needed to be protected in order for these animals to continue to support the industry. L-06 said, "Here, I learned that the whales are productive, economical, and cultural. More or less they come every year. Economically because they leave money and it's a way to earn some money. Part of that, we also have to protect them and all of that." There were also those who were more hesitant in their support, calling for actions that were feasible. L-05 noted, "Well, if it [protective measures] is feasible, then I think so. I think so, we can [protect cetaceans from the threats that they listed]. Within what's possible, we can."

In conjunction with responses about the threats to cetaceans, these interviews indicate a highly positive attitude about cetaceans among local people, but also, the need for further education and involvement of the community. CEBSE is working on this involvement with some limited partnerships with the WWOs (which provide the platform for their students, but didn't seem to provide funding for the NGO), but other programs might include community beach clean-ups, or citizen science, as has been established by

the Dominican Foundation of Marine Studies, Inc. (FUNDEMAR) with fishermen in the Bayahibe area. Those interviewed did not appear to be aware of potential trade-offs between WW/conservation actions and fisheries. According to SET, this is likely to play a role in local support for conservation support among residents because potential costs to local people are not perceived.

A specific discussion about WW regulations among local people revealed few results, because most were not aware of the negative impacts WW can have on whales. One respondent was concerned about the effect that WW regulations had on people in the community, however.

This interviewee (L-07) was dissatisfied with the way in which smaller boats were not allowed to run their own WW businesses.

Do not impose rules such as the catamarans can go while the smaller boats can't go, but everyone should have the ability to go and watch the whales. It's very bad that the small ones can't see the whales, and all the big ones can see them.

I believe that this description of "big" and "small" refers not only to boat size, but to power and establishment within the WW industry of Samaná Bay. Large boats belong to those who have been in the WW industry the longest, while those with smaller boats are mostly fishermen looking to break into this industry. Limitations of all boats (regardless of size) are a key method of preventing undue stress on whales, however, and limits on the number of boats WW is called for by nearly every researcher that has examined the negative impacts of WW (Arcangeli et al., 2009; Bain et al., 2002; K. Barr & Slooten, 1999; Beaubrun, 2002; Blane & Jaakson, 1994; R. Constantine et al., 2004; Erbe, 2002; Jelinski et al., 2002; Lachmuth et al., 2011; Lusseau, 2005; Matsuda et al., 2011; Ritter,



2004; Schaffar et al., 2010; Stensland & Berggren, 2007; Visser et al., 2011; R. Williams & Ashe, 2007). In this case, I see two potential solutions to improve sustainability if there are others with this concern. The first is to educate local people about the risks that WW poses to cetaceans, as it was not a common response among respondents when they were asked about threats to whales. Furthermore, an increase in the number of WW boats in the area is not only a problem for cetaceans. Overcrowding is known to have a negative impact on visitor satisfaction, which in turn undermines the industry's ability to be economically sustainable (Foxlee, 2001; Mustika et al., 2013; M. Orams, 1999). It is clear that local people need alternative sources of income, and are thus interested in WW, so it may be that investment into otherwise diversifying the economy in the community would be beneficial for both people and target animals (Birdsall & Londoño, 1997; Lloyd-Jones & Rakodi, 2014; Oldekop, Bebbington, Brockington, & Preziosi, 2010). CEBSE is currently playing a role in this by training local students in a variety of scientific methods as well as guiding and interpretation, and the government was also working on a ecotourism certification scheme, although this was in the very early phases of development.

WWOs generally had more expertise on the existence of, and need for, protective measures. General protective measures were not discussed in detail, although a few suggestions arose in connection with other conservation concerns. In particular, there was a desire to see fishermen change the kinds of gear that they use, or to move out of areas used by whales, in order to address the issue of entanglement. For the problem of vessel noise, particularly that of cruise ships, the following was said by WW0-05: "Samaná benefits from the cruises and many businessmen from the area, as well as the whales'

presence. If the whales and cruises were on different intervals it would have been great and less threatening." Seasonal restrictions on cruises are certainly one way to address this problem of large vessel noise pollution in the bay, but considering the economic opportunities associated with cruise lines for the Samaná community, it is possible that modifications of boat maneuvering or installment of quieter equipment could lessen the impact of their ships on cetaceans in the sanctuary (Richardson et al., 1995).

When considering WW regulations, WWOs appeared supportive of measures that were needed to protect whales from boat behavior that disturbs target animals. WWO-01 said, "The regulations are very specific, and what we try to see is that our captains like all of the other captains of the association, to try to keep the regulations and see that the whales are not disturbed." In fact, several WWOs even mentioned their willingness to help police other operators that might attempt to ignore these regulations while in the vicinity of the whales. This support makes sense, considering that the WWOs feel that they have played a central role in developing their own standards of behavior while working around the whales (Parsons, Warburton, Woods-Ballard, Hughes, & Johnston, 2003). WWO-04 explained the following:

Our whales are worth this to us, if we scare them away we're not going to have this, and so we went out onto the *Malecón* (oceanfront) and measured distances and talked about numbers of boats, and how far we could see... and we came up with the regulations on our own.

Likewise, in Puerto Plata, WWOs were integral in determining the kinds of behavior that would need to be controlled in order to keep the whales safe from their human visitors. In reference to one of the main WWOs in Puerto Plata, WWO-06 said the following: "And

he developed a way of watching... of whale watching which was very very safe, because... you don't go after the whales." There was also a feeling among some operators that they had a better sense for when the cetaceans were being harassed, and thus the regulations were unnecessary. This was also summed up by WWO-06, "I'm not going to force an encounter with an animal that has given me every indication that they don't want an encounter." It has been established, however, that the negative impacts of WW are not always apparent in the outward behavior of the animals (Bejder et al., 2006; M. Orams, 2004), so this idea of being able to see the impact of WW on whales is problematic. Thus, while the meetings meant to develop the Silver Bank Sanctuary Management Plan have already been completed, this data indicates that an ongoing conversation about emerging attitudes of WWOs, as well as negotiations on how to balance the industry perspectives with scientific findings will be key to on-going conservation success in the sanctuary (Olsson, Folke, & Berkes, 2004).

Overall, the results from this discussion on conservation are positive, because although there is a need for more community involvement and education, as well as ongoing conversations with WWOs about the practical applications of WW regulations, WW appears to have inspired support for the protection of whales, as well as an appreciation of their existence in the Dominican Republic. The results of this part of my research also appear to support SET assumptions and resulting hypotheses, because the benefits of cetaceans (e.g. resulting WW benefits, entertainment, etc.) are far more readily perceived by respondents than potential costs (e.g. competition with fisheries via predation and conflict with the WW industry) (Cropanzano & Mitchell, 2005; Goyder & Boyer, 2008; Rasoolimanesh et al., 2015).

## **F. The Benefits of WW**

As discussed previously, residents perceived the benefits of WW far more than the costs, and as per social exchange theory, this perception leads to the positive attitude that residents have towards the WW industry in the DR. The categories that these benefits fell into include economic, environmental or biodiversity conservation benefits, and experiential/educational opportunities for members of the community. Economic benefits, both direct and secondary (e.g. taxi services, hotel, etc.), were the most common benefits listed, but the two primary groups of the study also describe experiential and environmental positive impacts as well. The environmental benefits of WW have been described in section E above. Finally, I consider discussions of cooperation among actors as a benefit, because these cooperative interactions are necessary for conservation (Carlsson & Berkes, 2005; Redpath et al., 2013). Although benefits were more widely perceived than costs, the networks of cooperation were far less complex than those of conflict for all respondent groups. The following section will explore the general benefits described by local people and WWOs, and then focus on discussions of cooperation surrounding the WW industry.

Table 4.6: Comparison of Local People (Non-WWO) and WWO Sub-themes for Benefits Themes

<b>Local</b>	<b>WWO</b>	<b>Local</b>	<b>WWO</b>
<b>Economics</b>	<b>Economics</b>	<b>Experience/Educational</b>	<b>Experience/Educational</b>
Economics	Economics	Beauty	Beauty
Secondary economic benefits	Secondary economic benefits	Education	Education
Jobs	Jobs	Fun	Fun
Personal Gain	Money	Knowledge	Impactful
	Worth	Public awareness	Knowledge
			Public awareness
<b>Environmental</b>	<b>Environmental</b>		
Public Awareness	Alternatives		
Whaling	Public awareness		
	Whaling		

There is a realization among local people that WW provides direct impact in the form of jobs, as well as secondary impact through the extra flow of tourists and thus money, into the community. WWO-03 said, "We have a lot of people that directly or indirectly depend on the whale watching season." L-08 explained the following:

There are a lot of excursions and money can be earned. There are more people when there are whales around! For us is very valuable because when the time of whales is back, there's a lot of people that come. It's good for all the restaurants and people who work on boats, for the people that sell, and the hotels.

L-07 added, "Because through the whale watching industry there are many people that have resources and every year we wait for the whales because it gives us more income."

These economic benefits to the community may be further supported by the fact that Samaná's WWOs are local, as this is known to lessen the loss of tourism revenue to foreign entities (Chirenje et al., 2013; Lacher & Nepal, 2010). Some respondents also

mentioned that they believed that WW was both enjoyable and it enhanced the image of Samaná village. L-03 said the following on this subject:

I like it personally. I like it because it's very fun; these are things that I do not see every day and for the occupation, it makes my job, it makes people outsiders come and meet both the whale watching and Samaná. It's advertising Samaná.

In this way, WW may also lay the groundwork for repeat visits by tourists, further enhancing the economic impacts of the industry on the community.

WWOs were similarly enthusiastic about the economic benefits of WW, which is to be expected via SET, since they are benefiting from this industry most directly. Some WWOs make enough income during the WW season to support them throughout the year. WWO-06 explained, "He [WWO] makes all the money that he makes during those three months [WW season], so it is obviously very profitable for him." The benefits of money were also connected to human capital building and culture by one WWO. WWO-01 said, "We live from that [WW] here, a number of people in the province. For a long time it [WW] has been part of the pillar for the economy of Samaná. Especially in recent years because before it was an agricultural economy..." Another respondent mentioned the benefit of Samaná's WW industry hiring mostly local people. WWO-01 again explained the following:

Benefits of the company for the community. Well, all the employment that we have is local; all of our employees are Dominicans and the decision of the manager who already has 20 years with us is also from Samaná. So basically what we do is to employ staffs who are from Samaná.

This is an important point, because giving local people jobs lessens the loss of tourism revenue from the community (Chirenje et al., 2013; Lacher & Nepal, 2010). WWOs considered their industry to have a wide array of positive impacts. In terms of community benefit, WWO-02 described the direct monetary benefits of the industry in the following: "Whale watching in the bay of Samaná is a very educational business that includes almost 80% of the inhabitants in Samaná, one direct and one indirect because when the whales are here everyone has benefits." WWOs connected experiential and environmental benefits just as local respondents did. One WWO explained that as long as tourists choose responsible WWOs, they are helping to provide an alternative to whaling, which is a commonly cited conservation benefit of WW (Herrera & Hoagland, 2006). WWO-04 said the following:

... We try to leave people with a message. It's like, ok, so, what can we do? You can go whale and dolphin watching and be responsible about it. Like, choose somebody that gives you information, that behaves well around the whales, and is respectful, and you are providing an economic alternative to whaling.

Furthermore, one WWO explained that the WW industry professionals had played a key role in sending representatives from the DR to the International Whaling Commission, which has played a key role in determining whether or not whaling will continue to be disallowed on an international scale. Likewise, WW offer an alternative to captive cetacean tourism, which is a highly contentious form of entertainment (Brammer, 2015; Rowley & Johnson, 2016). In describing this message, one tourism professional (O-02) said the following: "People can observe them in their natural state. I think this is the right way, in freedom. Dolphins are not meant to be in aquariums, no matter how big."

Some respondents expressed that these benefits, as well as the experience of WW, led to cooperation in pressuring the government to act in order to protect cetaceans. All together, the interviews illustrated that the perceived benefits of the WW industry to residents encouraged local people to care about the protection of cetaceans overall. The value that cetaceans have through WW also prompted the community to act in the past, pushing the Ministry of the Environment to actively protect the whales that make Samaná so unique. L-01 said, "When the public awareness was made, people complained- oh, nobody is going to save the whales! Then the Minister said- ok, ok, let's do it." Besides this impression that public pressure is needed to encourage government action, there was also the implication that the government was unable to properly protect whales without the support of the community. L-06 explained, "We all have to protect the whales because the Ministry of the Environment might have 2 or 4 employees that are somewhere, but we are a lot."

The ability of WW to serve as a research platform is another environmental benefit of WW that is cited by environmental NGOs and others, but there are typically few WWOs that actually participate in research efforts (Hoyt, 2005b). In the case of WW in the DR, however, the industry has strong ties to research. CEBSE has been gathering data with the help of WWOs for several years, and WWOs in Puerto Plata explained that they had helped with a variety of research projects in the past as well. WWO-06 talked about this involvement with research, "... we did, in the five years that I was there, we did two whale tagging, uh, experiments. The second one was more successful than the first, but both of them were done by the whale experts at NOAA." Considering the



expense of cetacean research, this help is invaluable to our understanding of cetaceans and our ability to protect them (Mann et al., 2000).

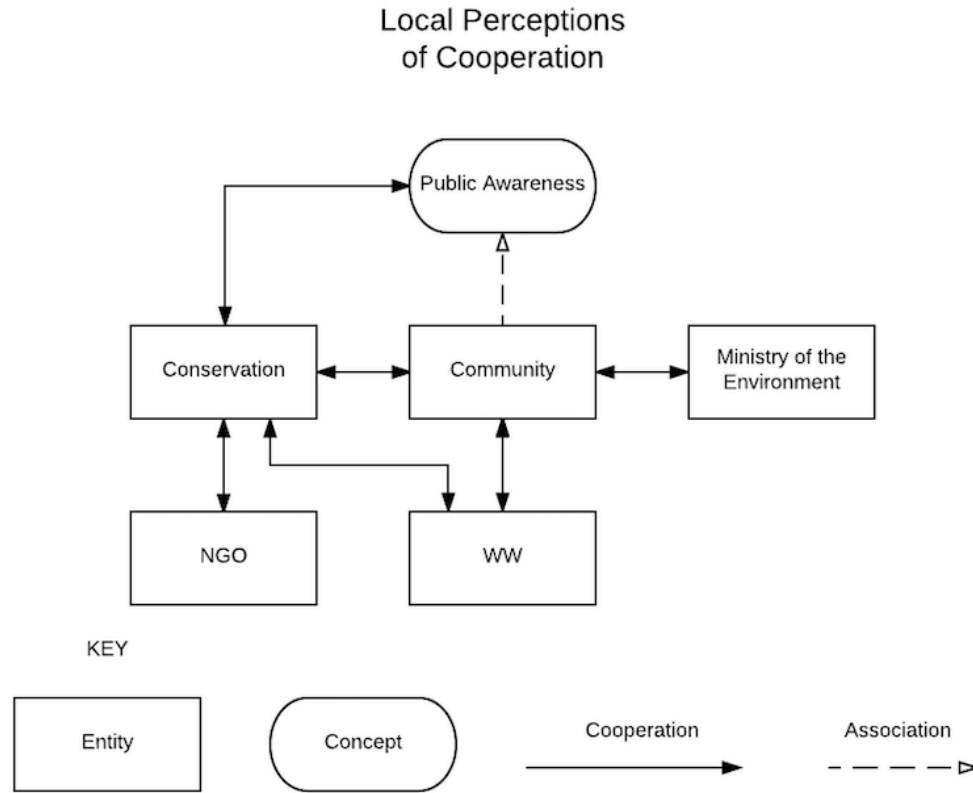


Figure 4.6: Local (Non-WWO) Perceptions of Cooperation Within the Whale Watching System. Boxes indicate actors within the system (with conservation including both its actions and the actors as described by respondents and described in section E), and ovals represent intangibles that are described as influencing the system. Solid arrows represent specific cooperative relationships as described by interviewees, and dotted arrows indicate a relationship that I infer from the interview information but which was not explicitly described.

Cooperative relationships within the system (Figure 4.6) were not limited to conservation as described by respondents. In this case, I consider cooperation to be synergistic relationships between actors (e.g. NGOs) or other influential forces within the system (e.g. public awareness), which can include collaboration or cooperation in regards

to a goal relevant to the industry (e.g. building the WW industry, or protecting cetaceans). I also group this with WW benefits as such partnerships/synergies considered may enhance associated cetacean conservation, greatly assists in successful management of the system with many stakeholders, and due to its positive influences on the community (Grey & Sadoff, 2003; Uphoff, 2001). While local people emphasized the benefits of WW over costs, the occurrence of descriptions of cooperation like that described above is much lower than that of conflicts. If we take cooperation to be a social benefit, this is somewhat surprising, as SET and the positive perceptions that local people held for WW would suggest that residents are more aware of the benefits than social costs such as conflict. However, it is may be that respondents are more highly sensitized to social conflict rather than cooperation, but that they still see the economic benefits of WW as outweighing issues of conflict, thus resulting in the overall positive perception of the industry (Cropanzano & Mitchell, 2005; Goyder & Boyer, 2008; Rasoolimanesh et al., 2015). Throughout the interviews, local people (non-WWOs) discussed the community as being central to the WW system in Samaná, working with the Ministry of the Environment and the WW industry, and though public awareness and activism enhancing conservation outcomes.

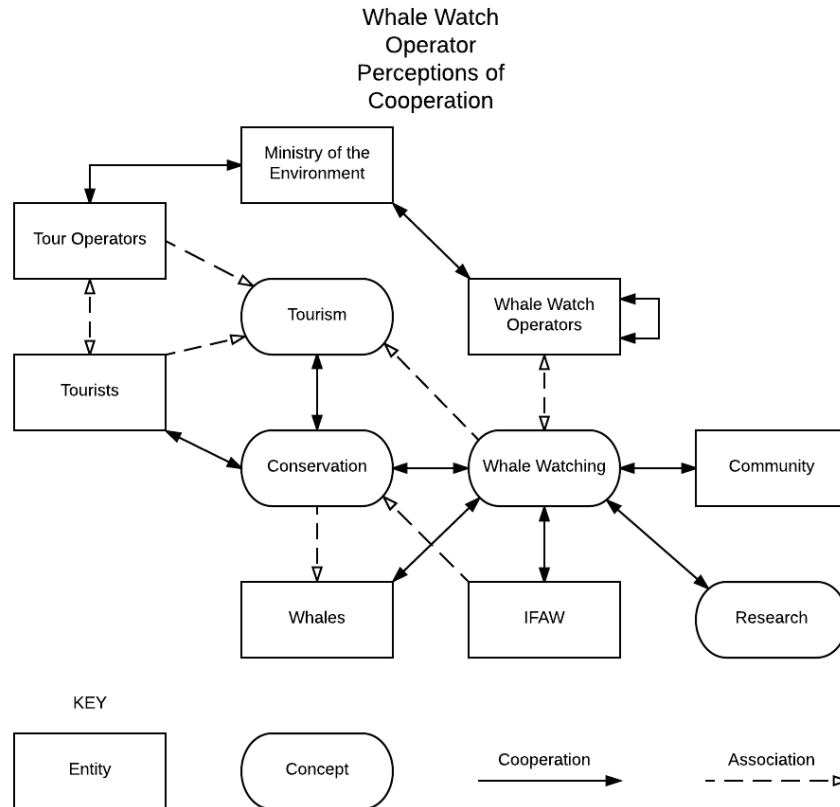


Figure 4.7: WWO Perceptions of Cooperation Within the Whale Watch System. Boxes indicate actors within the system (with conservation including both its actions and the actors as described by respondents and described in section E), and ovals represent intangibles that are described as influencing the system. Solid arrows represent specific cooperative relationships as described by interviewees, and dotted arrows indicate a relationship that I infer from the interview information but which was not explicitly described.

WWO descriptions of cooperation are more complex than those described by local people. This is likely due to their knowledge of the industry, as well as the fact that WW is their livelihood, which is supported by cooperation/collaboration/partnerships in many ways (Neves-Graca, 2004; M. Orams, 1999; Silva, 2015). In looking at Figure 4.7, WW itself is central to this described system, with the industry assisting the community, research, whales and conservation, and having close, beneficial ties with the operators themselves and tourism as a whole. Unlike the interviews with non-WWOs, operators do

not consider the community to be central to WW or conservation outcomes, but rather emphasize the influence of their own businesses, the government, and tourism in general. Local people did not mention tourism at all in their discussion of cooperative relationships, and nor did they talk about whales as players in this web of beneficial relationships in the way that WWOs did. This appreciation of whales as influencers within the system by WWOs makes some sense in regards to the reliance that they have on these animals as well as their understanding of cetacean personalities and intelligence.

### G. The Costs of Whale Watching

Table 4.7: Comparison of Local People (non-WWO) and WWO Sub-themes for Cost/conflict Themes

<b>Local</b>	<b>WWO</b>
<b>Environmental</b>	<b>Environmental</b>
Consequences	Intrude
Noise	Noise
Stress	Vessel Traffic
	Disturbance
	Stress
<b>Social</b>	<b>Social</b>
Competition	Competition
Conflict	Conflict

All respondents were highly positive about WW, but there were some environmental and social costs that both local people and WWOs discussed. Both groups of respondents acknowledged that the noise of boats is a stressor on cetaceans, but non-WWOs associated this with cruise ships, and WWOs themselves believed that WW was not a considerable threat in regards to this impact. WW0-02 said, "The thing is with the

acoustics, as an impact, it is transitory because the whale watch is from 8-4." WW0-01 claimed, "And as for the [WW] embarkings, we always meet our regulations so we know that we will not make a big threat apart from the noise and the hassle of being next to them all of the time." Other than this, however, WWOs had a much more detailed understanding of the potential environmental costs of WW, discussing things such as ship strikes, vessel traffic, and intrusions into key cetacean behaviors by observing boats. WW0-03 expressed the belief that it was the role of the government to help address some of these issues, saying the following: "We work hand-in-hand with the Ministry of Environment to make sure of the regulations."

While direct discussions about the negative impacts of WW were not particularly detailed, local people (non-WWOs) and WWOs both acknowledged that there was a considerable amount of conflict surrounding the industry. I consider this a cost due to the negative impacts that increased conflict can have on the community (Neves-Graca, 2004; Silva, 2015). Conflict has also been found in the past to hinder efforts to manage WW so that it minimizes possible harm to cetaceans (Neves-Graca, 2004; Redpath et al., 2013; Silva, 2015), and is particularly problematic in the case of the co-management system that the Dominican Republic uses in the Silver Bank Sanctuary (Ministerio de Medio Ambiente y Recursos Naturales, 2015; Olsson et al., 2004). Interestingly, while the potential or actual costs of WW to the community were not perceived by local people, networks of conflict described by participants were complex and contained a variety of actors. It would appear that conflict is the cost most apparent to residents, and while they do not appear to perceive it as outweighing the benefits that they identify, these are still

issues that should be examined and addressed. This section will focus on the analysis of this conflict as perceived by respondents.

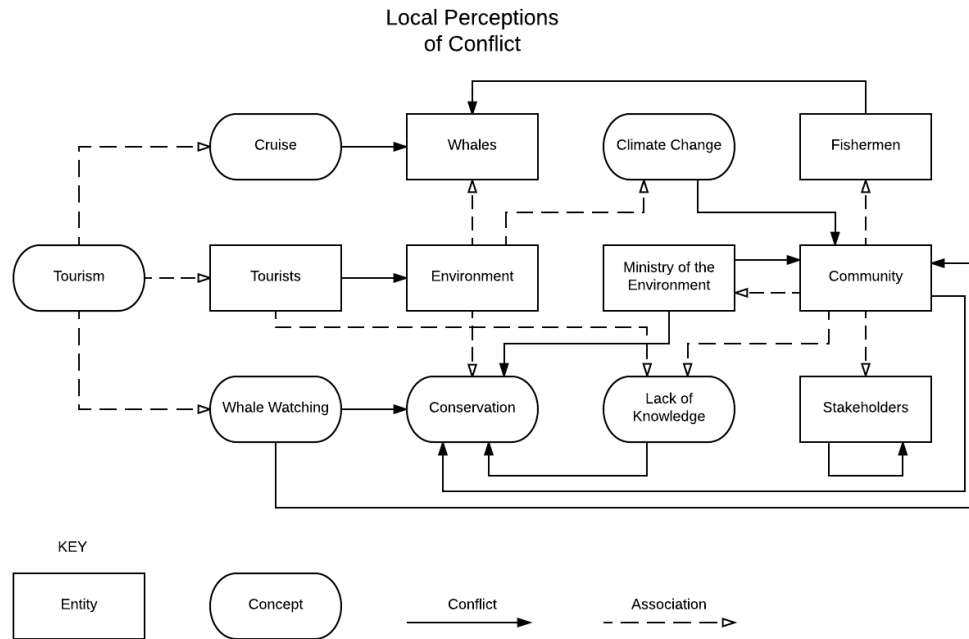


Figure 4.8: Resident (Non-WWO) Perceptions of Conflict Within the Whale Watch System. Boxes indicate actors within the system (with conservation including both its actions and the actors as described by respondents and described in section E), and ovals represent intangibles that are described as influencing the system. Solid arrows represent specific cooperative relationships as described by interviewees, and dotted arrows indicate a relationship that I infer from the interview information but which was not explicitly described.

The complexity of conflicts within WW is apparent in Figure 4.8 through the number of nodes and the connections between those nodes. This illustrates that local people perceive conservation efforts, community/stakeholders, and whales to have considerable amounts of conflict associated with them. This contention was described by respondents as coming from three different things. The Ministry of the Environment was seen as problematic as described by L-01, "And for example, to the participation of the International Whaling Commission, the government never has funds to assist." The lack

of knowledge that both community members and tourists have about the conservation was also seen as an issue, as L-04 explains in the following:

And I think the people... don't know these kinds of things here. They don't know that every year, they need to send people to say... we don't want to kill whales."

And finally, problems arise from the community itself, "Maybe not 100% protected as it should be because sometimes there's fishing out of season.

As would be expected from past social research on WW (Neves-Graca, 2004; Silva, 2015), there are also indications that local people perceive increasing levels of competition due to WW within the community, as it was noted that the stakeholders do experience conflict with one another at times. As one resident (L-02) noted:

Like I said before, the economic factors and what we call competition [are issues] because... there are several people that want to do it simpler, appropriating a small boat or a yacht without any type of discipline. So that could affect [the whales] and we can try to regulate it.

This respondent's discussion of competition indicates that there is a group looking to ignore WW regulations and another group supporting enforcement. Furthermore, this mindset appears to be expressing the need to keep the industry limited, a counter balance to the local participant that believed keeping smaller operators out of the industry was unfair.

The interviews reveal a strong interest among community members in WW work, particularly those with experience on the water, as well as a growing reliance on the industry. This is especially poignant when one considers another informant's concerns

that WW tourism is shifting out of Samaná village for a community much closer to the DR's tourism capital, Punta Cana. L-01 said the following:

But the thing is- things are changing. They built a brand -new road... In the other side of the bay. The majority of the tourists came [to Samaná] from Punta Cana.

They come by plane or they come by bus. But now it is cheaper to operate it [with the road].

Over-reliance on a single form of tourism makes the community vulnerable to such changes, which includes global shifts in climate that may threaten tourism attractions, and some respondents were aware of this potential problem. L-05 explained:

... there is something that worries me and I think it's not only me, if not the world, that is climate change. That's practically something that is of a concern to all of us and we understand that if this affects us, it also could affect the activities of the whales in our province. That is very worrying!

Again, these concerns highlight the support for the diversification of the local economy, such that over-reliance on WW and tourism in general is mitigated and/or avoided to some extent (Birdsall & Londoño, 1997; Lloyd-Jones & Rakodi, 2014; Oldekop et al., 2010).

Besides these conflicts with conservation and the community itself, several local respondents expressed dissatisfaction with the Ministry of the Environment's involvement in WW due to a lack of communication on the part of the government. Specifically, local people were not aware of what the Ministry's WW fees were being used for, and expressed a desire to see some of it invested in the community itself. L-03 expressed frustration, saying the following:



For example, the taxes that are paid. Each person that goes sees the whales pays 100 DR pesos of taxes to the Ministry of the Environment, but that money does not stay in the community, instead, it goes directly to the ministry.

Another resident (L-04) said the following in reference to the 100-peso fee that tourists pay to the Ministry of Environment for WW: "...we pay something for nothing." Local people would like to understand what the fees are being used for, but it was not only the Ministry that residents wished would invest in the surrounding area. L-06 said the following:

The only thing I see wrong is that the whales come and everyone thinks to benefit from money and this, but they do not invest some money in the community. If they said, well, let's do something like a small park for the children to benefit from the money they generated from the whale, you know.

Here, the WW professionals, as well the government are implicated, and this also illustrates a potential avenue for future perceptions of WW to become negative, due to the prevalence of this concern in both local people (non-WWOs) and WWOs, as will be discussed below.

