Applying Wildlife Conservation Tourism to Marine Endangered Species: Identifying Indicators for Triple Bottom Line Sustainability

Kayla N. Boyes

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Marc L. Miller, Chair

Edward H. Allison

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University of Washington

Abstract

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Kayla N. Boyes

Chair of the Supervisory Committee:
Dr. Marc L. Miller
School of Marine and Environmental Affairs

As global marine biodiversity rapidly decreases, it has become apparent that traditional ecological conservation practices that discourage human interaction with the natural environment are alone insufficient for long term wildlife and ecosystem protection. Tourism and recreation has emerged as an underutilized tool that can be applied in conjunction with existing marine wildlife management strategies. In this thesis, the field of wildlife conservation tourism (WCT) is established as an ecological conservation strategy that promotes and prioritizes endangered species conservation through meaningful interactions with tourists. WCT has great potential to provide critical educational and financial support for marine wildlife conservation while also providing an enriching and inspiring experience for tourists and a viable livelihood for tourism brokers. Framed within the human-artifactual-natural (HANS) system, this thesis identifies triple bottom line indicators that can be used to evaluate the efficacy of WCT enterprises to ensure sustainable marine wildlife management. The goal of this thesis is to utilize interdisciplinary

literature to identify and extract key indicators to facilitate ecologically, economically, and socially sustainable wildlife conservation tourism for the preservation and recovery of marine endangered species.

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Abbreviations

CAPS – Captive Animal Protection Society

CITES – Convention on International Trade in Endangered Species of Wild Fauna and Flora of 1973

CMT – Coastal and Marine Tourism

EBM – Ecosystem Based Management

ESA – Endangered Species Act of 1973

FPIs – Fishery Performance Indicators

GDP – Gross Domestic Product

HANS – Human Artifactual Natural System

ICM – Integrated Coastal and Ocean Management

IUCN – International Union for Conservation of Nature

MMPA – Marine Mammal Protection Act of 1972

MPA – Marine Protected Area

NMFS – National Marine Fisheries Service

NOAA – National Oceanic and Atmospheric Administration

TBL – Triple Bottom Line

USFWS – United States Fish and Wildlife Service

WAZA – World Association of Zoos and Aquariums

WCT – Wildlife Conservation Tourism

WCTIs – Wildlife Conservation Tourism Indicators

WTO – World Tourism Organization

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INTRODUCTION

The field of marine and environmental affairs involves the formal study of fisheries, community well-being, natural resource management, coastal and marine law and policy, and many other fields. The formal study of coastal and marine tourism is emerging as one of these fields. Coastal and marine tourism spans boating, sailing, and surfing, but this field also allows people to engage in the natural resources the marine environment has to offer, including marine wildlife. Tourists can swim with dolphins, sharks, whales and manatees, or dive amongst coral reefs and sea turtles, or simply visit the local zoo or aquarium.

Unfortunately, the health and diversity of wildlife in the oceans have been in decline. A variety of strategies have been implemented with the intention of slowing or reversing these species losses and extinctions. Legal interventions have been implemented in the United States like the Marine Mammal Protection Act, the Endangered Species Act, and the Convention on International Trade in Endangered Species of Wild Fauna and Flora, but these laws generally lack financial or stakeholder support and therefore fail ecologically. Single species recovery plans have proven to be impractical, unrealistic, and ineffective, so fisheries and marine habitat managers have turned to protecting ecosystems through marine protected areas and fishing restrictions. Aquaculture has been another strategy employed to lessen the pressure on wild fish stocks and minimize fishing practices that are detrimental to the environment. Zoos and aquariums are remain popular tools to educate and raise awareness and funding for endangered species and the marine environment. But more can be done.

As we strive to conserve and protect our precious marine fauna, a familiar industry has emerged as a legitimate new tool to support marine endangered species conservation: tourism. Tourism and recreation is a strategy that can be used in conjunction with biological strategies like spatially protected marine habitats, or can be used to make people more aware of the legal strategies in place for wildlife protection. However, a touristic strategy can fail when the biology and ecology of the ecosystem are ignored, and vice versa wildlife conservation via tourism will fail if the human dimensions of the system are neglected. Therefore, I have chosen to designate within the field of ecotourism and nature based tourism, a subfield called wildlife conservation tourism. Wildlife conservation tourism is designed to explicitly preserve endangered species by preserving their habitats through encouraging people to partake in that conservation effort in their recreation. Unlike other wildlife conservation endeavors, wildlife conservation tourism delves deep into the interactions between people and their marine environment through the human-artifactual-natural system lens. Most important about the use of this model is the designation of stakeholders into brokers, local, and tourists, which is a critical part of ensuring the social success of any tourism operation. In this thesis, I will apply this novel form of tourism to marine endangered species in the United States.

In order achieve their primary goal of marine endangered species conservation, marine wildlife conservation tourism businesses need to be sustainable. John Elkington's (1998) Triple Bottom Line Sustainability framework explains how developing and supporting three branches, economic, ecological, and social, concurrently will allow any business, including those promoting wildlife conservation tourism, to become more sustainable and successful. In many cases, businesses only focus on the economical bottom line: their profits. But Elkington contends that simultaneously meeting all three bottom lines will actually increase even the economic

benefits for a sustainable long-term time frame. This framework is especially relevant for businesses that utilize the natural environment for profit. Without maintenance of their ecological resources, their business is unsustainable. Lastly, social considerations must also be considered. Without compliance and support from stakeholders, a wildlife based business will deteriorate. With increasing transparency from businesses to their potential customers or clients, good ecological and social practices are becoming more critical to the long-term financial security of any business.

By applying the HANS and TBL concepts from the tourism and business industries to wildlife conservation tourism, it can become an additional strategy to apply to marine endangered species protection while simultaneously providing people with a meaningful experience. Evaluation criteria will be critical to monitoring and encouraging success and improvement in these new emerging businesses, so using Anderson and colleagues (2015) Fishery Performance Indicators as a guide I have developed Wildlife Conservation Tourism Indicators for application to marine wildlife conservation. This thesis explores the potential for wildlife conservation tourism, under the guidelines of the human-artifactual-natural systems model and triple bottom line sustainability theory, to achieve more effective and sustainable marine endangered species protection than current biological and legal strategies alone.

The Plan of This Thesis

This thesis applies wildlife conservation tourism to marine endangered species, and identifies indicators to assess economic, ecological, and social sustainability through a triple bottom line lens. This thesis is broken down into two parts.

Part I or this thesis reviews the basic concepts pertaining to the identification of wildlife conservation tourism indicators. Chapter 1 reviews the status of marine endangered species, the drivers of marine biodiversity and species loss, and discusses the strategies implemented to preserve them. Chapter 2 introduces and defines wildlife conservation tourism as a subfield of coastal and marine tourism and explains how it can be applied to marine endangered species conservation. Chapter 3 defines and discusses triple bottom line sustainability in the context of wildlife conservation tourism.

Part II of this thesis identifies indicators that can be used to assess the sustainability of wildlife conservation tourism operations in the context of the triple bottom line. Chapter 4 demonstrates the necessity of indicators for wildlife conservation tourism then goes on to categorize the ecological, economic, and social indicators. Chapter 5 discusses the application potential across disciplines, recommends the necessary next steps for this project, and highlights future research. This thesis concludes with a brief summary of the great potential wildlife conservation tourism has for the conservation of marine endangered species.

PART I: BASIC CONCEPTS

"The Animals of the planet are in desperate peril. Without free animal life I believe we will lose the spiritual equivalent of oxygen." - Alice Walker

CHAPTER 1: MARINE ENDANGERED SPECIES

Chapter 1 reviews the status and major drivers of wildlife extinction in marine environments. It also outlines the current biological and legal strategies currently employed to prevent the extinction of marine endangered species.

1.1 Marine Species Endangerment and Extinction

1.1.1 Current Status

It is important to point out that species extinctions occur naturally and that somewhere around 99% of all species that have ever lived on Earth are now extinct (Barnosky, 2011). But according to a recent study by Ceballos and colleagues (2015), the more important point is that extinctions now are happening at a breakneck speed. Even using conservative estimates, it has been projected that (at least for vertebrates), species loss is happening at up to 100 times faster than the pre-human background rate (Barnosky, 2011; Ceballos et al., 2015). There is debate among scientists about whether or not we are entering (if not creating) a sixth mass extinction event, but regardless, extinction rates compared to background rates without human influence are indisputably accelerating biodiversity loss both on land and in the oceans.

Despite this increase of extinction risk, marine species are not uniformly impacted by the environmental changes listed above. Larger marine species, like turtles, sharks, whales, and large fish have all experienced more pronounced declines and global extinctions than smaller marine organisms with pinniped and marine mustelids (i.e. seals, sea lions, walruses, and otters) experiencing the largest proportion of documented extinctions (Figure 1.1) (McCauley et al., 2015). And while many fish are not endangered or extinct, human selection has shifted the

average physical size of individual fish in some populations potentially threatening their ecological function in their environments (Sethi et al., 2010, Pinsky et al., 2011).

In addition, Figure 1.1 does not illustrate the full extent of population depletion. Figure 1.1 shows the percentage of marine life that is endangered, but a search of the IUCN Red List of Threatened Species shows that nearly 800 marine species are ‘Vulnerable’, meaning a species is “not Critically Endangered or Endangered but is facing a high risk of extinction in the wild in the medium-term future (IUCN, 2016).” One concrete example of this disparity comes from a study by Dulvy et al. (2008) in which they determine that though a small proportion of sharks are considered endangered (~5%), an additional 47% are considered vulnerable to becoming

