Conservation, Captivity, and Whaling: A Survey of Belize Whalewatching Tourists' Attitudes to Cetacean Conservation Issues

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DEDICATION

This is dedicated to my Mommy, Nancy M. Patterson, and to the late Mrs. Connie, Constance H. Cunningham... Because of you a dream was born.

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ABSTRACT

CONSERVATION, CAPTIVITY AND WHALING: A SURVEY OF BELIZE WHALEWATCHING TOURISTS' ATTITUDES TO CETACEAN CONSERVATION ISSUES

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With whalewatching activities and associated expenditures increasing annually, governments in coastal countries possess a large vested interest in the continued growth and protection of whale populations and the associated tourism. In 2007 and 2008, a survey investigating whalewatching tourists' attitudes toward key cetacean conservation issues, such as legislative protection, whaling, and captivity, was administered to volunteer participants at Blackbird Caye, Turneffe Atoll, Belize (n=166). With regards to attitudes towards cetacean conservation issues, the majority of participants considered dolphins and whales to be under protected or only slightly protected (36.4%; 45.1%, respectively) and expressed that marine mammal conservation laws and policies were very important (83.1%). In addition, 95% of participants expressed opposition against the hunting of whales (68.5% strongly opposed and 26.5% opposed), and the majority of participants were against keeping dolphins in captivity no matter if the dolphins were

kept in a dolphinarium or a semi-natural habitat confined by nets (78.1%; 66.9%, respectively). Furthermore, 93.3% of participants stated that they preferred to observe dolphins in the wild rather than in a captive setting, whether semi-natural or a dolphinarium. In addition to allowing a comparison of the attitudes and concerns of whalewatchers in Belize with other surveyed areas, this survey provides data that could assist the Belizean government with conservation-oriented decision-making. For example, 70.4% of participants felt that it was very important that Belize has a strong commitment to dolphin conservation and of those same participants, an additional 27.8% of participants ranked cetacean conservation as important. Additionally, 68.1% of participants said that they would actively boycott visiting pro-whaling countries and more specifically, 59.5% of participants stated that they would boycott visiting Belize if the country supported whaling, which has implications for Belize's position and policies at the International Whaling Commission.

CHAPTER 1: INTRODUCTION

Turneffe Atoll (17°20′N; 87°50′W) is located approximately 56 km (34.7 miles) east of Belize City, Belize, in the Caribbean Sea (Campbell *et al.*, 2002) (Fig. 1). Turneffe is separated from the Belizean mainland by the largest barrier reef in the Western hemisphere, second in size only to Australia's Great Barrier Reef (Campbell *et al.*, 2002; Grigg & Markowitz, 1997; Stoddart, 1962) (Fig. 1). Besides the main barrier reef, Belize also has a complex network of inshore reefs and three coral atolls: Glovers Reef, Lighthouse Reef, and Turneffe Atoll (Fig. 1.), making it also one of the most extensive reef ecosystems in the Western Hemisphere (Cho, 2005). These three atolls comprise three out of the only four coral atolls found in the Western Hemisphere. The fourth atoll, Banco Chinchorro, is located in Southern Mexico off the Yucatan Peninsula.

Turneffe Atoll is the largest of the four atolls, covering an area of 531.4km^2 (Bilgre, 1998; Grigg & Markowitz, 1997). The atoll supports three major ecosystems – coral reefs, mangrove forests, and seagrass beds, which serve as the dominant habitats in the atoll. The interactions between these three ecosystems support the high biodiversity of the marine organisms found within the atoll its surrounding areas (Green & Short, 2003). In fact, Turneffe is unique in that it is believed to support the highest biodiversity of any of the atolls found in the Western hemisphere (Stoddart, 1962). The atoll provides year-round habitat to a small population of coastal bottlenose dolphins (Grigg & Markowitz 1997; Campbell *et al.* 2002) that Dick and Hines (in review) estimated to

contain approximately 216 individuals. The atoll is also home to the endangered Antillean manatee (*Trichecus manatus manatus)* (Auil, 1998; Holguin, 2004), one third of the American crocodile (*Crocodylus acutus*) nesting population (Platt *et al.*, 2004), and provides nesting habitats for loggerhead sea turtles (*Caretta caretta*), hawksbill *(Eretmochelys imbricata)* sea turtles (Platt, 1999; personal observation) least terns (*Sternula antillarum*), roseate terns (*Sterna dougalli*), and the white crowned pigeon (*Columba leucocephala)* (B. Winning, pers. comm.).

The atoll also attracts snorkelers and divers to over 70 named dive sites including famous sites such as the "Elbow" which has been reported by several diving companies and magazines as a "top dive site" in the Caribbean. Despite the atoll's high diversity, Turneffe is currently the only atoll of the four found in the Mesoamerica area that lacks long-term permanent ecological protective measures (Dick & Hines, in review). However, there are three temporary fishery reserves intact today (PACT, 2008). Conservation efforts are necessary in order to maintain and guarantee the continued viability of the atoll. This project hopes to add another layer of evidence for the quest and overall goal to have long-term ecological protective measures implemented at Turneffe.

To date there have been no surveys conducted to establish the baseline level of public behaviors, attitudes, and knowledge of cetaceans or their conservation in Belize. Therefore, this study serves as a case study of the tourists that travel to Oceanic Society's Blackbird Caye Field Station, Turneffe Atoll. The purpose of this study was to ask participants about their opinions on key cetacean conservation issues, such as legislative

protection, whaling, captivity, and the environmental implications of their daily lifestyles. Along with discerning the opinions of the participants for key cetacean conservation issues, the data obtained from these surveys may also be used to compare the environmental awareness and concern of whalewatchers in Belize with those of other areas. The survey is capable of quantifying the level of impact that whalewatching has on the conservation awareness gained by the field station visitors. The questionnaire's goals are to determine whether or not tourists are less likely to go to anti-whaling or pro-whaling countries on holiday; whether or not tourists are more or less likely to go to captive facilities or on dolphin/whalewatching or research excursions; whether or not the tourists gain or increase their level of environmental awareness by observing dolphins in their natural habitat; and to quantify the respondents' overall environmental attitudes, behaviors, and knowledge.

Figure 1. Location of Turneffe Atoll, Belize, Central America. Map created by and courtesy of D. M. Dick, 2010.

Bottlenose dolphins

Bottlenose dolphins (*Tursiops truncatus*) are the most common and well-known cetacean species found in all temperate and tropical waters worldwide. This species is one of the estimated 85 species of marine mammals that make up the order Cetacea, a word derived from the Latin word "ketos," and the Greek word "cetus" meaning whale or sea monster (Wells & Scott, 1999; Hooker, 2002; Bannister, 2002). The cetacean order (whales, dolphins, and porpoises) can be further grouped into two suborders, Mysticeti (baleen whales) and Odontoceti (toothed whales). Mysticeti comes from the Greek word "mystax," meaning mustache, and is given to this suborder because of the baleen plates[1] these mammals have in place of teeth (Bannister, 2002). Odontoceti comes from the Greek word odous or odontos for "tooth" which describes the suborders toothed whale members (Hooker, 2002). Toothed whales differ from baleen whales in that they have a single blowhole rather than a paired blowhole, have functional teeth instead of baleen plates, have an asymmetrical skull, and have ribs that articulate with the sternum (Hooker, 2002).

Fourteen species of mysticetes are currently recognized (Bannister, 2002; Wada *et al.*, 2003), as are approximately 71 species of odontocetes (Hooker, 2002). There are approximately 10 families within the suborder Odontoceti and bottlenose dolphins represent one of the true dolphin species found in the family Delphinidae (Hooker, 2002). The exact number of odontocete families and species is still being debated today.

[1] Baleen plates are thin keratinous plates lined with thick, fringed edges on the inward side that are suspended down from each side of the upper jaw creating a highly specialized filter-feeding system (Bannister, 2002).

Historically, approximately 20 different *Tursiops* species were described; the large number of species designation is due to strong intraspecific differentiation found in these animals' coloration, size, and behavior (Rice, 1998). Bottlenose dolphins are highly polymorphic[2] and differ significantly among the oceans. Morphology can even differ greatly between coastal and offshore populations (LeDuc *et al.*, 1999).

Today, the classification of bottlenose dolphins is quite controversial as the only recognized genetically distinct species to date are the common bottlenose dolphin (*Tursiops truncatus*) and the Indo-Pacific bottlenose dolphin (*Tursiops aduncus*) (Wang *et al.* 1999, 2000a, 2000b). However, genetic studies suggest that *T. aduncus* may be more closely related to the *Stenella* genus, which includes striped (*S. coeruleoalba*), spotted (*S. frontalis*), and spinner dolphins (*S. longirostris*), than the *Tursiops* genus (LeDuc *et al.*, 1999). DNA analyses performed by Natoli *et al.* (2004), suggested that *T. aduncus* might even be two separate species, possibly leading to the defining of a third South African bottlenose species. Moreover, Kingston and Rosel (2004), reported greater genetic divergence between offshore and coastal morphotypes of common bottlenose dolphins in the western North Atlantic, and between two dolphin species in the western North Atlantic: the common dolphin (*Delphinus delphis*) and long-beaked common dolphin (*Delphinus capensis*). Thus, suggesting the possibility of a fourth species. Future genetic analyses are necessary to determine if all the various populations are genetically distinct enough to be considered sub-species or distinct species altogether.

[2] Genetic polymorphism is the occurrence of more than one allele at a given locus (Tamarin, 2002)

Bottlenose dolphins are found in all waters around the world except for the Arctic and Antarctic Oceans (Leatherwood & Reeves, 1990; Wells & Scott 1999; Reynolds *et al.*, 2000). By using several known bottlenose dolphin population abundance estimates, Hammond *et al.* (2008), estimated that at least 600,000 bottlenose dolphins could be found worldwide. These dolphins are found in both coastal and offshore waters and are characterized by their grey coloring and relatively short rostrum. Bottlenose dolphins exhibit a counter-shading coloration where their dorsal side is of a dark grey color and their ventral side is a lighter, and even sometimes white, color (Wells & Scott, 2002). These animals are medium sized, ranging between 2 – 3.8m (6 – 11.4ft) in length, and weigh between 150 and 650 kg (330 – 1430 lb). Body size typically varies between habitats; as water temperature decreases body size tends to increase (Wells & Scott, 1999). Inshore Atlantic bottlenose dolphins are generally smaller, lighter in color, and have larger flippers than offshore Atlantic bottlenose morphotypes (Wells & Scott, 2002). The average lifespan for bottlenose dolphins is approximately 40-50 years, with females tending to live slightly longer lives (50+ years) than males (40-45 years) (Wells & Scott, 1999). The dolphins that were viewed by the participants of this study were coastal bottlenose dolphins that inhabited Turneffe Atoll (Fig. 1).

Bottlenose dolphins are considered opportunistic-generalist feeders (Shane, 1990). A dolphin's general diet consists of a variety of pelagic fish found in the families sciaenidae, mugilidae, and a variety of bottom dwellers such as members of the scombridae family, as well as squid, crab and shrimp (Corkeron *et al.*, 1990; Cockcroft & Ross, 1990; Connor *et al.*, 2000b; Wells & Scott, 2002). The exact prey species of the

bottlenose population at Turneffe Atoll (Fig. 1) are unknown; however, dolphins have been observed interacting with fisherman's traps for the following species: spiny lobster (*Panulirus argus*), snapper (*Lutjanus* sp., *Ocyurus chrysurus*), and grouper (*Epinephelus* sp., *Mycteroperca* sp.), which may suggest some possible prey preferences (Grigg & Markowitz, 1997).

Dolphins use echolocation in order to find their prey by emitting a continuous beam of medium frequency sounds or clicks (10 kHz – 150 kHz), for anywhere from a few seconds to minutes. Bottlenose dolphins display a diverse array of foraging techniques both within and between populations (Shane, 1990; Connor *et al.*, 2000a). For example, dolphins will sometimes tail-slap repeatedly to stun or disorient their prey (Connor *et al.*, 2000b). Dolphins can also use their echolocation abilities to stun or disorient their prey by emitting strong, high amplitude, low frequency impulses (Sullivan & Hickey, 2002). Individual female dolphins in Shark Bay, Australia, have been observed using sponges to protect their rostrum while foraging for benthic creatures, which is an example of tool use in cetaceans (Mann & Sargeant, 2003; Krützen *et al.*, 2005; St. Amant & Horton, 2008). At Turneffe, dolphins have been observed displaying

foraging behaviors such as "rooster-tailing"[3], "kerplunking"[4], "sea-grass border feeding"[5], and "crater feeding"[6] (Eierman, 2006; personal observation).

Hunting success is often higher when bottlenose dolphins work cooperatively in groups. Dolphins have been observed corralling or herding fish into tight bait-balls where individuals then take turns swimming through the ball of fish grabbing any available fish as they pass through (Caldwell & Caldwell, 1972; Leatherwood, 1975; Rossbach, 1999); stirring up sediment to trap fish (Lewis & Schroeder, 2003); swimming in a crescent formation to drive fish ahead of the group (Leatherwood, 1975; Würsig, 1986); pinning fish against mud banks or chasing the fish onto mud banks—dolphins will then strand themselves or hydroplane across the mud banks to feed on the fish they have chased (Leatherwood, 1975; Hoese, 1971; Rigley *et al.*, 1981); and lastly, trapping the fish between dolphins attacking from either side (Würsig, 1986). Despite the common occurrence of these cooperative feeding habits within bottlenose dolphins, large group cooperative feeding has not been observed at Turneffe (Grigg & Markowitz, 1997).

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[3] Rooster tailing is a feeding behavior that involves a fish chase where the dolphin quickly swims along the surface of the water creating a sheet of water to trail off the dorsal fin; after the rooster tail, the dolphin dives to the bottom, often back-tracking the direction of the fast swim (Mann & Sargeant, 2003).

[4] In kerplunking, dolphins will raise their peduncle and tail flukes out of the water and then tail-slap the water producing a high splash of water (1-3.5m) and an audible "kerplunk" sound in the air (Connor *et al.*, 2000b)

[5] Dolphins feed along the boundary between seagrass beds and sandy areas, where fish densities were found to be higher then either sand or seagrass areas alone (Eierman, 2006).

[6] Crater feeding is described as the immersion of the rostrum of a bottlenose dolphin while deeply digging into the sand, creating a crater on the bottom (Rossbach & Herzing, 1997; Mann & Sargeant, 2003).

According to Dick (2008), the topography of the Central and Southern Lagoons in Turneffe (Fig. 1) may play a vital role in foraging success. These two lagoons are bordered by and contain mangrove cayes that are primarily composed of red mangroves (*Rhizophora mangle*). Sea grass beds predominantly consisting of turtle grass (*Thalassia testudinum*), and scattered with hexacorals and sponges are the dominant habitat found along the sea floor in both lagoons (Stoddart, 1962). Because both habitats provide nutrient rich environments that enhance productivity and serve as important juvenile reef fish nurseries (Nagelkerken *et al.*, 2000, 2001, 2002), higher fish concentrations may provide increased feeding opportunities for the dolphins (Dick, 2008).

Sharks are the largest natural predators of bottlenose dolphins, but areas where marine mammal eating killer whales exist may also pose a potential threat (Wells & Scott, 2002). Bull sharks (*Carcharhinus leucas*), tiger sharks (*Galeocerdo cuvier*), great white sharks (*Carcharodon carcharias*), and dusky sharks (*Carcharhinus obscurus*) are the primary predators of bottlenose dolphins globally (Wood *et al.*, 1970; Corkeron *et al.*, 1987; Long & Jones, 1996; Connor *et al.*, 1999). Furthermore, *Tursiops aduncus* populations in Australian waters exhibit a much higher frequency of scaring patterns indicative of shark bites than *Tursiops truncatus* populations (Wood *et al.*, 1970; Corkeron *et al,* 1987; Wells & Scott, 2002). Although bull sharks and tiger sharks are prominent in Belizean waters, no crescent-shaped scars that are generally associated with shark attacks have been documented on the bottlenose dolphins found at Turneffe Atoll suggesting that predation is low at this location (Campbell *et al.*, 2002; Dick, 2008).

Female dolphins reach sexual maturity between the ages of five and 13; the oldest documented female to successfully give birth and raise her young was 48 years old. Males typically mature later, between the ages of nine and 14, which appears to be correlated to the fact it takes the males longer to grow to approximately 85% of their asymptotic length[7] (Chivers, 2002). Female dolphins are polyestrous, and spontaneously ovulate, which may give the females more of a choice in mating partners and decrease paternity certainty thereby protecting their calves from infanticide by dominant males (Mann *et al.*, 1999). Male reproductive characteristics are not as well known as female reproduction, because this information does not play a vital role in determining reproductive potential and population dynamics (Chivers, 2002).