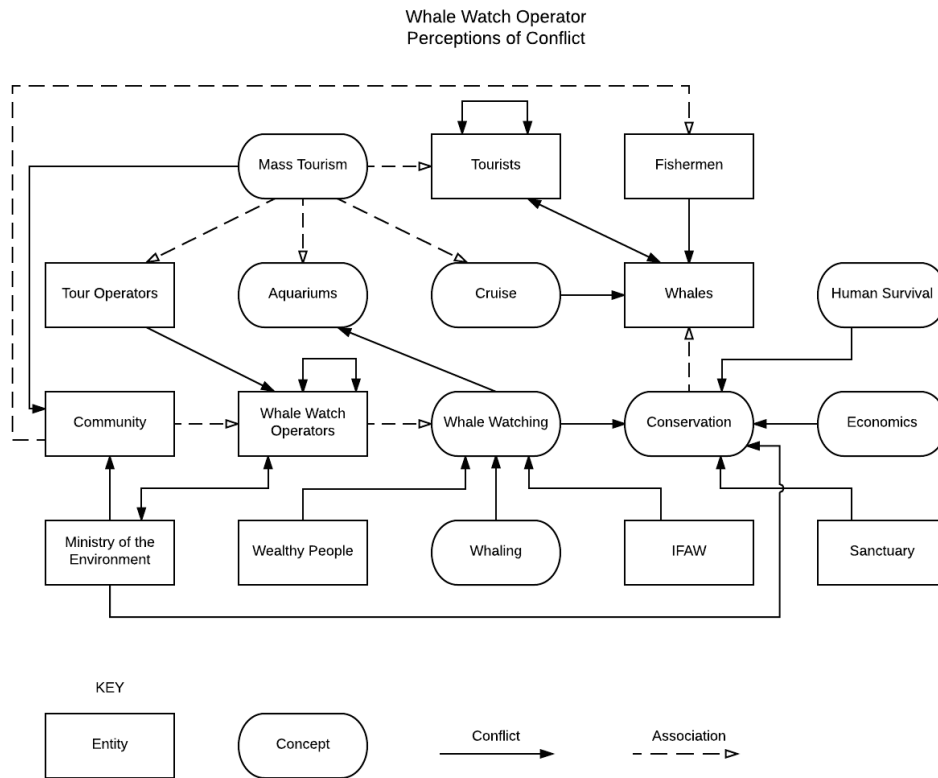


Figure 4.9: WWO Perceptions of Conflict Within the Whale Watch System. Boxes indicate actors within the system (with conservation including both its actions and the actors as described by respondents and described in section E), and ovals represent intangibles that are described as influencing the system. Solid arrows represent specific cooperative relationships as described by interviewees, and dotted arrows indicate a relationship that I infer from the interview information but which was not explicitly described.

As with the interviews with local people (non-WWOs), WWO impressions of conflict within the industry (Figure 4.9) appear to be relatively more complex than that of cooperation. There are a variety of things that were described by WWOs as problematic with respect to conservation. A common topic of discussion was the Ministry of the Environment, which as described previously, had not lived up to WWO expectations about dealing with problems of whale entanglement. However, the Ministry said the following on the matter: "We regulate the resource, not the equipment, but the equipment

hurts the resource." So, there appears to be an issue of communication here, a vagueness as to what the Ministry is allowed to do to protect cetaceans. Other issues with conservation included the large size of the Silver Bank Sanctuary, which makes it difficult for the government to effectively enforce regulations within the bounds of the sanctuary. O\_01 explained the following:

I think maybe with this [management] plan they can see a little bit further, and it will help to manage those institutions, both governmental and private, that are trying to do some work in developing a very strong management of the protected area of the [Silver Bank] sanctuary. It needs this... because it is a big, big area.

The pressing needs of local people were also discussed by WWOs as a challenge for conservation. WWO-04 also explained this issue, "When he would kill a manatee and feed his family for like a month. Right? So, unless you give people an alternative... and unless they understand... why that's important, they don't understand it [conservation]."

Once again, a call for education and increasing human capital is clear among respondents.

Conflict between various stakeholders was another topic explored by WWO respondents, including disagreement between different government ministries, struggles between WWOs, as well as issues with wealthy boat owners, and mass tourism. WWO-04 said, "You're battling economics all the time, but whenever you get like a head-on collision between the Ministry of Tourism and the Ministry of the Environment-economics versus the environment, economics wins." This second point is often the case with conservation, but under the right circumstances, WWOs and others in the DR have advocated for protective measures based on the economic success of the WW industry.

This suggests that a balance between the economic nature of WW and the needs of the environment can be struck, although it must be actively maintained and adapted in order for WW to remain successful and environmentally sustainable in the long term. The adaptive and cooperative systems needed to maintain this balance will likely be difficult to sustain if the WWOs themselves fall prey to in-fighting, which one participant described as being a recent problem in Samaná. Since this discussion contains too many identifiers to be utilized anonymously, I will paraphrase the issue here as being conflict between those WWOs that support WW regulations and those that believe they can make more money by ignoring them. This is a common conflict among WWOs around the world (J. Higham et al., 2014b; M. B. Orams, 2000; Silva, 2015). While this is known to impact visitor satisfaction (Neves-Graca, 2004; Silva, 2015), there was a lack of acknowledgement or perception of the intra-industry conflict among non-WWO respondents, so by SET it is unlikely that this would play a role in resident perceptions of the industry (Andereck et al., 2005; Cropanzano & Mitchell, 2005; Garau-Vadell et al., 2014; Goyder & Boyer, 2008; Rasoolimanesh et al., 2015).

Nonetheless, this internal struggle is more concerning when the many fishermen trying to start WW businesses are considered, as well as recreational boat owners and mass tourism companies all vying for access to humpback whales. As has been explained previously, limiting the number of WW boats is the most widely supported means of lessening negative impacts on target cetaceans among researchers (Arcangeli et al., 2009; Bain et al., 2002; K. Barr & Slooten, 1999; Beaubrun, 2002; Blane & Jaakson, 1994; R. Constantine et al., 2004; Erbe, 2002; Jelinski et al., 2002; Lachmuth et al., 2011; Lusseau, 2005; Matsuda et al., 2011; Ritter, 2004; Schaffar et al., 2010; Stensland &

Berggren, 2007; Visser et al., 2011; R. Williams & Ashe, 2007), and keeping WWOs local allows more economic support to stream to the community (Lacher & Nepal, 2010). WWO-06 described the struggle with individual boat owners, saying the following:

So, they would try to come out and do their own thing, sort of, freelance on their own... um, but there were only three permits that were given by the Dominican government. He [WWO] would approach them, or call them on the radio, or take one of the tenders and go over to them and say- hey, do you have a permit to be here? They would obviously say no, and he would say, you gotta leave.

Another respondent explained some of the perceived (and scientifically supported (Duval, 2004; Jayawardena, 2002)) problems with allowing mass tourism companies to run their own WW, by examining the current relationship between hotel middlemen that sell WW tickets to mass tourists and WWOs. WWO-04 explained, "The cruise ship, for example, charges \$99 to go whale watching and pays \$18 to the whale watch supplier." There was a concern that these companies would exploit the growing conflict between the WWOs and the Ministry of the Environment to gain access to WW permits thus cutting out the community all together. WWO-02 explained the established method of maintaining local control, "The union protects the people from Samaná. If there is a foreigner, they have to get in the union- to let them work [in whale watching]. And there is a list, waiting list to do whale watching." In this case of co-management, it does not appear that trusting relationships are being formed among key stakeholders particularly between the government and WWOs. Not only does this prevent co-

management from working efficiently, but it will likely serve as a challenge for ecotourism certification strategies being developed by the government.

In fact, the most poignant conflict described was a growing tension between WW professionals and the Ministry of the Environment in Samaná. This kind of conflict is extremely disconcerting in the case of WW in the DR, because co-management's effectiveness is limited when key groups can't trust one another or struggle to work together (Berkes, 2007; Carlsson & Berkes, 2005). Although there is now a new management plan describing regulations in the Silver Bank Sanctuary, which claims that local stakeholders were involved in its development (Ministerio de Medio Ambiente y Recursos Naturales, 2015), there was a feeling by one respondent that the WWOs were not involved enough in the plan's development. They admitted, however, that they did not attend as many meetings as they should have during the development of this document. WWO-04 said, "I remember, they [the government] attempted multiple times to get us [WWO] to participate [management plan workshops] and other people. But it was just so enormous, and overwhelming. I mean, we would make it to maybe one or two meetings."

Communication between the government and WWOs was made increasingly difficult during the period of investigation due to WWOs impressions that they were being ignored in negotiations, and that government officials were looking down on the WWO community, believing them to be more interested in benefiting themselves, than looking after the whales. WWO-04 explained, "And they [Ministry of the Environment] always treat us like... we're like only interested in money, we're completely commercial..." Unfortunately, if these things have been experienced by many WWOs, an environment is being created in which effective co-management and conservation is

likely very difficult to attain especially in the context of co-management (Carlsson & Berkes, 2005; Redpath et al., 2013). It is not clear what the long-term impacts of this conflict will be in regards to WWO perceptions of and involvement in the industry, as none of the WWO respondents expressed a desire to exit the industry, but there is likely to be a threshold at which the cost of such conflict with the government and other operators begin to outweigh the benefits (Cropanzano & Mitchell, 2005; Goyder & Boyer, 2008; Rasoolimanesh et al., 2015).

## **H. Study Limitations**

There are a variety of limitations that must be taken into account when considering the outcomes of this research. First, qualitative research is not meant to establish sweeping generalities, but in this case, gathering specific data about resident perceptions without coloring that information by the researcher's pre-conceptions was key. This reliance on resident insight turned out to be extremely important to my findings as the conflicts described by the interviews were not those that I would have expected. This does mean that if there is a need for generalizations, a quantitative method should be used to further examine the findings here, in a representative sample of people. Second, my experience in the DR has led me to suspect that there was an impact of me being an outsider on the kinds of answers that I received. While it makes sense that an off-shore activity like WW, with few apparent conflicts with fishing, would have limited costs that would be perceived by local people (Ap, 1992), I am hesitant to accept that most people were truly as happy with the industry as their answers suggest. It is possible that, to some extent, people provided me with the answers that they believed that I wanted to hear, or

which they felt would help me. Finally, there is evidence that the WW industry may conflict with other livelihoods in the community, particularly fisheries. While I was able to interview some fishermen, these were people that opportunistically did WW as well, so my study does not have a good grasp on the experiences of fishermen or specific groups of people who's jobs were negatively impacted by WW. It would be beneficial to see some targeted research on this subject in order to develop a more nuanced understanding of WW's role in the community.



## **Section Five: Results and Discussion of Preliminary Interviews from Dominica**

### **A. Interview Information**

Eleven interviews were administered for the preliminary study in Dominica, with five of these being with local people (non-WWO), two being with WWOs, and the rest being carried out with other informants such as government officials, tourism marketers, and researchers. Three respondents worked in the hotel business, one owned a business and restaurant near the cruise port, and one was a medical student. Of the WWOs interviewed, one was a WWO and one was an excursion company operator. I administered Skype interviews to one local participant, one WWO, and one extra informant; otherwise, I carried out all interviews in the capital of Roseau. All but two of the people interviewed were native to Dominica. The results being communicated here were based on a preliminary field season, thus the responses are not as detailed as those from the DR. Fewer people were interviewed, and the coding structure developed during the course of the more detailed DR study is utilized to examine the results here so that both countries could be compared.

### **B. Word Prevalence in WWO and Resident Responses**

Word prevalence was analyzed for Dominican interviews just as it was for DR respondents, however, because of both the limited number of interviews administered, as well as the nature of the preliminary reviews, these do not offer as much detail as those for the DR. All names were removed from this analysis.



Figure 4.10: Word Cloud for Local People (Non-WWO) Responses

Figure 4.10 shows the word cloud for respondents, with the words "know" (91 occurrences), think (61), and whales (55) being shown to be the most common. This is somewhat distinct from the DR, as "know" was not as commonly used among local respondents there. There are no notably negative words that occur more than 10 times in the interviews. Nature oriented words that were common in responses included "whales" (55), "dolphins" (17), "creatures" (12), and "island" (10).



### **C. Perceptions and Knowledge of Whale Watching**

The structure of WW in Dominica, at the time of my interviews in 2014, included both observation-only WW and swim-with tours. Both of these featured the resident population of sperm whales living in the vicinity of the island, but unlike the DR, the swim-with industry was just beginning to take off in 2014, and thus, lacked the structure and regulations developed in the DR. It is possible, considering the extent to which the Dominican Republic has developed protective measures for whales in an industry that also has both observational and swim-with tours, that the DR may serve as a good example for some methods of regulating the industry in Dominica. There were guidelines for traditional WW developed with the help of IFAW, but these were not enforced, and the emergence of the swim-with industry saw many of these regulations ignored as resident sperm whale groups were closely approached for swimmers to enter the water with them. The Fisheries Division of the Dominican government had primary control over the permitting for this part of the swim-with industry, as cetaceans are classed with fish as a marine resource, and swim-with groups utilized research permits in order to approach whales. These permits place limit on the number of boats carrying out swim-with tours at any one time, as well as restricting the number of people in the water. At the time of my interviews, it was common for photographers and excursion companies to organize swim-with tours in partnership with WWOs in Dominica. Concerning the regulation of WW in general in Dominica, there were many organizations that could have potentially had some control over the industry, including the Fisheries Division, as well as water sports and the hotel regulators, but the role of each of these was unclear to those operating in the system at the time.

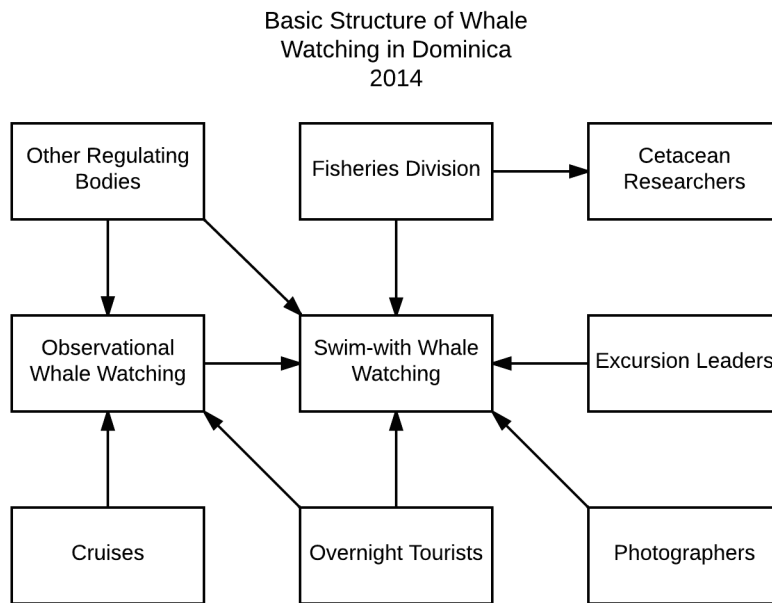


Figure 4.12: Structure of the Dominica Whale Watch System as Per Descriptive Coding. Note that this figure lacks the detail of Figure 4.4 for the Dominican Republic due to the difference in the preliminary v. finalized interview form. Boxes indicate actors within the system (with conservation including both its actions and the actors as described by respondents and described in section E), and ovals represent intangibles that are described as influencing the system. Solid arrows represent specific cooperative relationships as described by interviewees, and dotted arrows indicate a relationship that I infer from the interview information but which was not explicitly described.

As with the DR, respondents in Dominica had developed positive perceptions of the WW industry as of 2014. Outside of some of the conflicts explored here in comparison to the DR, no local people described any downsides to the industry, although this was not as explicitly discussed in the preliminary interviews as in the finalized version. Nonetheless, the interview data did reveal that local people in Dominica focused more on the benefits of the industry, and as with the DR, they were well aware of both its direct and secondary (e.g. taxis, hotel stays, etc.) economic impact on their community. Unlike the DR, however, local people commonly discussed the role of WW as a part of

their country's character as the "Nature Island," so it was clear that the country's emphasis on ecotourism influenced residents' views of the tourism industries in their community to some extent. In any case, this emphasis on benefits explains the resulting positive outlook on this industry, which is further emphasized by the fact that Dominica's WW industry did not appear to experience conflict with the fishing industry, which is relatively common elsewhere due to competition between fishermen and cetaceans and the impact of fishing gear on whales, dolphins and porpoises (J. Higham et al., 2014b; Mann et al., 2000). This is as would be expected from SET theory, as there are little real or perceived costs to local people from the WW industry, while the economic benefits are apparent to anyone who associates visitors with money entering the community. As with the interviews from the Dominican Republic, respondents from Dominica also discussed the characteristics of the industry, and groups of stakeholders involved with WW in the community.

Table 4.8: Comparison of Local People (Non-WWO) and WWO Sub-themes for Whale Watching

<b>Local</b>	<b>WWO</b>	<b>Local</b>	<b>WWO</b>
<b>Characteristics</b>	<b>Characteristics</b>	<b>Costs</b>	<b>Costs</b>
Advertising	Attraction	Conflict	Conflict
Charge/Fee	Charge/Fee		Disturbance
Ecotourism	Commercial		Changing whale behavior
Price	Family Business		
Season	History		
Tourism	Schedule		
	Season		
	Swim-with		
	Tourism		
	Unique		
<b>Benefits</b>	<b>Benefits</b>	<b>Stakeholders</b>	<b>Stakeholders</b>
Addition to tourism	Cooperation	Children	Community
Beauty	Development	Community	Everyone
Cooperation	Economics	Fishermen	Excursion
Economics	Jobs	Government	Companies
Experience	Knowledge	People	Fishermen
Tourism	Money	Students	Government
Whaling (Anti-)	Public Awareness	WWOs	Passengers
	Research		People
	Visitor Satisfaction		Researchers

#### **D. Perceptions of Cetaceans and Cetacean Conservation**

Cetaceans were well-liked among respondents, with local people describing a variety of benefits associated with this species, and no perceived costs when asked about what they knew about the animals, what they liked and disliked about them, and their opinions about associated biodiversity conservation. While there were similar descriptors for whales and dolphins used by people in the DR and Dominica, there was also an added level of detail to the perceptions of cetaceans in Dominica. Similar to the DR, some of the key reasons that people mentioned liking cetaceans was for certain elements of their perceived character, specifically for their intelligence, and for their friendly, social

nature. PL-02 said, "There's always something from them [whales and dolphins], you know, amazing to see, and friendly... You go to the water parks, and it is amazing what they [whales and dolphins] can do... it's impressive how intelligent they are." Such responses are positive, in terms of conservation, because even people who had not WW themselves seemed to be aware that these animals were likeable in the sense described above. One resident, who had been WW many times, mentioned cetacean intelligence in connection with captive cetacean entertainment.

Table 4.9: Comparison of Local People (Non-WWO) and WWO Sub-themes for Conservation Themes

<b>Local</b>	<b>WWO</b>	<b>Local</b>	<b>WWO</b>
<b>Characteristics</b>	<b>Characteristics</b>	<b>Protective Measures</b>	<b>Protective Measures</b>
Environment Feasible Ecosystem services National pride Research	Bonds with whales Discovery Ecosystem services Environment Know Better (WWO)	Assisted breeding Limits on hunting Protected areas	Alternatives Eco-friendly Education Management Protection Public Awareness Regulations Research
<b>Actors</b>	<b>Actors</b>	<b>Threats</b>	<b>Threats</b>
Community Government Researchers WWOs	Excursion companies Fisheries Division IFAW Researchers Tourism WWO	Hunting Pollution Predators	Disturbance Hunting Predators Ship strikes Stress

Unlike the DR, several respondents (both local and WWO) mentioned that one of their reasons for having positive perceptions of cetaceans was their part in the global ecosystem. PL-03 explained, "They [whales, dolphins and porpoises] are all part of the



grand scheme of things, they are part of the animal kingdom." One respondent (PL-05) went so far as to say that they didn't favor any animal over another for this reason.

I feel about whales and dolphins the same way that I feel about all other creatures. I believe that they are here for a purpose, and I believe that their purpose is, by and large, to be part of a global system that allows each one of us, if we understand the system well, to sort of live well and sustainably for a pretty long time.

When questioned about the value of cetaceans to the Dominican people, this idea about their role in the environment was reoccurring, along with the value of these species for tourism and their worth as a food source. PWWO-01 went into detail about this, discussing some of the more recent findings about whales and nutrient cycling in the oceans. "Well, factually whales are performing a pretty serious role in moving the nutrients from the bottom of the sea-bed to the top." PL-05 also mentioned cetaceans as an indicator species, especially in the case of Dominica's resident sperm whales.

Whales, definitely also can be an important barometer for us about the health and condition of our coastal environments. For example, in Dominica whales spawn and calve right in our waters. They wouldn't do that if our waters were polluted, if our waters were not healthy.

Such responses were not elicited by interviewees in the DR, and they suggest a positive understanding among residents of Dominica (at least in the Roseau-area) that cetaceans are important to the community for more than just their role as a resource for industry, tourism or otherwise. It is possible that such perceptions could be very positive for conservation, as a species' role in the ecosystem will retain its importance even when

potential trends such as WW have lost popularity (Millennium Ecosystem Assessment, 2005; Tallis et al., 2008).

Also unique to Dominica in comparison to the DR were discussions of cetaceans as a food resource. Small cetacean hunts are common in eastern Caribbean countries and Dominica is no exception (Alie, 2008; Caldwell & Caldwell, 1971), and this part of their culture came through in the interviews. Such hunts do add value to cetaceans, as one interviewee (PL-05) mentioned, "Well, surely they [cetaceans] have been valuable in terms of food." Such hunts are opportunistic in nature, however, as a Fisheries Division official explained that such meat was regularly available. Not all local people were receptive to this practice in their community, PL-03 explained, "Somebody had gone fishing and they had pulled it up. And they had brought it home, and it was a horrible experience to see it." But one Dominican respondent did describe cetaceans as "fish," which is a common belief where scientific information about cetaceans is not available, and which may support their use as a food source. PL-04 said, "Ok, well, they [cetaceans] are fish. And everybody loves fish, so I don't have a problem with them at all." For the most part, local respondents appeared to be fairly neutral about small cetacean hunts although they did acknowledge that this activity, if left unregulated, could be detrimental to cetacean populations and WW.

The local people of Dominica were also supportive of cetacean conservation efforts, as in the DR, likely in connection with the positive perceptions that they hold for the animals, due to the lack of costs and variety of benefits that local people experience in connection with healthy cetacean populations in their waters (Cropanzano & Mitchell, 2005; Goyder & Boyer, 2008; Rasoolimanesh et al., 2015). PL-02 said the following:

Well, for sure, laws and different things have to be put in place. And... and first, you have to see if people actually obey them. Other than that we... we've seen and heard of so many different animals and different, you know, species out there that have gone extinct, you know, because these type of things weren't done.

Specific questions concerning threats to cetaceans were not asked in Dominica, so data on this are lacking. There were a few threats that were mentioned by interviewees including ship strikes, and hunting. "I've always felt that it's a matter of time before we get a boat strike," PWWO-01 explained, and as a solution, "... there must be a special lookout for whales and dolphins that are also using these channels." PL-04 mentioned that reasonable limits on small cetacean catches should be utilized, which allowed the fishermen to continue their activities while also protecting the animals being hunted. "If you want to protect them from the fishermen, you don't want them to kill them everyday, because they are a form of recreation. People come to do whale watching and stuff like that, and we still use them." This quote also illustrates the role that WW is playing for this particular interviewee in garnering support for their protection. Some of the other methods mentioned as protective measures were as follows: protected areas, assisted breeding, and increasing research effort. Some respondents did have caveats to add to this, saying that they supported conservation efforts where science suggested that it was needed, and where feasible. PL-03 said, "If they need to be protected. If there is scientific evidence that they need to be protected, for sure." PL-01 added, "Well, for us as a small country, it's not possible for us to get the whales or the dolphins in some reserve where we can encourage mating." In the DR, there was a similar caveat concerning feasibility mentioned in connection to cetacean conservation, and this does suggest that working

with stakeholders in the community is essential in both nations in order to gauge when and why residents do or don't support certain conservation actions and where interventions may be most effective.

Finally, there was one last method mentioned by a WWO for protecting sperm whales in Dominica, and which had no equivalent in the DR responses. Specifically, this was the suggestion that hunting pilot whales, which were believed to feed on young sperm whales as well as compete with the sperm whales for food, would benefit Dominica's WW target species. Another operator (PWWO-02) described this issue: "Super frustrating, but he's [a WWO] out there saying, wow, maybe we should kill more of the pilot whales, because the pilot whales chase away all of the sperm whales, and pilot whales aren't worth anything to us." This is concerning, as such a method is not supported by science (Gerber, Morissette, Kaschner, & Pauly, 2009; Morissette, Kaschner, & Gerber, 2012), and this suggests that WW can be counterproductive for some species of cetaceans if this line of reasoning is followed. In this case, this WWO not only sees WW value as a reason to protect the animals that the industry relies on, but also sees WW as a reason to target another cetacean species for culling. This is counter to the conservation values that e-NGOs and others believe that WW can instill in industry professionals and others (J. Higham et al., 2014b; Hoyt, 2005b; M. B. Orams, 1997b). This is a perverse outcome of concern for the target species, and it illustrates that linking biodiversity conservation with any industry as incentives for protection may not spill over to other species or the ecosystem as a whole.

### **E. The Benefits of Whale Watching**

The resident interviewees in Dominica were very positive about WW overall and acknowledged both the direct and secondary economic benefits of the industry. There was widespread knowledge of the potential for WW to not only directly create jobs, but also supports the community by attracting tourists or enhancing their overall experience of the island. PL-01 said the following:

Well, anything that brings in tourists is good for the country, because, I mean, if you have one couple coming in just for whale watching, they take a taxi from the airport. There's a taxi operator benefiting from that. And there's the hotel association benefiting because they [the tourist] are finding somewhere to stay.

There was a sense, even among respondents that not experienced WW for themselves, that this kind of tourism was a part of their national identity. PL-02 explained, "... we're the whale watching capital of the Caribbean. So that's something that, you know, we stand out for..." Furthermore, since Dominica has marketed itself as the "Nature Island", several interviewees mentioned that WW fit in well with the rest of the nation's tourism product. PL-03 said, "Because it is one of our strengths, in our industry. As I said, it is a good fit with our Nature Island image. It provides jobs, and it protects our resource at the same time." In both Samaná and Dominica, WW is a point of pride and community character for residents. In the case of Dominica, however, this pride is linked with the country's effort to market itself as the Nature Island.

Table 4.10: Comparison of Local People (Non-WWO) and WWO Sub-themes for Benefits Themes

<b>Local</b>	<b>WWO</b>	<b>Local</b>	<b>WWO</b>
<b>Economics</b>	<b>Economics</b>	<b>Experience/Educational</b>	<b>Experience/Educational</b>
Addition to tourism	Economics	Beauty	Beauty
Economics	Secondary economic	Education	Education
Secondary economic	benefits	Fun	Fun
benefits	Jobs	Knowledge	
Jobs	Money	National pride	
<b>Environmental</b>	<b>Environmental</b>		
Support for	Public awareness		
conservation	Whaling (Anti-)		
Whaling (Anti-)			

In the discussion about benefits to individuals and the community, interviews revealed three categories of themes including economic benefits, environmental or biodiversity conservation benefits, and experiential/educational benefits for local people. Informed by my analysis of the Dominican Republic, I again consider cooperation to be a benefit of WW due to its positive effects on society (Uphoff, 2001), and its ability to enhance conservation outcomes associated with WW (Grey & Sadoff, 2003; Redpath et al., 2013). There were also some key areas of cooperation that were evolving or which had been established in Dominica. First, the relationship between the government and WWOs appeared to be respectful and beneficial. This may have been due to the lack of restrictions on the WW industry or be a function of scale, but there was also a mutual respect communicated on the part of both the WWOs and government officials at the time that the interviews were carried out. PWWO-01 said the following:

As operators with swim-with permits just to manage our things and our relationships with ourselves, among ourselves so that they don't have to get

involved. I think that was what [the government official] was saying. And I must say, I commend him for that. It's the right way to do it.

While it is uncertain what this relationship might evolve into if the government attempted to exert more control over WWOs, this mutual respect would form a good platform for ongoing discussion between the government and industry professionals about what needs to be done in order to protect Dominica's cetacean resource into the future. The complexity of this image is also in line with assumed perceptions based on SET in the case of positive attitudes towards WW, as this indicates that residents are well aware of this social benefit (Cropanzano & Mitchell, 2005; Goyder & Boyer, 2008; Rasoolimanesh et al., 2015).