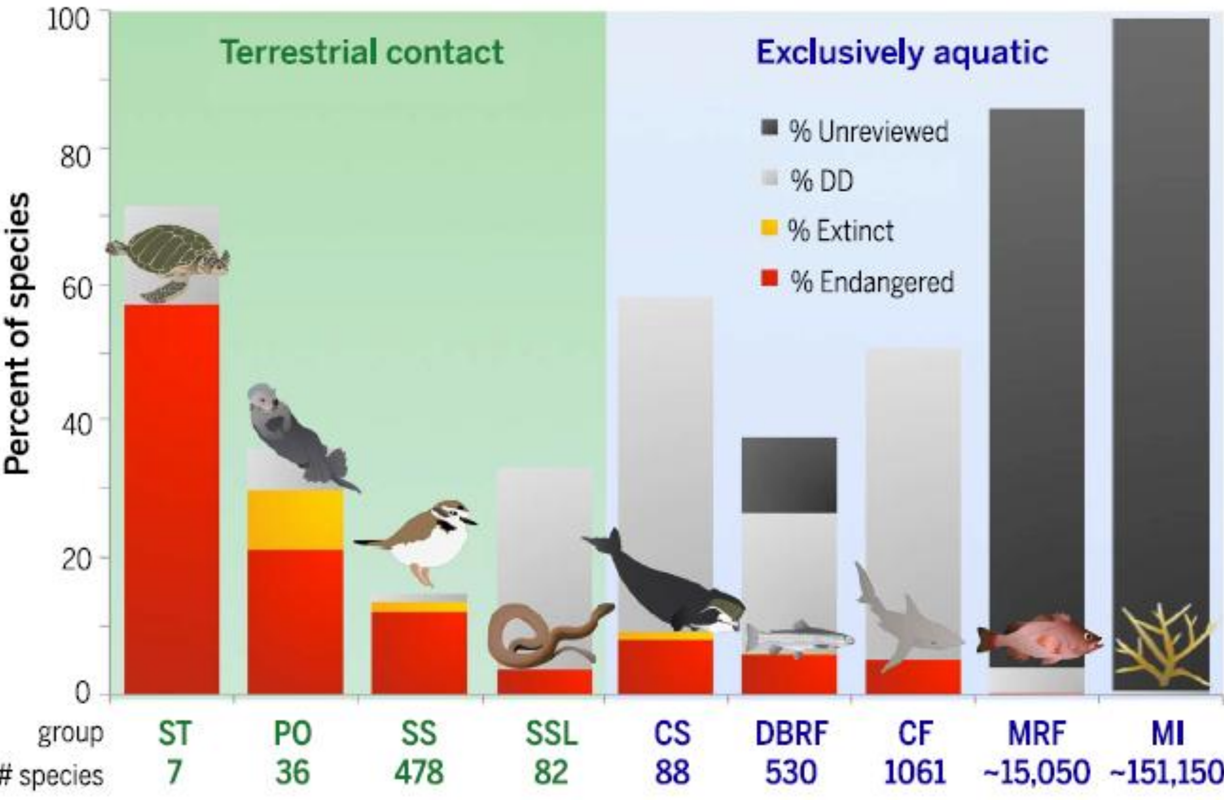

Figure. 1.1. Marine defaunation threat. Threat from defaunation is portrayed for different groups of marine fauna as chronicled by the IUCN Red List.Threat categories include “extinct” (orange), “endangered” (red; IUCN categories “critically endangered” + “endangered”), “data deficient” (light gray), and “unreviewed” (dark gray). Groups that contact land during some portion of their life history (green) are distinguished from species that do not (light blue).The total number of species estimated in each group is listed below the graph. Species groupings are coded as follows: ST, sea turtles; PO, pinnipeds and marine mustelids; SS, seabirds and shorebirds; SSL, sea snakes and marine lizard; CS, cetaceans and sirenians; DBRF, diadromous/brackish ray-finned fishes; CF, cartilaginous fishes; MRF, exclusively marine ray-finned fishes; MI, marine invertebrates (McCauley et al., 2015).

endangered. In the resource consumptive era we live in now, this is significant because as one resource (i.e. species) is depleted, intensive consumption will often shift to a new species instead. Investigating these complexities shows that the status of endangered species is indeed likely to worsen.

Another concern, as can be seen in Figure 1.1, is that a large number of organisms, especially cartilaginous fishes (sharks and rays), marine ray-finned fishes and marine invertebrates are data deficient or unreviewed meaning we cannot definitively determine the extent of endangerment and/or extinction. While it would be easy to be optimistic and assume that unreviewed and data deficient species may be stable, Figure 1.2 shows that as reviews of

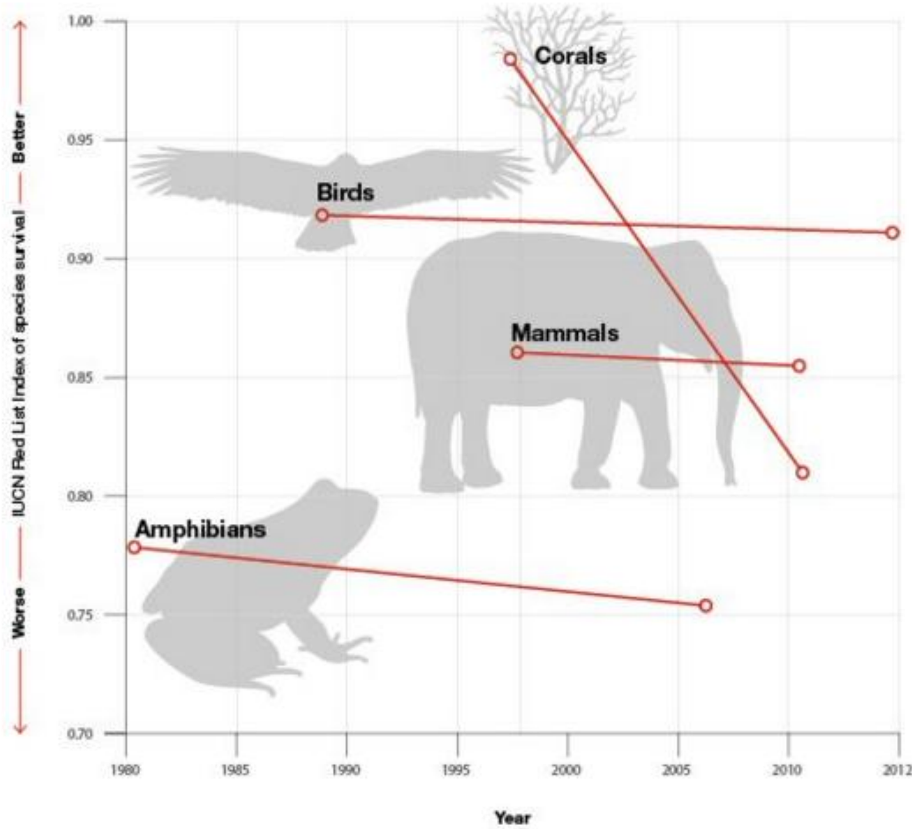

Figure 1.2. Red List Indices (RLIs) for reef-forming corals, birds, mammals, and amphibians. Coral species are moving towards increased extinction risk most rapidly, while amphibians are, on average, the most threatened group. An RLI value of 1.0 equates to all species qualifying as Least Concern (i.e. not expected to become Extinct in the near future). An RLI value of 0 equates to all species having gone Extinct. A constant RLI value over time indicates that the overall extinction risk for the group is constant. If the rate of biodiversity loss were reducing, the RLI would show an upward trend (IUCN, 2016).

corals are completed they have unfortunately proven to be the species moving most rapidly toward extinction (IUCN, 2016).

In contrast to many large bodied marine mammals and turtles, some species have actually benefitted from the reduction or extinction of other marine species in their trophic web. For example, in the absence of sea otters, a keystone predator, their prey, sea urchins proliferated. This sudden shift in urchin abundance in turn decreased the abundance of kelp, changing the composition of the ecologically important kelp forest habitat into an urchin barren (Mills, 1993). Smaller species with fast reproduction cycles, usually invertebrates like urchins or shrimp, are able to thrive in environments stripped of large predators. However, trophic web interactions and reactions to changes are incredibly complex, so it is difficult to determine how any species regardless of body size, reproductive characteristics, or commercial pressures will react to a loss of biodiversity. While it appears many marine species populations may be on the decline, some may benefit from environmental changes. Filling these knowledge gaps and gathering good baseline data will be critical to preventing the formation of monocultures or complete trophic collapses due to the proliferation of a single species well adapted to a stressed environment.

1.2 Factors Driving Marine Biodiversity Loss

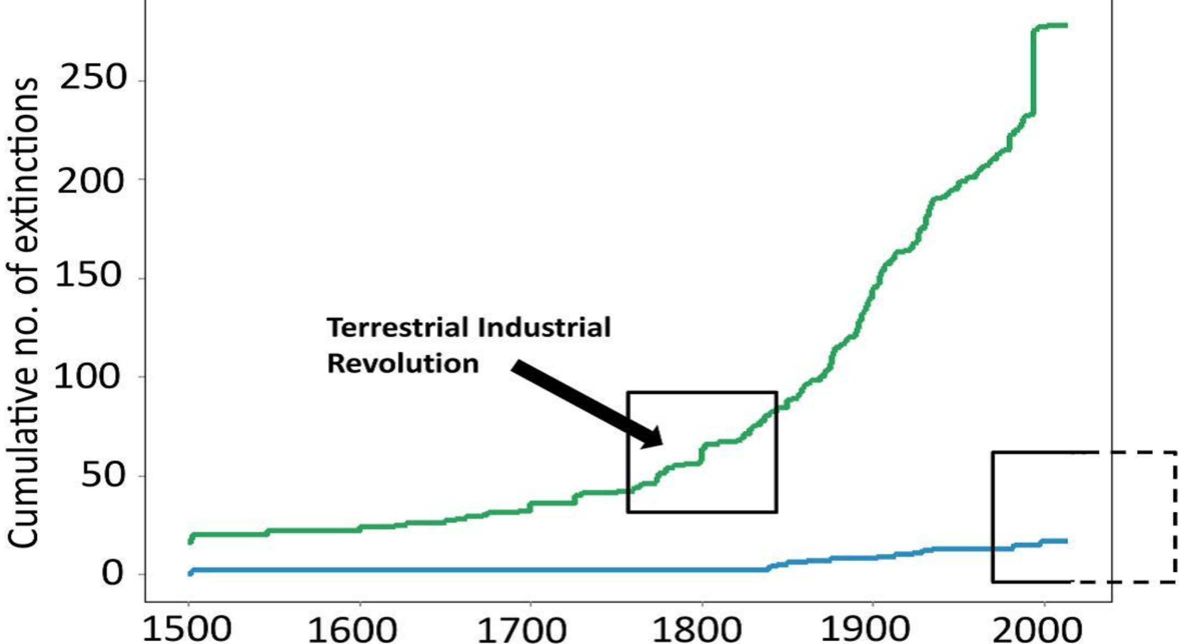

Figure. 1.3 The rising tide of marine extinctions. Rates of extinction for terrestrial (green) and marine (blue) animals recorded since 1500 CE. All extinctions and dates of extinction are interpreted from the IUCN Red List database (113). On land, extinction rates began to increase dramatically during the Industrial Revolution. The recent industrialization of marine wildlife harvest and the emerging industrialization of marine habitat use (e.g. mariculture, seabed mining, marine traffic, and maritime energy production) may contribute to a parallel spike in marine animal extinction rates during the "Marine Industrial Revolution" (McCauley et al., 2015, supplemental materials p.10).

There is an impressive amount of evidence indicating that high biodiversity and greater richness of wildlife is vital for the provision of a wide variety of valuable ecosystem goods and services (Balvanera, 2006; Turner et al., 2008; Worm et al., 2003). Healthy and biodiverse marine ecosystems are important for commercial and subsistence fishing, carbon sequestration, oceanic mixing, and coastal protection (Ferrario et al., 2013; McCauley et al., 2015). It has also been long argued since the early 1900's by influential naturalists like Aldo Leopold and John Muir that wildlife is intrinsically or inherently valuable regardless of what other value it may have (Callicott, 2003). But according to Butchart et al. (2010), the rate at which species are

becoming endangered or going extinct is unprecedented. While terrestrial anthropologic defaunation (or biodiversity loss) and/or extinction is relatively well documented (Dulvy et al., 2008; McCauley et al., 2015; IUCN, 2016), the rate of human impact is also increasing in the oceans. When compared to land, the exploitation of the oceans is certainly less, but humans have already caused many ecological marine extinctions (i.e. species cannot perform ecologic functions at low population numbers) and regional marine extinctions (extirpation of a species or population from a particular area or habitat) (McCauley et al., 2015). Marine extinction levels mirror those of terrestrial extinction prior to the industrial revolution after which terrestrial extinctions dramatically increased (Figure 1.3). With the recent increases in technology and the intensity of resource exploitation in the oceans (i.e. bottom trawling, long-lining, oil extraction, etc.) coupled with the stress of changing ocean climate and chemical composition, we may be facing a de facto “Marine Industrial Revolution” (McCauley et al., 2015).