There are three parts to the breeding cycle in bottlenose dolphins: gestation, lactation, and anestrous, or resting period (Chivers, 2002). The gestation period for these mammals is 12 months (Mann *et al.*, 1999). Female dolphins are only able to have one offspring at a time (Fordyce & Barnes, 1994), although the presence of multiple fetuses or multiple births has been documented. There are no known cases of successfully reared multiple offspring (Chivers, 2002). Calves are approximately 84 to 140 cm (33.1 – 44.9 in) in length when they are born. Mann *et al.* (1999) characterizes dolphins as providing extensive maternal investment in caring for their young. Captive studies record females nursing their calves for up to 18 months in their lactation period, however, field studies show nursing lasting twice as long (Mann *et al.*, 1999), and calves are not weaned until at least their third year. The calf's primary nutritional source for the first year is the milk it

[7] The asymptotic length is the size at which mammals become sexually mature.

receives from its mother while nursing. Towards the end of the first year of life, calves begin to mimic their mothers foraging techniques; however it takes several months of practice before a calf is able to successfully catch its first fish on its own (Connor *et al.*, 1999). There is a lot of inter- and intra-population variation in the amount of time a calf stays with its mother after birth. In Moray Firth, Scotland, calves stay highly associated with their mothers for eight years, and in Sarasota, FL, calves have been documented remaining with their mothers for up to ten years (Grellier *et al.*, 2003). As calves are weaned, the time the calves spend in close proximity to their mothers decreases as age increases (Mann & Smuts, 1999; Grellier *et al.*, 2003). Bottlenose dolphins have a minimum of a two to three year interbirth interval (IBI), with most females exhibiting a three to six year IBI average due to the prolonged weaning period exhibited in dolphins. This prolonged weaning period is thought to enhance calf survival, prey acquisition, cultural knowledge, and social development (Wells *et al.*, 1999; Connor *et al.*, 1999; Grellier *et al.*, 2003).

Calving takes place year round in bottlenose dolphins, however, there is generally a peak season in the warmer months possibly due to homeothermic or ecological factors (Connor *et al.*, 1999). A peak in calf births during the fall season was observed at Turneffe Atoll by Grigg and Markowitz (1997), which correlates with the seasonality in group size observations by Campbell *et al.* (2002). Furthermore, seasonality in calving is also consistent with other areas such as Shark Bay, Australia, where reproduction peaks between October and December (Mann *et al.*, 1999). Seasonal breeding is in the female's reproductive interest since she is subject to energetic costs from lactation, calf care, and

protection. Because both captive and wild bottlenose dolphin infants have high infant mortality rates, especially during the first few weeks of life, a longer breeding season is advantageous because the extended season benefits females by allowing enough time to resume cycling quickly, increasing opportunities to be impregnated again (Mann & Smuts, 1999; Mann *et al.*, 1999).

Female reproductive success correlates with both ecological factors such as water depth, and social factors, such as group size, mate choice (although not fully understood), and protection from conspecifics (Mann *et al.*, 1999). Shallow waters may be preferred because they give females an advantage against predators by being able to detect them more easily. Additionally, prey density may be higher in shallow waters than in deeper waters. Mann *et al.* (1999) determined that female reproductive success declined by 10% for every 3.5m change in depth. Calves are most vulnerable to exposure to harsh conditions, predators, and harassment from conspecifics in their first months of life; therefore, it is beneficial for females to associate in larger groups when caring for young calves for their first three months (Mann *et al.*, 1999). Previous researchers at Turneffe have noted that the atoll is important to both the reproductive success of its bottlenose dolphin population and the rearing of offspring. Campbell *et al.* (2002) also noted that one-third of the dolphin groups sighted contained at least one calf. Dick (2008) observed that the consistent sightings of dolphin calves and neonates in addition to the observed presence of a female dolphin both before and shortly after parturition suggests that the sheltered lagoons of the atoll remain important to this population's reproductive success.

Bottlenose dolphins, like other social mammals such as African elephants (*Loxodonta africana)* and chimpanzees (*Pan troglodytes)*, live in fission-fusion societies where the social organization of the population is constantly changing due to the fluid movement of individuals in and out of groups (Mann *et al.*, 1999; Grellier *et al.*, 2003). Large groups of individuals within the population will divide into smaller groups, while other smaller groups will fuse into larger groups often on a daily or hourly basis (Connor *et al.*, 2000a; Grellier *et al.*, 2003). Group sizes also vary depending on geographic location. Inshore populations tend to form smaller groups ranging from two to 15 individuals, while offshore populations form groups that can consist of up to 1,000 individuals at a time (Wells *et al.*, 1999). Sex, age, reproductive condition, and kinship are dynamic factors additionally determining group composition. For example, females with dependant calves tend to associate with other mother-calf pairs, while juveniles tend to affiliate with other juveniles of the same age class (Smolker *et al.*, 1992).

The strongest and most stable bonds in adult dolphins are between males that form complex hierarchical alliances in competition over estrus females (Connor *et al.*, 2000a). These alliances normally form between two to three individual males, and have been documented lasting for 13 years in Shark Bay, Australia, and for 20 years in Sarasota, FL (Connor *et al.*, 1999). Males in Shark Bay, Australia, form two levels of associations, "first order alliances" and "second order alliances," in order to compete for females. First order alliances occur when males form stable pairs or trios and have high coefficients of associations (COA) that range between 80 and 100. When two first order alliances join together they form a "second order alliance," and the group works

cooperatively to take female consorts from other alliances or to defend against such attacks. This behavior, known as "herding," is characterized by the capture of a solitary female or the isolation of an individual female from a larger group of females by the allied males. There are also cases where many alliances (10-30 individual males) will come together to form a superalliance. Whereas these "first order" and "second order" alliances share intermittent herding success, superalliances are successful at herding females the majority of the time. The second order alliances and superalliances are not normally long lasting affiliations and the individual alliance may go from cooperating together to attacking each other in a social context (Connor *et al.,* 1999).

Female associations are less fixed and more variable than their male counterparts. Most females tend to maintain a range of moderate strength same-sex associates, although some females lead relatively solitary lives (Smolker *et al.*, 1992). The variation in female 'sociability' has been linked to foraging habits, which also vary within a population (Mann & Sargeant, 2003). Female associations are based on gaining access to food and increasing their ability to protect their calves from predators and conspecifics (Mann *et al.*, 1999) where gaining and maintaining access to a female is the primary focus behind male alliances. Smolker *et al.* (1992) described female associations as more of a network instead of the discrete subgroups that are found in male alliances. Females most commonly associate most deeply with a subset of other adult females or kin in "bands" (Mann & Smuts, 1999; Möller *et al.*, 2006). Female bands exist when the females generally associate in groups with other females of the same reproductive status. For example, mother-calf pairs, with calves of similar ages, will be found in the one

group while another group will be composed of all females without calves. Only a minority of females does not belong to a band and lead solitary lives. These females spend more time foraging and have a higher calf mortality rates than the females that live in groups (Mann *et al.*, 1999).

Although bottlenose dolphins associate most closely with members of the same sex, mixed sex groups are not uncommon. Mixed group associations are tied to female reproductive status and are loosely defined. Associations are much more frequent when a female is in estrus or cycling than when she is pregnant; therefore, there is a higher association rate between males and females during the mating season when males use their alliances to herd the females (Connor *et al.*, 1999; Connor *et al.*, 2000a).

The behavior of cetaceans implies high intelligence. The complexity of cetacean communication has often been used as a potential indicator of intelligence (Parsons *et al.*, 2004). Bottlenose dolphins are capable of communicating with each other using tactile, visual, and audible expressions that come together to form a complex communication system. Their communication through tactile interaction is via extensively touching or rubbing against each other during play, courtship, sexual interactions, and mother/calf interactions (Dudzinski *et al.*, 2002). Bottlenose dolphins also use visual displays to increase the information transmitted to other individuals. Individuals can show aggressive behaviors by violently jerking or shaking the head, changing posture, or by displaying biting motions (Dudzinski *et al.*, 2002). Visual cues also may identify who is communicating, for example dolphins may blow bubbles while whistling so that other individuals are able to identify the whistler (Dudzinski *et al.*, 2002).

Sound travels four times faster in water than it does in air; therefore, acoustic communication is the most important communication method because hearing serves as a dolphins' primary sense. Bottlenose dolphins communicate with each other audibly by using a series of whistles or clicking sounds ranging from 4 kHz to at least 20 kHz and ranging in duration from 0.1 to 3.6 seconds (Smolker *et al.*, 1993). These vocalizations are thought to carry emotive content, signature information, and may serve as an important tool for binding social relationships (Janik, 2000). Furthermore, dolphin calves develop a signature whistle during the first year of their life (Tyack, 2000). As dolphins establish stronger individual-specific social relationships, these signature whistles are very important in allowing individuals to recognize, establish and maintain contact between distinct animals (Caldwell *et al.*, 1990). The ability to distinguish between unique individuals plays a role in the process of forming alliances, identifying relatives, and aids in coordinated behaviours such as foraging and repelling competitors or predators. Moreover, dolphins are the only non-human animals known to address each other individually while communicating (Terrace, 1985).

In addition, dolphins show a higher level of intelligence based on their capacity for vocal learning, ability to grasp abstract concepts, and level of self-awareness. Herman (1986) used a modified form of sign language and a computer-generated sound language to train dolphins to associate specific objects and actions with gestures or sounds, which exemplifies the dolphin's ability of symbol matching. The results of this study found that dolphins have the capacity for vocal learning (Herman, 1986). For example, Herman (1986) found that the dolphins were capable of understanding simple

sentences and could comprehend sentence structure or syntax, which is an advanced linguistic concept. The dolphins were also able to conduct complex series of behaviours based on the understood symbolic "language." Additionally, dolphins were found to be able to grasp abstract concepts such as being able to discriminate between numbers and objects. For example, dolphins were able to distinguish between "few" and "many" objects, and numerically "less" despite belief that the ability to distinguish between numbers of items was a strictly human attribute (Yaman *et al.*, 2004; Jaakkola *et al.*, 2005; Holden, 2004). Lastly, Reiss and Marino (2001) illustrated that dolphins are self-aware by conducting a mirror self-recognition test. In this study, two captive born male dolphins (ages 13 and 17) at the New York Aquarium in Brooklyn, NY, were exposed to reflective surfaces after being marked, sham-marked, or not marked (untouched) in the presence or absence of reflective surfaces (the dolphins had no prior training in relation to reflective surfaces or on cognitive tasks). These studies showed that the dolphins were able to recognize their image in a mirror and used the mirror to investigate the markings on their bodies, meaning that the animals were able to deduce the images they saw in the mirror were actually themselves and not another dolphin (Reiss & Marino, 2001). Most human infants do not pass the mirror test until they are 18-24 months old—marking the beginning of a developmental process of achieving increasingly abstract psychological levels of self-awareness, including introspection and mental state attribution (Rochat, 2003); therefore, it can be argued that bottlenose dolphins have a level of understanding comparable to a two-year-old child, but a dolphin's linguistic capabilities hints that its level of intelligence maybe more developed (Parsons *et al.*, 2004). A cetacean's high

level of sociality and intelligence are the basis of the argument that it is unethical to keep these animals in captivity (Rose *et al.,* 2009). This argument will be examined in greater detail in the "captivity" section.

Cetacean conservation

As a species, bottlenose dolphins are listed in the "least concern" category under the International Union for Conservation of Nature and Natural Resource's (IUCN) 2008 Red list update; however, there are specific populations that are near depletion due to anthropogenic activities such as habitat destruction and degradation, disturbance and harassment, prey depletion, pollution, and indirect and direct takes (Hammond *et al.*, 2008; Parsons *et al.*, 2010a).

Anecdotal evidence suggests that habitat degradation may have caused some dolphin populations to decline (Wells & Scott, 1999). A small number of bottlenose dolphins in certain areas of Shark Bay, Australia, and Panama City Beach, FL, USA, have become habituated to human presence and have been observed begging for and accepting fish handouts and occasional physical contact from people. Bottlenose dolphins have also been subject to boat collisions that have lead to severe injuries and mortality (Connor & Smolker, 1985; Samuels & Bjeder, 2004). In both areas, the human-dolphin interactions put the dolphins at risk to injury, illness, and death. For example, in Panama City Beach, people were observed inadvertently touching vulnerable body parts of the dolphin (i.e. people were observed sticking their fingers in the dolphin's blowhole); aggressive behaviors by both dolphins and humans were observed and

humans were observed feeding the dolphins' inappropriate food items and foreign objects (Samuels & Bjeder, 2004). Dolphin behaviors have also been recorded to change in the presence of vessels especially increases in avoidance behaviors towards oncoming vessels (Wells & Scott, 2002).

Pollution can also negatively affect dolphins in a large number of ways. For example, biopsy results have shown high concentrations of chlorinated hydrocarbons in the tissues of bottlenose dolphins around the world (O'Shea, 1999; Parsons & Chan, 2001). Even low levels of polychlorinated biphenyls (PCB's) and dichlorodiphenyltrichloroethane (DDT's) can cause decreases in a dolphin's immune system efficiency and can cause reproductive abnormalities (Lavhis *et al.*, 1995; Parsons & Chan, 2001; Wells & Scott, 2002). Additionally, bottlenose mothers pass 80% of their contaminants to their calf, possibly leading to an increase in calf and neonatal mortalities (Cockcroft *et al.*, 1989). Males tend to accumulate higher contamination levels than females, and in some cases contaminants have reached a level that could impair testosterone production and reduce reproductive ability (O'Shea, 1999; Kannan *et al.*, 2000; Wells & Scott, 2002; Wells *et al.*, 2005).

Lastly, many cetacean species are still taken both indirectly[8] or directly[9] today. For example, an animal may be taken as by-catch or seriously injured or killed from an entanglement in fishing gear (Wells & Scott, 1999). Dolphins are frequently caught as by-catch in gillnets, driftnets, purse seines, trawls, long-lines, and on hook-and-line gear

[8] Incidental takes are those where cetaceans are killed or injured accidentally, or as a result of activities that are not specifically targeting cetaceans (Parsons *et al.*, 2010a).
[9] Directed takes refer to activities that are specifically directed towards the killing or capturing of cetaceans (Parsons *et al.*, 2010a).

used in commercial and recreational fisheries, but the level of mortality is often poorly documented (Wells & Scott, 1999). Impacts of direct takes will be discussed in detail in the "whaling" section.

Parsons *et al.* (2010a) emphasized that the precise significance of virtually all of these threats is poorly known, and the situation is exacerbated by the fact that little is known about the distributions and habitat needs of these animals. Human-generated impacts are especially threatening to coastal populations as more people continue to move to costal areas, especially in developing countries (Dawson *et al.*, 2008). Parsons *et al.* (2010a) also fear that the same mistakes made for terrestrial species—driving them from their natural habitats, reducing ranges, and depleting or even extinguishing populations—may be repeated in the seas. Without adequate knowledge about the status and life history of these populations, it is likely that anthropogenic activities will inadvertently adversely change population statuses (Parsons *et al.*, 2010a). Because bottlenose dolphins are widespread and abundant, none of these threats are believed to be causing a major global population decline (Hammond *et al.*, 2008).

Threats at Turneffe Atoll

Bottlenose dolphins in Belize are protected from import and export, wildlife trade, and hunting under Belize's 1981 Wildlife Protection Act. Grigg and Markowitz (1997) noted that human interference is minimal within Turneffe Atoll and contaminant levels found in bottlenose dolphins at Turneffe have not been studied. Currently, there are three small resorts (maximum capacity is approximately 38 guests, plus staff) that cater to

scuba divers, sport fishermen, and ecotourists (Turneffe Island Lodge, Turneffe Flats, and Blackbird Caye Resort), two biological field stations (Oceanic Society's Blackbird Caye Field Station and the University of Belize's Field Station at Calabash Caye), a coast guard station, few private residences, and numerous small-scale fishing camps dispersed throughout the atoll. However, Turneffe is at great risk for rapid coastal development (mangrove clearing and burning, dredging, and overdevelopment), especially on the windward side of the atoll, which could result in habitat loss and degradation for many species including bottlenose dolphins (Platt & Thorbjarnarson, 1996; Platt, 1999; Holguin, 2004). The removal of highly productive seagrass beds and coastal mangroves by development activities may also threaten the dolphin population, could severely threaten the ecological integrity of the atoll, and will probably have considerable negative impacts on the atoll's sensitive ecosystem. As development pressures increase and the atoll's human population rises, there is a high probability that the dolphin population at Turneffe could be severely threatened due to habitat degradation, vessel traffic, and pollution (Wells & Scott 1999; Granek, 2006; Dick & Hines, in review).