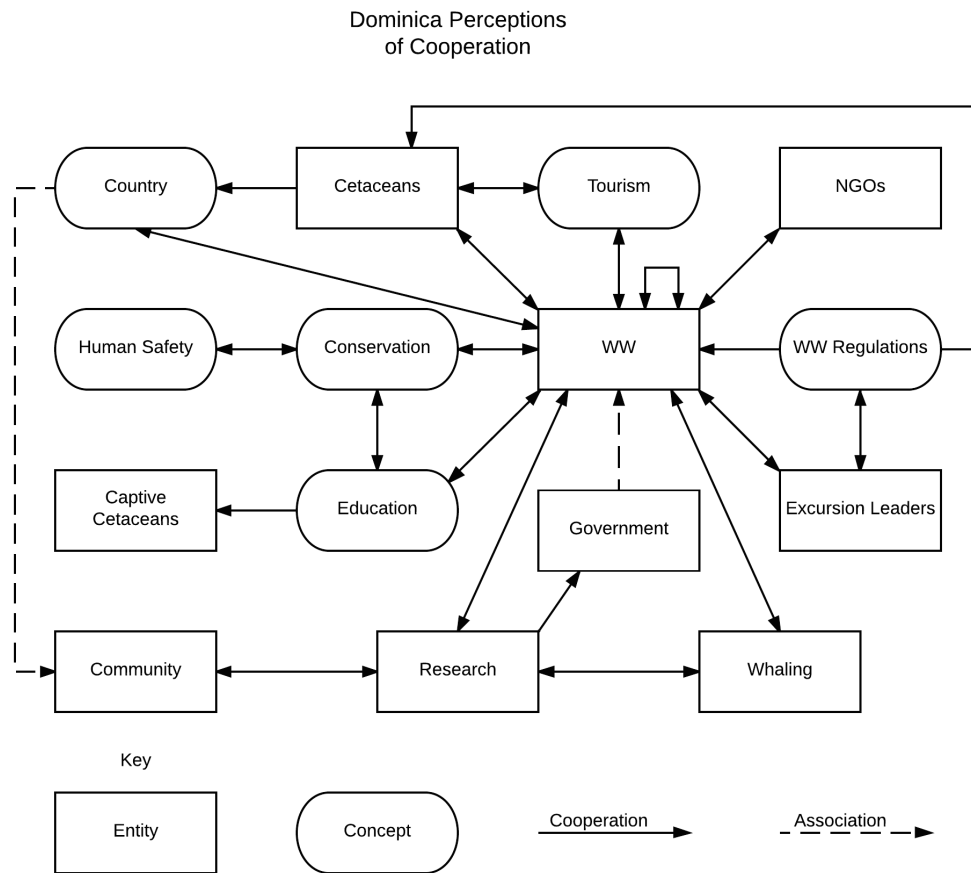


Figure 4.13: Perceptions of Cooperation within the Whale Watch System. Boxes indicate actors within the system (with conservation including both its actions and the actors as described by respondents and described in section E), and ovals represent intangibles that are described as influencing the system. Solid arrows represent specific cooperative relationships as described by interviewees, and dotted arrows indicate a relationship that I infer from the interview information but which was not explicitly described.

Perceptions of cooperation in the Dominica WW system were fairly complex (Figure 4.13). In 2014, there was also the potential for some very beneficial partnerships between domestic WWOs and international excursion companies, which brought in tourists and new expertise to Dominica's WW industry. While these international companies do take a cut of WW ticket prices local WWOs, they were also bringing some very high paying clients to Dominica, which is still building their tourism industry



(Caribbean Tourism Organization, 2015). Furthermore, these companies have experience with WW industries across the globe, and thus, they are aware of the problems that have been faced by different industries and the way that these challenges can be addressed. PWWO-02 explained, "[Dominican WWOs] don't have the experience of how whale watching tourism work in other parts of the world... Someone like myself [excursion leader] has the rare opportunity to have seen whale watching operations on just about every continent." Again, the DR may serve as a good example for the kind of regulatory structure that may serve as a solution to this problem, as they require swimmers to maintain a safe distance from the whales at all times, and only swim in safe conditions. Due to this, their swim with industry has had only one major injury since its inception (Ministerio de Medio Ambiente y Recursos Naturales, 2015). Furthermore, excursion companies coming to Dominica know a variety of strategies for controlling visitor behavior in order to protect the animals being viewed, while also optimizing visitor satisfaction, which they note as being absent among local WWOs. PWWO-02 said the following:

...what I add to that to help people comply is to say- hey look, if you follow these guidelines the whales will be more comfortable with us in the water. Once the whales are more comfortable, you're gonna see more behavior, they're gonna allow you to get closer. We'll see socializing, we'll see stuff that if you just get in the water and swim straight at them, and don't pay attention to their behavior, they'll dive and that's all you'll get...

Such a balance of regulation and client experience is key for the long-term success of any WW operation, and excursion companies may be able to play a key role in the

negotiations of needed regulations, since they are concerned with the same bottom line that Dominican WW are (J. Higham et al., 2014b; Parsons, 2012; Redpath et al., 2013).

### F. The Costs of Whale Watching

During the preliminary interviews, Dominican respondents did not actually discuss any perceived costs of the WW industry to the community. While such discussions were also rare in the case of the Silver Bank WW industry, there were some issues that were brought up by residents of the Dominican Republic, as were discussed in Section Four. This may be a product of the shorter preliminary interview period, the less developed version of the interview form itself, or a lack of perceived or realized costs altogether, as would be suggested by SET and the overall positive perceptions of residents about WW. In this case social conflict is even more of a focus in terms of negative impacts of WW on the community, because this emerged as both a social and environmental cost of the WW industry.

<b>Local</b>	<b>WWO</b>
<b>Environmental</b>	<b>Environmental</b>
	Bad visitor behavior Disturbance Harassment
<b>Social</b>	<b>Social</b>
<b>Conflict</b>	Competition Conflict

Such conflicts undermine conservation efforts (Redpath et al., 2013), and they are also acknowledged as being a problem in other WW industries, particularly in regards to

regulations/guidelines (Ris, 1993; Silva, 2015; Slinger-Friedman, 2009). In the case of the DR, both local people and WWOs identified conflicts with the Ministry of the Environment, but in Dominica's case, no such conflict with the government existed at the time of the interviews. As mentioned in section D above, the government allowed the WWOs to regulate themselves for the most part. The head of the Fisheries Division (having since retired), mentioned believing that industry professionals were in the best position to know what needed to be done in order to protect their resource. This was described by PWWO-02, "The government is basically looking to the industry to say, what do you want us to do?" Part of this willingness to leave management to WWOs may stem from the fact that fisheries and cetaceans are not managed in the same way, and the Fisheries Division is focused on the former rather than the latter. PO-02 explained, "A lot of them [fisheries officers] have, you know, master's degrees even in fisheries or resource management... they don't have any experience with marine mammals and their [cetaceans] management is very different from fisheries because they reproduce so much slower." This acknowledgement of differing expertise and the government's openness to negotiating with WWOs could be very beneficial for cooperation between the two groups, but it also allows for WW guidelines to be ignored and this can be dangerous for cetaceans (Parsons, 2012).

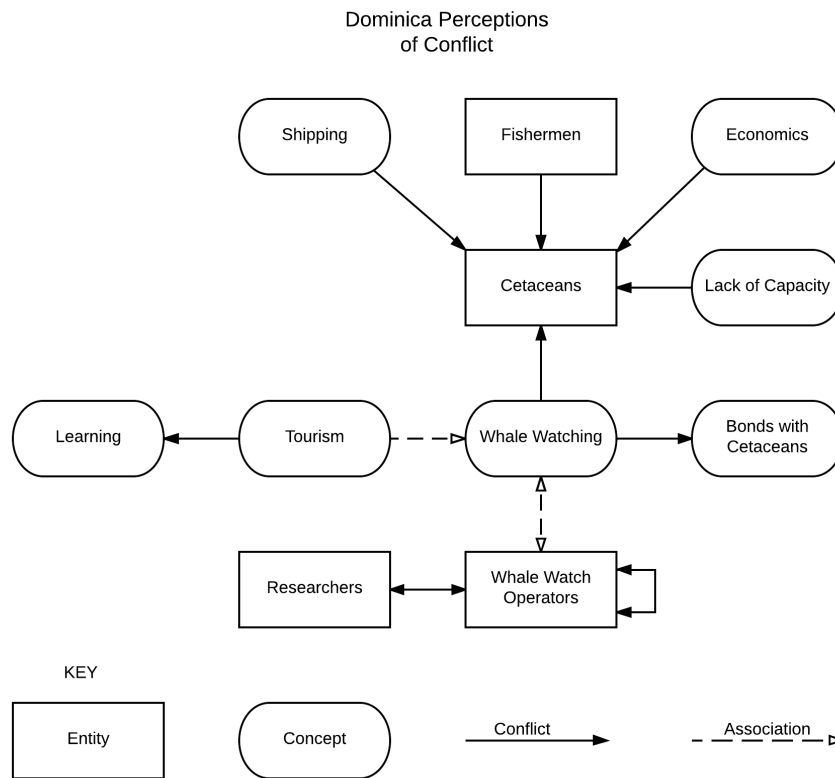


Figure 4.14: Perceptions of Conflict Within the Whale Watch System. Boxes indicate actors within the system (with conservation including both its actions and the actors as described by respondents and described in section E), and ovals represent intangibles that are described as influencing the system. Solid arrows represent specific cooperative relationships as described by interviewees, and dotted arrows indicate a relationship that I infer from the interview information but which was not explicitly described.

As with the Dominican Republic, the people of Dominica were aware of some issues of conflict within the WW system (Figure 4.14). While the relationship between the government and the industry was not problematic at the time of my interviews, there were no regulations or guidelines for WWO behavior. WWOs expressed frustration with one another over the topic of regulations, however, due to the fact that some wanted more restrictions to protect the whales and others believed that they knew enough about whale behavior to avoid negative impacts via self-regulation. There were concerns voiced by

traditional WWOs (observation only), that swim-with programs would drive the sperm whales further and further from shore, and changing their behavior. PO-02 explained, "I think that there's a concern there amongst most of the operators, um, and certainly the operators that don't do swim, but do traditional, that, you know, there will be a long term impact." Some swim-with operators, however, believed that they knew the whales well enough to be able to tell if they were being bothered. PWWO-01 said the following:

They want conservation, but they don't realize what we [WWOs] realize, is that the whales around here have been very habituated. And if they didn't like what we are doing, coming close to them, they would have done something about it.

While no such conflict exists between swim-with and traditional WWOs in the DR, due to use of different areas (Samaná bay for tradition and Silver Bank proper off of Puerto Plata for swim-with), there were also operators there that were less invested in behavioral regulations than others. This had caused conflicts on the water, and between operators when they were negotiating with the government concerning permits. In both countries, this difference of interests could have stemmed from different goals among the WWOs, and/or be due to differing levels of education. However, an actual correlation between knowledge of the animals and commitment in regulations cannot be made with this data set.

Unique to Dominica, due to its lack of established regulations, was the ad hoc way that new WWOs were prevented from establishing themselves, and the frustration expressed by foreign excursion leaders trying to deal with the ill-defined WW system. The first represents a possible point of contention with local people if the WW industry starts to be perceived as unfair, as was mentioned by one DR respondent. If excursion

leaders pull out of Dominica, this system could also pose a threat to the sustainability of the WW industry itself. In regards to the first issue, a regular swim-with client described this problem of ad hoc limitations of the WW industry size in Dominica. PO-01 said, "I had tried to go out with [WVO], but the permit was blocked by the others." In this case, client preference was being overridden by competition between operators, which then lowered visitor satisfaction. Further detail was added to this as the following was mentioned by PO-02:

If some new local guy buys a new boat and wants to go whale watching, does he need a whale... water sports permit, yes/no. Does he need to be affiliated with a hotel, yes/no. If he gets a permit from fisheries is he good? Like, none of those things are settled in anybody's eyes. Uh, and that's why the big players like Anchorage and Dive Dominica have so much sway, because, you know, they... they've kind of been running the business, and so, that status quo is kind of adopted basically out of necessity, right?

In this case, established power structures within the community, rather than any sort of protocol, were being utilized to keep newer operators from obtaining permits. This raises concerns about the relative fairness of the industry in Dominica, which can become a local concern as was illustrated in the DR. In the case of the DR, however, regulations that had been defined to keep the WW industry at a certain size to limit the amount of pressure on the whales, rather than limitations due to established WVOs wanting to reduce competition by simply preventing the establishment of new operators. Again, this suggests the regulations in Dominica need to be further defined and strengthened in order to protect the WW industry in the long-term.

Besides the issue of fairness, structural problems with Dominica's swim-with industry were becoming a threat to its economic stability by causing disillusion among the excursion leaders that brought groups into the country. PWWO-02 explained the following:

We can bring in more money, but the flip-side is that this has to be a professional business thing. It can't just be a negotiation between an operator and a singular government official. Um, you know, in some back room somewhere.

Specifically, confusion relating to permits and potential overlap of dates (as only one swim-with permit is supposed to be granted for any one time) had become problematic as expedition companies began organizing tours. When two swim-with permits were issued for the same dates, one of the two groups would have to move their trip, which became a risk factor for excursion companies, since this flexibility in travel is not convenient for their clients. PO-02 explained the following:

There's this other level of people who are making money [excursion companies].

And they say look, we can make more money but we need to regulate stuff...

Like how do I get a permit. I want to know that my dates are February 10th to February 20th, even months ahead of time. I can't know... I can't sell a tour and then have it shift by three days.

Due its relative lack of tourism publicity/popularity, Dominica's swim-with industry benefited greatly from the partnership with external tour companies, as these brought in larger groups of high-paying clients, and they had to work with local WWOs in order to run the tours. Thus, losing this partnership would be a significant hit on the industry, and clearly necessitates a structured system within which companies can function efficiently.

The Dominican Republic does not face such an issue as there are no such partnerships necessitated for its WW, likely due to both its WW industry structure and the fact that the country is one of the most popular WW destinations in the Caribbean, if not the world. In this case, it would seem that the WW situation in both countries is too different for the DR method to be directly applied, and furthermore, the solution to Dominica's 2014 problem is clearly the development of a regulatory framework that all stakeholders can work within.

### **G. Study Limitations**

The primary limitations of the Dominica study were the short time period over which the interviews were given, as well as the un-finalized, preliminary version of the interview form that was used. The length of the preliminary field season was only two weeks long, although there were several Skype interviews administered after I left Dominica. Furthermore, I had to spend some time in the field finding a good gatekeeper that could help me locate participants, as I was unable to find one remotely before I arrived. The interviews used in Dominica served as the foundation for the interviews used in the DR, and were used as a pilot study. There was less explicit focus on costs and benefits in the interview protocol, and more of a general line of questioning about people's perception of the WW industry and cetaceans. So, answers were less specific in this sense. Overall, these two things mean that I have fewer interviews from Dominica and those that I have were less detailed than those from the DR. This is partially why the findings of the DR were used for the final structure and analysis for those from Dominica.



Similar to the DR, I also got a sense that there may have been a tendency among respondents to give me the kinds of answers that they believed I wanted to hear or was more helpful for me. This would be a particular problem for discussions of the costs of WW on communities, and may be partially why so few participants discussed the negative impacts of WW. Furthermore, many of the participants in Dominica worked in the tourism industry, and this particular group of people is known to have generally positive perceptions of tourism, due to the economic benefits that they accrue from it (Ap, 1992). Due to the on-water nature of WW, however, it may just be that most people in the community actually do not perceive those costs. Secondly, there was a tendency of my gatekeeper to point me towards people that they felt knew a considerable amount about WW, and away from local participants less connected to the WW industry. I attempted to address this by finding some participants in the community on my own.

## **Section Six: Conclusions and Suggestions**

### **A. Conclusions and Suggestions for the Dominican Republic**

Overall, the findings of this study suggest that WW is playing a positive role in the community, and enhancing conservation efforts. It would seem that respondents from all groups perceive the benefits of WW to outweigh the costs, and as per SET, this is reflected in greater acknowledgement among interviewees about benefits than costs, as well as an positive perception of WW overall (Cropanzano & Mitchell, 2005; Goyder & Boyer, 2008; Rasoolimanesh et al., 2015). The data also suggest several key areas for needed improvement to insure the sustainability of this industry in the long-term, and to mitigate some of the negative impacts that were highlighted by respondents. Such findings are supported by targeted evaluations of the Silver Bank Sanctuary (León, 2003).

Local people had a positive view of the WW industry overall. They were well aware of the jobs that it provided, as well as the economic support that it created for the community through visitors' use of other services in the area. There was also a sense from several of the interviews that WW was part of the culture and spirit of Samaná Village, as well as some of the surrounding towns, and that it was a tool for shaping the international image of the community. On the other hand, participants did not appear to perceive any of the potential negative impacts of the industry. WWOs also widely expressed happiness with their business, and some expressed continuing support for hiring locally, which is key to the ability of tourism to have a strong, positive economic impact on the community (Lacher & Nepal, 2010). Furthermore, WW does appear to have played a role in getting local people as well as WWOs to care about the health of whale populations in the Silver Bank Sanctuary. These findings support the claims of e-NGOs and others about

the benefits of WW(Hoyt, 2005b; IFAW, 2013; WDC, 2016), and the Dominican Republic has thus far done a good job of balancing many stakeholder needs in order to accomplish this.

Such a system can only be maintained with an attention to addressing emergent problems, and there are some suggestions that arise from these interviews which could be used to ensure that WW in the DR remains sustainable. In regards to local people, it seems that there is a need to increase the community's opportunities to learn more about cetaceans and their relationships to humans and the ecosystem. Supporting the Samaná NGO CEBSE may be one relatively easy way to do this, as this organization is already part of the community, has long-term programs getting local students involved in science and industry monitoring, and runs a small museum about Samaná's whales. These projects should be continued, and increased funding could help continue development of the museum, and allow CEBSE to enhance their reach to the community. There is also a need for the Ministry of the Environment to increase their transparency in terms of the use of fees in a way that is accessible to local people. In doing so, they may have the opportunity to connect to the community more closely as well as offer residents educational opportunities. Partnerships between WWOs, the Ministry, and CEBSE in this regard are also key, and may help residents see how WWOs and the government are giving back to local people.

It was also made clear during this analysis that co-management has been effective in the Silver Bank Sanctuary, but there is evidence that the key players in the implementation of this strategy experienced some severe tensions in the past year. Whether or not these problems continue to persist, a positive relationship between

WWOs and the Ministry of the Environment must be maintained. The Ministry must be transparent in its use of current regulations, and continue to include WWOs in the process of developing and implementing management. WWOs, for their part, should continue to support strong industry leaders that seek to balance the safety of the whales that WW relies on and economic success. Both parties must respect the limitations that must be placed on the WW industry in order to preserve the natural resource being utilizing in the long-term.

Key to this, based on issues raised in the interviews, as well as WW impact research, is the commitment to keeping the number of boats allowed to WW at its historic level. While this does disadvantage small operators that would like to break into the industry, many WW researchers agree that high numbers of WW boats is very detrimental to target and non-target cetaceans due to harassment, noise pollution, and increased vessel traffic among other things (Arcangeli et al., 2009; Parsons, 2012; Weilgart, 2007). The humpback whales in the DR are particularly vulnerable since they are breeding in WW waters. Furthermore, allowing large companies (resorts or cruises) to run their own WW tours would lessen (or completely remove) benefits to the community, and thus should be avoided (Duval, 2004; Lawton & Butler, 1987; Matias, Nijkamp, & Sarmiento, 2011). While restrictive WWO permitting is only one of the many regulations that the DR has developed for the protection of its whales, it is integral to the country's ability to maintain the beneficial form that WW has taken in the Silver Bank Sanctuary so far, and it was specifically mentioned by residents and WWOs as being under threat.

In the end, these interviews indicate that the WW industry in the DR has been a positive force for conservation and community economic development, and thus, the DR

model of WW may serve as a good model for other Caribbean countries with WW industries. However, these benefits cannot continue without addressing issues such as those revealed by this study.

### **B. Conclusions and Suggestions from the Preliminary Study in Dominica**

While the data for Dominica were not as robust as that of the DR due to the preliminary nature of the study, they do provide insight into the industry in Dominica. It is clear that local people do support the WW industry overall, and because they are more aware of or experience the benefits rather than the costs of the industry (Cropanzano & Mitchell, 2005; Goyder & Boyer, 2008; Rasoolimanesh et al., 2015). It was apparent, however, that increased access for the community to this activity would be beneficial as a form of recreation and environmental education. Furthermore, residents expressed a great interest in this form of tourism, even if they had never been a participant. Many described it as a part of Dominica's character. Resident access to WW would also serve as a way to build community/national pride, while also serving as a local customer base for WWOs.

While there were many similarities between Dominica and the Dominican Republic in regards to WW, one of the key differences that stood out in regards to non-industry insight was the reference by several residents in Dominica to ecosystem services. There were no respondents in the Dominican Republic who discussed the role of cetaceans in the context of the larger ecosystem as a value to humans. This understanding of the role of other species in allowing humans to live our lives comfortably, even if they do not directly contribute to something like WW, is key to environmental sustainability. In some cases WW may be a long-term industry, able to enhance cetacean conservation

while also supporting coastal communities, but it is possible that this will not be the case in all destinations. Thus, having a population that sees the value of cetaceans despite the presence of WW suggests that there will still be support among local people for the protection of those species. Creating educational opportunities in the community to help local people understand this connection throughout the Caribbean would be extremely helpful to cetacean conservation, and WW may be able to play a role in this if opportunities to partake in this activity are provided to residents now and into the future.

In terms of regulations and long-term environmental and social sustainability, the interviews strongly suggest a need for a more cohesive regulatory structure that will limit/mitigate negative impacts on cetaceans, address human safety issues, encourage excursion companies to continue working with the countries WWOs, and avoid problems of unfairness which may lead to community dissatisfaction with the industry. Without such a system of regulations, it is unclear (but appears to be unlikely) that this industry will be sustainable in the long run. Both operators and additional informants brought up issues of human safety on multiple occasions, with fears that a lack of regulations was encouraging some WWOs to allow clients into the water in dangerous conditions. With respect to the cetaceans themselves, there were indications at the time that coastal development and increasing WW pressure may have been causing a movement away from shore, and further, the interviews indicated an interest by some to encourage the hunting of pilot whales in order to protect the more lucrative sperm whale species. Behavioral changes among the sperm whales, as well as concerning general population trends in the area as described by the Sperm Whale Project, do suggest that special care

must be taken in order to preserve the unique resource that Dominica has in its sperm whales.

The guidelines developed by Dominica in partnership with IFAW would likely be a good starting point for behavioral limitations, as they are one of the most detailed set of guidelines in the Caribbean (Carlson, 2011). Due to the fact that swim-with is prohibited by these guidelines, there would need to be some retooling and negotiation about a functional form that they could take, but this would not only help protect cetaceans but assist WWOs in dealing with conflict concerning behavior around the whales by initiating focused discussions on the matter. A co-management strategy may be helpful in this case, as the government has already allowed the WWOs to regulate themselves for the most part, which appeared to create a respectful working partnership between the two, but which also allowed for the industry "free-for-all" described in Section Four.

The WWO idea to hunt pilot whales in order to protect sperm whales must be addressed here as well, but as a comment on hunts as a method of conservation for another species, rather than a comment on small cetacean hunts as a food source, livelihood, or aspect of Dominican and Eastern Caribbean culture. As I have discussed in Section Four, culling one species to protect another is often not an effective management tool, especially when the ecological links between those species are not well understood (Gerber et al., 2009; Morissette et al., 2012). Furthermore, in terms of cetacean conservation overall, this line of reasoning, particularly in regards to the apparent devaluing of pilot whale lives (because they are not a popular WW target species) should be concerning to the e-NGOs and others that support WW as a cetacean conservation tool. There is a clear need for continuing partnerships and information exchange between

these e-NGOs, marine mammal researchers in Dominica, and industry professionals. WWOs should feel comfortable seeking information on topics of concern from researchers and knowledgeable e-NGOs, in this case, what is the impact of the pilot whale population on Dominica's WW industry's primary cetacean resource? E-NGOs also need to be active in their efforts to monitor when and where these potentially dangerous ideas are arising and then work with operators to find better ways to address industry concerns.

Finally, in looking at the WW industry in Dominica and the Dominican Republic, these interviews show that there is clear community support for WW, but that a variety of conflicts can arise from both highly developed and free-form WW systems. In both countries, residents had positive perceptions of WW and acknowledged both its direct and secondary economic effects, without much to say about its negative impacts on the community. However, both groups did describe conflict within the industry, particularly in regards to behavioral regulations on the water. This appears to be a common problem for WW (Cisneros-Montemayor et al., 2010; Neves-Graca, 2004; Silva, 2015). The nature of these conflicts differed to some extent in both study locations, due to the nature of regulations in each. For the DR, there was conflict among WWOs, but the most tension was expressed between industry professionals and the government, which was seen as undermining both regulations and WWO cohesion. In Dominica, there was little to no conflict with the government, since top-down regulations on the industry were nearly non-existent in 2014, but there were conflicts between WWOs, as well as concerns among excursion companies concerning the long-term viability of WW in its current form. There is no perfect system for WW or any other industry, in which there is no



conflict concerning limitations, but each of these examples does provide suggestions for future improvement. The DR has illustrated that co-management in the Caribbean is an effective way of achieving a sustainable WW industry, however, it is key to maintain respectful, working relationships between stakeholder groups. Dominica shows that government respect for WWO expertise may be one way to do this, but that some top-down regulation is likely necessary, once such rules have been agreed upon by relevant parties.

### **C. Theoretical Implications**

The results of this study are consistent with social exchange theory's parameters overall, although in the case that cooperation and conflict are considered social benefits or costs of the WW industry, there was a higher perception of conflict. Respondents in both study sites had positive perceptions of the WW industry in their community, which social exchange theory would suggest means that local people perceive the positive impacts of the industry as outweighing the negative impacts (Cropanzano & Mitchell, 2005; Goyder & Boyer, 2008; Rasoolimanesh et al., 2015). This appeared to be the case in both countries, with respondents being able to readily speak about the economic and social benefits of the industry, such as provision of jobs, support for the tourism industry of the community and thus a variety of businesses, increased recreational opportunities, and enhancement of community pride. People were generally less aware of the costs, and outside of the conflicts that they described most participants did not perceive any costs to the community by the WW industry.

There was an interesting focus more on conflict than cooperation, particularly in the case of the Dominican Republic, which was somewhat unexpected based on SET principles in light of the positive perceptions that local people had for the industry. However, this may be due to the circumstances in the Dominican Republic at the time that I carried out my interviews, because the interviews with WWOs indicated that there was some instability in the co-management system at the time that I was there. This could potentially create an emphasis on discussions of conflict for WWOs, but local people (non-WWOs) also described conflict in greater detail as well. However, my classification of conflict and cooperation as negative and positive impacts of WW is based on scientific findings concerning conservation and society, but they may not be something that respondents would also perceive as costs and benefits. If local people do perceive conflict and cooperation to be costs and benefits, SET still fits this case study well, as it is likely that they still see the benefits of WW overall to outweigh its costs in the community.

## CONCLUSIONS

Whale watching (WW) has the potential to benefit people and nature through the provision of economic value to living, free cetaceans. Past research has uncovered some of the social and environmental consequences of this tourism industry, but there are still many gaps in our knowledge about WW's effects on coastal communities and marine mammals (Parsons, 2012; Silva, 2015). Thus, the aim of this dissertation was to investigate some of the characteristics of WW which might lead to win-win outcomes for both people and nature. Using the data I gathered, I made suggestions concerning strategies to make the WW industry more sustainable in an environmental, social, and economic sense. In considering all three data-driven chapters of my dissertation, it is clear that there is need for management adaptation in response to our growing knowledge about the complex relationship that WW has with its host communities and the animals that it relies on, but there are also some positive indications that WW is providing both economic and conservation benefits. I will now briefly synthesize my results in regards to WW's impacts on coastal communities and cetaceans, and evaluate the industry as a whole via the lens of Buckley's 1994 restrictive ecotourism framework (Figure 5.1) and environmental ethics in order to provide insight into what ethical WW might look like.

### **A. Is Caribbean Whale Watching a Win-Win for People and Nature?**

Overall, Caribbean WW does appear to have net positive effects on the people of the Caribbean, although my study revealed some areas of concern. In terms of economic sustainability and benefits, past research and my interviews in WW communities confirm that this industry can be profitable for coastal communities (Higham et. al. 2014). My

investigation of the Caribbean country characteristics associated with WW expenditures illustrated that there was particular potential for benefits in developing nations. In particular, countries without major mass tourism development but with the provision of accommodation options appear to fit WW visitor preferences. In Dominica and the Dominican Republic, local people were also overwhelmingly positive about WW, and described both direct and secondary economic benefits as well as WW's positive impact on the community's image and overall tourism product. Their responses illustrated that they more readily perceived the benefits of WW than the costs, although there were some indications of underlying social challenges. In the case of Dominica, powerful families were able to control entrance into the industry, and in the Dominican Republic, tense relations between the government and the community was threatening the co-management system utilized in Silver Bank Sanctuary to protect cetaceans and local interests. There is also a need for a greater understanding of the interactions that WW may have with other industries, such as fisheries, that are key to community well-being, but which may conflict with marine tourism to some extent (Lien 2001). Thus, it is clear that issues of social conflict must continually be addressed in order to ensure that WW continues to serve the local community.