1.2.1 Overexploitation

One of the early culprits contributing to this ‘Marine Industrial Revolution’ is overexploitation of a species population or stock, commonly in the form of overharvesting of marine species including fish, marine mammals, and corals, or as bycatch of marine harvesting. Compared to paleoecological and archaeological records, fish stock assessments prior to anthropogenic exploitation reveal extraordinary declines in global marine abundance due to the introduction of commercial fisheries. Depending upon the extent of the exploitation, these fisheries have led to ecological or regional extinctions (Jackson et al., 2001). The overfishing problem is compounded in a cyclical manner, especially in high-demand commercial fisheries. With high fishing demand, technology has improved to make extraction more efficient.

However, in this process, the stock is often depleted to the point where it cannot recover fast enough to support the fishery. The limited stock leads to low resource yield despite increased fishing pressure and effort which causes the fish population to continue toward ecological or regional extinction and fishermen to struggle financially (Jackson et al., 2001).

1.2.2 Habitat Loss and Fragmentation

Habitat loss has been a major driver of terrestrial collapse (Briggs, 2011), but since the ocean is so vast, can marine species possibly go extinct from habitat loss? The short answer is yes. As the ocean undergoes changes in temperature, depth, salinity, and pH, sensitive mobile species may shift from their occupied habitats to more suitable areas. Highly mobile, low sensitivity, and/or quickly reproducing species with good genetic variability may be able to keep pace with these environmental changes; however, many large, slowly reproducing and/or immobile species will be unable to adapt quickly enough to these changes which will likely result in population declines. These changing ocean conditions in addition to physical destruction of habitat (i.e. mangrove logging, bottom trawling) can be classified as habitat loss or fragmentation and can increase the risk of marine species extinction.

A concrete example of marine habitat loss is that of coastal mangroves. Many mangroves are being cleared for aquaculture, timber, and coastal development (Polidoro et al., 2010). Under these harvest pressures, Polidoro et al. (2010) estimate that 16% of mangrove species worldwide are threatened with extinction with some at risk of becoming extinct within the decade. This has immense, though perhaps not immediate impacts on coral reef fishes. Mangrove forests are often used by juvenile fish to avoid predation, and eliminating this critical nursery habitat could wipe

out an entire generation of fish compromising the ability of the population to maintain viability. Polidoro and colleagues (2010) report that nearly 80% of global fish stocks are dependent in some way upon healthy mangrove habitats.

Another example that is becoming increasingly relevant as commercial fishing pressures continue to rise is that of destructive fishing practices. These practices can directly damage or kill threatened species like coral, and can also cause indirect damage by destroying or fragmenting habitats of threatened and endangered fishes, invertebrates, and mammals. Bottom trawling is a major culprit of benthic habitat destruction in developed nations, and in developing countries, practices like dynamite and bleach fishing are more isolated but still harmful methods of fishing. Better technology, depleted fish stocks, and an increasing population demanding fish products has increased the area of the ocean floor exploited by bottom trawling. Wrecking the habitat in order to harvest the fish will be detrimental to marine animal stocks in the long run.

Although we don't often think of habitat fragmentation as an issue in marine affairs, the increase in ocean dead zones is causing degradation and fragmentation of the coastal zones. Dead zones are areas of hypoxic (oxygen deficient) waters most often caused by eutrophication from anthropogenic fertilizer runoff, and since 1960 the number of global dead zones has

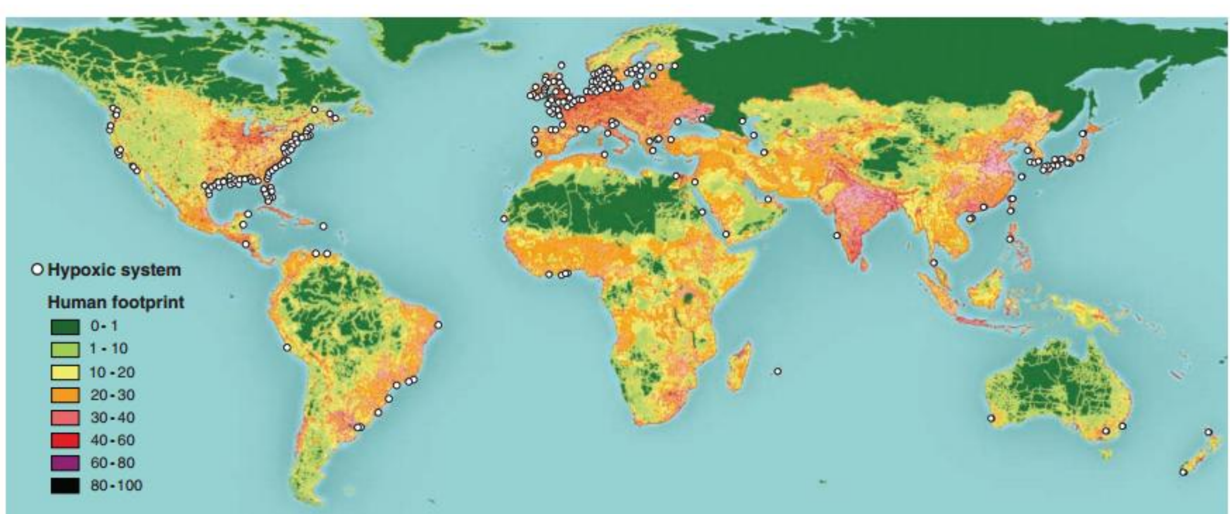

Figure 1.4 Global distribution of dead zones. 400-plus dead zone systems that have scientifically reported accounts of being eutrophication-associated dead zones (Diaz & Rosenberg, 2008).

effectively doubled each decade (Figure 1.4) (Diaz & Rosenberg, 2008). After persistent hypoxic conditions, ecosystems have low secondary production and little to no benthic fauna, and ecosystem collapse can occur as in the Swedish Norway lobster (*Nephrops norvegicus*) fishery in 1983 (Rosenberg, 1985; Diaz & Rosenberg, 2008). It takes approximately 10 years of hypoxic conditions for higher level ecosystem functioning to be compromised. Dead zones are relatively new barriers that have been increasing in quantity and severity since the 1960's that can separate faunal populations. As the oceans are spatially distinct as well, what may be a seemingly innocuous or isolated ecosystem degradation could mean the loss of a critical habitat or corridor decreasing overall ecosystem connectivity. This isolation reduces genetic variability and thus increases faunal susceptibility to invasive species and changing ocean conditions (Briggs, 2011).

Habitat loss does not only refer to the loss of physical space in the ocean that can be considered habitat. Habitat *quality* loss, which can often be indicated by biodiversity, can also drive marine species toward extinction. Some depleted commercial fish stocks have collapsed, though they have not yet become extinct. However, this means that they no longer perform their biological function in the habitat (Briggs, 2011). Functional extinctions often lead to actual extinctions; they mean a species is 'circling the drain', so to speak, and extinction is likely just a matter of time. This becomes a cycle where marine ecosystems lose biodiversity, habitats become less productive and efficient, and as a consequence additional biodiversity is lost from the habitat. If terrestrial extinctions are any indicator, marine habitat loss has the potential to become one of the most impactful drivers of marine biodiversity loss.

1.2.3 Global Regime Shifts

Larger scale anthropogenic drivers, mainly climate change, can exacerbate smaller scale issues like overexploitation or habitat loss adding one more challenge to the persistence of some marine species (Bellard et al., 2012). Since the ocean has incredible buffering capabilities, ocean conditions have remained relatively stable through time or at least changed at a slow rate. But now, with the rapid onset of climate change, warming water temperatures synergistically combined with ocean acidification, salinity shifts, chemical composition changes, invasive species dispersal, and rising sea levels will be especially harmful to ocean organisms that have become very well suited to a relatively constant habitat (Cheung et al., 2009; Hooper et al., 2012; McCauley et al., 2015; Gattuso et al., 2015). It is difficult to predict exactly how these changes will manifest in marine species biodiversity. Some species will adapt quickly, such as lionfish (*Pterois volitans* and *Pterois miles*) that have rapidly dispersed into warming waters that were previously thermally inaccessible (Côté & Green, 2012). However, it is also likely that many valuable species, such as corals, will face climate change related challenges due to their biological characteristics (Bellard et al., 2012). While there are many factors driving marine wildlife toward extinction, we are still near the tip of the proverbial iceberg; that is to say there is likely time to begin preemptively preventing the marine version of wildlife triage that we have so often encountered in terrestrial endangered species management.

1.3 Current Biological Strategies

Though the decline in marine biodiversity and the endangerment of marine wildlife species is entirely anthropogenic, humankind has established a range of strategies to prevent further degradation of wildlife. In this section, I will briefly discuss the ecological and legal

strategies currently utilized to prevent marine wildlife extinction. Some of these biological strategies have seen ecological success, but they could be improved upon.

1.3.1 Marine Protected Areas

In order to combat the host of biodiversity loss drivers described in chapter two, a variety of biological strategies have arisen with varying degrees of success. One of the most prevalent solutions for overexploitation of marine species, especially in fisheries, is the establishment of marine protected areas (MPAs). According to the National Oceanic and Atmospheric Administration (NOAA), an MPA is defined as:

> "any area of the marine environment that has been reserved by federal, state, territorial, tribal, or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein" (NOAA, 2016, http://marineprotectedareas.noaa.gov/aboutmpas/).

This definition is simplified (NOAA further defines the terms area, marine environment, reserved, lasting, and protection) but is sufficient for this thesis. Wildlife falls under the category of 'natural resources' under this definition. Some examples of MPAs include national and state marine sanctuaries, parks, historic monuments, and wildlife refuges. While the specifics of each MPA vary, one major purpose is to conserve resources. Documented benefits of MPAs include increased consumptive benefits from fishery resources, increased non-consumptive benefits from industries like tourism, ecosystem services such as carbon sequestration and shoreline protection, as well as existence or intrinsic value meaning the resources are valuable simply because they exist (Higginbottom, 2004; Charles & Wilson, 2008). Charles and Wilson (2008) also point out that establishing MPAs provides both option and insurance values as well, meaning that by

preserving our marine resources now, we then have the option to use them in the future, and insurance against uncertainty.

Though they all serve similar basic functions, there are many types of marine protected areas, and they vary based on the conservation focus and the protection level. The conservation focus can be natural heritage, cultural heritage, or sustainable production depending on the goals of the program. Protection level refers to the extent of restriction, permanence, constancy, and ecological scale of protection for the area (NOAA, 2016). Restriction can be thought of as a continuum, and can range from open access and extraction, to no-access. Not all MPAs are permanent either; they can be classified as conditional or temporary in addition to permanent. Constancy is determined on a temporal scale. MPAs can be implemented year-round, or only seasonally. Seasonally can refer to actual seasons, or to spawning or breeding seasons as well. They can also be implemented in a rotating manner where implementation is not constant for one geographic area but the protected zone moves to accommodate some access goal. Lastly, the scale of protection can be the protection of an entire ecosystem, or as small scale as the protection of a single species within the zone (NOAA, 2016). When creating an MPA, managers must consider the size, placement, number, and arrangement of the MPA(s) in addition to the conservation focus and protection level (Moffitt et al., 2010).