Although commercial fishing in the atoll is conducted on a small-scale for spiny lobster (*Panulirus argus*), conch (*Strombus* sp.), snapper (*Lutjanus* sp., *Ocyurus chrysurus*), and grouper (*Epinephelus* sp., *Mycteroperca* sp.), unsustainable fishing (overfishing and illegal fishing) pressures, especially of spawning aggregations of reef fish, are a growing threat to the atoll and could result in prey depletion for the dolphin population. However, The Nature Conservancy in collaboration with other national and international conservation organizations and local government efforts has been successful

in identifying thirteen spawning aggregation sites in which the Belizean government have labeled as temporary no-take zones (TNC, 2010), three of which are located at Turneffe Atoll: (1) a Nassau grouper protection reserve has been designated in the waters off of Mauger Caye (PACT, 2008); (2) Dog Flea Caye Marine Reserve is one of the largest spawning aggregation site reserves[10] for Nassau groupers in Belize; and (3) Caye Bokel Marine Reserve features spawning aggregations of mutton, cubera and yellowtail snappers, and other species (B. Winning pers. comm., 2008; PACT, 2008). Bottlenose dolphins often take advantage of the fisheries and other human activities and the dolphins at Turneffe have been observed rolling over the lobster and fish traps to go after fishermen's catches. This interaction could result in incidental mortality of the dolphins through entanglement and ingestion of fishing gear or could create a hostile attitude towards the dolphins (Grigg & Markowitz, 1997; Wells & Scott, 2002; Read *et al.*, 2003).

Whaling

Since the mid-1600's, marine mammals have been extensively hunted and no group escaped hunting pressures (Reeves, 2002). Baleen whales were taken for their oil, baleen, and to a lesser extent until recent years, their meat; pinnipeds (seals, sea lions, walruses) for their fat, meat, tusks (walruses) and pelts (seals); sirenians (manatees and dugongs) for their meat and hides; sea otters for their fur; and polar bears for their meat

[10] Spawning reserves are located in a fish spawning ground in which the area shall be closed to fishing all year round in order to protect important fish spawning grounds (PACT, 2008).

and hides (Reeves, 2002). The economic value of many of these animals—especially whales and seals—launched a vast commercial industry that critically depleted and threatened the existence of many species. It was such hunting that ultimately drove Stellar's sea cows (*Hydrodamalis gigas*) extinct in 1768, only twenty-seven years after it was discovered in 1741, and it is estimated that whaling may have reduced several cetacean species by 90% or more (Stejneger, 1887; Clapham & Baker, 2002). Whaling also lead to the extirpation of the Atlantic gray whale population (*Escherichtius robustus*) in the eighteenth century (Rice, 1998).

After recognizing that populations of economically valuable whale species had greatly declined, whalers of several nations joined forces to create the Convention for the Regulation of Whaling in 1931 (Parsons *et al.*, in press (a)) which became the International Convention for the Regulation of Whaling (ICRW) in 1946. In 1946, the ICRW established the International Whaling Commission (IWC) to regulate whaling and conserve whale populations worldwide (Gales *et al.*, 2005). Membership of the IWC is open to any country that formally adheres to the 1946 convention (IWC, 2009). As whale populations continued to decline, the IWC began to enact species-specific whaling bans. The hunting of bowhead whales (*Balaena mysticetus*) was the first to be banned in 1931 and the IWC went on to enact bans against hunting Southern and Northern right whales (*Eubalaena australis*; *Eubalaena glacialis*, respectively) (1925), gray whales (1937); humpback (*Megaptera novaeangliae*) and blue whales (*Balaenoptera musculus*) (1966), and sei whales (*Balaenoptera borealis)* (1979); except in Iceland 1979 (Parsons *et al.*, in press (a)).

The IWC began with three main committees: Scientific, Technical, and Finance & Administration, and in 2004 a new committee—the Conservation Committee—met for the first time (IWC, 2009). The Scientific Committee is made up of approximately 400 scientists (Parsons *et al.*, in press (a)) who are invited to join the Commission because of their expertise in an area of interest to the IWC or who are nominated by member governments (IWC, 2009). The Scientific Committee is responsible for providing scientific advice for the IWC Commissioners, especially on estimates of the abundance of cetacean stocks, reviewing environmental issues that may impact cetaceans, and making recommendations for future directions of scientific research, which is also published as an annual report as a special supplement of the *Journal of Cetacean Research and Managemen*t (IWC, 2009). This report is then read and discussed by the Commissioners[11] and their advisors, and serves as the basis from which the Commission develops its regulations for the control of whaling (IWC, 2009). Although the Commissioners' decisions are based on science, some have criticized the motives behind the Commissioners' decisions as being politically motivated (Parsons *et al.*, in press (a)).

Public and governmental concern for cetaceans and anti-whaling campaigns reached a peak in the 1970's. In 1972, the United States passed the Marine Mammal Protection Act (MMPA), which prohibited whaling and the sale of whale products in the United States, among other things. Additionally in 1974, the United States and Mexico

[11] The Commissioners are representatives of the IWC member nations and are often politicians or civil servants, (although some are also scientists) many being senior members of the governmental fisheries or environmental/conservation agencies (depending often on the stance of the particular country toward whales) of the member nation (Parsons *et al.*, in press (a)).

proposed a 10-year whaling moratorium at the United Nations Conference on the Human Environment in Stockholm. The moratorium passed 53 to 0, but it wasn't until 1986 that proposals were accepted by the IWC that established a zero catch quota for both pelagic and coastal whales (Parsons *et al.*, in press (a); Clapham & Baker, 2002). However, over 25,000 whales have been killed since the moratorium was put into effect. Norway had lodged a reservation to the moratorium and therefore is not bound by the ban; while Japan and Iceland (originally) continued to their whale hunts due to a loophole in the convention that allowed takes for "scientific purposes" (Parsons *et al.*, in press (a)).

Many cetacean species are still directly taken today by commercial whale hunts, lethal takes under the pretense of scientific purposes, aboriginal or subsistence hunts, or by culls or drive fisheries (Stroud, 1996; Reeves *et al.*, 2003). The commercial whaling industry is still active in Norway, Iceland, and Japan. Norway's commercial hunt currently allows the take of approximately 700 northern minke whales (*Balaenoptera acutorostrata*) in the North East Atlantic area, and the government is planning on increasing the quota to allow for the take over 1,000 individuals (Parsons *et al.*, 2010b). Iceland started "scientific" whaling in 2003, but resumed commercial whaling in 2006, despite a diplomatic demarche by 25 nations. The hunts ceased in 2007 due to a lack in demand for whale meat, but resumed in 2008. In 2009, Icelandic whalers caught 125 fin whales (*Balaenoptera physalus*) and 79 minke whales and enacted plans to export up to 1,500 tons of fin whale meat to Japan even though the trade of whale products is restricted under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (Parsons *et al.*, in press (a)).

Although, the Japanese insist their takes are for strictly scientific purposes and are intended to develop knowledge to ensure sustainable fisheries practices as whales are presumed to compete for their harvests, many leading cetacean scientists in the IWC Scientific Committee have critiqued this practice. The lethal sampling of whales for scientific research is extremely controversial (Gales *et al.*, 2005). Scientific whaling is permitted under Article VIII of the ICRW. This article gives each member nation the ability to grant its nationals a permit to take whales for scientific purposes, set its own quota, and establish its own research objectives. Japan currently conducts lethal directed takes of cetaceans for scientific purposes, although the use of the term "scientific" is very misleading (Clapham *et al.*, 2003; Parsons *et al.*, 2010b). Japan has taken approximately 7,900 minke whales, 243 Bryde's whales (*Balaenoptera edeni*), 140 sei whales, and 38 sperm whales (*Physeter macrocephalus*) since 1987 for "scientific" purposes, while all other nations have only killed 2,100 whales altogether for scientific research since 1952 (Gales *et al.,* 2005). The direction and relevance of this research has been heavily criticized, as much of the data reported to be gathered could have been obtained by using non-lethal methods that are much more efficient in achieving the same research goals (i.e. biopsy darts) (Gales *et al.,* 2005). According to Gales *et al.* (2005), Japanese scientific takes are effectively commercial whaling in everything but name. Japan's scientific whaling report was reviewed in 1997 by the IWC, which the report concluded that the research conducted failed to meet its stated objectives and that the data derived were "not required for management" (Gales *et al.,* 2005). Furthermore, very few peer-reviewed publications have derived from this research and no papers have been published in the

IWC's management-focused *Journal of Cetacean Research and Management*. If solid data are being gathered, they have not been shared with the wider scientific community. Clapham *et al.* (2003) continued that "many [IWC Scientific Committee] members have contended that Japan's scientific whaling program is so poor that it would not survive review by any independent funding agency." Lastly, Japanese research efforts have been criticized because the whale meat is processed and sold in markets after blubber and stomach content samples are taken (Clapham *et al.*, 2003), possibly leading to the "dependence upon these revenues [to] drive its quotas for scientific whaling, yet leave the real scientific questions unaddressed" (Gales *et al.*, 2005).

Indigenous communities are permitted to hunt a quota of whales for subsistence purposes in the Russian Federation, the USA, Greenland (Denmark), and Bequia (St. Vincent and the Grenadines) (Reeves *et al.*, 2003). The IWC currently sets aboriginal subsistence whaling quotas for certain whale stocks, to be used by indigenous peoples who demonstrate a *traditional*, *nutritional* and *cultural* need for hunting whales (Reeves *et al.*, 2003). However, some of these hunts include endangered species, such as the bowhead whale. Although aboriginal hunters have argued that their harvests are in line with cultural practices and history, there has been growing debate over these hunts as the hunters do not use traditional hunting methods, nor are they following traditional rituals, ceremonies, and practices before or after the hunt (Jenkins & Romanzo, 1998).

Lobbying has long been an accepted part of both national and international politics and it is practiced in the field of cetacean research and management, too. However, illegitimate lobbying methods such as vote coercion are widely deemed to be

unacceptable (Gillespie, 2001). At the end of the 1990's, a vote-buying allegation was made public against the Japanese government (Gillespie, 2001). Allegations surfaced after the Japanese Vice-Minister for Fisheries, Mr. Hiroaki Kamey, publicly commented that:

> "We would like to utilize overseas development aid as a practical means to promote nations to join [the IWC], expanding the grant aid towards non-member countries, which support Japan's claim" (Brown, 1999).

Countries such as Antigua and Barbuda, Dominica, Grenada, Guinea, Morocco, Panama, St. Lucia, St. Vincent and the Grenadines, St Kitts and Nevis, and the Solomon Islands have all confirmed that they had received Japanese subsidies to fund fishing fleets, for fish processing plants, and reports confirm that a conference center was paid for from the overseas aid (Brown, 1999). This aid money is said to be contingent upon votes supporting Japan's position at the IWC (Miller & Dolšak, 2007). In response to the vote-buying controversy, the IWC passed a specific resolution (Resolution 2001-1) on transparency within the Commission in 2001, which endorsed and affirmed "the complete independence of sovereign countries to decide their own policies and freely participate in the IWC (and other forums) without undue interference or coercion from other sovereign countries" (Gillespie, 2001)

Bottlenose dolphin hunts

Bottlenose dolphins are still culled[12] worldwide for human consumption, bait, and to reduce competition with commercial fisheries (Wells & Scott, 2002), especially in areas such as Peru, Sri Lanka, the Black Sea, and Japan. Peruvian fishermen use harpoons and gillnets to capture and kill bottlenose dolphins and other small cetaceans[13] for human consumption and bait (Hammond, 2008). Fishermen in Sri Lanka and Taiwan carry harpoons and will kill dolphins and other whales if the opportunity presents itself (Hammond, 2008). In the northern Adriatic Sea, extermination campaigns to reduce competition for fish have played a large role in the 50% decline of the bottlenose dolphin population over the past 50 years. These extermination campaigns were conducted until the early 1960s (Bearzi *et al.,* 2004; Bearzi & Fortuna, 2006). There have also been historical culls in the Black Sea off of Turkey for commercial products (Buckland *et al.,* 1992) that included takes of at least 24,000-28,000 during 1946-1983. These numbers, however, are greatly underestimated as figures did not include, or only partially included catch statistics from other Black Sea countries. The total number of dolphins actually killed in this area was probably greater by tens of thousands (Birkun, 2006).

Drive fisheries[14] have targeted dolphins in Denmark's Faroe Islands and Japan. The Faroe Island drive fisheries date back to 1803, and approximately 300 small

[12] Culls occur when cetaceans are killed in the name of removing a potential competitor for fisheries resources (Earle, 1996).
[13] Small cetaceans include all odontocete species except for sperm whales, plus the pygmy right whale (*Caperea marginata*).
[14] A small fleet of motorized boats is sent out to locate a pod of small cetaceans. Once found, the animals are herded towards shallow water as the fishermen use the noise of the boat engines and bang pipes underwater to disorient the cetaceans. The animals are then

cetaceans including dolphins and long-finned pilot whales are taken annually (Bloch, 1998). In Japan, more than 20,000 cetaceans are culled each year, largely by the drive fishery of Taiji and Futo, for human consumption and to remove presumed fishery competitors (Wells & Scott, 1999). The average annual catches from hunts conducted between 1995 and 2004 were 594 (Kasuya, 2007), and at least 400,000 dolphins have been killed in the past two decades (Harnell 2007). The dolphins that are slaughtered for human consumption or fertilizer in these fisheries are only worth a few hundred U.S. dollars; however, some of the individuals are captured and sold to the public display industry for as much as tens of thousands of U.S. dollars (Rose *et al.*, 2009). Although the whaling moratorium is still in effect today, there is no international body that monitors or manages the hunts of small cetaceans (Parsons *et al.*, in press (a)), and some member states do not recognize the IWC's competence to manage "small cetaceans" (i.e. Japan) (Fisher & Reeves, 2005).

To date, there have been no records of cetaceans being hunted or eaten at Turneffe Atoll (Campbell *et al.*, 2002). Although the Government of Belize originally signed the ICRW on July 15, 1982, the Ambassador of Belize gave notice of withdrawal from the Convention by the government on December 30, 1987, and their withdrawal became effective on June 30, 1988. No reasons were given for the decision, and Belize's current IWC Commissioner was not available for comments. Although there is speculation that Belize was possibly offered assistance by Japan in exchange for a pro-whaling vote at the IWC, these reports could not be confirmed. Belize reconsidered its

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driven into shallow water or onto the shore where they are slaughtered or selected for a public display facility (Rose *et al.*, 2009).

position and elected to re-sign on to the ICRW again on July 17, 2003 (Department of State, 2009), and it has maintained an anti-whaling stance at the IWC to date.

Captivity

Although there is an extensive history of the hunting of marine mammals, the capture of marine mammals for display has only become prevalent in the last century. Very few records of marine mammals in captivity exist before the late 1930's, however interest in keeping marine mammals in captivity arose in the middle of the eighteenth century (Mignucci-Giannoni, 1998). Some of the first documented captive records for marine mammals included: Scandinavian rulers keeping polar bears (*Ursus maritimus*) sometime before the Middle Ages; Roman guards keeping a live stranded orca (*Orcinus orca*) in the Coliseum for sport in 1 A.D.; and seals being kept in menageries in the 18th Century (Corkeron, 2002). P.T. Barnum was one of the first to keep two cetacean species in captivity, bottlenose dolphins and beluga whales (*Delphinapterus leucas*), in his New York museum in the middle of the eighteenth century. England's Brighton Aquarium followed in Barnum's footsteps in the late 1800's and in 1938, "Marine Studios" (now Marineland) opened in St. Augustine, Florida, with a bottlenose dolphin as its main attraction (Corkeron, 2002). Marine Studios gave rise to the world's first "oceanarium" and launched the modern era of marine mammal facilities found worldwide today (Corkeron, 2002).

Between the 1950's and the end of the 1970's, the number of marine mammals put into zoo and aquarium displays rose steeply in North America, Europe, and Australasia as capture techniques improved (Mignucci-Giannoni, 1998; Corkeron, 2002). Popularity of these exhibits increased exponentially after the television series, *Flipper*, publicized a trained bottlenose dolphin's acrobatic abilities and water-dancing antics between 1964 and 1967 (Corkeron, 2002; Anonymous, 2005).

Bottlenose dolphins, Pacific white-sided dolphins (*Lagenorhynchus obliquidens*), beluga whales, orcas, and false killer whales (*Pseudorca crassidens*) are the species most commonly kept in captivity and of those, the bottlenose dolphin is the most commonly displayed cetacean across all continents (Anonymous, 2005). In 1983 alone, it was estimated that over 1,300 marine mammals were held worldwide in oceanaria and zoological parks for both public display and scientific research purposes (Duffield & Dimeo-Ediger, 1984). Furthermore, the International Whaling Commission has estimated that 4,500 cetaceans have been displayed in captive facilities (Johnson, 1990).