Determining if WW is a win for cetaceans is a bit more difficult, although there were both positive and negative findings in this regard. On the positive side, my interviews with local people and WWOs indicated that WW had played a significant role in improving resident knowledge about cetaceans, and the industry served as incentive for community support of cetacean conservation. My regression analysis found a positive correlation between cetacean biodiversity and WW expenditures, serving as further

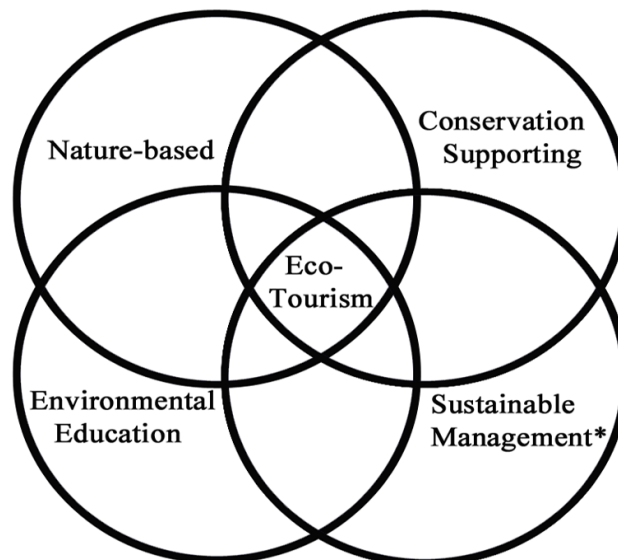
support for the link between the industry and conservation. Behavioral regulations on WWOs also had a positive correlation with industry expenditures, which gives some credence to the idea that environmentally sustainable WW can also be profitable. Furthermore, WW did not appear to have a positive relationship with mass tourism development, which is known to be particularly damaging to the coastal habitats that cetaceans rely on (Birkun Jr 2002; Duval 2004). Finally, the vulnerability index indicated that some of the species being targeted by the WW industry were actually fairly well-suited to this form of tourism. In particular, humpback whales had relatively low vulnerability in many of the index categories, except for those indicating high WW pressure.

However, the vulnerability index and the other components of my dissertation also illustrate that there is a considerable amount of risk to cetaceans in terms of WW's current implementation in the Caribbean. While humpback whales had low vulnerability, many target and non-target species did have characteristics that would make them susceptible to the negative impacts of WW (Higham et. al. 2014; Parsons 2012). Carlson's 2012 survey of WW regulations around the world also shows that regulations in the region are not likely well-developed enough to mitigate or prevent the negative impacts of WW attention. Furthermore, there were several characteristics that did not have sufficient data for inclusion in the index, indicating considerable uncertainty about both direct and indirect impacts of WW development on cetaceans. The social conflict uncovered in my interviews will likely serve as a challenge to addressing this problem (Redpath et. al. 2013). In terms of public policy and research, WWOs and, in some cases, government officials were resistant to further research on impacts due to fears that more

limits on WWO behavior would be needed, and a lack of positive relationships among actors in the system may undermine the ability of stakeholders to compromise and work together to develop fair solutions (Neves-Graca 2004; Ris 1993; Silva 2015). Finally, while I believe that the negative correlation between conservation agreement involvement and WW expenditures is due to an underlying association between overall levels of development and the ability of countries to participate in such international agreements, it does suggest uncertainty about WW's relationship with conservation. In order for WW to be a win for cetaceans and their environment, ethical forms of this industry must be developed, and examining the industry in relation to environmental ethics and the ecotourism framework can form the basis of what that industry should look like.

## B. What Should Ethical Whale Watching Look Like?

### CHARACTERISTICS OF ECOTOURISM (RESTRICTIVE DEFINITION)



\*Ecological, social, and economic sustainability.

Figure 5.1: Restrictive Definition of Ecotourism; modified from Buckley 1994

Evaluation of WW with the use of Buckley's 1994 restrictive ecotourism definition (Figure 5.1) reveals uncertainty as to whether or not Caribbean WW is, in fact, a sustainable and responsible form of tourism as suggested by its proponents (Greenpeace, 2004; IFAW, 2013; WDC, 2016). I have selected this specific framework due to its similarity to the International Society for Ecotourism's accepted definition (TIES, 2015), and because it accounts for the wide variety of potential, negative impacts that tourism can have (Bejder & Samuels, 2006; Jayawardena, 2002; Ryan, 2003; Silva, 2015; UNEP, 2013b). WW is nature-based, and *can* include environmental education, although my interviews in Dominica and the Dominican Republic revealed that this varies vastly from one operator to another. It is also unclear how much Caribbean WW supports cetacean conservation. One method for WW to support conservation is via its transformative value (Clayton & Myers 2015; Orams 1997). This is linked to education, and as mentioned that is not intrinsic to the industry, nor ubiquitous in the Caribbean context. My interviews did indicate, however, that the industry encourages local people in WW destinations to care about cetaceans, even in cases where residents know very little about them. This effect had practical ramifications in the Dominican Republic where residents pressed their government to act in the International Whaling Commission (IWC) against pro-whaling initiatives. In terms of environmental sustainability, my vulnerability index found that both target and non-target cetacean species had various combinations of characteristics that would likely make them vulnerable to WW impacts, both direct and indirect. There appears to be an insufficient amount of regulations/guidelines addressing these vulnerabilities throughout the region (Carlson, 2012), and thus WW has the potential to

have long-term, negative effects on the animals it relies on (Bejder et al., 2006; J. Higham et al., 2014b).

The social and economic sustainability of WW will depend on the ability of stakeholders to overcome conflicts. Resident perceptions of WW were positive in Dominica and the Dominican Republic, with local people perceiving many benefits and few if any costs. In the Dominican Republic, there is clear evidence of conflict surrounding WW, which may result in instability in the industry, particularly due to the expressed mistrust among WWOs and between the operators/local people and the government. While the system of co-management that the Dominican Republic utilizes for its WW is a potentially beneficial system for managing WW (Carlsson & Berkes, 2005), it is unlikely to be effective in tense, mistrustful social situations. Growing tensions may also threaten the WW industry, as it has in other locations, due to the way in which on-water conflicts among operators undermines visitor satisfaction, a key element to marine tourism success (Cisneros-Montemayor et al., 2010; Mustika et al., 2013; Silva, 2015). Thus, while there is the potential for WW to be a form of ecotourism, on a regional scale there does appear to be several key areas in need of improvement if this industry is really to be sustainable, responsible, and ethical. Stakeholders must form cooperative relationships with one another, the government and industry should invest in the local community to insure long-lasting benefits, and protective regulations for cetaceans must be in place.

Utilizing the environmental ethics frameworks of instrumental, intrinsic, and relational value, we can further explore the role of WW in terms of conservation and human well-being. Based on the claims made about WW by environmental NGOs,



particularly the idea that WW is a foil for whaling due to the fact that it creates an economic value for living cetaceans (Greenpeace, 2004; IFAW, 2013; WDC, 2016), instrumental value (or the anthropocentric view that nature and its components are valued and protected due to various ways that they fulfill human wants and needs) is key to the ethical standing of this tourism industry (Minteer, 2003). WW does provide instrumental value to cetaceans through its economic support for coastal communities around the world (O'Connor et al., 2009), and it also has the potential to add to that value by inspiring a love for cetaceans among visitors such that they see cetaceans as having existence value and thus seek to support their conservation (Millennium Ecosystem Assessment, 2005). Some studies have found very positive indications that cetacean-based tourism can influence people in this way, but the educational value of such trips must be high for the maximal positive effect (M. B. Orams, 1997b). My interviews also supported this among local people in WW destinations, as interviewees described learning first to value cetaceans for their role in making WW possible, and then, as they learned more about the animals, beginning to also value them for their playful nature, social tendencies, and intelligence.

In some ideal circumstances, WW may assist in taking such existence value even further, to the point that visitors agree that cetaceans have intrinsic value (a nonanthropocentric value by which components of nature have value in and of themselves), which some argue is essential to improving conservation support among the public and thus achieving global conservation goals more effectively (Rolston III, 2009). However, based on the conflict that I observed among WW professionals as well as many resident expressions about the practical use of cetaceans, I find that WW in the Caribbean

now is not likely to support such a shift from instrumental to intrinsic values.

Furthermore, WWO resistance to WW regulations as uncovered in my interviews in both Dominica and the Dominican Republic, as well as the final analysis of my cetacean vulnerability analysis which uncovered vulnerability in both target and non-target species and a lack of mitigating regulations/guidelines throughout the region, may indicate that WW has actively encouraged the opposite effect among professionals. In terms of relational values, such as nature's support for human social cohesion, identity, and cultural norms, WW did appear to bring some of this value to coastal communities, as local people described the industry and the cetaceans as part of their national identity, something that and something that they were proud of. This group of operators took part in the industry due to their love for cetaceans and their belief that they could help inspire visitors and residents to care for these animals around the world. In all, this suggests that WW has the potential to facilitate the strengthening and/or formation of personal identity in connection to healthy cetacean populations (M. B. Orams, 2000; Redpath et al., 2013).

With reference to the findings of this dissertation, as well as the analyses of both the restrictive definition of ecotourism and environmental ethics, there are several conclusions that can be made about what ethical WW should look like. First, the needs of cetaceans, both target and non-target, must be prioritized over economic benefits. This is true due to the high relational and instrumental (existence value) of cetaceans, as well as their intrinsic value. The precautionary principle also calls for this prioritization, due to the many unknowns of the WW system (Kriebel 2001). And finally, the long-term ability of WW to support and enhance the livelihoods of coastal communities will depend on healthy cetacean populations (Higham et. al. 2014), thus, prioritizing cetacean well-being

now will have long-lasting, positive impacts on communities in the future. In order to do this, limitations of WWO behaviors on the water are necessary, such as caps on the number of boats near target animals, spatial and temporal limits to the extent of WW, and specifications for how WW boats can approach animals (Parsons 2012). Coastal development must also be done in ways that lessen and mitigate negative impacts on the marine environment (Harwood 2001), and vessels should be design and outfitted to limit noise pollution below the water (Richardson 1995).

Destination residents must also be prioritized in regards to participation in the WW industry, related decision-making, and also in the receipt of educational/experiential benefits. Relational and instrumental values are key to local people's relationship with cetaceans in the context of WW, because residents will experience both the benefits and costs of the industry, and will have the highest direct impact on the cetaceans being impacted by WW in a destination. Thus, their support for WW and associated conservation actions is key to justice issues related to tourism development as well as conservation outcomes (Andereck et. al. 2005). Local people should be provided preferential access to the WW industry as potential operators, as has been done in the Dominican Republic, where licenses are primarily available to residents. Allowing for a balance between local decision-making and government-level enforcement via co-management may also play a key role in balancing resident rights to their environmental resources (Olsson et. al. 2004), as well as the need to prioritize cetacean protection within the context of WW. Co-management may also assist in the development of regulatory/guidelines structures that balance the needs and concerns of local people in a variety of jobs including WW and fisheries (Lien 2001). Finally, ticket prices for

residents that make WW more accessible for the community will benefit residents by providing recreational possibilities, while also enhancing the conservation impact of WW. Together, these things can help improve WW's ability to provide win-win outcomes for both people and the environment.

## References

- Adams, J. E. (1971). Historical geography of whaling in Bequia Island, West Indies. . *Caribbean Studies, 11*, 55-74.
- Adams, W. M., & Hutton, J. (2007). People, parks and poverty: political ecology and biodiversity conservation. *Conservation and Society, 5*(2), 147.
- Adams, W. M., Aveling, R., Brockington, D., Dickson, B., Elliott, J., Hutton, J., . . . Wolmer, W. (2004). Biodiversity conservation and the eradication of poverty. *Science, 306*, 1146-1149.
- Agardy, T., Bridgewater, P., Crosby, M. P., Day, J., Dayton, P. K., Kenchington, R., . . . Peau, L. (2003). Dangerous targets? Unresolved issues and ideological clashes around marine protected areas. *Aquatic Conservation: Marine and Freshwater Ecosystems, 13*(4), 353-367.
- Alie, K. (2008). Whales: more valuable alive than dead? A question for decision makers in Eastern Caribbean whale-watching destinations. *Business, Finance and Economics in Emerging Economies, 3*, 177-190.
- Allen, L. R., Long, P. T., Perdue, R. R., & Kieselbach, S. (1988). The impact of tourism development on residents' perceptions of community life. *Journal of Travel Research, 27*(1), 16-21.
- Allen, M. C., & Read, A. J. (2000). Habitat selection of foraging bottlenose dolphins in relation to boat density near Clearwater, Florida. *Marine Mammal Science, 16*(4), 815-824.
- Allen, S. J. (2014). From exploitation to adoration: The historical and contemporary contexts of human-cetacean interactions. In J. Higham, L. Bejder & R. Williams (Eds.), *Whale-watching: Sustainable Tourism and Ecological Management*. (pp. 31-47). Cambridge: Cambridge University Press.
- Alpert, P. (1996). Integrated conservation and development projects: Examples from Africa. *BioScience, 46*(11), 845-855.
- Andereck, K. L., Valentine, K. M., Knopf, R. C., & Vogt, C. A. (2005). Residents' perceptions of community tourism impacts. *Annals of Tourism Research, 32*(4), 1056-1076.
- Andersen, M. S., & Miller, M. L. (2006). Onboard marine environmental education: Whale watching in the San Juan Islands, Washington. *Tourism in Marine Environments, 2*(2), 111-118.
- Andersson, T. D., Gothall, S. E., & Wende, B. D. (2014). Iceland and the resumption of whaling: An empirical study of the attitudes of international tourists and whale-

- watch tour operators. In J. Higham, L. Bejder & R. Williams (Eds.), *Whale-watching: Sustainable Tourism and Ecological Management* (pp. 95-109). New York: Cambridge University Press.
- Andriotis, K. (2001). Scale of hospitality firms and local economic development-evidence from Crete. *Tourism Management*, 23, 333-341.
- Ap, J. (1992). Resident's perceptions on tourism impacts. *Annals of Tourism Research*, 19, 665-690.
- Ap, J., & Crompton, J. L. (1993). Residents' strategies for responding to tourism impacts. *Journal of Travel Research*, 32(1), 47-50.
- Arcangeli, A., Crosti, R., del Leviatano, A., & Rome, I. (2009). The short-term impact of dolphin-watching on the behaviour of bottlenose dolphins (*Tursiops truncatus*) in Western Australia. *Journal of Marine Animals and their Ecology*, 2(1), 3-9.
- Au, D., & Perryman, W. (1982). Movement and speed of dolphin schools responding to an approaching ship. *Fishery Bulletin*, 80(2), 371-379.
- Au, W. W. L., & Green, M. (2000). Acoustic interaction of humpback whales and whale-watching boats. *Marine Environmental Research*, 49, 469-481.
- Ayres, R. L. (1998). *Crime and violence as development issues in Latin America and the Caribbean*. World Bank Publications.
- Babin, B. J., Lee, Y. K., Kim, E. J., & Griffin, M. (2005). Modeling consumer satisfaction and word-of-mouth: restaurant patronage in Korea. *Journal of Services Marketing*, 19(3), 133-139.
- Bain, D. E., Trites, A. W., & Williams, R. (2002). *A model linking energetic effects of whale watching to killer whale (*Orcinus orca*) population dynamics*. (No. 1). Friday Harbor, Washington: Friday Harbor Laboratories, University of Washington.
- Ballantyne, R., Packer, J., & Hughes, K. (2009). Tourists' support for conservation messages and sustainable management practices in wildlife tourism experiences. *Tourism Management*, 30(5), 658-664.
- Baral, N., Stern, M. J., & Heinen, J. T. (2007). Integrated conservation and development life cycle in the Annapurna Conservation Area, Nepal: Is development overpowering conservation? *Biodiversity Conservation*, 16, 2903-2917.
- Barr, B., Utech, D., & Hoagland, P. (2000). *The economic contribution of whalewatching to regional economies: Perspectives from two National Marine Sanctuaries*. (). Silver Spring, MD: US Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Service.

- Barr, K., & Slooten, E. (1999). *Effects of tourism on dusky dolphins at Kaikoura*. Wellington, New Zealand: Department of Conservation.
- Barrera, B., Gjurgilova, P., Rabinowitz, S., & Suemori, H. (2007). *Tourism in the Dominican Republic*. MOC Project Paper.
- Baulch, S., & Perry, C. (2014). Evaluating the impacts of marine debris on cetaceans. *Marine Pollution Bulletin*, 80, 210-221.
- Beasley, I., Bejder, L., & Marsh, H. (2014). Cetacean-watching in developing countries: A case study from the Mekong River. In J. Higham, L. Bejder & R. Williams (Eds.), *Whale-watching: Sustainable Tourism and Ecological Management*. (pp. 307-322). Cambridge: Cambridge University Press.
- Beaubrun, P. C. (2002). Disturbance to Mediterranean cetaceans caused by whale watching. In G. Notarbartolo di Sciara (Ed.), *Cetaceans of the Mediterranean and Black Seas: state of knowledge and conservation strategies*.
- Bejder, L., & Samuels, A. (2006). Evaluating the effects of nature-based tourism on cetaceans. *Books Online*, , 229-256.
- Bejder, L., Samuels, A., Whitehead, H., Finn, H., & Allen, S. (2009). Impact assessment research: Use and misuse of habituation, sensitization and tolerance in describing wildlife responses to anthropogenic stimuli. *Marine Ecology Progress Series*, 395, 177-185.
- Bejder, L., Samuels, A., Whitehead, H., & Gales, N. (2006). Interpreting short-term behavioral responses to disturbance within a longitudinal perspective. *Animal Behavior*, 72(5), 1149-1158.
- Bejder, L., Samuels, A., Whitehead, H., Gales, N., Mann, J., Connor, R., . . . Krutzen, M. (2006). Decline in relative abundance of bottle nose dolphins exposed to long-term disturbance. *Conservation Biology*, 20, 1791-1798.
- Berkes, F. (2007). Community-based conservation in a globalized world. *PNAS*, 104(39), 15188-15193.
- Biermann, F. (2002). Strengthening Green Global Governance in a Disparate World Society: Would a World Environment Organisation Benefit the South? *International Environmental Agreements*, 2(4), 297-315.
- Biernacki, P., & Waldorf, D. (1981). Snowball sampling: Problems and techniques of chain referral sampling. *Sociological Methods & Research*, 10(2), 141-163.
- Birdsall, N., & Londoño, J. L. (1997). Asset inequality matters: an assessment of the World Bank's approach to poverty reduction. *The American Economic Review*, 87(2), 32-37.

- Birkun Jr, A. (2002). *Cetacean habitat loss and degradation in the Black Sea. Cetaceans of the Mediterranean and Black Seas: State of knowledge and conservation strategies*. ACCOBAMS.
- Blackman, A., Epanchin-Niell, R., Siikamaki, J., & Velez-Lopez, D. (2014). *Biodiversity Conservation in Latin America and the Caribbean: Prioritizing Policies*. New York: RFF Press.
- Blane, J. M., & Jaakson, R. (1994). The impact of ecotourism boats on the St Lawrence beluga whales. *Environmental Conservation*, 21(3), 267-269.
- Blau, P. M. (1964). *Exchange and power in social life*. New York: Wiley.
- Blom, B., Sunderland, T., & Murdiyarto, D. (2010). Getting REDD to work locally: lessons learned from integrated conservation and development projects. *Environmental Science & Policy*, 13(2), 164-172.
- Borggaard, D., Lien, J., & Stevick, P. (1999). Assessing the effects of industrial activity on large cetaceans in Trinity Bay, Newfoundland (1992-1995). *Aquatic Mammals*, 25(3), 149-161.
- Bossart, G. D. (2007). Emerging diseases in marine mammals: from dolphins to manatees. *Microbe-American Society for Microbiology*, 2(11), 544.
- Bottrill, C. G., & Pearce, D. G. (2009). Ecotourism: Towards a key elements approach to operationalizing the concept. *Journal of Sustainable Tourism*, 3(1), 45-54.
- Boyle, S. A., & Samson, F. B. (1985). Effects of non-consumptive recreation on wildlife: A review. *Wildlife Society Bulletin*, 13, 110-116.
- Brammer, R. (2015). Activism and antagonism: The 'Blackfish' effect!. *Screen Education*, 76, 72.
- Brida, J. G., Osti, L., & Faccioli, M. (2011). Residents' perception and attitudes towards tourism impacts: A case study of the small rural community of Folgaria (Trentino-Italy). *Benchmarking: An International Journal*, 18(3), 359-385.
- Britton, S. G. (1982). The political economy of tourism in the third world. *Annals of Tourism Research*, 9, 331-358.
- Brohman, J. (1996). New directions in tourism for third world development. *Annals of Tourism Development*, 23(1), 48-70.
- Brougham, J. E., & Butler, R. W. (1981). A segmentation analysis of resident attitudes to the social impact of tourism. *Annals of Tourism Research*, 8(4), 569-590.
- Brown, K. (2002). Innovations for conservation and development. *The Geographical Journal*, 168, 6-17.



- Brown, K., Adger, W. N., Tompkins, E., Bacon, P., Shim, D., & Young, K. (2001). Trade-off analysis for marine protected area management. *Ecological Economics*, 37, 417-434.
- Buckley, R. (1994). A framework for ecotourism. *Annals of Tourism Research*, 21(3), 661-669.
- Bulleri, F., & Chapman, M. G. (2010). The introduction of coastal infrastructure as a driver of change in marine environments. *Journal of Applied Ecology*, 47(1), 26-35.
- Burns, W. C. (1997). The International Whaling Commission and the Future of Cetaceans: Problems and prospects. *Colorado Journal of International Environmental Law and Policy*, 8, 31.
- Buscher, B., & Dietz, T. (2005). Conjunctions of governance: The state and conservation-development nexus in Southern Africa. *The Journal of Transdisciplinary Environmental Studies*, 4(2), 1-15.
- Butler, R. W. (1980). The concept of a tourist area cycle of evolution: implications for management of resources. *Canadian Geographer*, 24, 5-12.
- Cabezas, A. L. (2014). Between love and money: Sex, tourism, and citizenship in Cuba and the Dominican Republic. *Signs*, 40(1), 987-1015.
- Caldwell, D. K., & Caldwell, M. C. (1971). Porpoise fisheries in the southern Caribbean—present utilizations and future potentials. *Proceedings of the 23rd Annual Session of the Gulf and Caribbean Fisheries Institute* (pp. 195-206). Coral Gables, FL: Rosenstiel School of Marine and Atmospheric Science.
- Caribbean News Now. (2011, ). Three Caribbean countries walked out of IWC; Dominica sent no representative. *Dominica News Online*.
- Caribbean Tourism Organization. (2014). Statistics. Retrieved from <http://www.onecaribbean.org/statistics/>
- Caribbean Tourism Organization. (2015). Statistics. Retrieved from <http://www.onecaribbean.org/statistics/>
- Carlson, C. (2011). *A Review of Whale Watch Guidelines and Regulations Around the World: Version 2001*. International Whaling Commission.
- Carlson, C. (2012). *A review of whale watch guidelines and regulations around the world*. ACCOBAMS.
- Carlsson, L., & Berkes, F. (2005). Co-management: concepts and methodological implications. *Journal of Environmental Management*, 75(1), 65-76.

- Carrera, M. L., Favaro, E. G. P., & Souto, A. (2008). The response of marine tucuxis (*Sotalia fluviatilis*) towards tourist boats involves avoidance behaviour and a reduction in foraging. *Animal Welfare*, 17(2), 117-123.
- CAR-SPAW. (2012). *Marine protected areas: Caribbean Challenge Initiative*.
- Chilvers, B. L., Lawler, I. R., Macknight, F., Marsh, H., Noad, M., & Paterson, R. (2005). Moreton Bay, Queensland, Australia: an example of the co-existence of significant marine mammal populations and large-scale coastal development. *Biological Conservation*, 122(4), 559-571.
- Chirenje, L. I., Chitotombe, J., Gukurume, S., Chazovachii, B., & Chitongo, L. (2013). The impact of tourism leakages on local economies: A case study of Nyanga District Zimbabwe. *Journal of Human Ecology*, 42(1), 9-16.
- Christensen Jr., N. L. (2011). The road to sustainable development and conservation. *The Ecological Society of America*, 9, 134-135.
- Christiansen, F., & Lusseau, D. (2014). Understanding the ecological effects of whale-watching on cetaceans. In J. Higham, L. Bejder & R. Williams (Eds.), *Whale-watching: Sustainable Tourism and Ecological Management*. (pp. 177-192). Cambridge: Cambridge University Press.
- Christie, P. (2004). Marine protected areas as biological successes and social failures in Southeast Asia. *American Fisheries Society Symposium*, 42, 155-164.
- CIA. (2015). *The World Factbook*. Retrieved from <https://www.cia.gov/library/publications/the-world-factbook/>
- Cisneros-Montemayor, A. M., Sumaila, U. R., Kaschner, K., & Pauly, D. (2010). The global potential of whale watching. *Marine Policy*, 34, 1273-1278.
- Clapham, P. J., Childerhouse, S., Gales, N. J., Rojas-Bracho, L., Tillman, M. F., & Brownell Jr, R. L. (2007). The whaling issue: Conservation, confusion, and casuistry. *Marine Policy*, 31, 314-319.
- Clarke, J. (1997). A framework of approaches to sustainable tourism. *Journal of Sustainable Tourism*, 5(224-233).
- Collins, A. (1999). Tourism development and natural capital. *Annals of Tourism Research*, 26, 98-109.
- Constantine, R., & Baker, C. S. (1997). *Monitoring the commercial swim-with-dolphin operations in the Bay of Islands*. New Zealand: Department of Conservation.
- Constantine, R., Brunton, D. H., & Dennis, T. (2004). Dolphin-watching tour boats change bottlenose dolphin (*Tursiops truncatus*) behaviour. *Biological Conservation*, 117(3), 299-307.

- Converse, M. (2012). Philosophy of phenomenology: How understanding aids research. *Nurse Researcher*, 21(1), 28-32.
- Conway, D., & Timms, B. F. (2010). Re-branding alternative tourism in the Caribbean: The case for 'slow tourism.' *Tourism and Hospitality Research*, 10(4), 329-344.
- Cooney, R. (2004). *The Precautionary Principle in Biodiversity Conservation and Natural Resource Management: An issues paper for policy-makers, researchers and practitioners*. (No. 2).IUCN.
- Coria, J., & Calfucura, E. (2012). Ecotourism and the development of indigenous communities: The good, the bad, and the ugly. *Ecological Economics*, 73, 47-55.
- Corkeron, P. (2014). Human attitudes and values: Tradition and transformation and zombies. In J. Higham, L. Bejder & R. Williams (Eds.), *Whale-watching: Sustainable Tourism and Ecological Management*. (pp. 48-56). Cambridge: Cambridge University Press.
- Corkeron, P. J. (1995). Humpback whales (*Megaptera novaeangliae*) in Hervey Bay, Queensland: Behaviour and responses to whale-watching vessels. *Canadian Journal of Zoology*, 73(7), 1290-1299.
- Coscarella, M. A., Dans, S. L., Crespo, E. A., & Pedraza, S. N. (2003). Potential impact of unregulated dolphin watching activities in Patagonia. *Journal of Cetacean Research and Management*, 5(1), 77-84.
- Coyle, D. (2015). *GDP: A brief but affectionate history*. Princeton, NJ: Princeton University Press.
- Crain, C. M., Halpern, B. S., Beck, M. W., & Kappel, C. V. (2009). Understanding and managing human threats to the coastal marine environment. *Annals of the New York Academy of Sciences*, 1162(1), 39-62.
- Crain, C. M., Kroeker, K., & Halpern, B. S. (2008). Interactive and cumulative effects of multiple human stressors in marine systems. *Ecology Letters*, 11(12), 1304-1315.
- Crask, P. (2007). *Dominica*. St. Peter, UK: Bradt Travel Guides.
- Creswell, J. W. (2013). *Qualitative Inquiry and Research Design: Choosing Among Five Approaches*. (3rd ed.). Los Angeles, CA: Sage Publications.
- Cropanzano, R., & Mitchell, M. S. (2005). Social exchange theory: An interdisciplinary review. *Journal of Management*, 31(6), 874-900.
- Crouch, G. I. (1994). The study of international tourism demand: a review of findings. *Journal of Travel Research*, 33(1), 12-23.