While the theory and science behind MPA efficacy is generally sound (Jones et al., 2007), MPA implementation is not perfect (Franklin, 1993; Agardy et al., 2010). Ideal MPA design and arrangement specifics are debated by scientific researchers, managers, and politicians and can vary greatly depending upon the biological characteristics of the target species (Franklin, 1993; Lowry et al., 2009; McLeod et al., 2009; Halpern et al., 2010; Moffitt et al., 2010) or the human dimension component of the region; hence, the wide variety in MPA protection levels

listed above. Small protected areas have still shown some biological benefits and are generally more politically feasible. Large protected areas have demonstrated proportionally greater biological benefits, i.e. improved recruitment and are more practical for enforcement than a group of small protected areas. However, past a certain threshold, increasing the size of an MPA may just make it more difficult to maintain enforcement or to politically construct (Jones et al., 2007).

Researchers have been stressing that perfecting the design of a single MPA may still be irrelevant in the long run and that more efforts need to be focused on creating large MPA networks to accommodate biological uncertainties i.e. accurate population densities, exact migration or breeding patterns, climate change impacts, etc. as a network of MPAs will have a synergistic impact rather than just an additive one (Jones et al., 2007; McLeod et al., 2009; Lowry et al., 2009). Despite a growing knowledge of best quality MPA design, Allison and colleagues (1998) stress that factors such as human community interactions, physical contamination, and knowledge gaps make strictly biologically focused marine protected areas necessary but not fully sufficient for protecting or recovering species. Agardy and colleagues (2010) also illustrate incidents where these biological tools fail for political or economic reasons such as inadequate stakeholder involvement or unsustainable funding. What many MPA plans fail to recognize is that limiting fishing in one area will not diminish overall fishing pressure, it will just displace fishing pressure (Hilborn, 2014). Until MPA management becomes more than simply closing an area and enforcing it, MPA implementation is not likely to be sufficient for good marine wildlife conservation.

Due to the concerns listed above, a more holistic approach to MPA application and management has emerged. Halpern et al. (2010) are pushing for MPAs explicitly being linked to

the growing field of ecosystem-based management (EBM), Cicin-Sain and Belifore (2005) and Lowry and colleagues (2009) advocate for the consideration and inclusion of coastal zones when designing MPAs using integrated coastal and ocean management (ICM), Beger et al. (2010) take that one step further and are pushing for conservation planning that spans marine, terrestrial and freshwater ecosystems, especially in the cases of mangrove or estuarine habitats.

MPA management is also progressing toward encompassing more of the human dimension when implementing MPAs. Researchers are looking more in depth at the social, economic, and cultural aspects of MPAs (Charles & Wilson, 2008). Non-consumptive uses in accordance with the particular protection level of the MPA are also being explored. Many researchers support conditional recreation and tourism in conjunction with MPAs as a way to support them financially, socially, and/or politically (Miller & Auyong, 1991; Davis & Tisdell, 1995; Ceballos-Lascuráin, 1996; Reynolds & Braithwaite, 2001; Higginbottom, 2004; Charles & Wilson, 2008; Buckley, 2010), and it has even been suggested to create protected areas strictly for tourism and recreation i.e. marine protected destinations (Grant, 2004).

Regardless of their specific characteristics, the original purpose of MPAs are to designate an area of marine habitat for the protection or recovery of a target species or environment in order to conserve natural and cultural resources. MPAs are the primary tool implemented for marine conservation, but implementing other tools, such as community outreach or tourism, can provide the additional support biological strategies need to facilitate marine wildlife conservation.

1.3.2 Breeding Programs, Aquaculture, Zoos, and Aquariums

From a biological standpoint, MPAs are generally considered the preferred tool for marine wildlife biodiversity conservation and consequently preventing species endangerment, but there are other, more active tools for wildlife protection as well. To prevent extinctions or extirpations of a single marine species, sometimes more intense action is needed. In terrestrial conservation efforts, captive breeding programs have been instrumental in rehabilitating populations of black-footed ferrets (*Mustela* nigripes) and California condors (*Gymnogyps californianus*), but little progress has been seen in marine cases (Conde et al., 2011). Unfortunately, little academic research has been done on marine endangered species conservation through these programs, and breeding programs like SeaWorld's killer whale (*Orcinus orca*) program have been publicly scrutinized as ineffective and unethical (Lidz, 2015). On the other hand, some breeding programs have been quite successful, such as the recovery of the spiny seahorse (*Hippocampus histrix*) at the Minnesota Sea Life Aquarium (Minnesota Sea Life Aquarium, 2016). Unfortunately, the Captive Animal Protection Society (CAPS) reports that only about 2% and of threatened or endangered species are involved in breeding programs, and less than 0.5% have been reintroduced to the wild, and that includes terrestrial species. As discussed earlier, many marine species have not even been sufficiently evaluated yet, so the actual percentage of threatened and endangered species in breeding programs is miniscule. However, Araki and colleagues (2007) actually found that captive breeding of steelhead trout diminishes the reproductive success of the wild populations that domesticated fishes are supposed to supplement, showing that captive bred fish may not be beneficial for wild release. Breeding programs for marine species are controversial on both ethical and ecological standpoints, but have been shown to be effective in some cases.

Although there is little academic evidence that breeding programs have much of a direct impact in marine endangered species recovery, it is hopeful that aquaculture can help to fulfill some of the demand for marine products therefore lessening the overall damage to wild stocks. Aquaculture for human consumption is still relatively controversial; on the one hand it may relieve wild fishing pressure, but has also been known to be harmful to wild fish stocks through accidental hatchery releases, disease transmission, unsustainable feeding practices, and habitat destruction (Araki et al., 2007; De Silva, 2012). In contrast to consumption aquaculture, an example of a success can be found in the ornamental aquaculture industry for aquariums. According to Olivotto and colleagues (2011), the marine ornamental aquaculture business is a more biologically and socially sustainable alternative to the harvest of wild fish from reefs. Another promising avenue in aquaculture is the farming of coral. Where MPAs fail, more intensive and explicit protection of coral may be necessary to combat the impacts of climate change (rising water temperatures, rising sea levels, facilitate disease transmission) and the impacts of increasing dive tourism (Bongiorni et al., 2011). Advances in each of these fields are still being made to hopefully create more sustainable and effective aquaculture practices.

Lastly, I consider the contribution of zoos and aquariums to biological conservation. While institutions like SeaWorld have received criticism for unethical treatment of animals, there is a body of literature that supports zoos and aquariums as valuable conservation tools. Gusset and Dick (2010) published a study of 113 World Association of Zoos and Aquariums (WAZA) members finding that these organizations provide appreciable financial contributions that support global biodiversity conservation. Behind the Nature Conservancy and the World Wildlife Fund, WAZA is the third largest contributor to global biodiversity conservation (Conde et al., 2011). Perhaps most important for conservation after financial support is the contribution of zoos and

aquariums to the education of a large number of people. Environmental and conservation education in itself is not as important as the behavior changes that education has the potential to inspire in zoo and aquarium visitors (Orams, 1997; Packer & Ballantyne, 2010). While the conservation of less charismatic but equally imperiled species (i.e. frogs, fishes, insects, etc.) still needs improvement, more charismatic species like marine mammals and sea turtles unable to be released into the wild could serve as invaluable flagship species (Wadpole & Leader-Williams, 2002; Gusset & Dick, 2010). Flagship, or ambassador species, can generate monetary funding for less popular species, or at least provide more visibility for underrepresented species if they are ecologically related to a charismatic animal (i.e. linked through trophic cascades). Zoos and aquariums also provide opportunities for scientific research of wildlife that could contribute to better management of wild populations (Packer & Ballantyne, 2010). Of course there is room for improvement; Conde and colleagues (2011) recommend that to increase breeding success in zoos and aquariums, institutions must become more specialized. This could detract from the other services zoos and aquariums generally perform, but increase direct conservation of wildlife. Institutions also need to focus more on tropical species and ecosystems where the greatest proportion of threatened species exist. Finally, zoos and aquariums bring happiness to many people and allow them to experience wildlife in a way they would not be able to do so otherwise. Often it is not acknowledged that zoos and aquariums can be used as tools to educate and inspire people, and even change human behavior to help benefit wildlife and the environments they depend on (Orams, 1997). As our knowledge and technologies advance, these strategies will continue to improve and be valuable tools in the kit of global biodiversity conservation.

1.4 Current Legal Strategies

A portion of domestic marine wildlife, endangered or otherwise, is protected by the Marine Mammal Protection Act of 1972 (MMPA). Due to national concern for species like whales, West Indian manatees, dolphins, and sea otters (all of which were experiencing anthropogenic mortalities at that time), Congress passed the MMPA with the preemptive protection of all marine mammals. The MMPA prohibits activities that 'take' or "disturb, capture, injure, or kill marine mammals" (Baur et al., 2008, pp. 480). The MMPA takes the precautionary approach and will favor marine mammals in cases of ambiguity. In order to lawfully interact with marine mammals, the involved party must provide the burden of proof that their activities are in accordance with the MMPA in order to receive a permit. Jurisdiction is split between NOAA's National Marine Fisheries Service (NMFS), which oversees whales, dolphins, porpoises, seals, and sea lions, and the U.S. Department of the Interior's U.S. Fish and Wildlife Service (USFWS), which manages polar bears, walrus, sea otters, manatees, and dugongs.

Endangered marine, aquatic, and terrestrial species are protected under the Endangered Species Act of 1973 (ESA). The purpose of the ESA is as follows:

> "PURPOSES.—The purposes of this Act are to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species, and to take such steps as may be appropriate to achieve the purposes of the treaties and conventions set forth in subsection (a) of this section (U.S. Fish and Wildlife Service, 2016)."

The ESA recognizes that extinctions have occurred "as a consequence of economic growth and development untempered by adequate concern and conservation (U.S. Fish and Wildlife Service, 2016)". In response, the ESA was established to prevent further extinctions of plants and animals due to their inherent "aesthetic, ecological, educational, historical, recreational, and scientific value to the Nation and its people (U.S. Fish and Wildlife Service, 2016)". This law prohibits the

take of any endangered species. Unlike the MMPA, the ESA also extends protection to the ecosystems upon which the listed species depends, known as critical habitat.

Internationally, the United States became a party to the Convention on International Trade of Endangered Species of Wild Fauna and Flora (CITES) in 1973. The purpose of this convention is to prevent exploitation of endangered species through regulation of international trade. It mandates regulation for the trade of endangered species as well as species likely to become endangered without international trade regulation. Unfortunately, endangered species law expert Carlo Balistrieri (1993) laments that CITES is poorly defined and ineffectively enforced. However, with now 181 signatories to CITES (www.cites.org, 2016), there does seem to be a promising push toward the conservation of biodiversity on the international front.

CITES and the ESA do overlap. Any species protected by CITES is recognized by the United States as signatories to the agreement. However, the reverse is not necessarily true. A species protected under the ESA or MMPA in the United States may not be afforded that same protection internationally.