The growing debate over the ethics of capturing and maintaining marine mammals in captivity temporarily stopped the growth of the marine mammal display industry in the 1980s and even caused the closing of some facilities (DeMaster & Drevenak, 1988; Corkeron, 2002; Curtin & Wilkes, 2007). Between 1975 and 1986, the number of dolphinaria facilities in the United Kingdom decreased from forty-one to six and the industry completely collapsed shortly after due to growing ethical debates, anti-captivity campaigns, and an overall shift in public opinion about confining these animals in captivity and training them to become performers. A survey conducted in 1996

revealed that 85% of the British public found it unacceptable to keep whales and dolphins in captivity (Franklin, 1999; Hughes, 2001; WDCS, 2010).

In 1984, the United States Marine Mammal Commission expressed concern about the possible impacts of chase capture methods and revealed their suspicions that the actual impacts of capture operations were more extensive than those described in the permits (Twiss, 1984). Furthermore, captures were not required to be monitored at all in the U.S. until 1990; once in place, the U.S. National Marine Fisheries Service (NMFS) did not consistently enforce monitoring efforts (Mooney, 1998). Permitting requirements now demand that facilities record estimates for the number of animals that are chased, encircled, temporarily retained, and released, but the number of animals accidentally killed remains unknown (Mooney, 1998). Although the United States requires that some environmental impact analyses be performed before captures are allowed, these analyses are often scientifically unsound and are not required in foreign waters (Rose *et al.*, 2009). Furthermore, legislative measures have either severely tightened captivity regulations or prohibited the live capture, importation, or display of cetaceans in several areas (Lavigne *et al.*, 1999). Although regulations and restrictions continue to increase, the industry has remained, at the least, as diverse and formidable as it ever was (Reeves, 2003; Fisher & Reeves, 2005).

Historically, bottlenose dolphins were captured from the wild for three purposes: public display, research, and for military applications (Leatherwood & Reeves, 1982). The MMPA prohibited also the take of wild animals in U.S. waters in 1972; however, exemptions were made for the marine mammal display industry that allowed marine

mammal takes and captive display for education and conservation purposes. The exemptions became problematic because the act failed to define what constitutes as a valid educational reason or how or why public display furthers conservation. In addition, the act gave no justification for why the public display of marine mammals would be necessary to fulfil such educational voids (Rose *et al.*, 2009). According to Rose *et al.* (2009), members of congress were under the impression that the public display of animals was necessary to further education and conservation campaigns when the MMPA was passed and that this legislation was developed without the consent of the scientific community (Rose *et al.*, 2009). DeMaster and Drevenak (1998) continued that those involved in the passing of the MMPA and similar legislation in other countries identified marine mammals as sources of aesthetic, recreational, and economic significance.

Contrary to popular belief, live captures of cetaceans such as dolphins, belugas, and orcas for aquariums and marine theme parks continue today in areas such as Mexico, Honduras, the Dominican Republic (Parsons *et al.*, in press (b)), Colombia (Mignucci-Giannoni, 1998), Japan, China (Wells & Scott, 1999), the Solomon Islands (Parsons *et al.*, 2010b), Cuba (Van Waerebeek *et al.*, 2006), the Black Sea, and Russia (Birkun, 2006). These non-lethal takes have depleted wild populations of cetaceans all over the world and at times have brought populations to the brink of extirpation or extinction (Mignucci-Giannoni, 1998; Parsons *et al.*, 2010a). Furthermore, all currently used live cetacean capture methods are considered extremely traumatizing, invasive, stressful, and potentially lethal (Rose *et al.*, 2009). Most cetaceans are captured after being chased by high-speed boats, wrestled into submission, hauled out onto a boat and then dumped into

a shallow temporary holding tank (Rose *et al.*, 2009). Cetaceans are also caught by using seine-nets[15] or hoop nets[16], or are selected from a drive fishery.[17] The capture of a single individual can result in the harassment, harming, or even killing of multiple dolphins (Frohoff, 2004). Small and DeMaster (1995) and Woodley *et al.* (1997) found that mortality rates of captured bottlenose dolphins increase six-fold immediately after capture and did not decrease to normal captive levels for up to 35-45 days post capture.

Current conservation philosophies focus on saving natural habitats and their residents; therefore, removing dolphins from the wild to supply the display industry is contradictory to such philosophies (Frohoff, 2004). In a report made by the IUCN/SSC Cetacean Specialist Group, Reeves *et al.* (2003) stated that:

> "[The] removal of live cetaceans from the wild for captive display and/or research, is equivalent to incidental or deliberate killing, as the animals brought into captivity (or killed during capture operations) are no longer available to help maintain their natural populations. When unmanaged and undertaken without a rigorous program of research and monitoring, live-capture can become a serious threat to local cetacean populations".

Dolphins and other small cetaceans should not be removed from wild populations unless that specific population has undergone an assessment that determines delineation of stock

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[15] Natural resource managers consider seine netting captures the most humane. In this method, dolphins are chased by small boats, herded together, and encircled by a net (Rose *et al.*, 2009).

[16] During a hoop net capture, a collar attached to a break-away net is lowered over the head of a swimming dolphin that is bow-riding in front of the boat. As the dolphin swims away the animal becomes entangled in the net and then is pulled on boar the boat (Rose *et al.*, 2009).

[17] Younger more viable dolphins are often selected out and sold to dolphin aquariums in need of performing dolphins during drive fishery hunts in the Taiji and Futo drive fisheries in Japan (Harnell, 2007).

boundaries, abundance, reproductive potential, mortality, and status/population trends. Such assessments should also undergo peer-reviewed scientific analyses to determine how many individuals can be taken or captured without reducing the population's long-term viability or compromising its role in the ecosystem (Reeves *et al.*, 2003). If a sexually mature dolphin is removed from its wild population, that individual can never be replaced and the population maybe compromised. However, if a dolphin dies in captivity, a replacement can easily be captured from the wild with no consideration of the effect on the population (Frohoff, 2003).

Although the growth of marine mammal exhibits slowed in the 1980s, the decrease was only temporary for most areas of the world. Capturing dolphins for international sale and keeping marine mammals in captivity seems to even be a developing industry, especially in the Caribbean (Mignucci-Giannoni, 1998). Facilities that provide the public with the opportunity to watch and interact with marine mammals, especially dolphins, have become increasingly popular in the last twenty years (Curtin & Wilkes, 2007). These facilities provide the public with hands on interactions through petting pools,[18] swim-with-the- dolphin (SWTD) program,[19] or dolphin assisted therapy

[18] Petting pools allow the visitors to lean over the perimeter of a pool to touch or feed animals such as dolphins, sea lions, belugas and even orcas (WDCS & HSUS, 2003).
[19] SWTD facilities provide guests "educational opportunities" in a wide range of natural, semi-natural, and artificial environments, ranging from sea pens in tropical waters (as with several facilities in Florida) to concrete tanks (such as the facilities at Sea World) (HSUS, 2009).

programs (DAT)[20] (Curtin & Wilkes, 2007). Although, the exact number of captive cetaceans and facilities worldwide is not known, a survey that was conducted in 2005 determined that there are 199 known research and display institutions that house dolphins and whales in 49 countries (Anonymous, 2005). Furthermore, approximately 45 of the surveyed facilities were located within the United States and 14 – 18 of those facilities were either dedicated SWTD facilities or had dolphin show exhibits as the main feature of the marine park or aquarium (Anonymous, 2005; HSUS, 2009). Approximately 70% of captive dolphins within the United States are held primarily for *public display* and the remaining animals are used for research and military purposes (Wells & Scott, 1999).

Members of the captive display industry argue that their facilities and marine mammal exhibits provide a valuable educational experience to the public at large and serve an important conservation function and therefore follow regulations set forth by the MMPA (Rose *et al.,* 2009). For example, several zoological parks, aquaria, SWTD programs, and marine parks, provide online educational tools such as animal fact sheets, information and packets specifically for teachers, and interactive children's programs or games on their websites. Additionally, many facilities are involved with their local communities and frequently give presentations at schools, hospitals, and children centers. Many of these facilities also advertise that they have naturalists and or animal experts either throughout the park(s) throughout the day or stationed at specific locations to

[20] DAT programs offer therapeutic programs to patients (including young children) suffering from, Down's syndrome, cerebral palsy, cancer, head and spinal injuries, or autism among other conditions, (HSUS, 2009).

answer visitors' questions and provide the visitors with interesting facts and information about the animals and their habitats. However, despite claims from the industry that marine mammal facilities increase the public's knowledge of marine mammals, no peer-reviewed studies have documented significant educational benefits from captive facilities (Carlson & Frohoff, in prep.; Rose *et al.,* 2009). In fact, peer reviewed articles show the exact opposite effect. Curtin and Wilkes (2007) interviewed individuals that had participated in SWTD programs after they returned from their trips. The respondents could not remember many details of the educational information the trainers provided and one of the respondents was quoted saying:

> *"There was a brief talk, but to be honest, I can't remember much about it, I think I was so excited about the prospect of going in the water with the dolphins that I didn't pay much attention."*

Additionally, scientific information presented at facilities is often incorrect or distorted in order to avoid negative publicity. For example, facilities do not present any information against live captures, thus avoiding giving the public any reason to view them in a negative way (Rose *et al.*, 2009). Facilities that have animal shows such as SeaWorld Parks and the Gulfarium (Fort Walton, FL) provide little information about the natural history, ecology, behaviours, natural habitats, worldwide distribution, or threats to the animals being displayed (Davis, 1997). For example, in SeaWorld's 'The Making of "Believe" Video[21]', Laura Surovik, assistant curator for animal training, claimed, "*This is*

[21] This video was removed from SeaWorld's website after a trainer was killed on February 24, 2010, but can still be found online.

an opportunity of a lifetime. To put a brand new killer whale SHOW in and to actually go to another level".

Marine mammal exhibitors claim that by simply viewing or interacting with the animals, visitors make a personal connection with the animal. This connection piques the visitors' curiosity increasing their interest in the animal thereby driving them to learn more about marine mammals and increases their motivation to donate money towards, or become actively involved in, the conservation of the species. SWTD programs advertise and promote that interacting with the dolphins will be a "life changing experience" (Curtin & Wilkes, 2007) and that you will make "a friend that will live in your heart forever" (Discovery Cove, 2009b). One SWTD program, Discovery Cove, located in Orlando, FL, claims that their guests "gain a one-of-a-kind, personal connection with the animals that goes far beyond classroom education (Discovery Cove, 2009a)." However, it has been argued that these interactions are not a true exchange (Curtin & Wilkes, 2007).

A cetacean's high level of intelligence makes them more desired by the captive industry (Rose *et al.*, 2009). Because these animals possess the ability to learn human commands, natural behaviors are cultivated, changed, and disciplined through operant conditioning in the training process (Curtin & Wilkes, 2007; Rose *et al.*, 2009). The marine mammals wave to the audience and kiss swimmers because they have been trained to perform in order to achieve a desired reward, but not because they have independently sought the human interaction (Curtin & Wilkes, 2007). Furthermore, display industries that offer some type of human interaction with marine mammals gives

the public the misconception that it is okay to interact with wild dolphins, which in fact is prohibited in U.S. waters under the MMPA.

Captive facilities often promote themselves as conservation enterprises; however, less than ten percent of zoos, dolphinaria, and aquaria are involved in conservation programs in the natural world or in captive settings (Rose *et al.*, 2009). Captive facilities also advertise their involvement in conservation efforts by promoting species enhancing husbandry or rehabilitation programs; they may even join stranding networks designed to rescue beached animals. As bottlenose dolphins are the most common species found in captivity, claims of species enhancing programs as a primary institutional purpose are unfounded as this species of dolphins are neither threatened nor endangered (Rose *et al.*, 2009). Such programs would need to target threatened or endangered species to be plausible. Furthermore, reintroduction programs for captive-bred marine mammals to the wild have only been minimally successful. Beck *et al.* (1994) reviewed 145 reintroduction programs for captive bred-species and found that only 11% of the programs achieved any degree of success. Limited reintroduction success in cetaceans can be attributed to the fact that captive-bred animals never learn how to forage, never develop appropriate communication skills, and lack the understanding of the social hierarchies of their wild conspecifics (Snyder *et al.*, 1996). Therefore, it has been argued that captive breeding programs at dolphinaria create a surplus of animals that may never be released into the wild, thereby only propagating the captive industry (Rose *et al.*, 2009).

Finally, facilities claim to raise money for marine mammal conservation efforts by incorporating conservation fees in their entrance fees, adopt-an-animal programs, donating a portion of proceeds from merchandising to conservation, and by of course, accepting donations from visitors; however a study conducted by Bettinger and Quinn (2000) showed that aquarium and zoos that belonged to the American Zoological Association (AZA) contributed just a tenth of one percent of their operating budgets on conservation efforts, in contrast to the estimated 10% that is necessary to make a significant conservation contribution (Kelley, 1997). In 2007, the SeaWorld and Busch Gardens Conservation Fund allocated $1.3 million USD to conservation projects, which was the largest contribution to date. Although seemingly generous at a first glance, this amount represents less than one percent of the revenue that is generated by SeaWorld Orlando alone (Rose *et al.*, 2009). To put things in perspective, an estimated 50 million people visited marine park facilities in 1993 alone and reportedly spent at least US $1 billion dollars (Kestin, 2004). Additionally, approximately 3 million people visited SeaWorld San Antonio in 2008, and although revenues obtained by these facilities are not released, one can estimate the revenue that would be generated in ticket sales alone. In 2008, ticket prices ranged between $38.99 USD for children to $48.99 USD per adult; therefore, SeaWorld San Antonio would have generated US $90 million in ticket sales alone (Bailey, 2008). Furthermore, because of the large vested interest in the public display industry, some dolphins have become so valuable that they are said to be worth up to US $5 million because they are able to bring in US $2,000 - $3,000 USD per day or up to US $1 million a year (Curtin & Wilkes, 2007).

The captive cetacean industry also maintains the stance that it enhances the lives of marine mammals by protecting them from environmental rigors; however it is counter-argued that these animals have evolved physically and behaviourally to survive such rigors (Rose *et al.*, 2009). Proponents of the captive industry would argue that cetaceans benefit from captivity because there is food security, exceptional medical care, and protection from predators, but conversely Rose *et al.* (2009) argue that cetaceans' natural activity levels, sociality, hunting behaviours, and acoustic perceptions are all compromised by the circumstances of captivity. For example, wild dolphins will travel long distances (up to 150km / 93mi) daily in search for food while reaching speeds of up to 35kph (22mph). Captive settings greatly reduce a cetacean's activity level because the animals are no longer able to hunt since they are hand fed frozen fish (Rose *et al.*, 2009). The captive display industry counters that training sessions for marine mammal performers adequately replaces the stimulation of hunting for these individuals, but there is no scientific evidence to support such claims. Instead, it is argued that a dolphin's livelihood is greatly diminished because natural foraging patterns are lost. Moreover, by hand feeding the dolphins, the animals learn to associate food with operant conditioning usually associated with training. Furthermore, it is argued that if the diet of captive dolphins were efficient and nutritionally comparable to the diet of wild dolphins, there would be no need to give captive cetaceans vitamins and mineral pills on a regular basis (Rose *et al.*, 2009).

Additionally, a dolphin's home range can often exceed 100km^2, therefore confining cetaceans in a pool that is merely six or seven times its body length, guarantees a lack of

aerobic conditioning (Rose *et al.*, 2009). Such confinement also brings about stereotypical behaviours such as pacing and self-inflicted trauma that have also been documented in other wide-ranging carnivores in captivity (Rose *et al.*, 2009). As previously discussed, dolphins have complex social lives in which they form life-long alliances and associate with other conspecifics throughout the day; therefore, no captive facility—natural, semi-natural, or artificial—can recreate a habitat that fully fulfils the vast needs of cetaceans.

Arguably, there is significant evidence to support the position that captivity severely compromises a dolphin's quality of life (Curtin & Wilkes, 2007). For example, captive cetaceans exhibit behaviours that are considered to be indications of high stress (Frohoff, 2004), have high mortality rates (DeMaster & Drevenak, 1988; Small & DeMaster, 1995) and have been observed displaying a variety of behavioural abnormalities (Rose *et al.*, 2009). Stress has been known to severely affect the health of captive cetaceans, and the following conditions have all been attributed as signs of stress in cetaceans: weight loss, lack of appetite, increased anti-social behaviour, reduced calving success, arteriosclerosis, stomach ulcers, changes in blood cell counts, reduced immune response, and death (Fowler, 1978; Moberg, 1985; Weiner, 1987; Apanius, 1998; Sapolsky, 2004).