- Culik, B. (2002). *Review on small cetaceans: distribution, behaviour, migration and threats*. (Regional Sea Reports and Studies No. 177). Bonn Germany: UNEP, CMS, Regional Seas.
- D'Amico, A., Gisiner, R. C., Ketten, D. R., Hammock, J. A., Johnson, C., Tyack, P. L., & Mead, J. (2009). Beaked whale strandings and naval exercises. *Aquatic Mammals*, 35(4), 452.
- Danaher, P. J., & Arweiler, N. (1996). Customer Satisfaction in the Tourist Industry A Case Study of Visitors to New Zealand. . *Journal of Travel Research*, 35(1), 89-93.
- Dans, S. L., Crespo, E. A., Pedraza, S. N., Degradi, M., & Garaffo, G. V. (2008). Dusky dolphin and tourist interaction: effect on diurnal feeding behavior. *Marine Ecology Progress Series*, 369, 287-296.
- Davidson, A. D., Boyer, A. G., Kim, H., Pompa-Mansilla, S., Hamilton, M. J., Costa, D. P., . . . Brown, J. H. (2012). Drivers and hotspots of extinction risk in marine mammals. *Proceedings of the National Academy of Sciences*, 109(9), 3395-3400.
- Davis, D., Allen, J., & Cosenza, R. M. (1988). Segmenting local residents by their attitudes, interests, and opinions toward tourism. *Journal of Travel Research*, 27(2), 2-8.
- de Sá Alves, L. C. P., Andriolo, A., Orams, M. B., & de Freitas Azevedo, A. (2012). The growth of 'botos feeding tourism', a new tourism industry based on the boto (Amazon river dolphin) *Inia geoffrensis* in the Amazonas State, Brazil. *Sitientibus Serie Ciencias Biologicas*, 11(1), 8-15.
- Delfour, F. (2007). Hawaiian spinner dolphins and the growing dolphin watching activity in Oahu. . *Journal of the Marine Biological Association of the United Kingdom*, 87(1), 109-112.
- Delmas, M. A., & Burbano, V. C. (2011). The drivers of greenwashing. *California Management Review*, 54(1), 64-87.
- DiMatteo, K. (2007). *Dominica Agricultural Movement and Development of Organic Production in Dominica*. Washington, DC: USAID.
- Discover Dominica Authority. (2013). Dominica: The Nature Island. Retrieved from <http://www.dominica.dm/>
- Doğan, H. Z. (1989). Forms of adjustment: Sociocultural impacts of tourism. *Annals of Tourism Research*, 16(2), 216-236.
- Dolman, S., & Simmonds, M. (2010). Towards best environmental practice for cetacean conservation in developing Scotland's marine renewable energy. *Marine Policy*, 34(5), 1021-1027.

- Dowie, M. (2011). *Conservation refugees: the hundred-year conflict between global conservation and native peoples*. MIT Press.
- Draheim, M., Bonnelly, I., Bloom, T., Rose, N., & Parsons, E. C. M. (2010). Tourist attitudes towards marine mammal tourism: An example from the Dominican Republic. *Tourism in Marine Environments*, 6(4), 175-183.
- Dritsakis, N. (2004). Tourism as a long-run economic growth factor: an empirical investigation for Greece using causality analysis. *Tourism Economics*, 10(3), 305-316.
- Duffus, D. A. (1996). The recreational use of grey whales in southern Clayoquot Sound, Canada. *Applied Geography*, 16(3), 179-190.
- Duffus, D. A., & Dearden, P. (1990). Non-consumptive wildlife-oriented recreation: A conceptual framework. *Biological Conservation*, 53, 213-231.
- Duval, D. T. (Ed.). (2004). *Tourism in the Caribbean: Trends, Development, Prospects*. London, UK: Routledge.
- Eilat, Y., & Einav, L. (2004). Determinants of international tourism: a three-dimensional panel data analysis. *Applied Economics*, 36, 1315-1327.
- Emerson, R. M. (1976). Social exchange theory. *Annual Review of Sociology*, , 335-362.
- Erbe, C. (2002). Underwater noise of whale-watching boats and potential effects on killer whales (*Orcinus orca*), based on an acoustic impact model. . *Marine Mammal Science*, 18(2), 394-418.
- European Commission. (2005). *Sustainability Impact Assessment (SIA) of the EU-ACP Economic Partnership Agreements: Caribbean Region: Tourism*.
- Evans, P. G. H., Canwell, P. J., & Lewis, E. J. (1992). An experimental study of the effects of pleasure craft noise upon bottle-nosed dolphins in Cardigan Bay, West Wales. *European Research on Cetaceans*, 6, 43-46.
- FAO, IUCN & UNEP. (2013). ECOLEX: The Gateway to Environmental Law. Retrieved from <http://www.ecolex.org>
- Figueredo, D. H., & Argote-Freyre, F. (2008). *A Brief History of the Caribbean*. New York: Facts on File, Inc.
- Findlay, K. P. (1997). Attitudes and expenditures of whale watchers in Hermanus, South Africa. *South African Journal of Wildlife Research*, 27(2), 57-62.
- Finkler, W., & Higham, J. (2004). The human dimensions of whale watching: An analysis based on viewing platforms. . *Human Dimensions of Wildlife*, 9(2), 103-117.

- Food and Agriculture Organization of the United Nations. (2012). *FAOSTAT*. Rome, Italy: FAO.
- Foote, A. D., Osborne, R. W., & Hoelzel, A. R. (2004). Whale-call response to masking boat noise. *Nature*, *428*, 910.
- Foxlee, J. (2001). Whale watching at Hervey Bay. *Australian Parks and Leisure*, *4*(3), 17-18.
- Freitag, T. G. (1994). Enclave tourism development: For whom the benefits roll? *Annals of Tourism Research*, *21*(3), 538-554.
- French, H. F. (1994). Strengthening international environmental governance. *The Journal of Environment & Development*, *3*(1), 59-69.
- Gagne, D. (2015). Insight Crime 2014 Homicide Round-Up. Retrieved from <http://www.insightcrime.org/news-analysis/insight-crime-2014-homicide-round-up>
- Gambaiani, D. D., Mayol, P., Isaac, S. J., & Simmonds, M. P. (2009). Potential impacts of climate change and greenhouse gas emissions on Mediterranean marine ecosystems and cetaceans. *Journal of the Marine Biological Association of the United Kingdom*, *89*(1), 179-201.
- Garau-Vadell, J. B., Díaz-Armas, R., & Gutierrez-Taño, D. (2014). Residents' Perceptions of Tourism Impacts on Island Destinations: A Comparative Analysis. *International Journal of Tourism Research*, *16*(6), 578-585.
- Garrod, B., & Fennell, D. A. (2004). An analysis of whalewatching codes of conduct. *Annals of Tourism Research*, *31*(2), 334-352.
- Gerber, L. R., Morissette, L., Kaschner, K., & Pauly, D. (2009). Should whales be culled to increase fishery yield? *Science*, *323*, 880-881.
- Gero, S. (2008). *CARIBwhale Cetacean Watching Guidelines: Background and Recommendations for their Development*. CARIBwhale: The Caribbean Whale Watchers Association and USAID. Unpublished manuscript.
- Gero, S., Engelhaupt, D., Rendell, L., & Whitehead, H. (2009). Who cares? Between-group variation in alloparental caregiving in sperm whales. *Behavioral Ecology*, *20*(4), 838-843.
- Gero, S., Gordon, J., & Whitehead, H. (2013). Calves as social hubs: dynamics of the social network within sperm whale units. *Proceedings of the Royal Society B: Biological Sciences*, *280*(1763).

- Gillespie, A. (2001). Aboriginal subsistence whaling: a critique of the inter-relationship between international law and the international whaling commission. *Colorado Journal of International Environmental Law and Policy*, 12, 77-139.
- Gillespie, A. (2002). Environmental threats to cetaceans and the limits of existing management structures. *New Zealand Journal of Environmental Law*, 97(6), 97-138.
- Gober, P., & Kirkwood, C. W. (2010). Vulnerability assessment of climate-induced water shortage in Phoenix. *Proceedings of the National Academy of Sciences*, 107(50), 21295-21299.
- Goodwin, L., & Cotton, P. A. (2004). Effects of Boat Traffic on the Behaviour of Bottlenose Dolphins (*Tursiops truncatus*). *Aquatic Mammals*, 30(2), 279-283.
- Gordon, J., Leaper, R., Hartley, H. R., & Chappell, O. (1992). *Effects of Whale-watching Vessels on the Surface and Underwater Acoustic Behavior of Sperm Whales off Kaikoura, New Zealand*. Science and Research Services Series No. 52. Wellington, New Zealand: New Zealand Department of Conservation.
- Gossling, S. (1999). Ecotourism: a means to safeguard biodiversity and ecosystem functions? *Ecological Economics*, 29, 303-320.
- Goyder, J., & Boyer, L. (2008). Social Exchange Theory. In P. J. Lavrakas (Ed.), *Encyclopedia of Survey Research Methods*. (pp. 827-828). Thousand Oaks: Sage Publications.
- Greenpeace. (2004). Conservation not exploitation: Whale watching (Greenpeace briefing- IWC 56 Sorrento). Retrieved from <http://www.greenpeace.org/international/Global/international/planet-2/report/2004/7/whale-watching.pdf>.
- Greenpeace. (2010). Dominica does not support commercial whaling. Retrieved from <http://www.greenpeace.org/usa/en/campaigns/oceans/whale-defenders/dominica/>
- Grey, D., & Sadoff, C. (2003). Beyond the river: the benefits of cooperation on international rivers. *Water Science and Technology*, 47(6), 91-96.
- Gursoy, D., Jurowski, C., & Uysal, M. (2002). Resident attitudes: A structural modeling approach. *Annals of Tourism Research*, 29(1), 79-105.
- Gursoy, D., & Rutherford, D. G. (2004). Host attitudes toward tourism: An improved structural model. *Annals of Tourism Research*, 31(3), 495-516.
- Haddaway, N. R., & Bilotta, G. S. (2016). Systematic reviews: Separating fact from fiction. *Environment International*, 92, 578-584.

- Haddaway, N. R., Woodcock, P., Macura, B., & Collins, A. (2015). Making literature reviews more reliable through application of lessons from systematic reviews. *Conservation Biology*, 29(6), 1596-1605.
- Hamilton, W. D. (1971). Geometry for the selfish herd. *Journal of Theoretical Biology*, 31(2), 295-311.
- Harrigan, N. (1974). The legacy of Caribbean history and tourism. . *Annals of Tourism Research*, 2, 13-25.
- Harrill, R. (2004). Residents' attitudes toward tourism development: A literature review with implications for tourism planning. . *Journal of Planning Literature*, 18(3), 251-266.
- Harrill, R., & Potts, T. D. (2003). Tourism planning in historic districts. *Journal of American Planning Association*, 3, 233-244.
- Harrison, L. C., Jayawardena, C., & Clayton, A. (2003). Sustainable tourism development in the Caribbean: practical challenges. *International Journal of Contemporary Hospitality Management*, 15, 294-298.
- Harwood, J. (2001). Marine mammals and their environment in the twenty-first century. *Journal of Mammalogy*, 82(3), 630-640.
- Hastie, G. D., Wilson, B., Tufft, L. H., & Thompson, P. M. (2003). Bottlenose dolphins increase breathing synchrony in response to boat traffic. *Marine Mammal Science*, 19(1), 74-84.
- He, G., Chen, X., Liu, W., Bearer, S., Zhou, S., Cheng, L. Y., . . . Liu, J. (2008). Distribution of economic benefits from ecotourism: A case study of Wolog Nature Preserve for Giant Pandas in China. *Environmental Management*, 42, 1017-1025.
- Herrera, G. E., & Hoagland, P. (2006). Commercial whaling, tourism, and boycotts: An economic perspective. *Marine Policy*, 30, 261-269.
- Higgins-Desbiolles, F. (2011). Death by a thousand cuts: governance and environmental trade-offs in ecotourism development at Kangaroo Island, South Australia. *Journal of Sustainable Tourism*, 19, 553-570.
- Higham, J., Bejder, L., & Williams, R. (2014a). Tourism, cetaceans and sustainable development. In J. Higham, L. Bejder & R. Williams (Eds.), *Whale-watching: Sustainable Tourism and Ecological Management*. (pp. 1-15). Cambridge, UK: Cambridge University Press.
- Higham, J., Bejder, L., & Williams, R. (2014b). *Whale-watching: sustainable tourism and ecological management*. Cambridge, UK: Cambridge University Press.



- Higman, B. W. (2011). *A Concise History of the Caribbean*. Cambridge: Cambridge University Press.
- Hirst, S. (2006). *I Am the Grand Canyon: The Story of the Havasupai People*. Grand Canyon, AZ: Grand Canyon Association.
- Hoegh-Guldberg, O., & Bruno, J. F. (2010). The impact of climate change on the world's marine ecosystems. *Science*, 328(5985), 1523-1528.
- Homans, G. (1974). *Social behavior*. New York: Harcourt-Brace.
- Honey, M., & Stewart, E. (2002). Introduction. In M. Honey (Ed.), *Ecotourism & certification: Setting standards in practice*. (pp. 1-29).
- Honychurch, L. (1998). *Dominica: Isle of Adventure: An Introduction and Guide*. London: MacMillan Education LTD.
- Hoyt, E. (1999). *The Potential of Whale Watching in the Caribbean: 1999+*. Bath, UK.: Whale and Dolphin Conservation Society.
- Hoyt, E. (2001). *Whale watching 2001*. International Fund for Animal Welfare, UNEP.
- Hoyt, E. (2005a). *Marine Protected Areas: For Whales, Dolphins and Porpoises: A World Handbook for Cetacean Habitat Conservation*. London, UK: Earthscan.
- Hoyt, E. (2005b). Sustainable ecotourism on Atlantic islands, with special reference to whale watching, marine protected areas and sanctuaries for cetaceans. *Biology and Environment: Proceedings of the Royal Irish Academy*, 105B(3), 141-154.
- Hoyt, E. (2009). Whale watching. In W. F. Perrin, B. Würsig & J. G. M. Thewissen (Eds.), *Encyclopedia of Marine Mammals* (2nd ed., pp. 1219-1223). San Diego, CA: Academic Press.
- Hoyt, E., & Hvenegaard, G. T. (2010). A review of whale-watching and whaling with applications for the Caribbean. *Costal Management*, 30, 381-399.
- Hoyt, E., & Parsons, E. C. M. (2014). The whale-watching industry: Historical development. In J. Higham, L. Bejder & R. Williams (Eds.), *Whale-watching: Sustainable Tourism and Ecological Management*. (pp. 57-70). Cambridge: Cambridge University Press.
- Hughes, H. L. (1994). Tourism multiplier studies: a more judicious approach. *Tourism Management*, 15(6), 403-406.
- Huh, C., & Vogt, C. A. (2008). Changes in residents' attitudes toward tourism over time: A cohort analytical approach. *Journal of Travel Research*, 46(4), 446-455.

- Hunt, C., & Stronza, A. (2014). Stage-based tourism models and resident attitudes towards tourism in an emerging destination in the developing world. *Journal of Sustainable Tourism*, 22(2), 279-298.
- Hutchings, J. A., Myers, R. A., García, V. B., Lucifora, L. O., & Kuparinen, A. (2012). Life-history correlates of extinction risk and recovery potential. *Ecological Applications*, 22(4), 1061-1067.
- IFAW. (2013). Whale watching. Retrieved from <http://www.ifaw.org/united-states/defending-whales/whale-watching>
- IMO. (2015). International Maritime Organization: Member States. Retrieved from <http://www.imo.org/en/About/Membership/Pages/MemberStates.aspx>
- Intergovernmental Panel on Climate Change. (2014). *Climate Change 2014—Impacts, Adaptation and Vulnerability: Regional Aspects*. Cambridge University Press.
- International Whaling Commission. (2013). General Principles for Whale watching. Retrieved from <http://iwc.int/wwguidelines#manage>.
- International Whaling Commission. (2015). Membership. Retrieved from <https://iwc.int/members>
- International Whaling Commission. (2016). Catches and catch limits. Retrieved from <https://iwc.int/catches>
- Islam, M. S., & Tanaka, M. (2004). Impacts of pollution on coastal and marine ecosystems including coastal and marine fisheries and approach for management: a review and synthesis. *Marine Pollution Bulletin*, 48(7), 624-649.
- IUCN. (2016). *The IUCN Red List of Threatened Species*. Retrieved from <http://www.iucnredlist.org>
- IWC. (1996). General Principles for Whale Watching. Retrieved from <http://iwc.int/wwguidelines>
- Jackson, L. A. (2006). Ameliorating the negative impacts of tourism: A Caribbean perspective. *International Journal of Contemporary Hospitality Management*, 18(7), 574-582.
- Jahoda, M., Lafortuna, C. L., Biassoni, N., Almirante, C., Azzellino, A., Panigada, S., . . . Notarbartolo di Sciara, G. (2003). Mediterranean fin whale's (Balaenoptera physalus) response to small vessels and biopsy sampling assessed through passive tracking and timing of respiration. *Marine Mammal Science*, 19(1), 96-110.
- Janik, V. M., & Thompson, P. M. (1996). Changes in surfacing patterns of bottlenose dolphins in response to boat traffic. *Marine Mammal Science*, 12(4), 597-602.

- Jayawardena, C. (2002). Future challenges for tourism in the Caribbean. *Social and Economic Studies*, 51, 1-23.
- Jefferson, T. A., Hung, S. K., & Würsig, B. (2009). Protecting small cetaceans from coastal development: Impact assessment and mitigation experience in Hong Kong. *Marine Policy*, 33(2), 305-311.
- Jelinski, D. E., Krueger, C. C., & Duffus, D. A. (2002). Geostatistical analyses of interactions between killer whales (*Orcinus orca*) and recreational whale-watching boats. *Applied Geography*, 22(4), 393-411.
- Jensen, F. H., Wahlberg, M., Bejder, L., & Madsen, P. T. (2008). Noise levels and masking potential of small whale-watching and research vessels around two delphinid species. *Bioacoustics*, 17(1), 166-168.
- Johnson, J. D., Snepenger, D. J., & Akis, S. (1994). Residents' perceptions of tourism development. *Annals of Tourism Research*, 21(3), 629-642.
- Jones, J. B. (1992). Environmental impact of trawling on the seabed: a review. *New Zealand Journal of Marine and Freshwater Research*, 26(1), 59-67.
- Juffe-Bignoli, D., Burgess, N. D., Bingham, H., Belle, E. M. S., de Lima, M. G., Deguignet, M., . . . Kingston, N. (2014). *Protected Planet Report 2014*. (). Cambridge, UK.: UNEP-WCMC.
- Jurowski, C., Uysal, M., & Williams, D. R. (1997). A theoretical analysis of host community resident reactions to tourism. *Journal of Travel Research*, 36(2), 3-11.
- Karagiannis, N., & Madjd-Sadjadi, Z. (2012). Crime, criminal activity and tourism performance: Issues from the Caribbean. *Worldwide Hospitality and Tourism Themes*, 4(1), 73-90.
- Kareiva, P., Chang, A., & Marvier, M. (2008). Development and conservation goals in World Bank projects. *Science*, 321, 1638-1639.
- Kasuya, T. (2007). Japanese whaling and other cetacean fisheries. *Environmental Science and Pollution Research-International*, 14(1), 39-48.
- Kayat, K. (2002). Power, social exchanges and tourism in Langkawi: Rethinking resident perceptions. *International Journal of Tourism Research*, 4(3), 171-191.
- Keith, D. A., Martin, T. G., McDonald-Madden, E., & Walters, C. (2011). Uncertainty and adaptive management for biodiversity conservation. *Biological Conservation*, 144, 1175-1178.
- Kerosky, S., Munger, L., & Hildebrand, J. (2008). *Cetacean research and conservation: A summary of current efforts and future needs*. Unpublished report sponsored by the

*Pacific Life Foundation, University of California–San Diego. Unpublished manuscript.*

- Khan, M. M. (1997). Tourism development and dependency theory: mass tourism vs ecotourism. *Annals of Tourism Research, 24*(4), 988-991.
- King, B., Pizam, A., & Milman, A. (1993). Social impacts of tourism: Host perceptions. *Annals of Tourism Research, 20*(4), 650-665.
- Kinzig, A., & Starrett, D. (2003). Coping with uncertainty: a call for a new science-policy forum. *AMBIO: A Journal of the Human Environment, 32*(5), 330-335.
- Kinzig, A. P., Perrings, C., Chapin III, F. S., Polasky, S., Smith, V. K., Tilman, D., & Turner II, B. L. (2011). Paying for ecosystem services- Promise and peril. *Science, 334*, 603-604.
- Knowles, T., & Campbell, R. (2011). What's a whale worth. Valuing whales for National Whale Day. International Fund for Animal Welfare.
- Ko, D. W., & Stewart, W. P. (2002). A structural equation model of residents' attitudes for tourism development. *Tourism Management, 23*(5), 521-530.
- Kolbe, A. R., Brookes, K., & Muggah, R. (2013). *Is Tourism Haiti's Magic Bullet? An Empirical Treatment of Haiti's Tourism Potential*. Igarape Institute.
- Kriebel, D., Tickner, J., Epstein, P., Lemons, J., Levins, R., Loechler, E. L., . . . Soto, M. (2001). The precautionary principle in environmental science. *Environmental Health Perspectives, 109*(9), 871.
- Kruse, S. (1991). The interactions between killer whales and boats in Johnstone Strait, BC. In K. Pryor, & K. S. Norris (Eds.), *Dolphin societies: Discoveries and puzzles* (pp. 148-159). Berkeley, CA: University of California Press.
- Kvale, S., & Brinkmann, S. (2009). *InterViews: An Introduction to Qualitative Research Interviewing*. (2nd ed.). Los Angeles, CA: SAGE Publications.
- Lacher, R. G., & Nepal, S. K. (2010). From leakages to linkages: Local-level strategies for capturing tourism revenue in Northern Thailand. *Tourism Geographies: An International Journal of Tourism Space, Place and Environment, 12*(1), 77-99.
- Lachmuth, C. L., Barrett-Lennard, L. G., Steyn, D. Q., & Milsom, W. K. (2011). Estimation of southern resident killer whale exposure to exhaust emissions from whale-watching vessels and potential adverse health effects and toxicity thresholds. *Marine Pollution Bulletin, 62*, 792-805.
- Laist, D. W., Knowlton, A. R., Mead, J. G., Collet, A. S., & Podesta, M. (2001). Collisions between ships and whales. *Marine Mammal Science, 17*(1), 35-75.

- Lande, R. (1998). Anthropogenic, ecological and genetic factors in extinction and conservation. *Researches on Population Ecology*, 40(3), 259-269.
- Lankford, S. V. (1994). Attitudes and perceptions toward tourism and rural regional development. *Journal of Travel Research*, 32(3), 35-43.
- Lankford, S. V., & Howard, D. R. (1994). Developing a tourism impact attitude scale. *Annals of Tourism Research*, 21(1), 121-139.
- Lanza, A., & Pigiariu, F. (2000). Why are tourism countries small and fast-growing? *Tourism and sustainable economic development*. (pp. 57-69) Springer US.
- Larson, S., & Herr, A. (2008). Sustainable tourism in remote regions? Questions arising from research in North Kimberly, Australia. *Regulating Environmental Change*, 8, 1-13.
- Larson, T. (1995). Caribbean conference on ecotourism held in Venezuela. *ProQuest*.
- Látková, P., & Vogt, C. A. (2012). Residents' attitudes toward existing and future tourism development in rural communities. *Journal of Travel Research*, 51(1), 50-67.
- Lawton, L. J., & Butler, R. W. (1987). Cruise ship industry- patterns in the Caribbean 1880-1986. *Tourism Management*, 8(4), 329-343.
- Le Quesne, W. J., & Jennings, S. (2012). Predicting species vulnerability with minimal data to support rapid risk assessment of fishing impacts on biodiversity. *Journal of Applied Ecology*, 49(1), 20.
- LeDuc, T. (2014). World Health Rankings. Retrieved from <http://www.worldlifeexpectancy.com/world-health-rankings>
- Lee, M. Y. (2010). Economic tradeoffs in the Gulf of Maine ecosystem: Herring and whale-watching. *Marine Policy*, 34(1), 156-162.
- Lee, S. Y., Dunn, R. J. K., Young, R. A., Connolly, R. M., Dale, P. E. R., Dehayr, R., . . . Welsh, D. T. (2006). Impact of urbanization on coastal wetland structure and function. *Austral Ecology*, 31(2), 149-163.
- Lemon, M., Lynch, T. P., Cato, D. H., & Harcourt, R. G. (2006). Response of travelling bottlenose dolphins (*Tursiops aduncus*) to experimental approaches by a powerboat in Jervis Bay, New South Wales, Australia. *Biological Conservation*, 127(4), 363-372.
- León, Y. M. (2003). *Evaluación del Sistema de Co-manejo de Observación de Ballenas en la Bahía de Samaná*. (). Santo Domingo: Centro para la Conservación y Ecodesarrollo de la Bahía de Samaná y su Entorno (CEBSE).

- Leopold, M. F., & Camphuysen, C. J. (2008). *Did the pile driving during the construction of the Offshore Wind Farm Egmond aan Zee, the Netherlands, impact porpoises?* Wageningen IMARES, Location Texel.
- Litvin, S. W., Goldsmith, R. E., & Pan, B. (2008). Electronic word-of-mouth in hospitality and tourism management. *Tourism Management*, 29(3), 458-468.
- Liu, J. C., Sheldon, P. J., & Var, T. (1987). Resident perception of the environmental impacts of tourism. *Annals of Tourism Research*, 14(1), 17-37.
- Lloyd-Jones, T., & Rakodi, C. (2014). *Urban livelihoods: A people-centred approach to reducing poverty*. Routledge.
- Luis do Valle, A., & Melo, F. C. C. (2006). Alteracoes comportamentais do golfinho *Sotalia guianensis* (Gervais, 1953) provocadas por embarcacoes. *Biotemas*, 19(1), 75-80.
- Luksenberg, J., & Parsons, E. C. M. (2009). Effects of aircraft on cetaceans: Implications for aerial whalewatching. *Proceedings of the 61st Meeting of the International Whaling Commission*, Madeira, Portugal. , 61.
- Luksenburg, J. A., & Parsons, E. C. M. (2014). Attitudes towards marine mammal conservation issues before the introduction of whale-watching: a case study in Aruba (southern Caribbean). *Aquatic Conservation: Marine and Freshwater Ecosystems*, 24(1), 135-146.
- Lundberg, D. E., Krishnamoorthy, M., & Stavenga, M. H. (1995). *Tourism Economics*. New York: John Wiley and Sons, Inc.
- Lundquist, C. J., & Granek, E. F. (2005). Strategies for successful marine conservation: integrating socioeconomic, political, and scientific factors. *Conservation Biology*, 19(6), 1771-1778.
- Lundquist, D., Gemmell, N. J., Würsig, B., & Markowitz, T. (2013). Dusky dolphin movement patterns: short-term effects of tourism. *New Zealand Journal of Marine and Freshwater Research*, 47(4), 430-449.
- Lusseau, D. (2003a). Effects of tour boats on the behavior of bottlenose dolphins: using Markov chains to model anthropogenic impacts. *Conservation Biology*, 17(6), 1785-1793.
- Lusseau, D. (2003b). Male and female bottlenose dolphins *Tursiops* spp. have different strategies to avoid interactions with tour boats in Doubtful Sound, New Zealand. *Marine Ecology. Progress Series*, 257, 267-274.

- Lusseau, D. (2005). Residency pattern of bottlenose dolphins *Tursiops* spp. in Milford Sound, New Zealand, is related to boat traffic. *Marine Ecology Progress Series*, 295, 265-272.
- Lusseau, D. (2006). The short-term behavioral reactions of bottlenose dolphins to interactions with boats in Doubtful Sound, New Zealand. *Marine Mammal Science*, 22(4), 802-818.
- Lusseau, D. (2014). Ecological constraints and the propensity for population consequences of whale-watching disturbances. In J. Higham, L. Bejder & R. Williams (Eds.), *Whale-watching: Sustainable Tourism and Ecological Management*. (pp. 229-241). Cambridge: Cambridge University Press.
- Lusseau, D., Bain, D. E., Williams, R., & Smith, J. C. (2009). Vessel traffic disrupts the foraging behavior of southern resident killer whales *Orcinus orca*. *Endangered Species Research*, 6(3), 211-221.
- Lusseau, D., & Higham, J. E. S. (2004). Managing the impacts of dolphin-based tourism through the definition of critical habitats: the case of bottlenose dolphins (*Tursiops* spp.) in Doubtful Sound, New Zealand. *Tourism Management*, 25, 657-667.
- Lusseau, D., Slooten, L., & Currey, R. J. (2006). Unsustainable dolphin-watching tourism in Fiordland, New Zealand. *Tourism in Marine Environments*, 3(2), 173-178.
- Ma, Z., Li, B., Han, N., Chen, J., & Watkinson, A. R. (2009). Conflicts between biodiversity conservation and development in a biosphere reserve. *Journal of Applied Ecology*, 46, 527-535.
- Maddala, G. S., & Mount, T. D. (1973). A comparative study of alternative estimators for variance components models used in econometric applications. *Journal of the American Statistical Association*, 68(342), 324-328.
- Madrigal, R. (1993). A tale of tourism in two cities. *Annals of Tourism Research*, 20(2), 336-353.
- Magalhães, S., Prieto, R., Silva, M. A., Gonçalves, J., Afonso-Dias, M., & Santos, R. S. (2002). Short-term reactions of sperm whales (*Physeter macrocephalus*) to whale-watching vessels in the Azores. *Aquatic Mammals*, 28(3), 267-274.
- Mann, J., Connor, R. C., Tyack, P. L., & Whitehead, H. (2000). *Cetacean Societies*. Chicago, IL: The University of Chicago Press.
- Mason, P., & Cheyne, J. (2000). Residents' attitudes to proposed tourism development. *Annals of Tourism Research*, 27(2), 391-411.