Though endangered species are theoretically offered unlimited protection in the U.S. through this legislation, these strategies are not always entirely effective at either preventing or recovering listed species. First, wildlife is only afforded this protection if it goes through the official listing process, or is a marine mammal. Even if listed, recovery is not guaranteed. The ESA is sometimes criticized for creating ‘conservation-reliant’ species (Scott et al., 2005) where the species is prevented from going extinct, but is not actively recovering wasting money and resources. More cooperative efforts and additional tools are likely needed for the ESA to truly be effective in endangered species recovery. As for prevention, the listing of critical habitat for another species is likely the only way other non-mammalian species will gain preemptive

protection through the ESA. The ESA and MMPA have also come under fire for favoring non-scientific variables when listing species (i.e. political climate, available funding, charismatic quality of animal, etc.) (Ferraro et al., 2007). Not surprisingly, Ferraro and colleagues (2007) determine that ESA listing is only effective in species recovery when it is backed up by adequate funding and a good understanding of the human dimensions influencing the situation.

CHAPTER 2. WILDLIFE CONSERVATION TOURISM

Chapter 2 begins with a brief overview of coastal and marine tourism. It then goes on to introduce and define wildlife conservation tourism, a form of tourism explicitly implemented for wildlife conservation that can be applied in a marine setting, through the human-artifactual-natural systems lens specifically for tourist operations.

2.1 Coastal and Marine Tourism

Globally, tourism generates about 10% of global GDP making it the largest economic business sector worldwide, larger even than sectors such as automotive manufacturing, chemical manufacturing, banking, and agriculture (Honey & Krantz, 2007; World Travel and Tourism Council, 2015). Tourism, unlike some other industries (i.e. banking), contributes substantially to the GDPs of both developed and developing countries (World Travel and Tourism Council, 2015). In the United States, the Travel & Tourism sector contributed $458 billion in 2014 (2.6% of the national GDP). This is projected to rise to $684.6 billion (3.8% of the national GDP) by 2025 (World Travel & Tourism Council, 2015). However, only recently has tourism begun to be formally studied in an academic setting (Miller, 1993; Hall, 2001).

Coastal and marine tourism (CMT) is one of the most rapidly developing sectors within the larger tourism industry (Hall, 2001). Because many forms of tourism, recreation, and leisure occur in or near the coastal zone, for the purpose of this thesis I will define CMT as the following definition provided by the International Coastal and Marine Tourism Society (derived from Orams, 1999, pp. 9):

> "Coastal and marine tourism includes those recreational activities which involve travel away from one's place of residence which have as their host or focus the marine environment and/or the coastal zone" (ICMTS, 2016).

Coastal ecosystems include places like dunes, estuaries, beaches, and intertidal areas. Marine ecosystems include coral reefs, kelp forests, sea mounts, and open oceans (ICMTS, 2016). This definition allows for land-based activities, like beach combing or pier fishing to potentially qualify as marine tourism, but excludes occupational activities such as shipping, commercial fishing, etc. (Orams, 1999).

From scuba diving to whale watching, engagement in coastal and marine tourism offers an opportunity for people to have a meaningful experience involving the natural environment. CMT, especially CMT based on wildlife, is often dependent upon the quality of the natural resources available. The challenge is to develop and make available coastal and marine resources for tourism and recreation without threatening the very existence of the environments we wish to experience (Bookbinder et al., 2008). Some CMT tourism sectors have taken this challenge into account and have formally developed sectors of coastal and marine tourism that will propagate sustainable tourism rather than irrevocably degrade marine resources, including wildlife. Just as the previous chapter explored biological and legal strategies for the protection of endangered species, tourism also can be considered a conservation strategy if properly managed. In the next section, this thesis introduces *wildlilfe conservation tourism,* a sector of coastal and marine tourism designed to explicitly protect wildlife that can be applied to conserve marine threatened and endangered species.

2.2 Wildlife Conservation Tourism

2.2.1 Definition

Wildlife conservation tourism can be derived from existing tourism subfield definitions related to wildlife as an additional strategy to promote endangered species conservation. A

variety of definitions have been developed pertaining to wildlife tourism, ecotourism, nature-based tourism, conservation tourism and other related fields. The following quotes represent general definitions of each.

> "Thus wildlife tourism may be defined as an area of overlap between nature-based tourism, ecotourism, consumptive use of wildlife, rural tourism, and human relations with animals (Reynolds and Braithwaite, 2001, p. 32)."
>
> "Nature-based tourism is primarily concerned with the direct enjoyment of some relatively undisturbed phenomenon of nature (Valentine, 1992, p. 108)."
>
> Ecotourism is "That form of environmentally responsible tourism that involves travel and visitation to relatively undisturbed natural areas with the object of enjoying, admiring, and studying the nature (the scenery, wild plants and animals), as well as any cultural aspect (both past and present) found in these areas, through a process which promotes conservation, has a low impact on the environment and on culture and favors the active and socioeconomically beneficial involvement of local communities (Ceballos-Lascuráin, H., 1996, p. 20)."
>
> "Conservation tourism is, simply, tourism which operates as a conservation tool. More precisely, it may be defined as commercial tourism which makes and ecologically significant net positive contribution to the effective conservation of biological diversity (Buckley, 2010, p. 2)."

None of these definitions appropriately illustrate the simultaneous goals of protecting wildlife while also providing meaningful human experiences that set WCT apart from the other wildlife-based tourism subfields, but they do provide a good background to draw upon. Building upon the work of esteemed academics, in this thesis I introduce the term *wildlife conservation tourism* as a subfield of tourism and recreation closely related to existing subfields of tourism listed above (Figure 2.1.). As the field of wildlife conservation tourism rapidly emerges in the realms of private brokerage, academic literature, marine policy, and marine resource management, a formal definition will help develop sustainable best practices for more consistent and effective wildlife conservation. Therefore, I propose that wildlife conservation tourism (WCT) be defined

as a tourist or tourists having a meaningful interaction with wildlife in a non-extractive and non-consumptive manner that produces a net positive contribution toward conserving one or more species of wildlife. WCT can be narrowed further for more specific implementation as well; examples could include but aren't limited to marine WCT, terrestrial WCT, arctic WCT, etc.

It can be seen in Figure 2.1 that some aspects of wildlife-based tourism, for example, consumptive uses of wildlife (i.e. sport fishing) will be excluded from the WCT ellipse. Similarly, some forms of nature-based tourism, while non-extractive (i.e. birdwatching) may be purely for personal enjoyment therefore lacking the conservation component necessary to be considered WCT. It is also worth noting that although WCT is defined as non-consumptive, I

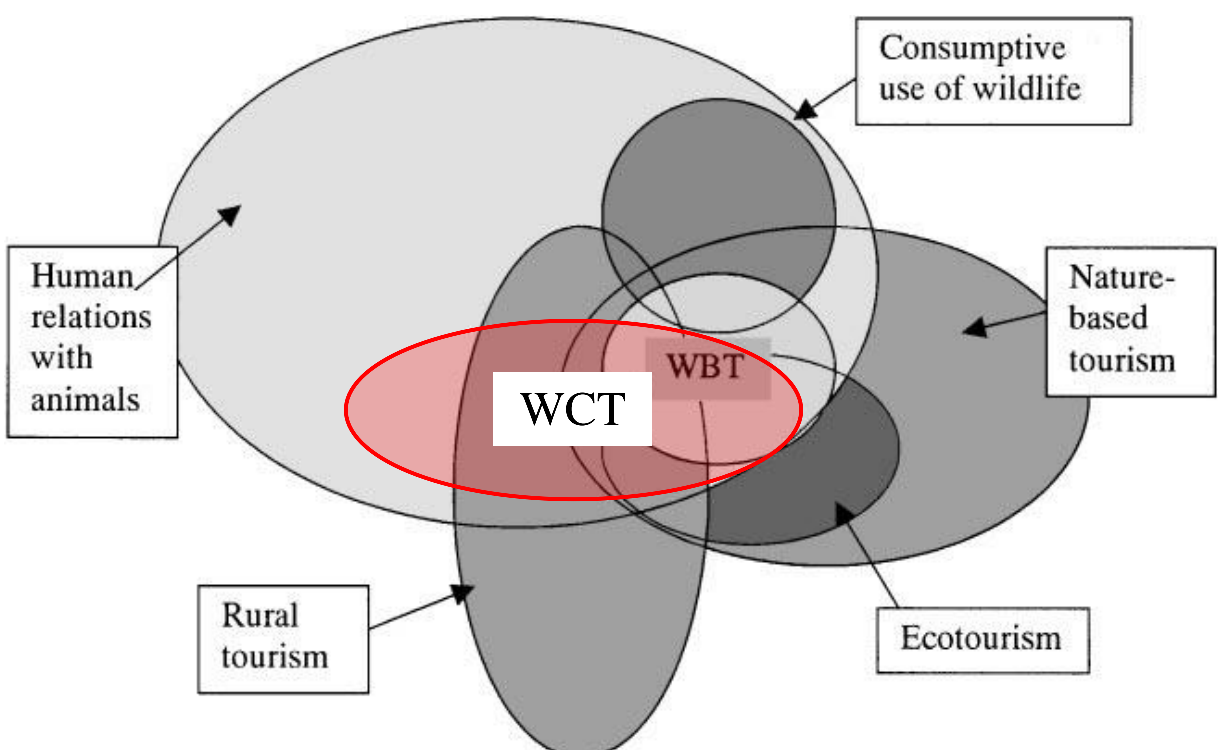

Figure 2.1. Wildlife Conservation Tourism within wildlife-based tourism: Adapted from Reynolds and Braithwaite, 2001, p. 32. This figure illustrates overlap as well as distinctions between some established subfields of coastal and marine tourism and recreation. Wildlife conservation tourism occupies a distinct space separate within these subfields, seen in red. Wildlife conservation without any human interaction can be represented by the space outside the 'human relations' ellipse and therefore bounds WCT. There is overlap, but WCT is exclusive from parts of tourism subfields that lack the wildlife conservation and/or a human interaction component.

recognize that non-consumptive is not synonymous with no impact. Tourism activities that are not extractive can still have an impact on the behavior and survivorship of wildlife (Orams, 2002). Though the argument exists (Orams, 2002) that any interaction with wildlife may negatively alter and therefore 'consume' wildlife as a marine resource, the term non-consumptive still best aligns with the goals of WCT.

Also important to note from Figure 2.1 is the presence of a human-natural interaction. Areas outside the 'human relations' ellipse are excluded from the WCT ellipse because without the tourist, there is no meaningful experience that can be utilized for conservation. This compiled definition also requires a desirable experience for tourists, but unlike other forms of nature based tourism, operates under the specific parameter that the tourist experience contributes to the ultimate goal of species and habitat conservation rather than for the sole intrinsic benefit of the tourist (Sinha, 2001).

To further refine the WCT, I maintain the definitions of wildlife presented by Higginbottom (2004), and Sinha (2001) as non-domesticated (though not necessarily wild) members of the Kingdom Animalia, excluding humans. Under these parameters, wildlife includes mammals, birds, reptiles, amphibians, and fishes, but also organisms like insects and invertebrates. Though this definition includes Animalia, it is important to note that not all wildlife is equally suited for successful WCT application (Smith et al., 2012).

Lastly, unlike other definitions drawn upon to define WCT, WCT does not absolutely incorporate a cultural component. However, I acknowledge that cultural forms of tourism and cultural customs and rituals may also impact and/or overlap WCT and vice versa. The three triple bottom line indicators that will be developed in Part II of this thesis will take social and cultural

impacts into account, so while it is not explicitly included in the definition, the most sustainable implementation of WCT will consider social and cultural factors.