Assessing stress in captive dolphins is challenging because of the animal's unique anatomy and their aquatic environment. Obtaining and interpreting physiological data in marine mammals is problematic beyond visible characteristics such as emaciation and perceptible wounds (Curtin & Wilkes, 2007). Stress-related behaviours may be overlooked or misinterpreted and can vary among individuals depending on age, gender,

reproductive status, social and environmental conditions, group size and composition, and the temperament of each individual (Curtin & Wilkes; Rose *et al.*, 2009). Disparities can also be related to variation in species, and previous experiences (i.e. how traumatic their catch and transportation have been); therefore, behavioural monitoring should serve as the primary indicator of an animal's physiological and psychological condition (Curtin & Wilkes, 2007). Frohoff (2004) believes that stress and its associated effects play a significant role in dolphin mortality and aggressive behaviour.

As previously stated, mortality rates of captured bottlenose dolphins increase six-fold immediately after capture (Small & DeMaster, 1995; Woodley *et al.*, 1997). Studies conducted by DeMaster and Drevenak (1988) and Small and DeMaster (1995) found that the survival of bottlenose dolphins varied significantly among institutions. Furthermore, records show that healthy captive cetaceans die regularly at young ages with little to no warning (Rose *et al.*, 2009). If captivity truly enhanced the lives of cetaceans, then one would expect to see improved survivorship profiles for both adults and calves, especially since these animals have access to modern veterinary care and are protected from both natural and human-caused hazards (Rose *et al.*, 2009).

Lastly, human – cetacean interactions can be dangerous for both the animals and the people. Confinement in captive settings have lead to a variety of behavioural abnormalities in marine mammals such as consumption of foreign objects, self mutilation, stress induced vomiting, excessive sexual behaviour, and increased aggression (Curtin & Wilkes, 2007). More than half of marine mammal caretakers and trainers have been injured by the animals that they interact with (n=251) (Mazet *et al.*, 2004), and

in some cases such interactions have been fatal as seen in recent events.[22] Disease transmission rates between marine mammals and humans are also high (Rose *et al.*, 2009). Therefore, both humans and marine mammals are exposed to great risks and many organizations argue that if tourists knew the 'real cost' (Frohoff, 2004) to the dolphin, then they would think twice before participating in such activities (Curtin & Wilkes, 2007).

In summary, the ethical debate over whether it is humane to keep marine mammals in captivity continues today. The current reasoning against captivity is that dolphins are removed from wild populations to supply new attractions; they are forced to perform unnatural tricks for food; their lifespan is reduced considerably; they can suffer stress-related disorders; their size, strength and unpredictability can be a potential risk to humans; their lives are devoid of naturalness; people do not receive an accurate picture of the animals' natural lives; performances fuel an anthropomorphic and distorted understanding of dolphin behaviour; and the industry desensitizes people to captivity's inherent cruelties (Johnson, 1990; Frohoff, 2003; Bulbeck, 2005; Rose *et al.*, 2009). In its defense, the captive industry claims that the welfare of the dolphin in captivity is enhanced, not compromised; marine mammals are no different than other captive wildlife species; and that the debate against captivity is laden with emotional overtones and a

[22] On February 24, 2010, an orca (the largest dolphin species) that had been involved in two previous deaths attacked and killed a trainer at SeaWorld Orlando despite being warned by the Occupational Safety and Health Administration (OSHA) about the inherent dangers of swimming with killer whales (Kaye, 2010).

decision should be made on a non-emotional basis (Kirtland & Stringer, 1995; Samuels & Spradlin, 1995; Small & DeMaster, 1995, Kyngdon *et al.*, 2003).

There has only been one captive dolphin facility in Belize, and the institution was only open for eighteen months. The Hugh Parkey Foundation submitted a proposal to develop a dolphin park at Hugh Parkey's Adventure Lodge (HPAL), Spanish Caye Lookout, Drowned Cayes, Belize, and the proposal was accepted after Belize's Department of the Environment (DOE) completed an Environmental Compliance Plan for the dolphin park. Prior to the arrival of the dolphins in Belize, four Belizean trainers/care-takers spent approximately 3-6 months training with the animals in Roatan, Honduras, at the Roatan Institute of Marine Science (RIMS) on Anthony's Key (C. Self-Sullivan, pers. comm.). RIMS is one of the few Caribbean facilities that has had success with its captive-breeding program (N. Rose, pers. comm.). In 2006, HPAL received four captive born bottlenose dolphins (3 males, 1 female) that were all between the ages of three and four years from RIMS. There is speculation that dolphins that were captured during an illegal take near Roatan Island in March of 2005,[23] may have replaced the dolphins that were transported to Belize from RIMS. The dolphins that were transported to HPAL from RIMS were "on loan" to HPAL and were accompanied by their primary trainer from Roatan. These dolphins were kept in a four-acre natural lagoon enclosure.

[23] During the IWC's Small Cetaceans Sub-committee meeting in 2006, researchers reported that 15 dolphins were captured illegally near Roatan, Honduras in March of 2005. The disposition (released, died, retained, or exported) of these animals was not reported (IWC report of the Sub-Committee on Small Cetaceans, 2007).

In 2007, HPAL closed its dolphin park because it had become financially unsustainable after a strong downturn in the tourism industry, and the dolphins and their trainers were returned to RIMS.

Attitudes

Studies on cognitive structure have examined the nature of knowledge, as well as, how knowledge influences and is influenced by learning in the natural sciences (Novak & Gowan, 1984; Novak, 1998). Studies show that the relationships among cognitive structure, attitudes, and behavior are conceptually rich, especially in scientific domains (Simpson *et al.*, 1994). Furthermore, there is a considerable amount of literature that discusses the correlations between attitude and behavior (ABCs) but these studies are limited to fields outside of the natural science arena (Thompson & Mintzes, 2002). However, ABCs have exhibited significant practical implications in many disciplines including conservation and environmental protection and preservation (Thompson & Mintzes, 2002), and ABCs have been exceptionally successful in evoking changes in public behavior patterns through broad scale education efforts (Runkel, 1992).

Eagly (1992) defined attitude as "a tendency or state internal to a person which biases or predisposes a person toward evaluative responses which are to some degree favorable or unfavorable." Such tendencies consist of a collection of cognitive, affective, and behavioral components (Weiten, 1997). The cognitive component is comprised of a series of beliefs or values that a person maintains, while the emotions a person feels after being stimulated by and attitude or object make up the affective component. Lastly, the

behavioral component consists of a set of predispositions to act a certain way (Weiten, 1997). According to Kraus (1995), "the most fundamental assumption underlying the attitude concept is the notion that attitudes, in some way, guide, influence, direct, shape, or predict behavior." Furthermore, Dietz and Stern (1995) illustrate that when an individual is presented with a new attitude object and posses a limited knowledge base, their response will be determined by their ability to quantify the object's value in relation to a pre-established value system derived from prior stored responses to similar attitude object interactions.

As outdoor social activities continue to threaten marine ecosystems, environmentally sustainable safeguards must be put into place in order to protect the long-term population viability of cetaceans (Dietz *et al.*, 2005). The issue of environmental sustainability, however, is dependent upon social values; the definition of which relies upon context. Changes in one's values directly affect one's beliefs, decisions made, and behavior exhibited, a relationship aptly demonstrated by the "Values-Beliefs-Norms (VBN) Theory" (Dietz *et al.*, 2005). Thus, according to the VBN Theory one can reduce threats to general environmental values by altering beliefs concerning the subsequent consequences of defying current norm (Dietz *et al.*, 2005). Moreover, individuals that are committed to conservation may have strong interests in promoting positive attitudes with the hopes that such efforts will result in attitudinal changes that could directly influence public behavior.

Kellert and Berry (1980) found a direct relationship between education level and concern, interest and awareness of environmental issues. The study showed that

individuals the had obtained higher levels of education resulted in more "naturalistic,"[24] "ecologistic,"[25] "humanistic,"[26] and "moralistic,"[27] attitudinal tendencies according to Kellert's (1996) attitudinal scales, while individuals with less education possessed "utilitarian,"[28] "dominionistic,"[29] and "negativistic"[30] attitudes. Furthermore, Kellert (1996) determined that education was the most powerful force shaping perception of nature and biodiversity.

It has been suggested that Americans value various animal species based on historical attitudes, emotions that are educed by the species, and functionality or usefulness to humans (Driscoll, 1995). Additionally, attitudes, both negative and positive, can also be shaped on whether or not a person has encountered the species first hand (Dobson, 2007). Environmental educators and advocates have long recognized the value of "charismatic megafauna," such as the bottlenose dolphin, bald eagle (*Haliaeetus leucocephalus*), and giant panda (*Ailuropoda melanoleuca*), for capturing and directing

[24] Naturalistic individuals are defined as individuals that are interested in a direct experience with animals and exploration of nature (Kellert, 1996).
[25] Ecologistic individuals are defined as individuals that are concerned for the environment as a system and for interrelationships of wildlife species and the environment (Kellert, 1996).
[26] Humanistic individuals are defined as individuals that are interested and show strong affection for animals, with strong emotional attachment and "love" for them (Kellert, 1996).
[27] Moralistic individuals are defined as individuals that are concerned for the right and wrong treatment of animals, with strong opposition to exploitation or cruelty towards animals (Kellert, 1996).
[28] Utilitarian individuals are defined as individuals that are concerned for the practical and material value of animals; their body parts or habitats, or both (Kellert, 1996).
[29] Dominionistic individuals are defined as individuals that are interested in the mastery and control of animals, as in sporting or other competitive contexts (Kellert, 1996).
[30] Negativistic individuals are defined as individuals that are oriented towards an active avoidance of animals as a result of dislike or fear (Kellert, 1996).

the public's attention towards conservation and preservation of the natural environment (Barney *et al.*, 2005). Although many charismatic species are often threatened or endangered, some are used as a conservation flagship species to focus concern or awareness on otherwise less visible problems of ecosystem degradation (Barney *et al.*, 2005). Bottlenose dolphins often produce positive, aesthetic, and humanistic views (Kellert, 1999). Ironically, scientists have suggested that such attitudes encourage human-animal interactions that are often harmful and sometimes fatal to the dolphins (Barney *et al.*, 2005). However, Barney *et al.* (2005) found that the most knowledgeable and environmentally responsible individuals in their study were the least likely to engage in disruptive or potentially harmful harassment behaviors towards dolphins.

Many demographic factors, such as age, gender, residency (urban vs. rural), ethnicity, income, and wildlife activities, have all been found to affect attitudes towards the natural environment. Kellert (1976) found that people's attitudes significantly change with age. Children's (ages 6-9) attitudes tend to center around emotional relationships towards animals, but these views shift to ones that focus on cognitive or factual understandings by the time they are young adolescents (ages 10-13). A third and final shift occurs post-adolescence leaving people with a view that embraces both an ethical concern and ecological awareness of the role of animals in their natural habitats (Kellert, 1976).

Variations in perceptions and behavior due to differences in gender appear to have both theoretical and practical importance. Kellert and Berry (1987) found considerable differences between male and female attitudes, knowledge, and behavior towards

animals. The results of their study showed that women seemed to value animals as objects of affection and expressed concern regarding the consumptive exploitation of wildlife, whereas males were more inclined to value animals for practical and recreational reasons. Additionally, males were far more knowledgeable and less fearful of wildlife (Kellert & Berry, 1987). Similarly, Thompson and & Mintzes (2002) found that females were significantly more "moralistic" and significantly less "naturalistic" and "utilitarian" than males according to Kellert's (1996) attitudinal scales. Furthermore, Kellert and Berry (1987) concluded that gender is among the most important demographic factors that influence attitudes about animals.

As previously noted, there have been no surveys conducted to establish the baseline level of public behaviors, attitudes, and knowledge of cetaceans or their conservation in Belize. Therefore, this study serves as a case study of the tourists that travel to Oceanic Society's Blackbird Caye Field Station, Turneffe Atoll. Specifically the purpose of this study is to:

(1) assess the participants' opinion on cetacean conservation issues, whaling and captivity, and their possible ramifications;
(2) assess the participants' environmental stewardship and green consumerism;
(3) explore the effects age, gender, education level had on a participant's behavior, attitude, and knowledge;
(4) explore the effects viewing dolphins in the wild had on a participant's behavior, attitude, and knowledge;
(5) determine if a participant's level of behavior, attitude, and/or knowledge differed amongst three different whalewatching categories (dedicated whale research, incidental whaling, and other marine tour); and

(6) determine if a participant's level of behavior, attitude, and/or knowledge differed between the type of tour the participant was partaking in (research vs. natural history).

CHAPTER 2: METHODOLOGY

A draft survey instrument (Appendix I) was initially administered to a small trial population comprised of graduate students and faculty members in the Environmental Science and Policy department at George Mason University in Fairfax, VA, in order to ensure that questions were comprehensible and unambiguous. Feedback from this trial was used to make revisions. George Mason University's Human Subjects Review Board approved the revised questionnaire and the proposed survey method for administering the questionnaires before the current study commenced.

Between 2007 and 2008, the revised questionnaire (Appendix I) was administered to volunteer participants at Oceanic Society's Blackbird Caye Field Station, Turneffe Atoll, Belize, with a 94.31% response rate (n=166 completed surveys). Guests at the field station were asked if they would like to participate in the study and were instructed to sign a consent form releasing the information they provided if they chose to participate. Since the guests created a "captive" audience, the author of the study left the room immediately after introducing the questionnaires so that no answers would be prompted or influenced and anonymity would be maintained. There were no incentives for participating in the study; it was strictly voluntary. Survey materials were collected after the author had been notified that all participants had finished. Collected surveys were each assigned a number and the participants' responses were number coded based

on a predetermined coding system (Appendix II) and were then entered into an Excel spreadsheet. To check for coding errors, two volunteers were selected to recode a random set of 50 surveys and compare their responses to the original dataset. No errors were found in any instances.

After the data was coded in an Excel spreadsheet, it was then transferred into Stata/IC 10.1 for Mac OS X. The data in Stata/IC 10.1 was then checked for transfer errors by comparing seven random cells from each survey (or 10% of the data) to the Excel database. Any errors that were found in Stata/IC 10.1 were corrected and the entire column and row of data were then checked against the Excel database. Stata/IC 10.1 was used for all statistical analyses.

Questions from this point forward will be referenced by their variable code. Questions in part I, dolphin watching, were labeled as dolX (1-10); questions in part II, cetacean conservation, were labeled as conX (1-4); questions in part III, whaling, were labeled as whaX (1-9); questions in part IV, captivity, were labeled as capX (1-10); questions in part V, environmental behavior, were labeled as enX (1-9); and questions in part VI, demographics, were labeled as demX (1-12). "X" in all variables refers to the question number in that section. Two part questions were further labeled "Xy" where "y" was a, b, or c depending on the number of sub-questions. The questionnaire used in this study can be found in Appendix I, and the codebook with corresponding question labels can be found in Appendix II.

Participant categories

Whalewatching involves the viewing of free-ranging cetaceans in the wild and therefore does not include tourism activities in which the animals' movements are restricted by humans or captivity (i.e. sea pen, lagoon, pool, or other enclosure type) (Parsons et al., 2005). There are different types and varieties of whalewatching operations and each have different characteristics that affect monitoring and regulation of their activities. Using definitions of whalewatching activities developed by the IWC Whalewatching subcommittee (Parsons et al., 2005), two types of whalewatching activities were defined at the study site. The participants were then grouped into three different categories based on the proportion of their excursion that was dedicated to marine mammals: (a) dedicated cetacean research, (b) incidental cetacean watching, and (c) other marine expeditions. Participants in the "dedicated cetacean research" category participated in advertised research expeditions that were focused on bottlenose dolphins, and the excursions were funded partially by financial payments by the participants (Parsons et al., 2005). The participants in the "incidental whalewatching"[31] category had traveled to the study site for either coral reef research or snorkeling, but had encountered dolphins (no more than 3 in a week) either on the way to or from their field or snorkel sites. Lastly, participants in the "other marine expedition" category never encountered marine mammals during their stay at the field station. These categories were analyzed against the different behavior, attitude, and knowledge indices by using bivariate regressions.

[31] The "incidental whalewatching" category is comparable to a category 2b whalewatching operation as defined by Parsons *et al.*, 2003a.

The groups of participants were also divided into two other categories: research or natural history, depending on the type of excursion they were participating in. All participants that came to the field station for dolphin research, coral reef research, or on a research base field course fell into the "research category." All participants that came to the field station for snorkeling or on a family trip fell into the "natural history" category since they did not participate in any systematic studies. A one-way Analysis of Variance (ANOVA), followed by a Scheffé post-hoc comparison was conducted to determine whether or not there were significant differences between how the groups were answering the variety of questions.