- Matias, A., Nijkamp, P., & Sarmiento, M. (2011). *Tourism Economics: Impact Analysis*. Berlin: Physica-Verlag.
- Matsuda, N., Shirakihara, M., & Shirakihara, K. (2011). Effects of dolphin-watching boats on the behavior of indo-pacific bottlenose dolphins off amakusa-shimoshima island, japan. *Nippon Suisan Gakkaishi*, 77(1), 8-14.
- Mattson, M. C., Thomas, J. A., & Aubin, D. S. (2005). Effects of Boat Activity on the Behavior of Bottlenose Dolphins(*Tursiops truncatus*) in Waters Surrounding Hilton Head Island, South Carolina. *Aquatic Mammals*, 31(1), 133-140.
- Mbaiwa, J. E. (2005). The socio-cultural impacts of tourism development in the Okavango Delta, Botswana. *Journal of Tourism and Cultural Change*, 2(3), 163-185.
- McClatchy. (2012, ). Whaling never an aboriginal activity in St. Vincent and the Grenadines, say National Trust chair. *Tribune Business News*.
- McCool, S. F., & Martin, S. R. (1994). Community attachment and attitudes toward tourism development. *Journal of Travel Research*, 32(3), 29-34.
- McDavid, H., & Ramajeessingh, D. (2003). The state and tourism: A Caribbean perspective. *International Journal of Hospitality Management*, 15(3), 180-183.
- McGehee, N. G., & Andereck, K. L. (2004). Factors predicting rural residents' support of tourism. *Journal of Travel Research*, 43(2), 131-140.
- Meeker, B. F. (1971). Decisions and exchange. *American Sociological Review*, 36, 485-495.
- Millennium Ecosystem Assessment. (2005). *Ecosystem and Human Well-being: Synthesis*. Washington DC: Island Press.
- Miller, P. J., Biassoni, N., Samuels, A., & Tyack, P. L. (2000). Whale songs lengthen in response to sonar. *Nature*, 405(6789), 903.
- Miller, T. R., Minter, B. A., & Malan, L. C. (2011). The new conservation debate: the view from practical ethics. *Biological Conservation*, 144(3), 948-957.
- Ministerio de Medio Ambiente y Recursos Naturales. (2015). *Plan de Manejo del Santuario de Mamíferos Marinos Bancos de La Plata y La Navidad*. Santo Domingo, Republica Dominicana.
- Minter, B. A. (2003). Valuing Nature: Ethical Perspectives on the Loss of Biodiversity. In S. L. Spray, & K. L. McGlothli (Eds.), *The Loss of Biodiversity* (pp. 75 - 97). Lanham, MD: Rowman & Littlefield.



- Mittermeier, R. A., Myers, N., Mittermeier, C. G., & Robles Gil, P. (1999). *Hotspots: Earth's biologically richest and most endangered terrestrial ecoregions*. Washington DC: Conservation International.
- Mok, C., Slater, B., & Cheung, V. (1991). Residents' attitudes towards tourism in Hong Kong. *International Journal of Hospitality Management*, 10(3), 289-293.
- Moreno, P. S. (2005). Ecotourism along the Meso-American Caribbean Reef: The impacts of foreign investment. *Human Ecology*, 33, 217-244.
- Morissette, L., Kaschner, K., & Gerber, L. R. (2012). 'Whales eat fish'? Demystifying the myth in the Caribbean marine ecosystem. *Fish and Fisheries*, 11(4), 388-404.
- Mouton, M., & Botha, A. (2012). *Cutaneous Lesions in Cetaceans: An Indicator of Ecosystem Status?*. In A. Romero, & E. O. Keith (Eds.), *New Approaches to the Study of Marine Mammals* (pp. 123-150) INTECH Open Access Publisher.
- Moyle, B. J., & Evans, M. (2008). Economic development options for island states: The case of whale-watching. *Shima: The International Journal of Research into Island Cultures*, 2(1), 41-58.
- Muganda, M., Sahli, M., & Smith, K. A. (2010). Tourism's contribution to poverty alleviation: a community perspective from Tasmania. *Development Southern Africa*, 27, 629-646.
- Muloin, S. (1998). Wildlife tourism: the psychological benefits of whale watching. *Pacific Tourism Review*, 2(3/4), 199-213.
- Mulvaney, K. (2003). *The Whaling Season: An Inside Account of the Struggle to Stop Commercial Whaling*. Washington D.C.: Island Press.
- Mustika, P. L. K., Birtles, A., Everingham, Y., & Marsh, H. (2013). The human dimensions of wildlife tourism in a developing country: Watching spinner dolphins at Lovina, Bali, Indonesia. *Journal of Sustainable Tourism*, 21(2), 229-251.
- Mustika, P. L. K., Birtles, A., Welters, R., & Marsh, H. (2012). The economic influence of community-based dolphin watching on a local economy in a developing country: Implications for conservation. *Ecological Economics*, 79, 11-20.
- Neil, D., Orams, M. B., & Baglioni, A. (1995). Effect of previous whale watching experience on participants knowledge of, and response to, whales and whale watching. In K. Colgan, S. Prasser & A. Jeffery (Eds.), *Encounters with whales 1995 proceedings*. (pp. 182-188) Australian Nature Conservation Agency.
- Nelson, D. R., Adger, W. N., & Brown, K. (2007). Adaptation to environmental change: contributions of a resilience framework. *Annual Review of Environmental Resources*, 32, 395-419.

- Neumann, D. R., & Orams, M. B. (2006). Impacts of ecotourism on short-beaked common dolphins (*Delphinus delphis*) in Mercury Bay, New Zealand. *Aquatic Mammals*, 32(1), 1-9.
- Neves, K. (2010). Cashing in on cetourism: a critical ecological engagement with dominant E-NGO discourses on whaling, cetacean conservation, and whale watching. *Antipode*, 42(3), 719-741.
- Neves-Graca, K. (2004). Revisiting the tragedy of the commons: ecological dilemmas of whale watching in the Azores. *Human Organization*, 63(3), 289-300.
- Newmark, W. D., & Hough, J. L. (2000). Conserving wildlife in Africa: integrated conservation and development projects and beyond because multiple factors hinder integrated conservation and development projects in Africa from achieving their objectives, alternative and complementary approaches for promoting wildlife conservation must be actively explored. *BioScience*, 50(7), 585-592.
- Ng, S. L., & Leung, S. (2003). Behavioral response of Indo-Pacific humpback dolphin (*Sousa chinensis*) to vessel traffic. *Marine Environmental Research*, 56(5), 555-567.
- Nicholas, L. N., Thapa, B., & Ko, Y. J. (2009). Residents' perspectives of a world heritage site: The Pitons Management Area, St. Lucia. *Annals of Tourism Research*, 36(3), 390-412.
- NOAA. (2017). NOAA Fisheries. Retrieved from <http://www.nmfs.noaa.gov/>
- Noren, D. P., Johnson, A. H., Rehder, D., & Larson, A. (2009). Close approaches by vessels elicit surface active behaviors by southern resident killer whales. *Endangered Species Research*, 8(3), 179-192.
- Nowacek, D. P., Thorne, L. H., Johnston, D. W., & Tyack, P. L. (2007). Responses of cetaceans to anthropogenic noise. *Mammal Review*, 37(2), 81-115.
- Nowacek, S. M., Wells, R. S., & Solow, A. R. (2001). Short-term effects of boat traffic on bottlenose dolphins, *Tursiops truncatus*, in Sarasota Bay, Florida. *Marine Mammal Science*, 17(4), 673-688.
- Nyaupane, G., & Poudel, S. (2011). Linkages among biodiversity, livelihood, and tourism. *Annals of Tourism Research*, 38(4), 1344-1366.
- O'Connor, S., Campbell, R., Cortez, H., & Knowles, T. (2009). *Whale Watching Worldwide: Tourism Numbers, Expenditures, and Expanding Economic Benefits: A Special Report from the International Fund for Animal Welfare*. Yarmouth, MA: Economists at Large.

- Oldekop, J. A., Bebbington, A. J., Brockington, D., & Preziosi, R. F. (2010). Understanding the lessons and limitations of conservation and development. . *Conservation Biology*, 24, 461-469.
- Olsson, P., Folke, C., & Berkes, F. (2004). Adaptive comanagement for building resilience in social–ecological systems. *Environmental Management*, 34(1), 75-90.
- O'Neill, F., Barnard, S., & Lee, D. (2004). *Best practice and interpretation in tourist/wildlife encounters: A wild dolphin swim tour example*. (Wildlife Tourism Research Report Series No. 25).CRC for Sustainable Tourism.
- Orams, M. (1999). *Marine Tourism: Development, Impacts, and Management*. London, UK: Routledge.
- Orams, M. (2004). Why dolphins may get ulcers: Considering the impacts of cetacean-based tourism in New Zealand. *Tourism in Marine Environments*, 1(1), 17-28.
- Orams, M. (2013). Economic activity derived from whale-based tourism in Vava'u, Tonga. *Coastal Management*, 41(6), 481-500.
- Orams, M. B. (1997a). Historical accounts of human-dolphin interaction and recent developments in wild dolphin based tourism in Australasia. . *Tourism Management*, 18(5), 317-326.
- Orams, M. B. (2002a). Feeding wildlife as a tourism attraction: a review of issues and impacts. . *Tourism Management*, 23(3), 281-293.
- Orams, M. B., Hill, G. J., & Baglioni, A. J. (1996). "Pushy" behavior in wild dolphin feeding program at Tangalooma, Australia. *Marine Mammal Science*, 12(1), 107-117.
- Orams, M. B. (1997b). The effectiveness of environmental education: Can we turn tourists into 'Greenies'? *Progress in Tourism and Hospitality Research*, 3, 295-306.
- Orams, M. B. (2000). Tourists getting close to whales, is it what whale watching is all about? *Tourism Management*, 21, 561-569.
- Orams, M. B. (2002b). Humpback whales in Tonga: An economic resource for tourism. *Coastal Management*, 30, 361-380.
- Pagiola, S., Bishop, J., & Landell-Mills, N. (2002). *Selling Forest Environmental Services: Market-Based Mechanisms for Conservation and Development*. . London, UK: Earthscan Publications.
- Pallemaerts, M. (1986). Development, conservation, and indigenous rights in Brazil. *Human Rights Quarterly*, 8(3), 374-400.

- Parsons, E. C. M., & Woods-Ballard, A. (2003). Acceptance of Voluntary Whalewatching Codes of Conduct in West Scotland: The Effectiveness of Governmental Versus Industry-led Guidelines. *Current Issues in Tourism*, 6(2), 172-182.
- Parsons, E. C. M. (2012). The negative impacts of whale watching. *Journal of Marine Biology*, 2012, 1-9.
- Parsons, E. C. M., Warburton, C. A., Woods-Ballard, A., Hughes, A., & Johnston, P. (2003). The value of conserving whales: the impacts of cetacean related tourism on the economy of rural West Scotland. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 13, 397-415.
- Patterson, T., Gulden, T., Cousins, K., & Kraev, E. (2004). Integrating environmental, social and economic systems: a dynamic model of tourism in Dominica. *Ecological Modelling*, 175, 121-136.
- Pattullo, P. (2005). *Last resorts: The cost of tourism in the Caribbean*. London, UK: NYU Press.
- Pemstein, D., Meserve, S. A., & Melton, J. (2010). Democratic compromise: A latent variable analysis of ten measures of regime type. *Political Analysis*, 18(4), 426-449.
- Pendleton, L. H. (2005). *Understanding the potential economic value of marine wildlife viewing and whale watching in California: Executive Summary*.
- Perdue, R. R., Long, P. T., & Allen, L. (1987). Rural resident tourism perceptions and attitudes. *Annals of Tourism Research*, 14(3), 420-429.
- Perdue, R. R., Long, P. T., & Allen, L. (1990). Resident support for tourism development. *Annals of Tourism Research*, 17(4), 586-599.
- Perry, S. L., DeMaster, D. P., & Silber, G. K. (1999). The great whales: history and status of six species listed as endangered under the US Endangered Species Act of 1973. *Marine Fisheries Review*, 61(1), 1-74.
- Peterson Jr., J. H. (1993). Epilogue: Whales and elephants as cultural symbols. *Arctic*, 46, 172-174.
- Pizam, A. (1978). Tourism's impacts: The social costs to the destination community as perceived by its residents. *Journal of Travel Research*, 16(4), 8-12.
- Ponnampalam, L. S. (2011). Dolphin watching in Muscat, Sultanate of Oman: Tourist perceptions and actual current practice. *Tourism in Marine Environments*, 7(2), 81-93.

- Pons, F. M. (2010). *The Dominican Republic: A National History*. Markus Wiener Publishers.
- Poole, R. M. (2011). What became of the Taino? Retrieved from <http://www.smithsonianmag.com/people-places/what-became-of-the-taino-73824867/?no-ist>
- Powell, R. B., & Ham, S. H. (2008). Can ecotourism interpretation really lead to pro-conservation knowledge, attitudes and behavior? Evidence from the Galapagos Islands. *Journal of Sustainable Tourism*, 16(4), 467-489.
- Raffensperger, C., & Tickner, J. (1999). *Protecting public health and the environment: implementing the precautionary principle*. . Washington DC: Island Press.
- Rasoolimanesh, S. M., Jaafar, M., Kock, N., & Ramayah, T. (2015). A revised framework of social exchange theory to investigate the factors influencing residents' perceptions. *Tourism Management Perspectives*, 16, 335-345.
- Redpath, S. M., Young, J., Evely, A., Adams, W. M., Sutherland, W. J., Whitehouse, A., . . . Gutiérrez, R. J. (2013). Understanding and managing conservation conflicts. *Trends in Ecology & Evolution*, 28(2), 100-109.
- Reeves, R. R. (2002). The origins and character of 'aboriginal subsistence' whaling: a global review. *Mammal Review*, 32, 71-106.
- Reeves, R. R., Smith, B. D., Crespo, E. A., & Notarbartolo di Sciara, G. (2003). In IUCN/SSC Cetacean Specialist Group (Ed.), *2002-2010 Conservation Action Plan for the World's Cetaceans: Dolphins, Whales and Porpoises*. Gland, Switzerland: IUCN.
- Reijnders, P. J., Aguilar, A., & Borrell, A. (2002). Pollution and marine mammals. *Encyclopedia of Marine Mammals*. (pp. 948-957). San Diego, CA: Academic Press.
- Reynolds, J. E., Perrin, W. F., Reeves, R. R., Montgomery, S., & Ragen, T. J. (2005). *Marine Mammal Research*. Baltimore: John Hopkins University Press.
- Richardson, W. J., Greene, C. R., Malme, C. I., Thomson, D. H., Moore, S. E., & Wursig, B. (1995). *Marine Mammals and Noise*. San Diego, CA: Academic Press.
- Richter, C., Dawson, S., & Slooten, E. (2006). Impacts of commercial whale watching on male sperm whales at Kaikoura, New Zealand. *Marine Mammal Science*, 22(1), 46-63.
- Ridgway, S. H., & Harrison, R. (Eds.). (1994). *Handbook of Marine Mammals: Volume 5: The First Book of Dolphins*. London, UK: Academic Press.
- Ridgway, S. H., & Harrison, R. (1999). *Handbook of Marine Mammals: Volume 6: The Second Book of Dolphins and the Porpoises*. San Diego, CA: Academic Press.

- Ridgway, S. H., & R. Harrison (eds.). (1985). *Handbook of Marine Mammals: Volume 3: The Sirenians and Baleen Whales*. London, UK: Academic Press.
- Ris, M. (1993). Conflicting cultural values: whale tourism in northern Norway. *Arctic*, 46(2), 156-163.
- Ritter, F. (2004). *Interactions of Cetaceans with Whale Watching Boats- Implications for the Management of Whale Watching Tourism*. Berlin, Germany.
- Rolston III, H. (2009). Converging versus reconstituting environmental ethics. In B. A. Minteer (Ed.), *Nature in Common? Environmental Ethics and the Contested Foundations of Environmental Policy* (pp. 97-117). Philadelphia: Temple University Press.
- Roman, J., Estes, J. A., Morissette, L., Smith, C., Costa, D., McCarthy, J., & Smetacek, V. (2014). Whales as marine ecosystem engineers. *Frontiers in Ecology and the Environment*, 12(7), 377-385.
- Roman, J., & McCarthy, J. J. (2010). The whale pump: Marine mammals enhance primary productivity in a coastal basin. *Plos One*, 5, e13255.
- Roorda, E. P., Derby, L. H., & González, R. (2014). *Dominican Republic Reader*. Durham, NC: Duke University Press Books.
- Rouse, I. (1993). *The Tainos: rise and decline of the people who greeted Columbus*. New Haven, CT: Yale University Press.
- Rowley, L., & Johnson, K. A. (2016). Anthropomorphic anthropocentrism and the rhetoric of Blackfish. *Environmental Communications*, , 1-15.
- Rusu, S. (2011). Tourism multiplier effect. *Journal of Economics and Business Research*, 17(1), 70-76.
- Ryan, C. (2003). *Aspects of Tourism: Recreational Tourism: Demand and Impacts*. Clevedon, UK: Channel View Publications.
- Salafsky, N. (2011). Integrating development with conservation. A means to a conservation end or a mean end to conservation? *Biological Conservation*, 144, 973-978.
- Saldaña, J. (2013). *The coding manual for qualitative researchers*. (2nd ed.). London, UK: Sage.
- Samuels, A., & Bejder, L. (2004). Chronic interaction between humans and free-ranging bottlenose dolphins near Panama City Beach, Florida. *Journal of Cetacean Research and Management*, 6(1), 69-77.

- Schaffar, A., Garrigue, C., & Constantine, R. (2010). Exposure of humpback whales to unregulated whalewatching activities in their main reproductive area in New Caledonia. *Journal of Cetacean Research and Management*, 11(2), 147-152.
- Schaffar, A., Madon, B., Garrigue, C., & Constantine, R. (2009). *Avoidance of whale watching boats by humpback whales in their main breeding ground in New Caledonia*. (No. 61).IWC.
- Scheidat, M., Castro, C., Gonzalez, J., & Williams, R. (2004). Behavioural responses of humpback whales (*Megaptera novaeangliae*) to whalewatching boats near Isla de la Plata, Machalilla National Park, Ecuador. *Journal of Cetacean Research and Management*, 6(1), 63-68.
- Segi, S. (2003). The coexistence of whaling and whale watching in a traditional whaling region: The case of Taiji, Wakayama Prefecture, Japan. *SPC Traditional Marine Resource Management and Knowledge Information Bulletin*, 15, 21-25.
- Sharma, B., & Dyer, P. (2009). Residents' involvement in tourism and their perceptions of tourism impacts. *Benchmarking: An International Journal*, 16(3), 351-371.
- Sheldon, P. J., & Var, T. (1984). Resident attitudes to tourism in North Wales. *Tourism Management*, 5(1), 40-47.
- Sigler, M. (2014). The effects of plastic pollution on aquatic wildlife: current situations and future solutions. *Water, Air, & Soil Pollution*, 225(11), 1-9.
- Sigurjónsson, J. (1995). On the life history and autecology of North Atlantic rorquals. *Developments in Marine Biology*, 4, 425-441.
- Silva, L. (2015). How ecotourism works at the community-level: the case of whale-watching in the Azores. *Current Issues in Tourism*, 18(3), 196-211.
- Simmonds, M. P., & Elliott, W. J. (2009). Climate change and cetaceans: Concerns and recent developments. *Journal of the Marine Biological Association of the United Kingdom*, 89(1), 203-210.
- Sirakaya, E., Teye, V., & Sönmez, S. (2002). Understanding residents' support for tourism development in the central region of Ghana. *Journal of Travel Research*, 41(1), 57-67.
- Sironi, M., Schteinbarg, R., Losano, P., & Carlson, C. (2005). Sustainable whale watching at Península Valdés, Argentina: An assessment by owners and captains of local whale watch companies. *Journal of Cetacean Research and Management*, SC/57/WW2, 1-9.

- Slinger-Friedman, V. (2009). Ecotourism in Dominica: Studying the potential for economic development, environmental protection and cultural conservation. *Island Studies Journal*, 4, 3-24.
- Smith, H., Samuels, A., & Bradley, S. (2008). Reducing risky interactions between tourists and free-ranging dolphins (*Tursiops* sp.) in an artificial feeding program at Monkey Mia, Western Australia. *Tourism Management*, 29(5), 994-1001.
- Smol, J. P. (2008). *Pollution of lakes and rivers: a paleoenvironmental perspective*. (2nd ed.). Malden, MA: Blackwell Publishing.
- Soule, M. E. (1983). What do we really know about extinction? In C. M. Schonewald-Cox, S. M. Chamber, B. Macbride & L. Thomas (Eds.), *Genetics and Conservation*. (pp. 111-124). Menlo Park, CA: Benjamin/Cummings.
- Sousa-Lima, R. S., & Clark, C. W. (2008). Modeling the effect of boat traffic on the fluctuation of humpback whale singing activity in the Abrolhos National Marine Park, Brazil. *Canadian Acoustics*, 36(1), 174-181.
- Spence, M. (1996). Dispossessing the wilderness: Yosemite Indians and the national park ideal, 1864-1930. *Pacific Historical Review*, 65(1), 27-59.
- Stamation, K. A., Croft, D. B., Shaughnessy, P. D., Waples, K. A., & Briggs, S. V. (2007). Educational and conservation value of whale watching. *Tourism in Marine Environments*, 4(1), 41-55.
- Stamation, K. A., Croft, D. B., Shaughnessy, P. D., Waples, K. A., & Briggs, S. V. (2010). Behavioral responses of humpback whales (*Megaptera novaeangliae*) to whale-watching vessels on the southeastern coast of Australia. *Marine Mammal Science*, 26(1), 98-122.
- Steckenreuter, A., Harcourt, R., & Moller, L. (2012). Are Speed Restriction Zones an effective tool for minimizing impacts of boats on dolphins in an Australian marine park? *Marine Policy*, 36, 258-264.
- Steckenreuter, A., Moller, L., & Harcourt, R. (2012). How does Australia's largest dolphin watching industry affect the behavior of a small and resident population of Indo-Pacific bottlenose dolphins? *Journal of Environmental Management*, 97, 14-21.
- Stensland, E., & Berggren, P. (2007). Behavioural changes in female Indo-Pacific bottlenose dolphins in response to boat-based tourism. *Marine Ecology Progress Series*, 332, 225-234.
- Stockin, K. A., Lusseau, D., Binedell, V., Wiseman, N., & Orams, M. B. (2008). Tourism affects the behavioral budget of the common dolphin *Delphinus* sp. in the Hauraki Gulf, New Zealand. *Marine Ecology- Progress Series*, 355, 287.



- Stoett, P. J. (1997). *The International Politics of Whaling*. Vancouver: UBC Press.
- Stone, G. S., & Yoshinaga, A. (2000). Hector's Dolphin (*Cephalorhynchus hectori*) calf mortalities may indicate new risks from boat traffic and habituation. *Pacific Conservation Biology*, 6(2), 162-170.
- Sutherland, D. (2001). Whaling in the Caribbean. *Earth Island Journal*, 16, 22-23.
- Tallis, H., Kareiva, P., Marvier, M., & Chang, A. (2008). An ecosystem services framework to support both practical conservation and economic development. *PNAS*, 102(28), 9457-9464.
- Teelucksingh, S., Nunes, P. A. L. D., & Perrings, C. (2013). Biodiversity-based development in small island developing states. *Environment and Development Economics*, 18(4), 381-391.
- Teelucksingh, S. S., & Watson, P. K. (2013). Linking tourism flows and biological biodiversity in Small Island Developing States (SIDS): evidence from panel data. *Environment and Development Economics*, 18, 392-404.
- The Nature Conservancy. (2016). Caribbean: Caribbean Challenge Initiative. Retrieved from <http://www.nature.org/ourinitiatives/regions/caribbean/caribbean-challenge.xml>
- The World Bank. (2013). Dominican Republic: Data. Retrieved from [data.worldbank.org/country/dominican-republic](http://data.worldbank.org/country/dominican-republic)
- The World Bank. (2016). Data. Retrieved from <http://data.worldbank.org>
- The World Bank Group. (2014). Data: Dominica. Retrieved from <http://data.worldbank.org/country/dominica>
- TIES. (2015). TIES announces ecotourism principles revision. Retrieved from <https://www.ecotourism.org/news/ties-announces-ecotourism-principles-revision>
- Tilman, D., & Lehman, C. (2001). Human-caused environmental change: impacts on plant diversity and evolution. *Proceedings of the National Academy of Sciences*, 98(10), 5433-5440.
- Timmel, G., Courbis, S., Sargeant-Green, H., & Markowitz, H. (2008). Effects of human traffic on the movement patterns of Hawaiian spinner dolphins (*Stenella longirostris*) in Kealakekua Bay, Hawaii. *Aquatic Mammals*, 34(4), 402-411.
- Tisdell, C. (2012). Economic benefits, conservation and wildlife tourism. *Acta Turistica*, 24, 127-148.
- Tosun, C. (2000). Limits to community participation in the tourism development process in developing countries. *Tourism Management*, 21, 613-633.

- Turner, B. L., Kasperson, R. E., Matson, P. A., McCarthy, J. J., Corell, R. W., Christensen, L., . . . Schiller, A. (2003). A framework for vulnerability analysis in sustainability science. *Proceedings of the National Academy of Sciences*, 100(14), 8074-8079.
- Turvey, S. T., Pitman, R. L., Taylor, B. L., Barlow, J., Akamatsu, T., Barrett, L. A., & Wei, Z. (2007). First human-caused extinction of a cetacean species? *Biology Letters*, 3(5), 537-540.
- Tyack, P. L. (2008). Implications for marine mammals of large-scale changes in the marine acoustic environment. *Journal of Mammalogy*, 89(3), 549-558.
- Uddhammar, E. (2006). Development, conservation and tourism: conflict or symbiosis? *Review of International Political Economy*, 13, 656-678.
- UNEP. (2013a). CITES: List of Contracting Parties. Retrieved from [https://www.cites.org/eng/disc/parties/chronolo.php?order=field\\_country\\_official\\_name&sort=asc](https://www.cites.org/eng/disc/parties/chronolo.php?order=field_country_official_name&sort=asc)
- UNEP. (2013b). Impacts of Tourism. *Resource Efficiency and Sustainable Consumption and Production*. Retrieved from <http://www.unep.org/resourceefficiency/Business/SectoralActivities/Tourism/FactsandFiguresaboutTourism/ImpactsofTourism/tabid/78774/Default.aspx>
- UNEP. (2015). Convention on Biological Diversity: List of Parties. Retrieved from <https://www.cbd.int/information/parties.shtml>
- UNEP, The Caribbean Environment Programme. (2015a). Overview of the LBS Protocol. Retrieved from <http://www.cep.unep.org/cartagena-convention/lbs-protocol/protocol-concerning-pollution-from-land-based-sources-and-activities>
- UNEP, The Caribbean Environment Programme. (2015b). Overview of the SPAW Protocol. Retrieved from <http://www.cep.unep.org/cartagena-convention/spaw-protocol>
- UNEP/CMS Secretariat. (2015). CMS: Convention on the Conservation of Migratory Species of Wild Animals: Parties and Range States. Retrieved from <http://www.cms.int/en/parties-range-states>
- United Nations. (2016). United Nations Treaty Collection. Retrieved from <https://treaties.un.org/Home.aspx?lang=en>
- United Nations Statistics Division. (2016). System of National Accounts. Retrieved from <http://unstats.un.org/unsd/nationalaccount/default.asp>
- UNODC. (2013). Global Study on Homicide. Retrieved from <https://www.unodc.org/gsh/>

- Upchurch, R. S., & Teivane, U. (2000). Resident perceptions of tourism development in Riga, Latvia. *Tourism Management*, 21(5), 499-507.
- Uphoff, N. (2001). Understanding social capital: learning from the analysis and experience of participation. . In P. Dasgupta, & I. Serageldin (Eds.), *Social capital: A multifaceted perspective*. (pp. 215-249) World Bank Publications.
- Vail, C. S., Vasquez, O. E., Aquino, J. M., Bordey, M., Bordey, E. T., Simon, M., & Michaud, E. F. (2011). *Development of Multidimensional Research and Education Project in Grand Goave, Republic of Haiti*. Haiti Ocean Project.
- Valentine, P. S., Birtles, A., Curnock, M., Arnold, P., & Dunstan, A. (2004). Getting closer to whales—passenger expectations and experiences, and the management of swim with dwarf minke whale interactions in the Great Barrier Reef. *Tourism Management*, 25(6), 647-655.
- Van Bresseem, M. F., Raga, J. A., Di Guardo, G., Jepson, P. D., Duignan, P. J., Siebert, U., . . . Waerebeek, K. (2009). Emerging infectious diseases in cetaceans worldwide and the possible role of environmental stressors. *Dis Aquat Organ*, 86(2), 143-157.
- Van Parijs, S. M., & Corkeron, P. J. (2001). Boat traffic affects the acoustic behaviour of Pacific humpback dolphins, *Sousa chinensis*. *Journal of the Marine Biological Association of the UK*, 81(3), 533-538.
- VanBlaricom, G. R., Gerber, L. R., & Brownell, R. L. (2001). Extinctions of marine mammals. *Encyclopedia of Biodiversity*, 4, 37-69.
- Visser, F., Hartman, K. L., Rood, E. J., Hendriks, A. J., Zult, D. B., Wolff, W. J., . . . Pierce, G. J. (2011). Risso's dolphins alter daily resting pattern in response to whale watching at the Azores. *Marine Mammal Science*, 27(2), 366-381.
- Vriend, N. J. (1996). Rational behavior and economic theory. *Journal of Economic Behavior & Organization*, 29(2), 263-285.
- Walker, B., Carpenter, S., Anderies, J., Abel, N., Cumming, G., Janssen, M., & Pritchard, R. (2002). Resilience management in social-ecological systems: a working hypothesis for a participatory approach. *Conservation Ecology*, 6(1).
- Wall, G. (1997). Is ecotourism sustainable? *Environmental Management*, 21, 483-491.
- Wang, Y. A., & Pfister, R. E. (2008). Residents' attitudes toward tourism and perceived personal benefits in a rural community. *Journal of Travel Research*, 47, 84-93.
- Waples, K. A., & Gales, N. J. (2002). Evaluating and minimising social stress in the care of captive bottlenose dolphins (*Tursiops aduncus*). . *Zoo Biology*, 21(1), 5-26.
- Warburton, C. (1999). *Marine wildlife tourism and whale watching on the island of Mull, West Scotland*. (Unpublished MSc). University of Kent.