The working definition of WCT can include but is not limited to tourism and recreation experiences associated with zoos and aquariums, viewing safaris, whale watching, etc. but does exclude consumptive and extractive practices such as hunting and fishing (Miller, 2008). Though some forms of consumptive tourism may have a net positive contribution to wildlife conservation (i.e. invasive species derbies), they will not be considered WCT for the purposes of this thesis.

In this thesis, I examine this definition of WCT in a coastal and marine context for the conservation of marine endangered species either through direct tourism or via flagship species, but WCT concepts and frameworks can be applied to different ecosystems, places, or species as well.

2.2.2 Human-Artifactual-Natural System Framework

In order to most effectively define WCT, it is necessary to specify the tourism-specific framework under which WCT operates (Reynolds & Braithwaite, 2001). The human-artifactual-natural system (HANS) framework originally developed by Miller et al. (2014) for National Parks can be applied to WCT to identify the processes and most importantly the actors involved in any given WCT system (Figure 2.2). The human component is made up of brokers, locals, and tourists, which will be expanded upon in the following paragraph. The natural component is composed of the biotic and abiotic resources in an environment. This component includes wildlife as well as components of their habitats, like sand, or trees, or fossil fuels. The third

component, the artifactual component, includes things that are neither human nor natural such as the products and technologies of human culture and innovation. Artifacts include physical objects, or 'hard artifacts', ranging from cutlery to cruise ships, but also include 'soft artifacts' such as policies and laws. WCT will refer mainly to the interactions between the human and natural components within the HANS system, but will also interact with the artifactual component as well. Also illustrated in Figure 2.2, the entire system is also impacted by external processes that can modify interactions between components. Global drivers (biotic, abiotic, and/or globalization processes) can influence the way the components interact with each other. For example, climate change, an abiotic process, has changed how humans extract natural resources from the natural component.

According to Miller and Auyong (1991), the human component of the HANS model can be broken down into three sectors: 1. tourism brokers, 2. tourism locals, and 3. the tourists. These

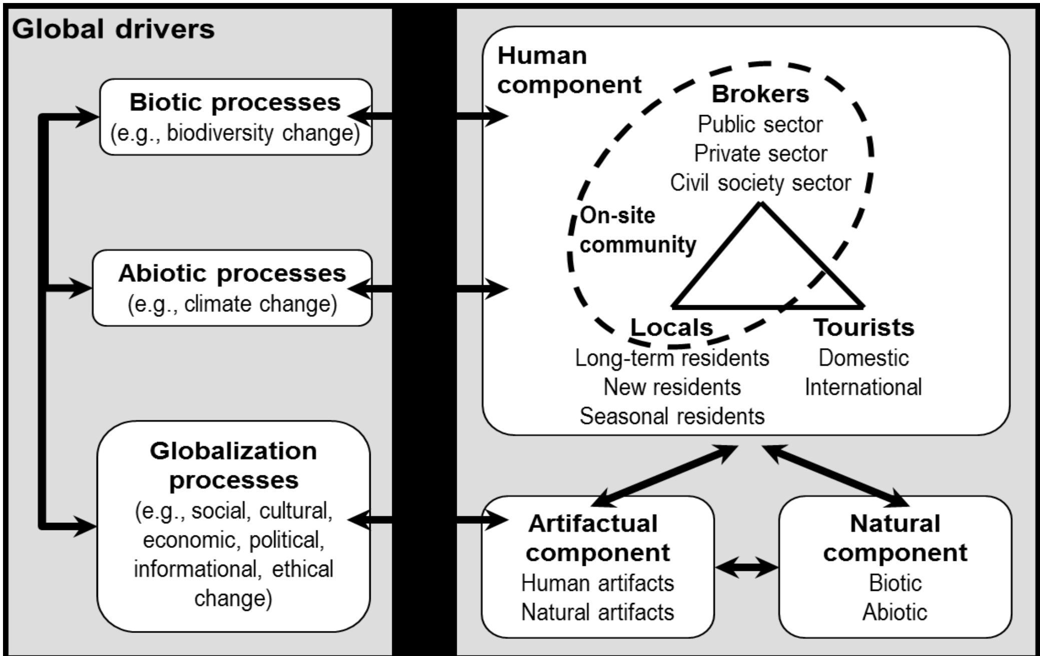

Figure 2.2. Human-Artifactual-Natural System model: A tourist is distinctly defined as neither a local nor a broker for a given WCT system. (Miller et al., 2014, pp. 261).

three sectors make up the broker-local-tourist (BLT) model that operates within the HANS model (Figure 2.2). Brokers consist of people living in or around a destination that are invested in tourist activity occupationally. Brokers can work in the private, public, or non-governmental organization sectors and a few examples include tour guides, national park rangers, environmental advocacy employees, and hotel managers. Locals consist of people living in and around a destination area that are not occupationally invested in that destination. An example of this is a destination resident who is occupationally a farmer, or a banker. Together, the on-site brokers and the locals make up the on-site community. Lastly, the BLT includes the tourists. Tourists are people who seek to visit a destination, but then return home after their experience. For this thesis, it is also important to note that while a tourist can be from a local area, they are not labeled a 'local' when participating in a tourism activity. Tourists can be domestic or international.

Under this system, the location's community is not just made up of locals, but also of brokers who reside in the area as well. This distinction is critically important in tourism operations as the 'community' often assumes that the interests of the community are homogenous. The ideas, opinions, and actions of the 'locals' or the 'community' of an area are sometimes expressed without acknowledging the differences between the brokers and locals. Not differentiating the two sectors when defining success for WCT would be a mistake and in this case lead to suboptimal marine endangered species conservation. In addition to the distinction between brokers and locals, the tourists are also identified as key stakeholders. Including the tourists as stakeholders is crucial to managing a WCT or any tourism operation because they too have different goals than brokers or locals. Tourists are occasionally overlooked or

underestimated in a tourism system, but their contribution is paramount; tourist perceptions and demands drive the tourism industry and without them successful WCT would not be possible.

It should also be noted that people within the BLT system can shift from one sector to another. A tourist may move to a destination, become a local, then open a hotel and become a broker. Within this dynamic model, WCT has the potential to impact all of the three groups; but mostly, WCT will concern brokers looking to attract tourists and tourists seeking a meaningful wildlife experience; however, WCT has the potential to financially and culturally influence locals as well.

With the conditions of the system outlined, WCT can be more clearly defined and also monitored. This definition intersects many other recognized forms of tourism and can be applied across ecosystems, but WCT is a distinct subfield in that the primary goal is non-consumptive sustainable wildlife protection and the secondary goal is tourist enrichment. The importance of the tourist to the system however, should not be overlooked; the satisfaction and subsequent support, education, and funding generated by tourist involvement makes it possible to implement or adjust conservation policies and techniques to maximize wildlife conservation (Farrell and Runyan, 1991). If managed properly, WCT operations applied in coastal and marine ecosystems will provide mutual sustainable benefits in both the human and the natural components of the system to provide conservation support for marine endangered species.

CHAPTER 3. TRIPLE BOTTOM LINE SUSTAINABILITY

"Good environmental and social programs make good business sense."

- *Bob Willard (Willard, 2002, pp. 2)*

Chapter 3 introduces the triple bottom line theory and explains why it is relevant for the development of sustainable wildlife conservation tourism.

3.1 Definition

The term 'sustainable development' was defined in 1987 by the World Commission on Environment and Development report (often referred to as the Bruntland report for Norwegian prime minister Gro Harlem Bruntland) as "meeting the needs of the present without compromising the ability of future generations to meet their own needs" (Willard, 2002, pp. 5). Note, this definition does not discourage development of resources, but advocates that development, if pursued, be done in a sustainable manner. In business, this concept of sustainability was further developed to have three sustainability subsets. These subsets are described using many different words and phrases, but are fundamentally the same. The three sustainability subsets have been described as social, environmental, and financial, as the 3 Ps: profit, planet, people, and also as the 3Es: economy, environment, equity (Willard, 2002; Slaper & Hall, 2011). Willard (2002) describes the subsets using the analogy of a stool. The seat of the stool, representative of sustainable development, is supported equally by three legs: sustainable economic prosperity, environmental stewardship, and social responsibility (Willard, 2002, pp. 5). In his book, *Cannibals with Forks*, John Elkington was the first to christen this concept of three equally important subsets of sustainability as the 'triple bottom line' (TBL) (Elkington, 1998).

3.2 Application to WCT

Thus far, the TBL model has mostly been applied to traditional business practices, explicitly or otherwise, either as TBL sustainability, or often in the form of corporate social responsibility (CSR) (Willard, 2002; Szymanowicz, 2016). In many businesses, economics has historically been the only bottom line considered; though now, ecological and social sustainability have become equally important measures of sustainable development for businesses to remain competitive for consumer demand. The TBL concept has therefore been adapted and applied mostly in the business world, including in tourism businesses (Dwyer, 2005; Stoddard et al., 2012; Tyrrell et al., 2013). The TBL model is also being investigated across other less conventional disciplines. Anderson and colleagues (2015) introduced the first indicators of the triple bottom line for fisheries, Stoddard and colleagues (2010) developed a novel framework for TBL sustainable tourism, Kucukvar and Tatari (2013) have examined TBL in the context of U.S. construction businesses, and Detre and Gunderson (2011) have even examined TBL impacts on agribusiness. This shift from one to three bottom lines is due to the increasing transparency of businesses to the public and an overall increase in environmentally and culturally aware consumer attitudes and is not only beneficial to the economic bottom line, but likely to become necessary to maintain business viability (Dwyer, 2005).

For the purposes of this thesis, we will adopt the use of ecological and economic bottom lines set forth by Anderson and colleagues' (2015) and modify 'community' to social. This phrasing is intentional. As Niemi & McDonald (2004) point out, the term 'environmental' refers to the environment as a whole, including the people. As I am attempting to categorize the people and the ecological sectors separately, I refer to the biological ecosystem indicators as ecological. The term social is in keeping with the HANS model as community refers to the brokers and

locals on-site and would exclude the tourists from the social system. Although there is overlap between some aspects of the three bottom lines, striving for sustainable management of each separately will best allow for sustainable development in wildlife conservation tourism businesses.

Sustainable development through the TBL model is valuable to the field of conservation for many reasons (market competitiveness, long term success, better short term success, political stability, fulfilling ethical/intrinsic/moral obligations). Too often WCT enterprises only focus on one or two of the three bottom lines, but actively pursuing all three will increase the long term success for the business. Willard (2002) in his book *The Sustainability Advantage* has identified seven benefits of adhering to a TBL strategy that make good business sense as well as being more ecologically and socially sustainable. The seven benefits are: 1. Easier hiring of the best talent, 2. Higher retention of top talent, 3. Increased employee productivity, 4. Reduced expenses for manufacturing, 5. Reduced expenses at commercial sites, 6. Increased revenue/market share, and 7. Reduced risk, easier financing. Though all three TBL sectors are rarely the guiding principles for conservation endeavors, the TBL philosophy has been rapidly gaining popularity in the tourism industry which could apply to any conservation-focused tourism enterprise (Stoddard et al., 2012). In fact, according to the World Tourism Organization, sustainable tourism:

> "meets the needs of present tourists and host regions while protecting and enhancing opportunities for the future. It is envisaged as leading to management of all resources in such a way that economic, social and aesthetic needs can be fulfilled while maintaining cultural integrity, essential ecological processes, biological diversity and life support systems." (European Commission, 2002; pp. 7).