Behavior

A factor analysis was conducted on all of the survey questions that were considered to be "behavior" related questions (Appendix II). A factor analysis finds patterns among the variations in the values of several variables in order to determine if the questions can be reduced into a smaller number of latent constructs or factors. The behavior questions were factor-analyzed using a principal components solution and varimax rotation with Kaiser[32] normalization. By performing a varimax rotation, the variance of the "new" variable or factor is maximized, while the variance around the new factor is minimized. The rotation attempts to describe the factor loadings by re-expressing them so that the loadings on a few initial variables are as large as possible,

[32]According to Kaiser's rule, factors should not be kept if they explain less of the variation (have an eigenvalue less than one) than is contained in a single variable.

making the factor loadings stronger, more interpretable, and more meaningful because the factors will have better predictability.

After rotation, four factors with an eigenvalue[33] of greater than one were retained in the rotated factor matrix and items possessing factor loadings of 0.40[34] or greater were interpreted. Factor four was dropped because it only contained one variable[35] (Table 1). The questions that loaded in Factors 1, 2, and 3 were all added together to create an overall behavior index (ball). The three factors that were retained were then used separately to create three sub-indices of the overall behavior index (ball). Questions in factor one were used to establish the "behavior modification" (bmod) sub-index; questions in Factor 2 were used to create the "behavior affected by whaling activities" (bwha) sub-index; and lastly, the questions that loaded under Factor 3 gave rise to the "environmental behavior" (benv) sub-index (Table 1).

Social scientists often use indices constructed from other variables to reflect some underlying unobservable variable. The questions in this survey were divided into three major categories in order to create a behavior, attitude, and knowledge index. In this study, the behavior index (ball) was created to determine if the participants act in a pro-conservation / pro-environmental way. This index consisted of twelve questions: dol6, dol7a, dol8, wha3, wha6, wha7, wha9, en1a, en3a, en7, en8, en9 (Table 2). Questions en1c, en3b, and en4b, were omitted from this index due to an insufficient number of

[33] An eigenvalue is the amount of variation explained by a particular factor.
[34] Factor loadings of 0.4 or greater represent strongly correlated variables.
[35] In order to keep a factor, the factor needs two variables within it that each contains a factor loading of 0.4 or greater.

observation, question dol2 was not included in this index because it loaded independently on the factor analysis (Table 1).

Table 1. Summary of the behavior factor analysis using principal components solution and varimax rotation with Kaiser normalization. Factor loadings greater than 0.4 are emboldened.

Variable	Factor 1	Factor 2	Factor 3	Factor 4	Uniqueness[36]
Behavior Modification					
dol6	**0.824**	-0.1157	-0.0402	0.1673	0.278
dol7a	**0.9064**	-0.0924	-0.0571	0.0122	0.1665
dol8	**0.9197**	-0.099	-0.0279	-0.0126	0.1433
en7	**0.5061**	-0.2046	0.3502	0.3816	0.4338
Behaviors affected by whaling activities					
wha3	-0.1001	**0.8506**	-0.0113	-0.0008	0.2664
wha6	0.2137	**-0.6317**	0.0056	-0.1287	0.5387
wha7	0.2197	**0.6046**	0.0406	-0.1285	0.5679
wha9	-0.2676	**0.8127**	0.0209	-0.0036	0.2675
Environmental behaviors					
en1a	0.0824	-0.1064	**-0.6068**	0.3837	0.4664
en3a	-0.1709	-0.0207	**0.4423**	0.3635	0.721
en8	-0.0473	0.0327	**0.8409**	-0.0332	0.2884
en9	-0.0735	0.0159	**0.739**	-0.0518	0.4456
Variables that loaded independently:					
dol2	0.2967	-0.0221	0.022	**0.7007**	0.4201

[36] The 'uniqueness' values represent the percent of the variance for the variable that is not explained by the factors.

Table 2. List of variables that were included in the behavior indices and their associated questions.

Variable	Question
dol6	Do your experiences on this trip make you more likely to visit Belize and participate in a dolphin research expedition again?
dol7a	Do your experiences on this trip make you more likely to go on a dolphin or whale research expedition abroad (or dolphin/whalewatching?)
dol8	Has this trip made it more likely for you to go on a dolphin watching excursion?
wha3	Would you boycott visiting a country involved in whaling?
wha6	If Belize supported whaling at the International Whaling Commission (IWC), would it make you less likely or more likely to travel to the country?
wha7	Would you travel to Belize and still whalewatch if the country supported whaling?
wha9	Would you boycott visiting a country that is actively involved in whaling?
en1a	Do you recycle on a weekly basis?
en3a	Do you use energy-saving light bulbs?
en7	Has going on this trip increased the likelihood of you joining an environmental or animal welfare organization?
en8	Would you be willing to pay higher prices in order to protect the environment?
en9	Would you be willing to pay higher taxes in order to protect the environment?

All of the questions in the behavior index, except wha6, were coded on a binary scale (0, 1). Question wha6 asked "if Belize supported whaling at the International Whaling Commission (IWC), would it make you more likely, less likely, or no difference to travel to the country?" This question was coded on a three-point likert scale (scale using levels of agreement or disagreement) where a "more likely" answer had a score of 2, a "less likely" response scored 1, and a "no difference" reply scored zero. Six of the binary coded questions (wha3, wha7 wha9, en3a, en8, and en9) were reverse coded to make the creation of the index possible (Table 2). By adding the total score for each question, the index scale ranged from zero to thirteen and higher scores represented a more pro-conservation / pro-environment behavior. This index was found to be internally reliable (Cronbach's Alpha = 0.713).[37]

[37] Cronbach's Alpha determines how well a set of items or variables measures a single uni-dimensional latent construct.

The questions that loaded within Factor 1 during the factor analysis were used to construct the behavior modification sub-index (bmod) (Table 1). "bmod" included questions that would determine if the participants' experiences on their trip made them more likely to continue taking dolphin/whalewatching or dolphin/whale research excursions and would encourage them to act in environmentally conscious ways. This sub-index contained the following four questions: dol6, dol7a, dol8, and en7 (Table 2). Questions en3b, en4b, and en6c were omitted due to an insufficient number of observations. All of the questions in the sub-index were coded on a binary scale (0, 1) and therefore, the highest possible score for the sub-index was four. Higher scores indicated that participants were more likely to go on dolphin/whale excursion and were more willing to change their behaviors to "environmentally friendlier" ways. This sub-index was found to be internally reliable (Cronbach's Alpha = 0.850).

The questions that loaded within Factor 2 were used to construct the behaviors affected by whaling activities sub-index (bwha) (Table 1). "bwha" was developed in order to determine if the participants behaved in an "anti-whaling" manner (i.e. would show opposition to commercial whaling). This sub-index included the following four questions: wha3, wha6, wha7, wha9 (Table 2). All of the questions in this sub-index were coded on a binary scale (0, 1) except wha6. As previously explained, this question was coded on a three-point likert scale, where a "more likely" answer had a score of 2, a "less likely" response scored 1, and a "no difference" reply scored zero. One of the questions (wha6) was reverse coded to make the creation of the sub-index possible. The highest possible score for the sub-index was five. Higher scores represented the

likelihood the participant would be opposed to whaling. This sub-index was found to be internally reliable (Cronbach's Alpha = 0.701).

The final behavior sub-index, the environmental behavior sub-index (benv), was created by using the questions found within Factor 3 in order to determine the participants' willingness to pay higher prices and/or taxes in order to protect the environment (Table 1). This sub-index was comprised of four questions, en1a, en3a, en8 and en9 that were coded on the binary scale (0,1) (Table 2). The highest possible score for this sub-index was four. Higher scores represented the participants' willingness to pay higher prices and/or taxes in order to protect the environment. This index was found to be somewhat internally reliable (Cronbach's Alpha = 0.423). Due to the low Cronbach's Alpha, is understood that the results do not definitively support or reject a hypothesis because of the index's degree of reliability.

Lastly, question dol2 ("Do your experiences on this trip make you more likely to visit Belize again?") loaded independently in the factor analysis (Table 1) and therefore was examined individually and was not included in any of the behavior indices. Question cap10, which asks "would you be more or less likely to go to a captive dolphin facility over observing dolphins from a whalewatch?" was the only behavioral question about captivity; therefore, it was also examined independently and was not included in any of the behavior indices.

Attitude

A factor analysis using a principal components solution and varimax rotation with Kaiser normalization was also performed on all of the survey questions that were considered to be "attitude" related questions (Appendix II). After rotation, six factors with an eigenvalue of greater than one were retained in the rotated factor matrix and items possessing factor loadings of 0.45 or greater were interpreted. Factors four, five, and six were dropped because they either contained no variable that had a factor loading greater than 0.45 or only contained one variable (Table 3). The questions that loaded in Factors one, two, and three were combined together to create an overall attitude index (aall). These three factors were then used separately to create three sub-indices of the overall attitude index (aall). Questions in factor one were used to establish the "conservation attitude" (acon) sub-index; questions in factor two were used to create the "captivity attitude" (acap) sub-index; and lastly, the questions that loaded under Factor 3 gave rise to the "environmental behavior" (aenv) sub-index (Table 4).

Table 3. Summary of the attitude factor analysis using principal components solution and varimax rotation with Kaiser normalization. Factor loadings greater than 0.45 are emboldened.

Variable	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Uniqueness
Factor 1							
dol9	**0.652**	0.196	0.166	-0.197	-0.153	0.049	0.444
con1	**0.860**	-0.062	0.081	0.017	0.042	-0.129	0.232
con2	**0.880**	-0.042	0.121	-0.064	0.001	-0.011	0.205
con3	**0.575**	-0.154	0.363	0.015	-0.082	0.321	0.404
Factor 2							
cap1	-0.257	**0.460**	-0.249	0.132	0.266	-0.200	0.532
cap2	-0.090	**0.706**	0.057	0.254	0.102	0.058	0.412
cap3	-0.079	**0.862**	-0.014	0.155	-0.004	0.128	0.210
cap4	0.015	**0.696**	-0.067	0.406	-0.162	-0.219	0.272
cap6	0.071	**0.598**	-0.005	0.338	0.266	-0.387	0.302
cap7	0.052	**0.758**	-0.004	0.132	-0.182	0.148	0.351
cap8	-0.122	**0.710**	-0.020	0.349	-0.039	0.009	0.357
Factor 3							
en2	0.280	-0.025	**0.742**	-0.056	-0.002	0.001	0.367
en4a	-0.087	0.172	**0.685**	-0.327	0.116	0.078	0.368
en5	0.267	-0.101	**0.756**	0.182	-0.069	-0.142	0.289
Variables that loaded independently:							
con4	-0.236	0.050	-0.025	0.116	**0.698**	0.153	0.417
cap5	-0.043	0.059	-0.059	0.030	0.131	**0.833**	0.279

Table 4. List of variables that were included in the attitude indices and their associated questions.

Variable	Question
dol9	How important is it to you that your trip does not disturb or harass the dolphins being watched?
con1	How important is it to you that your trip works locally with dolphin conservation efforts?
con2	How important is it to you that Belize has a strong commitment to whale and dolphin conservation?
con3	How important do you think marine mammal conservation laws and policies are?
cap1	Is it right to keep dolphins in captivity when the dolphins are captured from the wild?
cap2	Is it right to keep dolphins in captivity when the dolphins are captive bred?
cap3	Is it right to keep dolphins in captivity when the dolphins are kept in a dolphinaria (aquarium/tank)?
cap4	Is it right to keep dolphins in captivity when the dolphins are in their natural habitat, but are confined to an area by nets?
cap6	Is it right to keep dolphins in captivity for human enjoyment to perform shows involving tricks?
cap7	Is it right to keep dolphins in captivity for conducting research on captive dolphin rearing and breeding (Husbandry)?
cap8	Is it right to keep dolphins in captivity for conducting research relevant to dolphin conservation in the wild?
en2	How important is it to you to buy paper and plastic products that are made from recycled products?
en4a	Do you prefer to purchase household chemicals such as detergents and cleaning solutions that are environmentally friendly?
en5	How important is it to you to avoid buying products form a company that you know might be harming the environment?

The attitude index (aall) was created to measure the participants' overall attitudes to determine if they would possessed pro-conservation / pro-environmental attitudes. This index consisted of the following fourteen questions: dol9, con1, con2, con3, cap1, cap2, cap3, cap4, cap6, cap7, cap8, en2, en4a, and en5 (Table 4). Questions dol9, con1, con2, con3, en2, and en5 were all coded on a four-point likert scale where a "very important" response scored 3, "important" scored 2, "unimportant" scored 1, and "very unimportant" scored 0. Questions cap1, cap2, cap3, cap4, cap6, cap7, cap8, and en4a were coded on a binary scale (0, 1). Seven of the questions (cap1-cap4; cap6-cap8) were reverse coded to make the creation of the index possible. The highest possible score for this index was twenty-six; higher scores represented more pro-conservation / pro-

environmental attitudes. This index was found to be internally reliable (Cronbach's Alpha = 0.750).

The conservation attitude sub-index (acon) was created to measure the participants' attitudes towards cetacean conservation issues. This sub-index contained questions dol9, con1, con2, and con3 (Table 4), and all the questions were coded on a four-point likert scale where a "very important" response scored 3, "important" scored 2, "unimportant" scored 1, and "very unimportant" scored 0. The highest possible score for this sub-index was 12. Higher scores illustrated that participants had pro-conservation attitudes towards the cetacean conservation issues. This sub-index was found to be internally reliable (Cronbach's Alpha = 0.786).

The captivity attitude sub-index (acap) was created to measure the participants' attitudes towards various reasons for keeping cetaceans in captivity. This sub-index contained questions cap1-cap4 and cap6-cap8 (Table 4), and all of the questions in this sub-index were coded on a binary scale (0, 1). The highest possible score for this sub-index was seven; however, in this sub-index, the *lowest* score demonstrated the more environmental attitudes, which are "anti-captivity" attitudes. This sub-index was found to be internally reliable (Cronbach's Alpha = 0.754).

The final attitudinal sub-index, the environmental attitude sub-index (aenv) was created in order to determine how important it was that the participants use environmentally conscious and/or were a member to and environmental or animal welfare organization. This sub-index was made of three questions: en2, en4a, and en5 (Table 4). Questions en2, en4a, and en 5 were all coded on a four-point likert scale

where a "very important" response scored 3, "important" scored 2, "unimportant" scored 1, and "very unimportant" scored 0. The highest possible score for this sub-index was nine; higher scores represented the likelihood the participants' willingness to pay higher prices and/or taxes in order to protect the environment. This sub-index was found to be somewhat internally reliable (Cronbach's Alpha = 0.642). Due to the lower Cronbach's Alpha, is understood that the results do not definitively support or reject a hypothesis because of the index's degree of reliability.

Question wha8 ("Please indicate whether you support or oppose the hunting of whales") was the only attitudinal question about whaling; therefore, it was examined independently and was not included in any of the attitudinal indices. Lastly, questions dol10, con4, and cap5 loaded independently in the factor analysis and therefore were not included in any of the attitudinal indices but were examined individually (Table 3 and 5).

Table 5. List of independent attitude variables that were examined individually and their associated questions.

Variable	Question
dol10	How important is it to you that your trip has an educational component?
con4	How well do you think bottlenose dolphins and other whale and dolphin species are protected?
cap5	Do you believe it is right to keep dolphins in captivity when the dolphins are sick and/or injured?

Knowledge

The knowledge index (know) was created to measure the participants' knowledge level about whaling and captivity issues. The knowledge index contained four questions: wha1, wha2, wha4a, and wha5 (Table 6), and all of the questions in this index were coded on a binary scale (0, 1). Therefore, the highest possible score for this index was

four. Higher scores generally indicate a high knowledge level; however, this index was found to only be somewhat internally reliable (Cronbach's Alpha = 0.518). This index was used in a few of the analyses; however, it is understood that the results do not definitively support or reject a hypothesis because of the index's degree of reliability. Because question cap9 ("were you aware that there is a captive swim with dolphins program in Belize?") was the only knowledge question about captivity, it was examined independently and was not included in the knowledge index.

Table 6. List of variables that were included in the knowledge index and their associated questions.

Variable	Question
wha1	Were you aware that there are several countries that are still involved in whaling?
wha2	Were you aware that currently more than 50% of the countries that are part of the International Whaling Commission support whaling?
wha4a	Are you aware of Belize's current stance on whaling?
wha5	Have you ever heard of the International Whaling Commission (IWC)?

Demographics

Gender has the potential to be very influential in shaping attitudes towards wildlife (Lauber *et al.*, 2001); therefore, the relationships between all of the behavior, attitude, and knowledge indices and demographic information, including gender, as well as age and education level, were examined by performing standard linear regressions.