- WDC. (2016). Whale and dolphin watching. Retrieved from <http://us.whales.org/issues/whale-and-dolphin-watching>
- WDCS. (2013). *Whale watching in New England*. Retrieved from [http://www.wdcs-na.org/watching\\_whales.php](http://www.wdcs-na.org/watching_whales.php)
- Weatherbase. (2016). Weather Averages- All Countries. Retrieved from <http://www.weatherbase.com/weather/countryall.php3>
- Weaver, D. (1991). Alternative to mass tourism in Dominica. *Annals of Tourism Research, 18*, 414-432.
- Weaver, D. (1993). Ecotourism in the small island Caribbean. *GeoJournal, 31*, 457-465.
- Weilgart, L. S. (2007). The impacts of anthropogenic ocean noise on cetaceans and implications for management. *Canadian Journal of Zoology, 85*(11), 1091-1116.
- Weinrich, M., & Corbelli, C. (2009). Does whale watching in Southern New England impact humpback whale (*Megaptera novaeangliae*) calf production or calf survival? *Biological Conservation, 142*(12), 2931-2940.
- Wells, M., & Brandon, K. (1992). *People and Parks: Linking Protected Area Management with Local Communities*. World Bank.
- West, P., & Carrier, J. G. (2004). Ecotourism and authenticity: Getting away from it all? *Current Anthropology, 45*, 483-498.
- West, P., Igoe, J., & Brockington, D. (2006). Parks and peoples: the social impact of protected areas. *Annual Review of Anthropology, 35*, 251-277.
- Wight, P. A. (2001). Ecotourists: Not a homogeneous market segment. In D. B. Weaver, K. F. Backman, E. Cater, P. F. J. Eagles & B. McKercher (Eds.), *The Encyclopedia of Ecotourism*, (pp. 37-62). New York, NY: CABI Publishing.
- Wilcove, D. S. (2008). *No way home: the decline of the world's great animal migrations*. Washington DC: Island Press.
- Wiley, D. N., Moller, J. C., Pace III, R. M., & Carlson, C. (2008). Effectiveness of voluntary conservation agreements: case study of endangered whales and commercial whale watching. *Conservation Biology, 22*, 450-457.
- Williams, R., & Ashe, E. (2007). Killer whale evasive tactics vary with boat number. *Journal of Zoology, 272*(4), 390-397.
- Williams, R., Bain, D. E., Ford, J. K., & Trites, A. W. (2002). Behavioral responses of male killer whales to a 'leapfrogging' vessel. *Journal of Cetacean Research and Management, 4*(3), 305-310.

- Williams, R., Lusseau, D., & Hammond, P. S. (2006). Estimating relative energetic costs of human disturbance to killer whales (*Orcinus orca*). *Biological Conservation*, *133*(3), 301-311.
- Williams, R., Trites, A. W., & Bain, D. E. (2002). Behavioural responses of killer whales (*Orcinus orca*) to whale-watching boats: opportunistic observations and experimental approaches. *Journal of Zoology*, *256*(2), 255-270.
- Wong, P. P. (1998). Coastal tourism development in Southeast Asia: relevance and lesson for coastal zone management. *Ocean and Coastal Management*, *38*, 89-109.
- Wood, L. J. (2007). MPA Global: A database of the world's marine protected areas. Sea Around Us Project, UNEP-WCMC & WWF. Retrieved from [www.mpaglobal.org](http://www.mpaglobal.org)
- Woods-Ballard, A. J., Parsons, E. C. M., Hughes, A. J., Velandar, K. A., Ladle, R. J., & Warburton, C. A. (2003). The sustainability of whale-watching in Scotland. *Journal of Sustainable Tourism*, *11*(1), 40-55.
- World Bank. (2014). *World Development Indicators*. Washington DC: World Bank. doi:10.1596/978-1-4648-0163-1.
- World Port Source. (2016). World Ports by Country. Retrieved from <http://www.worldportsource.com/countries.php>
- World Travel and Tourism Council. (2013). *Travel and Tourism: Economic Impact 2013: Dominican Republic*.
- WTO. (1992). *Compendium of Tourism Statistics* (12th ed.). Madrid, Spain: World Tourism Organization.
- WTO. (1997). *Compendium of Tourism Statistics: 1991-1995* (17th ed.). Madrid, Spain: World Tourism Organization.
- WTO. (2001). *Compendium of Tourism Statistics*. Madrid, Spain: World Tourism Organization.
- WTO. (2003). *Compendium of Tourism Statistics: 1997-2001*. Madrid, Spain: World Tourism Organization.
- WTO. (2007). *Compendium of Tourism Statistics: Data 2001-2005*. Madrid, Spain: World Tourism Organization.
- WTO. (2008). *Compendium of Tourism Statistics: Data 2002-2006*. Madrid, Spain: World Tourism Organization.
- WTO. (2012). *Compendium of Tourism Statistics, Data 2006-2010*. Madrid, Spain: World Tourism Organization.

- Wunder, S. (2000). Ecotourism and economic incentives: an empirical approach. *Ecological Economics*, 32, 465-479.
- Würsig, B. (1996). Swim-with-dolphin activities in nature: Weighing the pros and cons. *Whalewatcher*, 30, 11-15.
- Ye, Q., Law, R., Gu, B., & Chen, W. (2011). The influence of user-generated content on traveler behavior: An empirical investigation on the effects of e-word-of-mouth to hotel online bookings. . *Computers in Human Behavior*, 27(2), 634-639.
- Zakai, D., & Chadwick-Furman, N. E. (2002). Impacts of intensive recreational diving on reef corals at Eilat, northern Red Sea. *Biological Conservation*, 105(2), 179-187.
- Zambrano, A. M. A., Broadbent, E. N., & Durham, W. H. (2010). Social and environmental effects of ecotourism in the Osa Peninsula of Costa Rica: The Lapas Rios case. *Journal of Ecotourism*, 9(1), 62-83.
- Zeppel, H., & Muloin, S. (2014). Green messengers or nature's spectacle: Understanding visitor experiences of wild cetacean tours. In J. Higham, L. Bejder & R. Williams (Eds.), *Whale-watching: Sustainable Tourism and Ecological Management*. (pp. 110-127). Cambridge: Cambridge University Press.

APPENDIX I  
THE ECONOMIC BENEFITS OF WHALE WATCHING IN THE ARGUMENT  
AGAINST WHALING

WW is often utilized as a tool to argue against the resumption of industry whaling. In terms of economic activities, is considered by many to have a much lesser impact than hunting, which actively removes individuals from the environment. As shown in the previous section, there are substantial economic benefits that WW can provide in certain circumstances. It has been argued that not only do these benefits outweigh those of modern whaling, but that the two industries are competitive and may threaten one another's economic gains. Whaling's most direct effect on WW is its potential to lower the number of cetaceans available; this depends on the species of whales hunted and viewed in different areas, as the industries may utilize different species in some areas. It is also possible that whaling may change the behavior of cetaceans, making them avoid boats of any type (Hoyt & Hvenegaard, 2010). Surveys of four WWOs in Iceland, which resumed whaling in 2003, found that 3/4 felt that they had noticed this impact, and while this is far from being conclusive due to the small sample size, it does represent some empirical data supporting the presence of this impact in the real world (Andersson et al., 2014). In either case, these potential impacts could increase the costs of operations for WWOs by making cetaceans harder to find, and lower visitor satisfaction by making sightings less frequent and assured.

While there are practical arguments as to the conflict between WW and whaling, there are also moral and emotional links between the two industries that can make their co-existence difficult. In fact, a survey of WW tourists in one of Scotland's premier WW destinations found that 79% of respondents would not partake in a trip to a country participating in whaling, and 12.4% more indicated that while they might travel to such



countries, they would not WW while there (Parsons & Rawles, 2003). One British tour operator reported a 25% reduction in bookings shortly after the resumption of whaling in Iceland (N. Williams, 2006). Long-term data show that the WW industry in Iceland grew steadily from 1995-2002, but that this growth slowed in 2003 when Iceland started its scientific whaling program. In contrast, a survey of WW tourists in Iceland in 2007 found that 79% of visitors knew that whaling had resumed there, and 83% expressed willingness return to Iceland knowing that whaling was occurring in the country. These findings indicate that some tourists are willing to accept whaling in the countries that they visit, but it is possible that Iceland had already lost those tourists who were unwilling to visit countries that support the hunting of cetaceans (Andersson et al., 2014). In support of this theory, research done by Higham and Lusseau compared Iceland and Norway's WW statistics in relation to their whaling industries, and found that Norwegian WW numbers plateaued below those of Iceland, despite the fact that their tourism industry is larger than Iceland overall (J. E. S. Higham & Lusseau, 2007). While this does not account for other potential variables or the quality of WW and/or ecotourism in these two different locations, Norway has continued whaling throughout the time during which their WW industry developed and grew. While Iceland stopped whaling until 2003, so it is possible that these trends are due to the differing policies on whaling over time.

Acknowledging both the direct impacts of whaling on WW (e.g. reduction of cetacean populations, avoidance of boats by hunted cetaceans, etc.) as well as factors that influence tourist decision making, such as the sentiments expressed in the 2003 Scotland study, Kuo et. al. (2012) developed a model to estimate the potential impacts of whaling on the global WW demand. The primary finding of this model was that the loss of

individual whales would decrease the number of whale watchers (WWers). In the case of minke whales, a popular WW and whaling target species in both Norway and Japan, this equated to a loss of 0.14-0.17 watchers per whale removed from the population (by whaling or otherwise). If the maximum number of minke whales allowed by the IWC (0.5% of the total adult population) were removed on an annual basis in a modeled resumption of commercial whaling, the number of WWers per country/territory with a WW industry would be reduced by 396-568 WWers yearly. Due to varying prices for WW throughout the world, a monetary value was not assigned to this loss (Kuo, Chen, & McAleer, 2012). However, while minke whales are a popular WW species worldwide, this is not ubiquitous, and the numerical results produced by the model did not take this difference into account when calculating the total number of WWers lost per year due to the resumption of commercial whaling for minke whales. Due to the fact that other countries rely on different cetacean species for their WW industries and the complex reasons for tourist destination/activity choices, the actual number of WWers lost per year, globally could be expected to be somewhat lower than those reported by the study. While these results are subject to limitations, they do serve to illustrate the potentially detrimental conflicts between whaling and WW (Kuo et al., 2012).

Whaling's relationship to WW has also been examined in the Caribbean itself. In 2009 a survey was distributed to more than 200 tourists in the Dominican Republic (DR) in order to investigate the influence that the country's stance on cetacean exploitation would have on travelers' willingness to visit Caribbean countries. Similar to the surveys of Iceland's tourists, it was found that 77.1% of the respondents would be less likely to visit a Caribbean country that supporting the hunting of either large or small cetaceans

(Parsons & Draheim, 2009). However, it is unclear from this study exactly what "less likely" means, and as Iceland's case has shown, the impact that such activities have on a country's tourism is complicated. It is possible that tourists would be less likely to come, but not entirely unwilling. Thus, certain attractions or draws to these countries may be enough to outweigh concerns for cetacean hunts. In order to have a better understanding of this relationship in the Caribbean, examining the economics of whaling and WW in St. Vincent and the Grenadines (SVG) would be informative, as this is the only Caribbean country with an IWC aboriginal subsistence permit. In the case of SVG, there was an instance in which a humpback whale was killed in front of WWers in 2011. This sparked international outrage and local concern for the country's tourism industry if whaling were to continue there, even at a small scale (McClatchy, 2012). In the Kuo et al. 2012 model, it was also suggested that the impact of aboriginal whaling on WW was less than that of commercial whaling, but the SVG example shows that this impact may still be considerable if enough negative media coverage is focused on small-scale whaling.

Overall, despite the arguments that can be made for or against whaling when WW is concerned, it is likely that no one answer will be sufficient for the entire world, despite the positive outlook that many papers considering the economic impact of WW present. In some places, such as the Pacific, which can still be hard to access in comparison to other potential WW destinations, increasing competition may deeply undercut WW profits. Furthermore, in areas where whaling once formed an integral part of traditional lifeways, the consequences of banning small-scale whaling on traditional culture may be considerable (Moyle & Evans, 2008). It was industrial whaling practices, not aboriginal strategies for hunting that lead to the commercial collapse of many large whale species

(Mulvaney, 2003), and it is often the case that communities in SIDS do not have the infrastructure to benefit extensively from tourism (Pattullo, 2005). Since tourism is host to a variety of potential benefits as well as costs to destination communities (Duval, 2004; Tisdell, 2012), it is not appropriate to make sweeping claims about the superiority of WW over small-scale whaling. There may be cases in which small-scale cetacean hunting is better for local people, due to the cultural and historical characteristics of an area, as well as the sometimes limited economic potential of WW and the potential for the industry to negatively impact cetaceans. Due to this, understanding the role that different country characteristics may play in determining the economic success of WW is an important step in the direction of evaluating the circumstances of individual countries when making development recommendations in regards to cetaceans.

## APPENDIX II

DETAILED RATIONAL BEHIND THE INITIAL INCLUSION OF VARIABLES  
REMOVED FROM THE WHALE WATCHING EXPENDITURE/COUNTRY  
CHARACTERISTICS MODEL AND THEIR HYPOTHESES

Notes on removal procedures: As discussed in detail in Chapter Two's methods section, I determined which variables to remove by examining groups of correlated variables and comparing their significance. Those variables within the group that were the most significant in terms of p-value or most relevant in terms of the benefits of WW to communities or conservation were retained. This was an iterative process which removed some variables earlier than others, and all variables that were removed early on, and were later tested again in the final model (with correlated variables removed) in order to double check for significance. Notes below on reasons for removal do not fully acknowledge this process, but rather, highlight the primary reasons for each variable's removal from the model.

Average Annual Temperature (-): There is likely to be a prime temperature that tourists prefer, which is not too hot and not too cold for the activities that they want to participate in. However, it is likely that the Caribbean region is mostly close to this preferred temperature, and if anything, it likely reaches into the too hot category more than too cold. Furthermore, hurricane season is throughout the summer, making bad weather associated with higher temperatures. Thus, for this region, it is likely that there will be a negative relationship between temperature and WW expenditure. Modeled as a fixed variable, the annual average temperature is an important country characteristic for countries such as those in the Caribbean, because they are attracting tourists for outdoor activities surrounding use of their beaches (Jayawardena, 2002; Pattullo, 2005). Likewise, more pleasant temperatures are conducive to more enjoyable WW trips and thus higher visitor satisfaction (M. B. Orams, 2000).

Data Sources: (Weatherbase, 2016)

Reason for removal: This variable was not significant in any of the four models, and precipitation as a indicator of weather patterns was already included and significant in the analysis.

Country Area (N/A): This fixed variable is included as an indicator of a country's physical size, and is measured in kilometers squared.

Data Source: (Sea Around Us, 2015)

Reason for removal: Number of airports and country area had a correlation value of 0.9514. In terms of p-values and vif values, the two were alternatively better than one another in different models. I decided to keep the number of airports variable because it was more specific to tourism.

Democracy Score (+): I hypothesized that the more democratic a country is, the better its WW expenditure will be. This is thought to be the case, because E-NGOs are positing that WW tourism will be connected to benefits to local people, and making the assumption that democracy is good for local people, the relationship between these two variables should be a positive one. This is a synthesis of democracy scores from a variety of sources. It is believed that combining the scores allows for greater accuracy when determining the conditions of politics in each location, and it allows for greater data coverage as well (Pemstein et al., 2010). This data will help characterize the political atmosphere of different countries in the Caribbean. Furthermore, there is some data to suggest that countries with many years of democracy tend to be more politically stable

(Bollen & Jackman, 1989). Political stability, in turn, is needed for strong tourism industries, as political instability seems to most travelers to be an indication of danger (Eilat & Einav, 2004). However, the relationship between democracy and political stability is not direct, and there are several prime examples of non-democratic countries that have thriving tourism industries and long-standing political stability (L. K. Richter, 2007) Thus, this democracy score can only be considered a very rough proxy for political stability. Due to this, this value's relationship to WW expenditures is most appropriately interpreted as the impact that the form of government has on WW expenditures. Although it may hint at other relationships as well, none of these can be clearly interpreted.

Data Source: (Pemstein et al., 2010)

Reason for removal: This variable was not significant in any of the models.

Direct Contribution to Employment (+): I expected that higher levels of WW expenditure would also coincide with higher levels of employment in the tourism industry. Furthermore, a larger tourism industry, hiring more people, would be likely to correlate with a more economically successful WW industry (Cisneros-Montemayor et al., 2010). This is the contribution of the tourism industry to a country's employment (World Travel and Tourism Council 2013). This data is an indicator of the economic strength of the tourism industry in different countries. Tourism industries that provide high levels of employment to local communities are likely to be more economically supportive of those communities (although this does not account for the quality of those jobs). Furthermore, the claim has been made by E-NGOs that WW supports local coastal communities (IFAW, 2013; WDCS, 2013).



Data Sources: (World Tourism and Travel Council, 2015)

Reason for removal: This variable was collinear with capital investment in tourism, and when compared in the models, capital investment was more significant.

Direct Contribution to GDP (+): This is a measure of the economic impact that tourism has in different countries, and thus an indication of the economic magnitude that tourism industries have. Some locations may have relatively small numbers of tourism arrivals, but it is possible that their tourism industries still provide a considerable proportion of their GDP. Thus, WW expenditures should be positively correlated to the direct contribution to GDP, because WW economic success is believed to be closely linked to the success of the general tourism industry (Cisneros-Montemayor et al., 2010).

(+)

Data Sources: (World Tourism and Travel Council, 2015)

Reason for removal: This was collinear with tourism's direct contribution to employment, and while their levels of significance were comparable, direct contribution to employment was retained due to its specific significance to the local community's well being.

Exchange Rate (+): I expected that exchange rates that favored the US dollar would be positively correlated with higher WW revenue, because these exchange rates will make the overall price of the trip to such a destination cheaper for the US traveler (one of the largest markets for the Caribbean). Typically, it is believed that exchange rate plays a role in destination selection due to the influence that exchange rate has on the

overall price of a trip. In this case, the specific exchange rate between the USD and various Caribbean currencies is used. While there are considerable numbers of travelers to the Caribbean from Europe and Canada, the largest market, by far, for the Caribbean is the United States. The Caribbean Tourism Organization provides data that shows that for the entire region in 2009, ~49% of tourists came from the United States, ~14% from Canada, ~21% from Europe and ~17% from other countries. From this, it is clear that the United States is the single most important country when it comes to tourism in the region.

Data Sources: (fxtop.com, 2015; OANDA, 2015)

Reason for removal: Exchange rate was collinear with the number of hotel rooms and arrivals by air, and of these, number of hotel rooms was the most significant.

Exclusive Economic Zone (N/A): This is fixed variable that represents a marine area over which a state has special rights for economic development (e.g. exploration and use of marine resources). This is determined by the United Nations' Convention on the Law of the Sea, and is measured in kilometers squared.

Data Source: (Sea Around Us, 2015)

Reason for removal: The exclusive economic zone was collinear with fishing area, shelf area, length of coastline, and country area. Of these variables, country area was the most significant.

Imports as a Proportion of GDP (-): This was calculated as imports/GDP, and this metric was chosen in order to normalize the amount of imports into a country based on the size of its economy. This variable is important for several reasons. First, it is an

indication of how open an economy is to global trade. More importantly, in the case of tourism imports are an indication of the potential for tourism revenue leakage in a country. This is because countries with a heavy reliance on imports stream some of their tourism income to outside economies in order to get the materials necessary for their visitors. This results in a direct loss of revenue, and also a lost potential for further spending in the community (Chirenje et al., 2013; Lacher & Nepal, 2010).

The relationship of imports to tourism in the Caribbean is complex, as many Caribbean islands import many of the luxuries that mass tourists demand (Jayawardena, 2002; Pattullo, 2005). The relationship between imports and WW tourism is not obvious, however. Due to the idea that WW supports coastal communities, and imports is here being used as an indicator of leakages, I postulated that there would be a negative relationship between imports as a proportion of GDP and WW expenditures.

Data Sources: (United Nations Statistics Division, 2016; World Bank, 2014)

Reason for removal: This variable was not significant in any of the models.

Inshore Fishing Area (+): The inshore fishing area likely to be utilized by inshore cetaceans. So, I hypothesized that there would be a positive relationship between inshore fishing area and WW expenditures as if this area is larger, there is a larger area for human-cetacean interactions to take place. This is a fixed variable representing areas that are accessible by small-scale fishing operations (as opposed to industrial fishing), and is here defined as the area from shore to either 50 km offshore or to a depth of 200 m (Chuenpagdee, Liguori, Palomares, & Pauly, 2006). This is measured in kilometers squared.

Data Source: (Sea Around Us, 2015)

Reason for removal: Inshore fishing area was collinear with length of the coastline, shelf area, size of a country's exclusive economic zone (EEZ), and country area. Of these variables, country area was the most significant.

Length of Coastline (+): This is a fixed variable that is a geographic characteristic of a country, and is measured in kilometers. There should be a positive relationship between the length of the coast and WW expenditure, because more coastline means that there is more potential habitat for cetaceans and humans to easily interact.

Data Source: (Sea Around Us, 2015)

Reason for removal: Length of coastline was collinear with fishing area, shelf area, size of a country's exclusive economic zone (EEZ), and country area. Of these variables, country area was the most significant.

Marine protected areas as a % of territorial waters (+): I hypothesized that there would be a positive relationship between MPA and WW expenditures, because MPAs should support marine biodiversity, and this improves visitor satisfaction, word of mouth advertising, and then revenue. Marine protected areas can be designed to protect a wide variety of species, including cetaceans. In some situations, they are also used to encourage WW (Hoyt, 2005b). So this variable is just a general proxy for a country's focus on marine conservation, but it is valuable nonetheless. Biodiversity improves the tourism industry in general (M. Orams, 1999; S. S. Teelucksingh & Watson, 2013), but this can also enhance visitor satisfaction with WW specifically. More cetacean species

means a higher chance of viewing success. Whether or not cetaceans are seen, WWers commonly say that learning about the environment improves the experience (B. Barr et al., 2000; M. B. Orams, 2000). It is assumed here that MPAs will support thriving, biodiverse marine ecosystems.

Data Sources: (Bacci, 1998; Government of the British Virgin Islands, 2008; Hoggarth, 2001; Juffe-Bignoli et al., 2014; Triana, 2009; World Bank, 2014)

Reason for removal: MPAs were not significant for any of the four models.

Number of Airports(+): More airports will make a location more accessible, and thus more airports should have a positive relationship with WW direct expenditures. The # of airports in a location is one proxy for the accessibility of a country. Countries that are most accessible are likely to have a stronger tourism industry (Crouch, 1994), and countries with stronger tourism industries have a higher potential for WW economic success (Mustika et al., 2012; M. Orams, 1999).

Data Sources: (CIA, 2015; Nation Master, 2015)

Reason for removal: Number of airports was collinear with # of air arrivals, # of hotels, and exchange rate. Of these three, number of hotel rooms had the highest significance overall when tested in the models.

Number of arrivals by air (+): There would be a positive relationship between WW expenditures and arrivals by air, because this indicates more overnight travelers. This is a subset of tourism arrivals that can be indicative of both the strength of the tourism industry, as well as the primary or secondary mode of arrival (with the other

primary means of transportation within the Caribbean being by sea) (Pattullo, 2005). This particular form of travel may also be indicative of overnight tourists (as opposed to cruise arrivals). Overnight travelers will have a higher impact on the economy of the destination (Duval, 2004; Lundberg et al., 1995).

Data Sources: (WTO, 1997; WTO, 2001; WTO, 2003; WTO, 2007; WTO, 2008; WTO, 2012)

Reason for removal: Arrivals by air was collinear with number of hotel rooms, # of airports, and exchange rate. Of these three, number of hotel rooms had the highest significance overall when tested in the models.

Number of Fishers (-): This variable has been included as an indication of the size of the fishery industry in different countries, which is likely to have a complex relationship with WW. Fisheries are important to coastal communities as a both a source of food and employment (Pauly et al., 2002), and there has been competition between WW and fisheries in some locations (M. Y. Lee, 2010). Alternatively, fishermen have pioneered WW in other locations (Mustika et al., 2012). However, there has been conflict between fisheries and cetacean conservation due to the notion that cetaceans are contributing to fisheries collapses (Morissette et al., 2012). Although this is likely to not be the case, there have been actions taken against cetaceans in some countries due to this belief, or due to some cetaceans actively stealing fish from nets and lines (Reeves et al., 2003).

It is likely that the relationship between fisheries and WW will vary by country due to the development path of WW, and the beliefs of fishers concerning cetaceans.

However, in the long-term it is likely that there will be some competition between WWOs and fishermen, especially if the idea that cetaceans are competing with fishermen for resources becomes prominent among fishermen of the region. Alternatively, if WW businesses become concerned that fisheries is having a negative impact on their industry, they may lobby for regulations to limit fishing activities. Thus, it will be hypothesized that there will be a negative relationship between the number of fishermen in a country and WW expenditures.

Data Sources: (FAO, 2015; FAO, 2016; Food and Agriculture Organization of the United Nations, 2012)

Reason for removal: Number of fishers was not significant in any of the four models.

Number of threatened mammals (-): This is the number of mammals that are threatened (IUCN Categories: Critically Endangered, Endangered and Vulnerable) by country. This serves as an indicator of general trends concerning mammal conservation in different locations. By E-NGO claims and hopes for WW, we would expect to see a negative relationship between the number of threatened mammals in a location and WW expenditure. This would be the case because WW should encourage cetacean conservation, and more biodiverse locations should attract more visitors (although it should be noted that some locations may have high numbers of threatened species and still maintain high biodiversity- or this may be an indication of biodiversity, as there are simply more species in that location to be threatened).

Data Source: (IUCN, 2016)

Reason for removal: This was not significant in any of the models.

Number of whale watchers (+): The # of WWers would be positively related to the WW expenditures because more WWers means more ticket sales, etc. WW revenue should be directly related to the number of WWers participating in the industry. This relationship is so obvious that this variable is primarily an indicator for the models being used, as a positive relationship is expected.

Data Source: (O'Connor et al., 2009)

Reason for removal: Accounts for too much of the variability in WW expenditures due to the fact that the # of WWers is the result of all other country characteristics and directly leads to WW expenditure.

Percent of the Population with Access to Improved Sanitation (+): Higher levels of access to improved sanitation will indicate higher levels of basic infrastructure, and result in higher levels of WW revenue as a larger pool of potential clients will be willing to travel to such a destination. Basic infrastructure such as improved sanitation can play a major role in making different locations more appealing to most tourists (Lundberg et al., 1995). Thus, an understanding of various countries ability to provide this basic service to its people is likely to be indicative of the tourism industry's ability to utilize these same utilities for guests. This connection is not 100%, however, as large-scale tourism firms can afford to provide services for tourists that are not available to local people (Duval, 2004; Pattullo, 2005).

Data Source: (World Bank, 2014)



Reason for removal: This variable was not significant in any of the four models.

Population (N/A): This variable was included as an indication of the size of a country.

Data Sources: (World Bank, 2014)

Reason for removal: This variable was collinear with many other variables, and its removal vastly improved the overall vif scores of the models (signaling less collinearity).

Shelf Area (+): This is a fixed variable that represents the size of the continental shelf (area of relatively shallow water, < 200 m deep) connected to the shores of the countries of interest. This is measured in kilometers squared. I hypothesized that there would be a positive relationship between shelf area and WW expenditures. Cetaceans that utilize shallow waters are easier for WWOs to access, as they are typically closer to shore, and shorter boat rides lessen the costs of running business (M. Y. Lee, 2010), and increase visitor satisfaction (M. B. Orams, 2000).

Data Sources: (Sea Around Us, 2015)

Reason for removal: Shelf area was collinear with fishing area, length of the coastline, size of a country's exclusive economic zone (EEZ), and country area. Of these variables, country area was the most significant.

Sub-region (N/A): Sub-regions in the Caribbean, developed by the World Resources Institute, were used to examine a potential affect that location within the region might have on WW expenditures.

Data Source: (World Resources Institute, 2015)

Reason for removal: This variable was not significant in any of the four models.