Therefore, the TBL philosophy is appropriate to apply to WCT to promote the sustainable use of endangered species and their habitats.

Often these TBL values are defined, but not measured or assessed. Ecological and community quality are difficult to quantify because they are not exclusively monetary in value and are often measured in different ways; consistent and feasible monitoring of these qualitative values will be crucial to successful TBL sustainable development (Tyrell et al., 2013). Because of the mismatch in measurement units, evaluating TBL sustainability is often time consuming and inconsistent. Opponents (generally from the business perspective) claim that TBL goals are not beneficial to their companies, and that having three simultaneous goals is unnecessary or counterproductive (Willard, 2002). Another issue prevalent in TBL assessment plans is the difficulties associated with accurate reporting of each of the bottom lines. Self-reporting of performance in each of the sectors may also lead to dishonest reporting.

Despite the challenges of implementing the TBL philosophy, this model is becoming increasingly popular in the tourism industry because of its relevance. Firstly, the economic bottom line is important because without a strong economic sector, a business cannot endure. Secondly, ethical obligations aside, for any tourism operation utilizing natural resources, the resources must be preserved in order to maintain the business; hence, the ecological bottom line. And third, managing wildlife has been shown to necessitate managing people. Looking deeper at the community impact that wildlife tourism operations would have on the surrounding stakeholders, be they brokers, locals, or the tourists themselves will help guide wildlife conservation tourism to more sustainable business practices. In Part II of this thesis, I apply the TBL philosophy to wildlife conservation as a tool to achieve the sustainable development of

marine and coastal resources by developing indicators that will enable assessment and improvement of wildlife conservation tourism.

PART II: IDENTIFYING INDICATORS FOR SUSTAINABLE WILDLIFE CONSERVATION TOURISM

"Any glimpse into the life of an animal quickens our own and makes it so much the larger and better in every way." - John Muir

CHAPTER 4: WILDLIFE CONSERVATION TOURISM INDICATORS

Chapter 4 reviews the need for establishing indicators for wildlife conservation tourism followed by the sample indicators identified for use in the monitoring, assessment, and certification processes.

4.1 The Need for Indicators

Using indicators has been acknowledged and even recommended for meeting sustainable development goals by the United Nation Commission of Sustainable Development (Barzekar et al., 2011). Establishment and measurement of indicators is important for creating baselines, measuring progress, informing future decision making, determining risks, obtaining certifications, and promoting and achieving sustainable development (International Working Group on Indicators of Sustainable Tourism, 1993; Rodgers, 2010; Barzekar et al., 2011). Stoddard and colleagues (2012) iterate that each industry sector (i.e. automotive, banking, tourism sectors) is faced with unique sustainability issues; so it is important to provide indicators for a new form of tourism, like WCT, because it has different characteristics and goals than other forms of nature-based or ecotourism.

In this case, the organization of WCT indicators is especially important. WCT is defined using the HANS model for tourism, but nested within the goals of TBL sustainability. This definition calls for coordinating organization of indicators for the three bottom lines to work cooperatively. In the next section, this thesis identifies WCT specific indicators in order to create an implementable monitoring system for sustainable marine endangered species conservation.

4.2 Identifying Wildlife Conservation Tourism Indicators (WCTIs)

4.2.1 Methods

In Part I, this thesis introduced the basic concepts of the triple bottom line and how applying TBL goals to WCT businesses can improve sustainability and overall business success. Unfortunately, Ko (2005) points out that thus far, tourism businesses that are claiming TBL implementation are often lacking standards or criteria by which to measure and evaluate their TBL progress and achievement. Some European and Australian academic studies have already begun working to close this gap by developing guidelines, standards, best practices, and indicators for sustainable environmental tourism (International Working Group on Indicators of Sustainable Tourism, 1993; Higham & L Guijt et al., 2001; World Tourism Organization, 2004; Secretariat of the Convention on Biological Diversity, 2007; Rodgers et al., 2010; Global Reporting Initiative, 2015). These documents have focused on the triple bottom line benefits, sustainable tourism indicators, or ecological conservation requirements, but few have focused on using these tools together in the context of marine endangered species conservation, and none have developed TBL indicators using the breakdown of the human-artifactual-natural system.

A diverse collection of literature and including conservation biology, marine protected area management, triple bottom line sustainability, economics, social science, and wildlife and nature-based tourism was drawn from to integrate and identify possible Wildlife Conservation Tourism Indicators (WCTIs) based on the work of Anderson and colleagues' (2015) fishery performance indicators (FPIs) for the evaluation and monitoring of each of the bottom lines in the U.S. marine WCT industry. Additional key concepts were suggested by experts in the tourism field during a presentation of WCT at the 8th International Coastal and Marine Tourism Conference in Kailua-Kona, Hawaii, in November of 2015 that were then researched and uncovered in scientific literature (See Appendix I). Some indicators were pulled directly from

other documents identifying indicators, while others were adapted from concepts presented in peer-reviewed literature.

According to Guijt and colleagues (2001), good indicators are measurable, representative, reliable, and feasible. WCTIs have been chosen with these considerations in mind as they apply to protected area managers or tourism operators. Additional indicators could be developed for the use of a more sophisticated third party monitoring organization. As per the guidelines set by the International Working Group on Indicators of Sustainable Tourism (1993), the candidate indicators developed here will have the most effective monitoring at the highest efficiency.

> "The candidate indicators would cover the most important subjects at a national or regional level that tourism decision-makers need to know to build towards a more sustainable form of tourism development." (International Working Group on Indicators of Sustainable Tourism, 1993).

Candidate indicators align best with the guidelines set out by Guijt et al. (2001) as they are more feasible than a comprehensive, or ideal, set of indicators, and are also more reliable and representative than the base, or minimum, indicators.

These indicators are not all measured in monetary units. While helpful for comparison across the bottom lines, ecological and social measures are not always accurately portrayed by monetary values (Faux, 2005; Slaper & Hall, 2011). Schianetz & Kavanagh (2008) summarize some of the difficulties in deriving indicators, i.e. assigning indicators with ambiguity, limited comparability, mismatches in scale or sensitivity, etc., but maintain that without some assessment criteria or measures in place the term 'sustainable' as applied to tourism will become meaningless.

Due to the complexity of and interactions within a WCT system, some indicators could potentially overlap, but are only listed in one primary category for simplicity and efficacy. For each indicator the source material is provided as well. There are a multitude of ways to organize these indicators, but organizing WCTIs as a human-artifactual-natural system nested within the triple bottom line sustainability standards will lead to the most effective monitoring system for improving marine endangered species conservation through tourism.

4.2.2 Ecological Indicators

The ecological indicators (Table 1.) are centered on the health of the natural environment, especially the wildlife. Firstly, direct wildlife management indicators were identified. One or more threatened/endangered target species should be monitored via population size at a minimum as well as a general measure of the biodiversity of the utilized area. In addition to the status of target species and overall biodiversity, it will also be appropriate to observe and recognize any changes and/or trends in species' IUCN listing status. Hopefully the addition of this indicator will help identify successes or failures in non-target species that may not otherwise be considered by the WCT operation.

Specific to operations interacting with endangered species, proper licensure should be procured under the MMPA, the ESA, and CITES when applicable. Indicators for compliance with company policies for ecological protection should be implemented. The extent to which flagship species are available and utilized is also a valuable tool for precautionarily limiting negative impacts upon endangered species by rerouting wildlife interactions to a better suited species (Lauck et al., 1998). Lastly, the impact of the tourist interactions on the target wildlife

should be documented as well in order to identify and maximize positive ecological outcomes.

In addition to direct monitoring of the wildlife in the system, proxies for natural environmental health should also be tracked i.e. pollution, eutrophication, air and water quality, erosion, and habitat restoration. Related to these, waste disposal and energy consumption are metrics that can be readily tracked and assessed for ecological impacts (World Tourism

Ecological	
Status of Target Species: Number of and Population Size of Each	Li, 2004
Number of species in the operation's jurisdiction moved to and from IUCN's threatened and endangered list	IUCN, 2016
IUCN category of protection	World Tourism Organization, 2004
Compliance with regulations	Secretariat of the Convention on Biological Diversity, 2007
Proper licensure for endangered species interaction	Secretariat of the Convention on Biological Diversity, 2007
Use of flagship species	Walpole & Leader-Williams, 2002
Impact of tourist-wildlife interaction on wildlife	Rodgers et al., 2010; Higginbottom; 2004
Tourism intensity/seasonality	World Tourism Organization, 2004
Biodiversity	Secretariat of the Convention on Biological Diversity, 2007
Invasive species status	Global Reporting Initiative, 2015; Secretariat of the Convention on Biological Diversity, 2007
Pollution	Secretariat of the Convention on Biological Diversity, 2007
Eutrophication	Secretariat of the Convention on Biological Diversity, 2007
Land/Erosion	Guijt et al., 2001; SCBD, 2007; Barzekar et al., 2011
Air quality	Guijt et al., 2001; International Working Group on Indicators of Sustainable Tourism, 1993
Water quality	Guijt et al., 2001 & International Working Group on Indicators of Sustainable Tourism, 1993
Habitat restoration	Global Reporting Initiative, 2015
Energy use	Global Reporting Initiative, 2015; World Tourism Organization, 2004
Waste disposal	Global Reporting Initiative, 2015
Use of environmental impact assessments (EIAs)	Barzekar et al., 2011; International Working Group on Indicators of Sustainable Tourism, 1993
Ethical treatment of individual animals	Norton, 1995; Callicot, 2003; Higginbottom; 2004
Climate change considerations	World Tourism Organization, 2004; Scott 2011

Table 1. Indicators for Ecological Sustainability

Organization, 2004; Global Reporting Initiative, 2015). Lastly, for ecological sustainability of wildlife and their habitats, it will also become necessary to report the extent to which a company is prepared to utilize and/or mitigate environmental changes allowed by climate change.

Economic Indicators	**Source**
Number of Visitors	World Tourism Organization, 2004
Revenue	Global Reporting Initiative, 2015
% of Revenue Toward Conservation	World Tourism Organization, 2004; Brandon & Margoluis, 1996
Revenue Volatility/Seasonality	Anderson et al., 2015
Operating Costs	Global Reporting Initiative, 2015
International Trade	Anderson et al., 2015
Number of Jobs Created	Global Reporting Initiative, 2015
Employee Wages/Benefits	Global Reporting Initiative, 2015
Age of Facility/Equipment	Anderson et al., 2015
Carrying Capacity	World Tourism Organization, 2004

CSR Plan Presence/Absence	Syzmanowicz, 2016; International Working Group on Indicators of Sustainable Tourism, 1993
‘Green' Marketing Strategy/Network	World Tourism Organization, 2004

4.2.3 Economic Indicators

Economic indicators (Table 2.) for tourism and wildlife-based tourism are relatively well defined. How much money the enterprise is making is critical to viability, and that is measured in this sector. Specific to WCT, the financial contribution toward conservation is requisite. Also important for long term economic success are assessments of volatility or seasonality of the profits, the extent of international trade, the number of employees necessary to sustain the business, those employees’ wages and benefits, and the presence of a corporate social responsibility plan and marketing network. Tracking these economic indicators can help a WCT organization ensure financial stability, allowing it to continue endangered species conservation.