CHAPTER 3: RESULTS

Demographics

The vast majority of the participants in this study were from the United States; six individuals were from the UK, and two people were from Canada. The majority of the current sample population was female (71.95%; n=118), while males made up the remaining 28.05% (n=46) of the total population. These results are comparable to other studies that suggest that women tend to outnumber men in cetacean-based tourism (Muloin, 1998; Parsons *et al.,* 2003b; Bulbeck, 2005). The age range of the sample population was from 18 to 83 years of age and the mean age was 52.93 (SD =1.51) (Fig. 2).

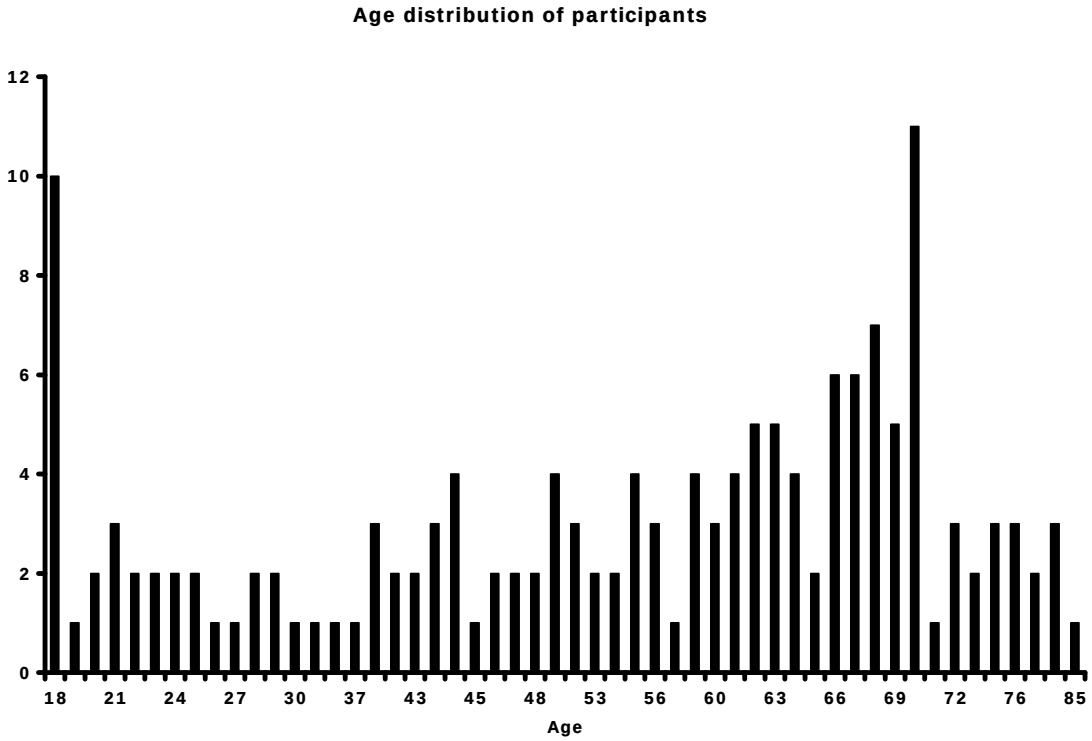

Figure 2. Distribution of ages in the sample population (n=152).

In terms of education, approximately half of the participants (48.12%, n= 77) had completed at least an associate's degree, while the remaining 51.87% (n=83) had obtained a higher degree (M.S./M.A., Ph.D., M.D., J.D., etc.) (Fig. 3 and Table 7). Furthermore, 95.73% of the participants felt that it was important that their trip contain an educational component (55.49% felt that it was very important; 40.24% felt that it was important) (Fig. 4 and Table 8).

Table 7. Responses to the question "Please indicate the highest level of education that you have completed." Answers are represented as percentages (n = 160).

Education Level	Less than high school	High school diploma / GED	Some college, no degree	Associate / Bachelor Degree	Master Degree	Ph.D., M.D., or other terminal degree
Percentage of Respondents	2.50	5.00	12.50	28.12	33.12	18.75

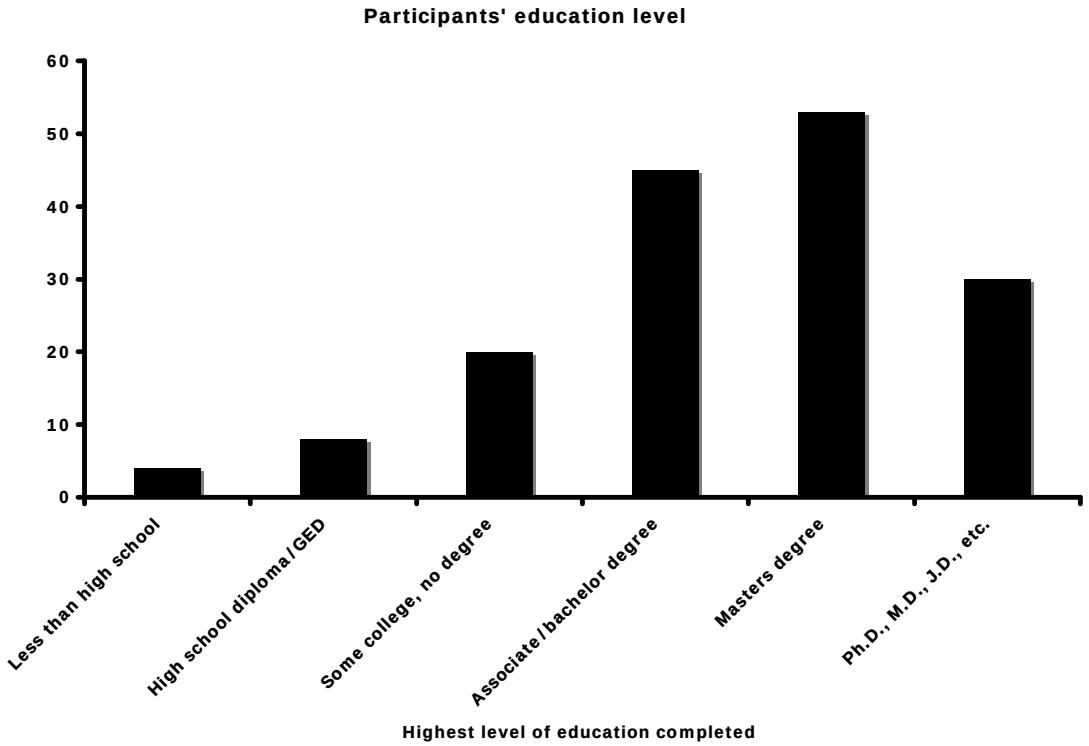

Figure 3. Responses to the question "Please indicate the highest level of education that you have completed" (n=160).

Table 8. Responses to the question "How important is it to you that your trip has an educational component?" Answers are represented as percentages (n = 160).

	Very Important	Important	Unimportant	Very unimportant
Percentage of participants	55.49	40.24	3.66	0.61

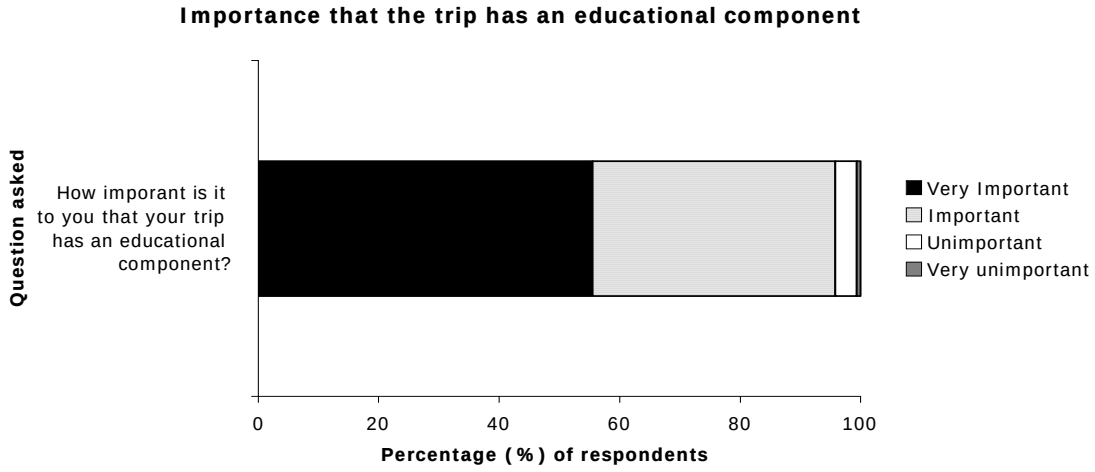

Figure 4. Responses to the question "How important is it to you that your trip has an educational component?" (n = 160).

Additionally, 42.33% of the participants spent an average of four days traveling around Belize after they departed the field station. Over half of these individuals (59.21%) went to archeological sites such as Mayan ruins, and the remaining 40.79% traveled to various other cayes (Ambergris Caye and Caye Caulker, in particular). Participants also documented the amount of money they intended to spend on souvenirs while in Belize, which amounted to be approximately US $75 per person. Lastly, the majority of the participants felt that dolphins and whales were either slightly or under protected (45.06%; 36.42%, respectively) (Fig. 5 and Table 9).

Table 9. Response to the question "How well do you think bottlenose dolphins and other whale and dolphin species are protected?" Answers are represented as percentages. (n = 159)

	Overprotected	Protected	Slightly protected	Under protected
Percentage of participants	0.62	17.90	45.06	36.42

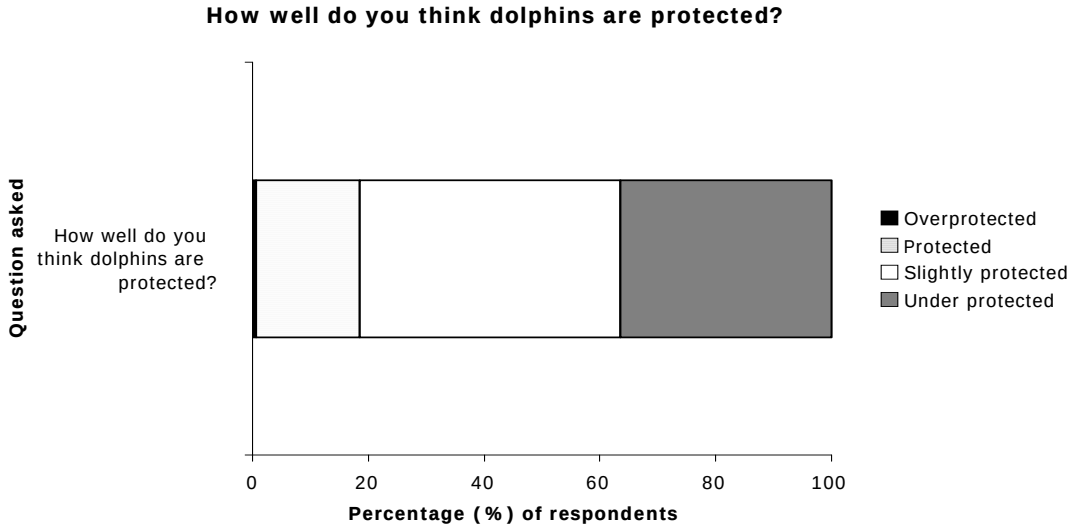

Figure 5. Responses to the question "how well do you think dolphins are protected?" (n=159).

Participant categories

As previously mentioned, participants were also grouped into three different categories based on their level of interaction with the bottlenose dolphins at Turneffe. Seventy-seven percent of participants had some type of an encounter with the bottlenose dolphins of Turneffe while at the field station, while less than a quarter of participants never saw dolphins during their stay (Table 10 and Fig. 6).

Table 10. Percentage of participants that fell into each whalewatching category (n = 164).

Excursion category	Dedicated whale research	Incidental whalewatching	Other marine tour
Percentage of respondents	36.59	40.24	23.17

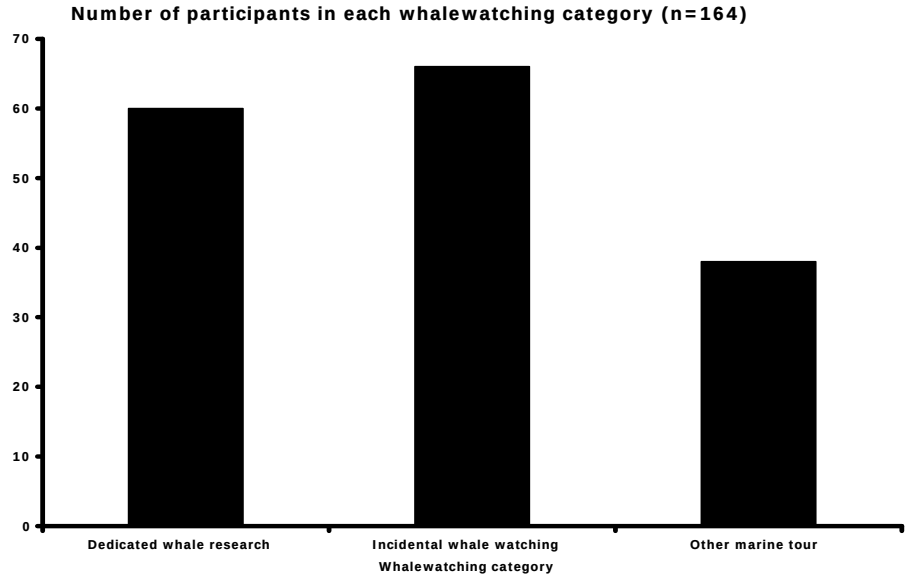

Figure 6. Number of participants that fell into each whalewatching category (n = 164).

Demographic information for each whalewatching category was compared in order to explore the dynamics of each category further. Dedicated cetacean researchers had the youngest mean age and contained the fewest number of people that had obtained a higher degree with respect to the other two whalewatching categories (Table 11). Conversely, the other marine tour group had the eldest mean age and the incidental cetacean watching category had the highest percentage of participants that had completed a higher degree. All three categories were majority female.

Table 11. Demographic make-up of each whalewatching category.

	Dedicated cetacean research	Incidental cetacean watching	Other marine tour
Percent female	76.27 (n=59)	66.67 (n=66)	75.68 (n=37)
Mean age	42.83 (n=53)	54.81 (n=63)	64.47 (n=34)
Percent higher degree	33.33 (n=60)	66.67 (n=63)	57.14 (n=35)

Participants were also separated into two categories depending on whether their excursion was research-based or was simply a natural history trip. Two-thirds of the participants (64.63%) had visited the field station for a research excursion while the remaining one-third (35.37%) had signed up for a natural history excursion that did not involve a scientific study (n=164). Examining the demographics of these two groups revealed that once again the research participants' mean age was lower and a larger number of natural history participants had obtained a higher degree. Both of these groups were also majority female.

Table 12. Demographic make-up of each tour type.

	Research Excursion	Natural History Trip
Percent female	76.92 (n=104)	63.79 (n=58)
Mean age	49.19 (n=94)	58.77 (n=56)
Percent higher degree	41.18 (n=102)	71.43 (n=56)

Behavior

The behavior index (ball) (Cronbach's Alpha = 0.713) had a minimum possible score of zero and a maximum possible score of thirteen, where higher scores represented higher pro-conservation and pro-environment behaviors, and lower scores represented less environmentally conscious behaviors. The participants' scores ranged from one to twelve, and the mean score was 7.79 (SD = 0.193) (Fig. 7).

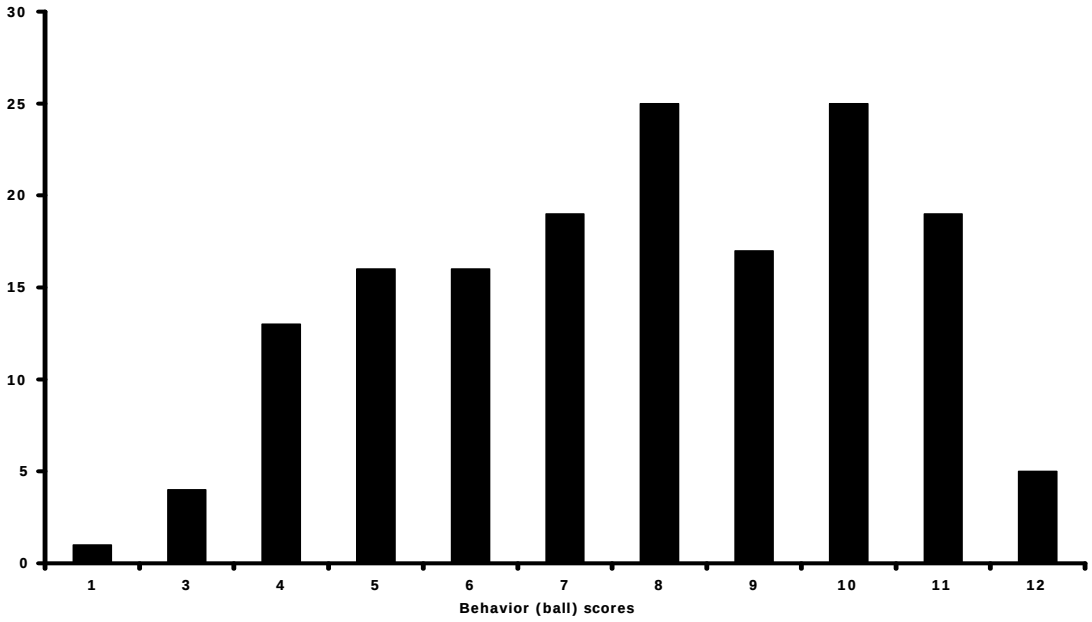

Figure 7. Range of respondent's behavior scores, showing how environmentally conscious their behaviors are likely to be. Higher scores represent more pro-conservation and or pro-environment behaviors (n=160).