Tourism Arrivals (+): "International inbound tourists (overnight visitors) are the number of tourists who travel to a country other than that in which they have their usual residence, but outside their usual environment, for a period not exceeding 12 months and whose main purpose in visiting is other than an activity remunerated from within the country visited" (WTO, 2012). This variable is a good indication of the size of a destination's tourism industry. Thus, there will be a positive relationship between WW expenditures and tourism arrivals, because there is a higher potential for more WWers the larger a destination's tourism industry in general (Cisneros-Montemayor et al., 2010).

Data Sources: (WTO, 1992; WTO, 1997; WTO, 2001; WTO, 2003; WTO, 2007; WTO, 2008; WTO, 2012)

Reason for removal: Tourism arrivals and arrivals by air were collinear, and arrivals by air was more significant overall. Furthermore, since I wanted to include arrivals by cruise ship, arrivals by air was more appropriate.

Table II.1: Full Variable and Source Table for Economic Regression Analysis

<u>Data</u>	<u>Code</u>	<u>Importance</u> <u>Dependent Variable</u>	<u>General Hypothesis</u>	<u>Source</u>
WW Expenditure	<u>WWEx</u>	Indicator of money flow into local economies.		(O'Connor et. al. 2009)
		<b>Independent Variables</b>		
		<b>WW Characteristics</b>		
# of Target Species	<u>Tspecies</u>	Indicator of cetacean diversity.	+ : More target species increases visitor satisfaction and improves WOM advertising and return visits.	(O'Connor et. al. 2009)
		<b>Tourism Indicators</b>		
Arrivals by Air	<u>AirArriv</u>	Sub-set of tourism arrivals, specific to one type of overnight tourist.	+ : More overnight tourists means a larger pool of potential <u>WWers</u> .	(WTO, 1992; WTO, 1997; WTO, 2001; WTO, 2003; WTO, 2007; WTO, 2008; WTO, 2012)
Cruise Ship Arrivals	Cruise	Common source of non-overnight tourists in the Caribbean.	+/- : Potentially complex relationship.	(WTO, 1992; WTO, 1997; WTO, 2001; WTO, 2003; WTO, 2007; WTO, 2008; WTO, 2012)
Democracy Score	Dem	Indicator of a key political characteristic.	+/- : Democratic states are more familiar to the main markets for Caribbean tourism, but democracy is not necessary for a strong tourism industry.	(Pemstein et al., 2010)
Direct Contribution to	DContEmp	Indicator of the tourism	+ : Large tourism industries	(World Tourism and

Employment		industry's support for a destination's economy.	are likely to support larger WW industries- higher employment is likely an indication of a larger tourism industry.	Travel Council, 2015)
Exchange Rate	ExRate	Proxy for price of travel to a location.	+: The main market for the Caribbean is the US, and thus exchange rates that favor the US dollar will make a trip to any certain destination cheaper.	(OANDA, 2015)
Per capita GDP	GDP	Indicator of economic development with the size of a destination's population taken into consideration.	+: More developed countries are likely to be more appealing and accessible to tourists, thus increasing the possible pool of <u>WWers</u> .	(World Bank, 2014)
# of Hotels	Hotels	Indicator or tourism development and the supply of accommodations.	+: More tourism infrastructure can support a larger tourism industry.	(WTO, 1992; WTO, 1997; WTO, 2001; WTO, 2003; WTO, 2007; WTO, 2008; WTO, 2012)
Tourism Arrivals	TArrivals	Full accounting of overnight visitors to a location, thus indicating the size of the tourism industry.	+: More tourism means a larger pool of potential <u>WWers</u> .	(WTO, 1992; WTO, 1997; WTO, 2001; WTO, 2003; WTO, 2007; WTO, 2008; WTO, 2012)
Marine protected areas (% of territorial waters)	MPA	Conservation Indicators General proxy for government involvement in marine conservation.	+: WW should be associated with higher levels of marine conservation efforts according to e-NGO claims.	(Bacci, 1998; Government of the British Virgin Islands, 2008; Hoggarth, 2001; Juffe-Bignoli et al.,

# of threatened mammals	<u>MamThrt</u>	General proxy for the state of mammal biodiversity/conservation in a location.		2014; Triana, 2009; World Bank, 2014) (IUCN, 2016)
WW regulations/guidelines	<u>WWReg</u>	Indicator of government/industry involvement in protecting cetaceans from industry impacts.	-: If WW is to be associated with cetacean conservation it should also be associated with lower levels of threatened mammal species. +: WW can have negative impacts on cetaceans, regulations/guidelines are needed to lessen this, and thus if WW is to be connected to cetacean conservation, more regulations should be associated with more successful locations.	(Carlson, 2011)
Conservation Agreements	<u>ConAgree</u>	This index is meant to represent a country's involvement in international/regional efforts at conservation.	+: If WW is a tool to enhance cetacean conservation, it is hypothesized that the industry will also be associated with higher levels of international/regional conservation efforts.	(FAO et al., 2013; IMO, 2015; International Whaling Commission, 2015; The Nature Conservancy, 2016; UNEP, 2013a; UNEP, 2015; UNEP, The Caribbean Environment Programme, 2015a; UNEP, The Caribbean Environment Programme, 2015b; UNEP/CMS Secretariat, 2015; United Nations, 2016; United Nations

				Statistics Division, 2016)
Number of Fishers	Fishers	<b>Other</b> Number of fishers can help indicate the size of a fishing industry.	-: There is likely to be some competition, regulatory conflicts between the fisheries industry and WW. +: The coast is a habitat in which humans and cetaceans can easily interact.	(FAO, 2015; FAO, 2016; Food and Agriculture Organization of the United Nations, 2012) (Sea Around Us, 2015)
Length of Coastline	Coast	Geographic characteristic of a country.		
Inshore Fishing Area	<del>E</del> Area	Areas that are accessible by small-scale fishing operations.	+/-: Similar to shelf area, this habitat is commonly used by cetaceans. However, it will also be an area of potential conflict between WW and fishermen.	(Sea Around Us, 2015)
# of Seaports	Seaports	Indicator of maritime development.	+: Coastal development can help facilitate WW development.	(World Port Source, 2016)

**Table II.2: Full List of Model Variables Considered**

<b>WW Characteristics</b>	<b>Tourism Indicators</b>	<b>Conservation</b>	<b>Other</b>
# of WWers	Arrivals by air	Conservation agreements	Area
# of target species	# of airports	# of threatened mammals	Length of coastline
	Cruise arrivals	Marine protected areas	Democracy score
	Direct contribution to employment	WW regulations/guidelines	Exclusive economic zone
	Direct contribution to GDP		Exchange rate
	# of hotels		Inshore fishing area
	Tourism arrivals		# of fishers
			Per capita GDP
			Population
			Average annual precipitation
			Average annual temperature
			Imports as a proportion of GDP
			Sub-region
			% of the population with access to improved
			# of seaports
			Shelf area

APPENDIX III

SUMMARY OF WHALE WATCHING IMPACT LITERATURE REVIEW



<b>Reference</b>	<b>Location</b>	<b>Species (Common)</b>	<b>Species (Scientific)</b>
(Filla & Monteiro-Filho, 2009)	Cananeia, Brazil	Estuarine Dolphin/ Costero	Sotalia guianensis
(Wright et al., 2002)	N/A	Beaked Whales	
(Acevedo, 1991)	Ensanada De La Paz, Mexico	Bottlenose Dolphin	Tursiops truncatus
(M. C. Allen & Read, 2000)	Clearwater, Florida	Bottlenose Dolphin	Tursiops truncatus
(Arcangeli et al., 2009)	Bunbury, Australia	Bottlenose Dolphin	Tursiops truncatus
(Berrow & Holmes, 1999)	Shannon estuary, Ireland	Bottlenose Dolphin	Tursiops truncatus
(Buckstaff, 2004)	Sarasota Bay, Florida	Bottlenose Dolphin	Tursiops truncatus
(R. Constantine et al., 2004)	Bay of Islands, New Zealand	Bottlenose Dolphin	Tursiops truncatus
(Evans et al., 1992)	Cardigan Bay, Wales	Bottlenose Dolphin	Tursiops truncatus
(Goodwin & Cotton, 2004)	Teignmouth Bay, UK	Bottlenose Dolphin	Tursiops truncatus
(Hastie et al., 2003)	Cromarty Firth, Scotland	Bottlenose Dolphin	Tursiops truncatus
(Janik & Thompson, 1996)	Beaulieu Firth, Scotland	Bottlenose Dolphin	Tursiops truncatus
(Jensen et al., 2008)	Koombana Bay, Australia	Bottlenose Dolphin	Tursiops truncatus
(Jensen et al., 2008)	Tenerife	Short-finned pilot whale	Globicephala macrorhynchus
(Mattson et al., 2005)	Hilton Head island, South Carolina	Bottlenose Dolphin	Tursiops truncatus
(L. J. Miller, Solangi, & Kuczaj, 2008)	Mississippi Sound	Bottlenose Dolphin	Tursiops truncatus
(S. M. Nowacek et al., 2001)	Sarasota Bay, Florida	Bottlenose Dolphin	Tursiops truncatus
(Scarpaci, Nugegoda, & Corkeron, 2004)	Port Phillip Bay, Australia	Bottlenose Dolphin	Tursiops truncatus

(Scarpaci, Dayanthi, & Corkeron, 2003)	Port Phillip Bay, Australia	Bottlenose Dolphin	Tursiops truncatus
(Lusseau, 2003b)	Doubtful Sound, New Zealand	Bottlenose Dolphin Species	Tursiops spp.
(Lusseau, 2003a)	Doubtful Sound, New Zealand	Bottlenose Dolphin Species	Tursiops spp.
(Lusseau, 2005)	Milford Sound, New Zealand	Bottlenose Dolphin Species	Tursiops spp.
(Lusseau, 2006)	Doubtful Sound, New Zealand	Bottlenose Dolphin Species	Tursiops spp.
(Samuels & Bejder, 2004)	Panama City Beach, Florida	Bottlenose Dolphin Species	Tursiops spp.
(Constantine, R., & Baker, C. S., 1997)	Bay of Islands, New Zealand	Bottlenose Dolphin	Tursiops truncatus
(Constantine, R., & Baker, C. S., 1997)	Bay of Islands, New Zealand	Common Dolphin	Delphinus delphis
(Ritter, 2004)	La Gomera, Canary Islands	Bottlenose Dolphin	Tursiops truncatus
(Ritter, 2004)	La Gomera, Canary Islands	Atlantic Spotted Dolphin	Stenella frontalis
(Ritter, 2004)	La Gomera, Canary Islands	Pilot Whale	Globicephala macrorhynchus
(Ritter, 2004)	La Gomera, Canary Islands	Rough-toothed Dolphin	Steno bredanensis
(Ritter, 2004)	La Gomera, Canary Islands	Striped Dolphin	Stenella coeruleoalba
(Ritter, 2004)	La Gomera, Canary Islands	Dense Beaked Whale	Mesoplodon densirostris
(Stockin et al., 2008)	Hauraki Gulf, New Zealand	Common Dolphins	Delphinus sp.
(Luis do Valle & Melo, 2006)	Curral, Pipa-RN, Brazil	Costero	Sotalia guianensis
(Jahoda et al., 2001)	Ligurian Sea	Fin Whale	Balaenoptera physalus
(Jahoda et al., 2003)	Ligurian Sea	Fin Whale	Balaenoptera

			physalus
(Notarbartolo di Sciara, Jahoda, Biassoni, & Lafortuna, 1996)	Ligurian Sea	Fin Whale	Balaenoptera physalus
(W. W. L. Au & Green, 2000)	Maui, HI	Humpback Whale	Megaptera novaeangliae
(Bauer, Mobley, & Herman, 1993)	Maui, Hawaii	Humpback Whale	Megaptera novaeangliae
(P. J. Corkeron, 1995)	Hervey Bay, Queensland, Australia	Humpback Whale	Megaptera novaeangliae
(Schaffar et al., 2010)	Cap Ndoua, New Caledonia	Humpback Whale	Megaptera novaeangliae
(Schaffar et al., 2010)	Cap Ndoua, New Caledonia	Humpback Whale	Megaptera novaeangliae
(Scheidat et al., 2004)	Isla de la Plata, Machalilla NP, Ecuador	Humpback Whale	Megaptera novaeangliae
(Sousa-Lima & Clark, 2008)	Arbolhos National Park Brazil	Humpback Whale	Megaptera novaeangliae
(Stamation et al., 2010)	New South Wales, Australia	Humpback Whale	Megaptera novaeangliae
(Weinrich & Corbelli, 2009)	Stellwagen Bank, Jeffreys Ledge, Maine	Humpback Whale	Megaptera novaeangliae
(Watkins, 1986)	Cape Cod	Humpback Whale	Megaptera novaeangliae
(Watkins, 1986)	Cape Cod	Minke Whales	Balaenoptera acutorostrata
(Watkins, 1986)	Cape Cod	Finback	Balaenoptera physalus
(Watkins, 1986)	Cape Cod	Right Whales	Eubalaena glacialis
(Visser et al., 2011)	Pico Island, Azores	Risso's Dolphin	Grampus griseus
(Neumann & Orams, 2006)	Mercury Bay, New Zealand	Short-beaked Common Dolphin	Delphinus delphis
(Gordon et al., 1992)	Kaikoura, New Zealand	Sperm Whale	Physeter macrocephalus
(Magalhães et al., 2002)	Azores	Sperm Whale	Physeter macrocephalus
(C. Richter et al., 2006)	Kaikoura, New Zealand	Sperm Whale	Physeter

			macrocephalus
(D. Au & Perryman, 1982)	Clipperton Islands, Pacific Ocean	Spinner Dolphin	Stenella longirostris
(D. Au & Perryman, 1982)	Clipperton Islands, Pacific Ocean	Spotted Dolphins	Stenella attenuata
(D. Au & Perryman, 1982)	Clipperton Islands, Pacific Ocean	Striped Dolphin	Stenella coeruleoalba
(Delfour, 2007)	Oahu, Hawaii	Spinner Dolphin	Stenella longirostris
(Timmel et al., 2008)	Kealahou Bay, Hawaii	Spinner Dolphin (Hawaii)	Stenella longirostris
(Bain et al., 2002)	British Columbia, Washington, Oregon	Orca	Orcinus orca
(Erbe, 2002)	Southern British Columbia and Northwestern Washington	Orca	Orcinus orca
(Foote et al., 2004)	Washington State	Orca	Orcinus orca
(Jelinski et al., 2002)	Johnstone Strait, British Columbia	Orca	Orcinus orca
(Kruse, 1991)	Johnstone Strait, British Columbia	Orca	Orcinus orca
(Lusseau et al., 2009)	San Juan Island, WA, USA	Orca	Orcinus orca
(Lachmuth et al., 2011)	San Juan Islands, WA, USA	Orca	Orcinus orca
(Noren et al., 2009)	Vancouver Is, British Columbia, Canada	Orca	Orcinus orca
(R. Williams et al., 2002)	Johnstone Strait, British Columbia	Orca	Orcinus orca
(R. Williams & Ashe, 2007)	Johnstone Strait, British Columbia	Orca	Orcinus orca
(R. Williams et al., 2006)	Johnstone Strait, British Columbia	Orca	Orcinus orca
(R. Williams et al., 2002)	Johnstone Strait, British Columbia	Orca	Orcinus orca
Species Not Found in the Caribbean			
(Blane & Jaakson, 1994)	St. Lawrence Estuary	Beluga Whales	Delphinapterus leucas

(Lesage, Barrette, Kingsley, & Sjare, 1999)	St. Lawrence Estuary	Beluga Whales	Delphinapterus leucas
(Ribeiro, Viddi, & Freitas, 2005)	Yaldad Bay, Southern Chile	Chilean Dolphin	Cephalorhynchus eutropia
(K. Barr & Slooten, 1999)	Kaikoura, New Zealand	Dusky Dolphin	Lagenorhynchus obscurus
(Dans et al., 2008)	Golfo Nuevo, Peninsula Valdes, Argentina	Dusky Dolphin	Lagenorhynchus obscurus
(D. Lundquist et al., 2013)	Kaikoura Canyon, New Zealand	Dusky Dolphin	Lagenorhynchus obscurus
(Duffus, 1996)	Clayoquot Sound, British Columbia	Grey Whale	Eschrichtius robustus
(Evans et al., 1994)	Mousa Sound, Southeast Shetland	Harbour Porpoise	Phocoena phocoena
(Bejder et al., 2006)	Shark Bay, Western Australia	Indo-pacific Bottlenose Dolphin	Tursiops aduncus
(Lemon et al., 2006)	Jervis Bay, New South Wales, Australia	Indo-pacific Bottlenose Dolphin	Tursiops aduncus
(Matsuda et al., 2011)	Amakusa-Shimoshima Island, Japan	Indo-pacific Bottlenose Dolphin	Tursiops aduncus
(Seuront & Cribb, 2011)	Adelaide River-Baker Inlet Estuary, South Australia	Indo-pacific Bottlenose Dolphin	Tursiops aduncus
(Steckenreuter et al., 2012)	Port Stephens, Australia	Indo-pacific Bottlenose Dolphin	Tursiops aduncus
(Stensland & Berggren, 2007)	Zanzibar	Indo-pacific Bottlenose Dolphin	Tursiops aduncus
(Ng & Leung, 2003)	Hong Kong	Indo-Pacific humpback dolphin	Sousa chinensis
(Beaubrun, 2002)	Mediterranean Sea	Various	Various
(Coscarella et al., 2003)	Patagonia, Argentina	Dusky Dolphin	Lagenorhynchus obscurus
(Coscarella et al., 2003)	Patagonia, Argentina	Commerson's Dolphin	Cephalorhynchus commersonii
(Carrera et al., 2008)	Dolphin Bay, Brazil	Marine	Sotalia

		Tucuxis	fluviatilis
(Van Parijs & Corkeron, 2001)	Amity Point, Stradbroke Is, Queensland, Australia	Pacific Humpback Dolphins	Sousa chinensis
(Hewitt, 1985)	Tropical Pacific Ocean	Various	Various

APPENDIX IV  
THE THEORY OF SOCIAL EXCHANGE

While there has not been focused research on resident (or host) relationships to WW, there is a well-developed body of research examining resident perceptions of tourism in general, and these studies provide an important foundation for examining the relations between local people and the WW industry. One of the primary tools used in this research on resident perceptions is social exchange theory (SET), which is particularly relevant for my study of resident perceptions for several key reasons. First, it is commonly used throughout tourism research of this nature, so taking SET into consideration will couch my findings in the rest of the literature. Second, SET has the ability to account for both positive and negative perceptions, and take both tangible and intangible benefits into account for groups or individuals (Ap, 1992; Jurowski et al., 1997; Látková & Vogt, 2012; Rasoolimanesh et al., 2015; Wang & Pfister, 2008). This makes it very versatile when examining a wide array of differing circumstances and cultures within a host communities. In the following section, I will describe the definitions and rules of this theory, and explore some of its primary weaknesses. In my project itself, the SET framework will be used to help analyze the data from my qualitative interviews, but in a primarily descriptive manner that will be described further in the methods section of Chapter Four.

Social exchange theory was developed during the 1960s by sociologists and social psychologists, primarily George Homans, John Thibaut, Harold Kelley, and Peter Blau (Emerson, 1976). A simple definition of the framework was described by Blau as the following: "Social exchange as here conceived is limited to actions that are contingent on rewarding reactions from others" (Blau, 1964). In essence, it is a system within which



there are at least two actors (individuals or groups) that each agree to participate in an exchange (Ap, 1992; Emerson, 1976; Rasoolimanesh et al., 2015). There are a variety of things that can be exchanged within this system, including both tangible and intangible rewards. The most obvious benefits are money, goods, and services, but intangible exchanges that improve the status and confidence of actors, preserves tradition and group norms, and provides things such as love and information are also important (Cropanzano & Mitchell, 2005; Goyder & Boyer, 2008).

The long-term persistence of the exchange relationship depends on its characteristics, because each person or group in the exchange requires the benefits of the interaction to outweigh the costs, and the provision of benefits rely on the behavior of the other party (Cropanzano & Mitchell, 2005; Emerson, 1976; Goyder & Boyer, 2008).

Thus, there are a set of general rules by which SET relationships appear to depend on, (1) in the long run, participants believe that the trade is fair, (2) those who give will receive an acceptable amount of benefits for their sacrifice, and (3) those who do not reciprocate or follow acceptable behavior with SET will be punished in some sense (Cropanzano & Mitchell, 2005).

Within this framework either the economic concept of rational behavior or Skinner's operant theory are used to conceptualize and predict behavior (Emerson, 1976). Rational behavior assumes that actors will make choices to optimize and often maximize the benefits that they receive out of an interaction (Vriend, 1996). The use of operant theory gives particular insight into human behavior when tangible exchanges are not being made. This theory tells us that behavior that is rewarded is more likely to be

repeated in the future. More specifically, Skinner held several things to be true, (1) if there is a particular stimuli associated with an action that received a reward, the more likely a person is to repeat that action in connection with that stimuli; (2) the more recently a reward has been received the less valuable a further unit of that reward becomes; (3) and the more valuable the reward is to an individual the more likely they are to carry out the action that resulted in that reward in the past (Homans, 1974).

SET is a seductively simple and seemingly logical lens through which to examine the world, and for this reason, it carries with it the risk of being overused, and over-relied upon without consideration for its weaknesses (Goyder & Boyer, 2008). Key shortcomings should be kept in mind in order to utilize this tool in an effective manner. The first issue is with the assumption of rational behavior, because there are many instances in which humans do not make decisions that will bring them the most gain for the least cost (Ap, 1992; Emerson, 1976). However, additional rules or propositions can be added to the theory in order to help explain some of these choices. These include the four following concepts: altruism, group gain, status consistency, and competition (Meeker, 1971). Altruism can be considered selfless behavior, while competition is an effort to attain superiority over another actor or faction. Group gain includes behaviors that may appear to be neutral or have negative consequences for a single actor, but which provides benefits to the group that that individual is a part of. Status consistency, or rank equilibrium refers to actions that maintain or improve a persons standing within the social group (Cropanzano & Mitchell, 2005; Meeker, 1971; Rasoolimanesh et al., 2015). Despite the potential benefit of these added rules, however, they are rarely utilized in on-

the-ground research, and there has not been enough done with them for researchers to know which rules should be applied to the different kinds of exchange resources (Cropanzano & Mitchell, 2005).

There is also an issue of tautology, particularly when utilizing the operant theory to explain behavior within the SET framework. Of particular concern here are the first and third propositions of Homans' use of Skinnerian operant theory, (1) that the more an action is rewarded, the more likely a person is to carry out that action, and (3) that the more often a person receives a particular reward, the less valuable a further unit of that reward is to them (Emerson, 1976). While each of these makes sense in isolation, there is an element of circular thinking here that does not appear to support long-term SET relationships. Reductionism is a concern as well, because it can be argued that the behavior of the different actors or parties appears to be motivated by one another. If this is the case, then it is questionable whether the relationship has been explained or only described. Furthermore, it is not clear whether it is more effective to examine interactions as two different, interdependent sets of decisions (as they are in SET), or a single case with two actors or parties (Emerson, 1976).

The use of SET to explain resident perceptions of tourism and its development has become commonplace. This kind of research is important because these perceptions are known to influence the behavior of local people in host communities, and thus shape the quality of the tourism experience and the industry's longevity in a location (Perdue, Long, & Allen, 1987). It is assumed for good reason that the economic sustainability of tourism relies on its benefits offsetting the social and environmental costs of the industry

(e.g. increased crime, local exclusion from previously open spaces, etc.). This relationship is well suited to be explored by SET, because this framework can be used to examine both negative and positive perceptions on group or individual levels (Ap, 1992; Jurowski et al., 1997; Látková & Vogt, 2012; Rasoolimanesh et al., 2015; Wang & Pfister, 2008). In 1992, J. Ap wrote a paper that has remained widely cited in tourism literature, explaining the SET theory in relation to tourism, and delineating the primary rules of this framework as it applies to resident perceptions of tourism. Ap explains that tourism exchange relationships are most often formed by communities or individuals that believe there is something to be gained from the introduction of the industry. There are then three primary principles that shape scientific predictions about the form that this relationship will take. (1) When there are more benefits than costs, perceptions will be more positive, and vice versa. (2) Individuals will determine their attitude based on whether or not the benefits and costs balance out at a level that they believe is acceptable. (3) When the actions of one group or individual is reciprocated by the other side of the exchange relationship, then the interaction is considered balanced. Alternatively, interactions with people that have similar levels of power are also considered balanced, and balanced relationships are perceived more positively. All in all, these come together to make up a Justice Principle by which positive perceptions are created by relationships that appear to be fair within the social context of the host community (Ap, 1992).

Although SET has weaknesses, the use of this framework in the body of tourism research has led to considerable insight into the relationship that local people in host communities have with the travel industry (Harrill, 2004).

APPENDIX V

THE PHILOSOPHY OF PHENOMENOLOGY

Phenomenology focuses on developing a deep understanding of a shared experience, or phenomena. It typically uses interviews to gather data from different individuals about a phenomenon of interest, and then distills this information down to the essential experience that individuals within a certain group share (Creswell 2013). The foundational philosophy of phenomenology is based on the ideas of Edmund Husserl, and is essentially a method of understanding experiences without the interference of the researcher's preconceived ideas. Thus, within phenomenological research, the researcher discloses their own experience with the phenomena, and attempts to distance their own impressions and biases from their work (Converse 2012). Due to this, the typical aim of phenomenological research is to provide a description of an experience, rather than an explanation or analysis (Creswell 2013). However, there are two different forms of phenomenological research that are commonly used. The first is transcendental phenomenology, which is more focused on the description of the experience than the researcher's interpretation, and is more traditional. The second is hermeneutical phenomenology, which allows for more inclusion of the researcher's interpretation of their findings along with the description of the phenomena (Creswell 2013; Converse 2012).

APPENDIX VI

WHALE WATCH OPERATORS AND RESIDENT INTERVIEW FORMS

#### A. Local Interview

##### **Background Knowledge and Personal Experience with Whale Watching:**

Discuss. How would you explain what whale watching is to someone who doesn't know?

Have you gone whale watching before? If so, how many times have you gone?

Discuss:

(1) If you haven't gone, is this something that you would like to do? Why or why not?

OR

(2) If you have been whale-watching, what did you think of your experience whale watching?

-In what ways was the whale watching trip an educational experience? What topics do you remember learning about?

What whales and/or dolphins do you remember seeing while whale watching?

Had you ever seen these animals before the trip- either from the shore or in photographs?

How many people do you know who work for a whale watching company?

What do they do?

Is their job seasonal?

##### **Perspectives of the Whale Watching Industry**

Discuss:

In what ways do you think that the whale watching industry is valuable for you personally and for your occupation?

What are the costs or negative impacts that the whale watching industry imposes on you or your occupation?

How is the whale watching industry beneficial for your community?

What are the costs that the whale watching industry imposes on your community?

What changes do you believe should be made to the whale watching industry in order to improve it for the benefit of your community?

Overall, do you believe that the whale watching industry is beneficial for your community?

##### **Cetacean Conservation**

Discuss:



Would you describe your feelings towards whales and dolphins as positive or negative overall? Why?

- How have your feelings towards whales and dolphins changed over time?

How do you feel about nature conservation?

- In what ways do you think that nature conservation is valuable to you and your community?

- What costs does nature conservation impose on your and/or your community?

Who do you think should be responsible for nature conservation?

Do you think that whales and dolphins should be protected?

Discuss:

- If yes, in what ways and who should be responsible for this protection?

- If no, why not?

What other uses does your community have for whales and dolphins other than whale watching?

B. WWO Interview

**Perception of Cetaceans and Whale Watching:**

Discuss:

- Would you describe your feelings towards whales and dolphins as positive or negative overall? Why?

- Do you have the same opinion about whales and dolphins, or do you think about them differently? If differently, in what ways?

- In what ways are they interesting to you?

- In what ways, if any, are they special or different from other animals?

- In what ways do you think that whales and dolphins are important for the environment?  
How about for the economy?

- Have you always felt this way?

- [If no:] How has it changed? Why do you think that your feelings have changed?

- Why did you decide to run a whale watching business?

- In what ways does your business benefit your community?

- In what ways does your business encourage more tourists to visit the area?

- What educational opportunities does your business provide to the local communities?
- In what ways does your business improve local employment opportunities?
- What is your relationship to fishermen?
- What negative impacts or costs might your business have on your community, if any?
- What negative impacts might your business have on the local environment?
- What negative impacts might your business have on the community?
- What conflicts of interest does your business have with fisheries? Other local businesses?

**Business Philosophy of Care:**

Discuss:

- What methods of self-regulation do local whale watching companies use to protect whales and dolphins? What methods of self-regulation does your company use?
- Pretend I am someone who does not know anything about nature conservation. Explain it to me.
- In what ways do you think that nature conservation is valuable to you and your community?
- What costs does nature conservation have for you and/or your community?
- Who do you think should be responsible for nature conservation? [E.g. government officials, non-governmental organizations, business owners, etc.]
- What threats do you believe there are to whales and dolphins?
- Do you think that whales and dolphins should be protected?
  - If yes, in what ways and who should be responsible for this protection?
  - If no, why not?