Table 2. Indicators for Economic Sustainability

4.2.4 Social Indicators

Social indicators (Table 3.) for organizations that could engage in WCT have many times been measured from either one or two of the perspectives of the BLT model, but less often are all three considered. The BLT model requires all three social categories to be satisfied for social sustainability in the WCT industry.

Broker security is measured via established criteria including wages, promotional potential, access to education and health care, and job site safety and sanitation. In addition, the social standing and wellbeing of the brokers within their community is also a valuable indicator to mark progress toward social sustainability.

Sometimes the introduction of a new business that utilizes shared natural resources causes a loss in cultural integrity, introduction of crime, or unjust distribution of resources (Diedrich, 2007; Charles and Wilson, 2008; Biaggi and Detotto, 2014). Studies looking at social justice and equity in the division and usage of natural resources in marine protected areas are concerned with the local piece of the BLT pie (Walpole & Goodwin, 2001; Higginbottom, 2004; Diedrich, 2007; World Tourism Organization, 2004; Barzekar, 2011). By monitoring the demographics of how many locals are not involved in the WCT business, the status of their basic needs, the cultural protections afforded to them, the rate of crime in the area, and the amount of indirect support that a WCT operation would have for local businesses, the social indicators for the local sector attempt to identify and eliminate these social injustices and promote sustainable, mutually beneficial interactions between brokers, locals, and tourists.

Social	**Source**
Broker	
Earnings	Anderson et al., 2015
Career/Promotional Potential	Anderson et al., 2015
Education Access	Anderson et al., 2015
Benefits/Health Care Access	Anderson et al., 2015
Job Site Sanitation	Anderson et al., 2015
Job Safety	Anderson et al., 2015
Social Standing	Anderson et al., 2015
% Community employed as direct and indirect brokers	Li, 2004
Local	
Cultural Protection/Maintenance	International Working Group on Indicators of Sustainable Tourism, 2004; Barzekar et al., 2011
% Homes with Potable Water	International Working Group on Indicators of Sustainable Tourism, 2004
% Homes with Sewage Services	International Working Group on Indicators of Sustainable Tourism, 2004
% Brokers that are Community Members	International Working Group on Indicators of Sustainable Tourism, 2004
Regional Support Businesses	Anderson et al., 2015

Crime Rate	International Working Group on Indicators of Sustainable Tourism, 2004; Biaggi & Detotto, 2014
Tourist	
Demographics: Country of Origin, Age, Sex	European Commission, 2002
Satisfaction and enjoyment	Highham & Lück, 2008
Education and learning	Highham & Lück, 2008; Orams, 1997
Attitude or belief change	Highham & Lück, 2008
Behavior or lifestyle change	Highham & Lück, 2008; Orams, 1997
Perception of safety	Barzekar et al., 2011

Table 3. Indicators for Social Sustainability

Lastly, any good tourism enterprise must earnestly examine the motivations and satisfaction of their tourists. Under this framework, tourists are not just a means to turn a profit; rather, each individual represents an opportunity for meaningful interaction. A tourist can be changed by an experience with wildlife (Orams, 1995; Reynolds & Braithwaite, 2001; Ballantyne et al., 2007; Higham & Lück, 2008; Curtin 2010; Ballantyne et al., 2011), and better conservation can be facilitated through that experience. Orams (1995, 1997) advocates that the most desirable result of a tourist-natural interaction is not merely the enjoyment of the tourist, but a shift toward more environmentally responsible behavior.

Therefore, I propose that the satisfaction of the tourist be monitored for the purposes of tourist enjoyment and continued financial support of the institution, but also to assess how tourists' attitudes and behaviors change as a result of their WCT experience.

Some of these indicators are checkpoints with presence/absence as the metric. These are important for showing milestone progress, but many of these indicators are measured on a continuous scale. This allows a business to set short term achievable goals, or checkpoints, but also to track their progress long term.

CHAPTER 5: DISCUSSION

Chapter 5 discusses how the framing and the methods used in this thesis can apply in other disciplines. Chapter 5 then outlines the next steps needed to move toward the most sustainable and beneficial form of wildlife conservation tourism through monitoring indicators and points out future research in this field.

The indicators developed in this thesis for wildlife conservation tourism can be applied to marine environments for the protection and conservation of threatened and endangered marine species. However, the WCTIs are preliminary indicators and require adjustment before application. As per the development of Anderson and colleagues' (2015) FPIs, the next step for these WCTIs would be to present them at workshops and engage all stakeholders in identifying, eliminating, and/or refining additional WCTIs. After that, appropriate standardized metrics should be assigned to each indicator for consistent assessment using best available knowledge and utilizing experts in that target field. Further research will be critical in finding the best balance between feasible and ideal as well as determining the best metrics for the tourism sector for which metrics are less developed. Finally, the indicators will be ready for field testing on WCT companies to test efficacy and revise as needed. While the hope is to get the best indicators through interdisciplinary collaboration and stakeholder engagement, after finalization and implementation evaluation of indicators and adaptive management techniques are recommended to ensure continued success in constantly changing human, artifactual, and natural environments (Honey, 2002; Secretariat of the Convention on Biological Diversity, 2007; Rodger et al., 2010).

Identifying indicators can be useful for achieving important short term goals as well as monitoring long term efficacy for a wildlife conservation tourism company (Higginbottom, 2004; Rodgers et al., 2010). Another potential benefit of setting standardized indicators is the

opportunity to certify a company's commitment to triple bottom line sustainability and ecological conservation through a formal certification or eco-label and designations of 'sustainable tourism destinations' (Honey, 2002). As certification programs and awards arise in the future, it will also be imperative for the WCT industry to demand accreditation to ensure the credibility of the certification agencies (Honey, 2002).

As the field of wildlife conservation tourism is developed and expanded, tourism operators, tourists, and conservation ecologists have a unique opportunity to apply this specific form of tourism to marine species to prevent extinctions and preserve natural resources for sustainable business, ecosystem services, heritage, and livelihoods (Bookbinder et al., 2008). While refinement of the WCTIs is necessary, development of indicators based on the human-artifactual-natural system under triple bottom line sustainability should be applied to any tourism system be it marine, terrestrial, or otherwise. Besides the continued development of the indicators presented here, future technologies should be considered and taken advantage of i.e. social media (In future research WCTIs can be slightly modified to adapt to new environments and different forms of tourism i.e. voluntourism, hunting and fishing tourism, museum tourism, adventure tourism, etc. to meet that specific tourism business' goals.

Overall, through natural and anthropogenic processes, marine species and their habitats have experienced ecological decline. As with terrestrial systems, marine areas designated for ecological conservation purposes can take advantage of the growing demand for wild natural interactions to facilitate businesses, conserve wildlife, support local communities and to provide people with meaningful experiences. Wildlife conservation tourism, if applied correctly, has the potential to not only meet triple bottom line sustainability goals of allowing future generations to

meet their own needs, but to actually provide non-consumptive value that will allow our generation to not only maintain but improve the conditions of our natural resources.

CONCLUSION

The identification of indicators is a critical next step to the development of wildlife conservation tourism for use in marine endangered species conservation. By nesting the HANS model inside the TBL model of sustainability, this thesis identified tourism specific indicators to ensure effective economic, ecological, and social success over long temporal scales. While the exact indicators need to be field tested and peer reviewed for each field, the basic concepts discussed in this thesis are applicable to other fields of tourism as well. These indicators can provide baselines to assess progress made, provide a basis for certifications, identify areas to improve upon, and assist tourists in choosing the business that best aligns with their personal philosophies.

Wildlife tourism has great potential to work in conjunction with conservation tools already in use in the U.S., such as marine protected areas, national wildlife refuges, etc. to combat wildlife overexploitation and habitat destruction while simultaneously educating and inspiring tourists. Legal intervention, MPA implementation, breeding programs, zoos, aquariums, and other strategies currently in use will not be necessary, but not sufficient to displace the extractive pressures currently placed on our marine resources. Applying interdisciplinary ideas to the field of marine and environmental affairs will provide the best use of coastal and marine tourism as a valuable strategy to slow the rate of biodiversity loss and species extinction.

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Appendices

Appendix I: Applying Wildlife Conservation Tourism to Marine Endangered Species Conservation: Poster presented at the 8th International Coastal and Marine Tourism Conference in Kailua-Kona, Hawaii, in November 2015.

Applying Wildlife Conservation Tourism to Marine Endangered Species Conservation

Kayla N. Boyes
boyesk@uw.edu
University of Washington
School of Marine and Environmental Affairs
8th International Coastal and Marine Tourism Conference

Introduction to WCT

- *Wildlife conservation tourism (WCT)* can be defined as a tourist or tourists having a meaningful interaction with wildlife in a nonconsumptive manner that produces a positive net contribution toward conserving one or more species of wildlife
- Derived from definitions of *conservation tourism, ecotourism, nature-based tourism,* and *wildlife-based tourism*
- WCT overlaps and intersects many of these forms of human-natural system interactions
- Examples include but are not limited to: birdwatching, zoo visits, wild encounters etc.

Human-Artifactual-Natural System [1]

Global drivers
Biotic processes (e.g., biodiversity change)
Abiotic processes (e.g., climate change)
Globalization processes (e.g., social, cultural, economic, political, informational, ethical change)
Human component
Brokers: Public sector, Private sector, Civil society sector
On-site community
Locals: Long-term residents, New residents, Seasonal residents
Tourists: Domestic, International
Artifactual component: Human artifacts, Natural artifacts
Natural component: Biotic, Abiotic

WCT is framed as part of a HANS System [1]. WCT mainly applies where the human and natural component interactions occur, but artifacts can play a role too i.e. binoculars, vehicles, dive gear, etc. This framework helps interpret and manage interactions between the sectors.

Advantages for Marine Endangered Species

- WCT has the potential to support the conservation of species and/or habitats financially and through the creation of tourist awareness [3].
- Tourists gain some sort of desirable, enjoyable, educational, meaningful experience from interacting with wildlife [2][3][4].
- If properly managed, local tourism brokers and other businesses can profit from WCT [2][5].

Disadvantages for Marine Endangered Species

- It can be argued that interactions between tourists and wildlife jeopardize the very goal of conservation. It is also debatable whether WCT will continue to be effective as a growing industry [5].
- Wildlife can be harassed, stressed, harmed, or even killed by tourists or tourist related activities. Even seemingly beneficial activities like feeding can alter behavior and have negative impacts [4][5].

Case Study: Scuba Diving with Grey Nurse Sharks[5]

- Grey nurse sharks (*Carcharias taurus*) are a slow growing, low fecundity species
- The east Australian population has been listed as 'Critically Endangered' by the International Union for the Conservation of Nature (IUCN)
- An industry for scuba diving with these rare sharks has developed
- A study of diver compliance in this industry revealed a 100% diver compliance rate with diving code of conduct
- Sharks exhibited usual behavior during interactions with compliant divers indicating no short-term behavioral impacts
- Likely promoted through clear guidelines, educated divers, and stakeholder involvement in management [5]

Recommendations for Agencies

It is possible for both tourists and endangered species to benefit from human-natural interactions. To ensure this, when implementing WCT for marine species it is recommended that agencies take into consideration:

- Biological characteristics of the species
- Flagship or secondary tourism
- Proper permitting/legal compliance
- Educational supplementation
- Ethical treatment of wildlife and people

Regular monitoring, evaluation, and re-evaluation will be critical for developing best practices in this new field.

Key References

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Full reference list available upon request from boyesk@uw.edu