The behavior modification (bmod) sub-index (Cronbach's Alpha = 0.850) had a minimum possible score of zero and a maximum possible score of four. The participants' scores ranged from zero to four and the mean score for this index was 2.53 (SD = 0.125) (Fig. 8). Higher scores for this sub-index indicated that the participants' experience on their trip to the field station made them more likely to go on dolphin/whalewatching or research activities in the future. The trip also encouraged the participants to act in pro-conservation and environmentally friendly ways (Fig. 9 and Table 13).

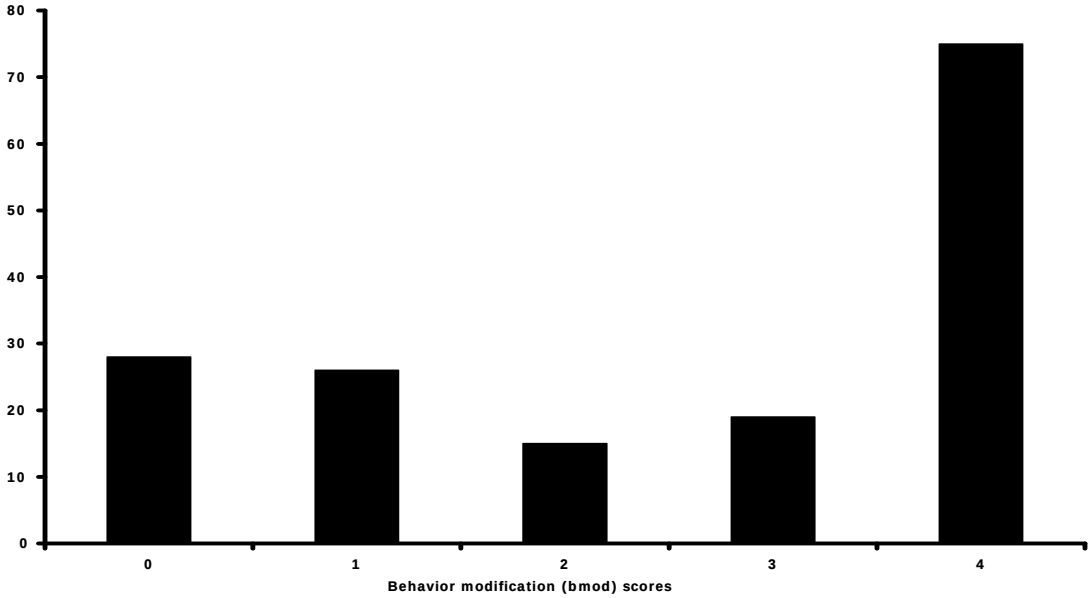

Figure 8. Range of respondent's behavior modification scores, showing how environmentally conscious their behaviors are likely to be. Higher scores indicate that the participant's experience on their trip in Belize made them more likely to participate in dolphin/whalewatching or research activities in the future and the trip also encouraged the participants to act in pro-conservation and environmentally friendly ways (n=163).

Table 13. Reponses to behavior modification sub-index questions. "Yes" responses are emboldened and indicate that a participant stated that he/she was likely to change his/her behaviors. Answers are represented as percentages.

	Yes	No	N
Do your experiences on this trip make you more likely to visit Belize and participate in a dolphin research expedition again?	**56.63**	43.37	166
Do your experiences on this trip make you more likely to go on a dolphin or whale research expedition abroad (or dolphin/whalewatching?)	**61.45**	38.55	166
Has this trip made it more likely for you to go on a dolphin watching excursion?	**62.05**	37.95	166
Has going on this trip increased the likelihood that you would donate to an environmental or animal welfare organization?	**71.78**	28.22	163

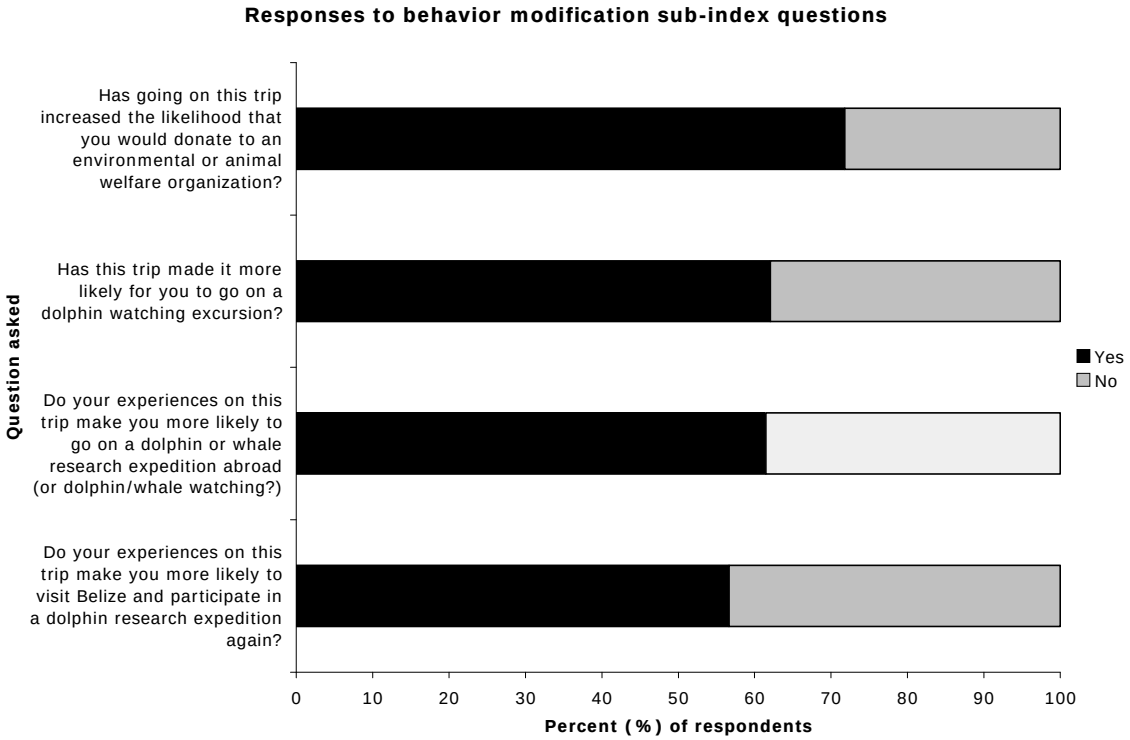

Figure 9. Reponses to behavior modification sub-index questions (n=163).

It is noteworthy that although 74.70% of participants (n=166) had never visited Belize and 73.60% (n=125) of participants had never been on a dolphin research expedition or dolphin watching trip prior to this one, the majority of participants stated that they were likely to both visit Belize again (85.45%, n=166) and take another dolphin research/watching excursion, in either Belize or abroad (56.63%; 61.45%, respectively n=166). Additionally, 91.36% (n=162) of participants stated that they would recommend their trip to friends and 86.79% (n=159) claimed that they would recommend dolphin-watching to their friends.

The whaling behavior (bwha) sub-index (Cronbach's Alpha = 0.701) had a minimum possible score of zero and a maximum possible score of five where higher

scores indicated that participants would be less likely to visit countries involved in whaling and would be more likely to boycott traveling to such countries all together. The participants' scores ranged from zero to five, and the mean score was 2.27 (SD = 0.081); demonstrating that the participants had moderately "anti-whaling" behavior scores overall (Fig. 10). However, it is noteworthy that the majority of respondents stated that they would boycott visiting Belize or any country that supported whaling (Tables 14a-14b, and Figs. 11a – 11b).

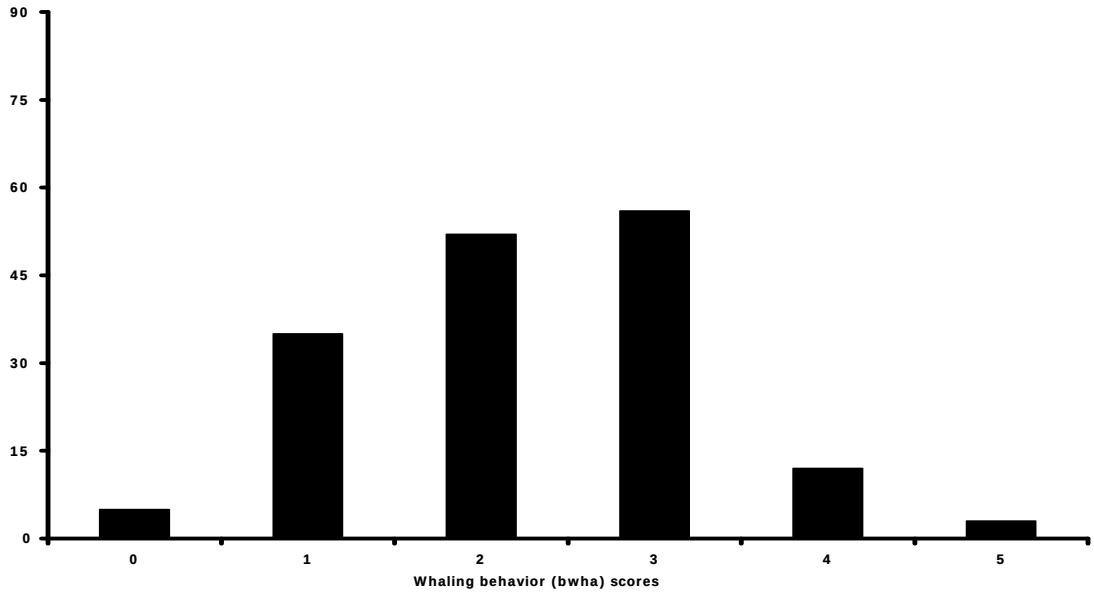

Figure 10. Range of respondent's whaling behavior scores; higher scores indicated that participants would be less likely to visit countries involved in whaling, and would be more likely to boycott traveling to such countries all together (n=163).

Table 14a. Reponses to whaling behavior sub-index questions. The responses considered to be "anti-whaling" are emboldened and all answers are represented as percentages.

	Yes	No	N
Would you boycott visiting a country involved in whaling?	**68.10**	31.90	163
Would you travel to Belize and still whalewatch if the country supported whaling?	40.49	**59.51**	163
Would you boycott visiting a country that is actively involved in whaling?	**61.96**	38.04	163

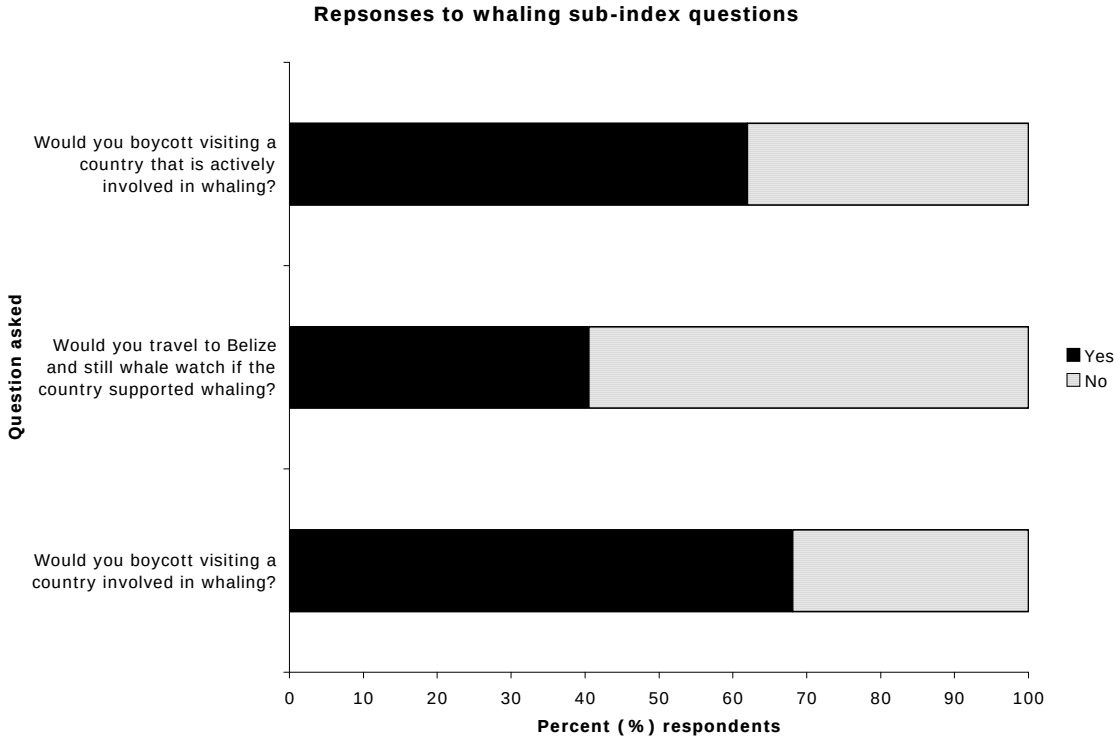

Figure 11a. Reponses to whaling behavior sub-index questions (n=163).

Table 14b. Reponses to whaling behavior sub-index questions continued. The responses considered to be "anti-whaling" are represented emboldened and all answers are represented as percentages.

	More likely	Less likely	No difference	N
If Belize supported whaling at the International Whaling Commission (IWC), would it make you less likely or more likely to travel to the country?	7.83	**40.36**	51.81	166

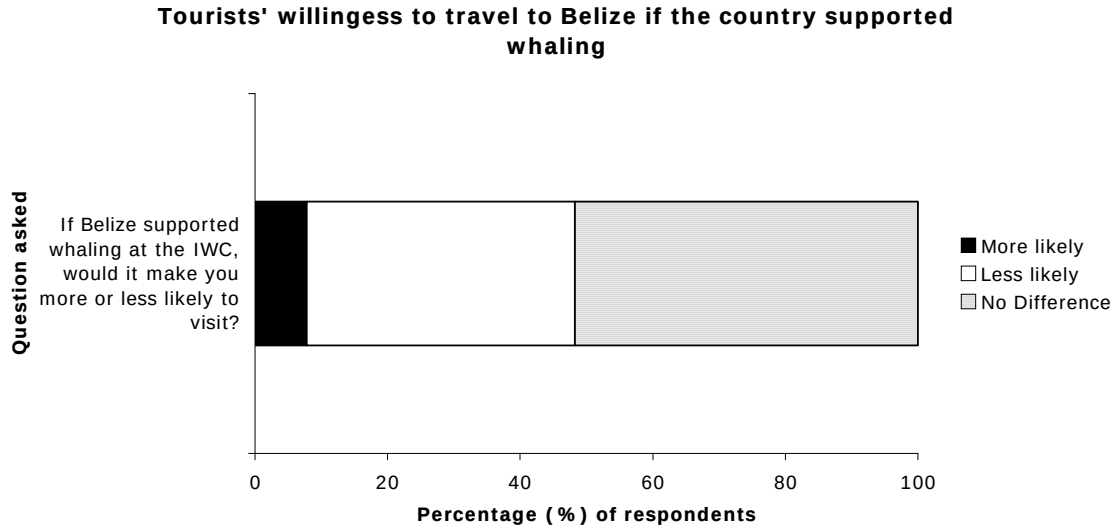

Figure 11b. Response to the question "If Belize supported whaling at the International Whaling Commission (IWC), would it make you more likely or less likely to travel to the country?" (n=166).

The environmental behavior (benv) sub-index (Cronbach's Alpha = 0.423) had a minimum possible score of zero and a maximum possible score of four. Higher scores for this sub-index indicated that participants were more likely to behave in environmentally friendly ways. The participants' scores ranged from one to four and the mean score was 3.56 (SD = 0.059) (Fig. 12). Furthermore, the results showed that the vast majority of the participants in this study already engaged in environmentally friendly practices and would be willing to pay both higher taxes and prices for the protection of the environment (Fig. 13 and Table 15).

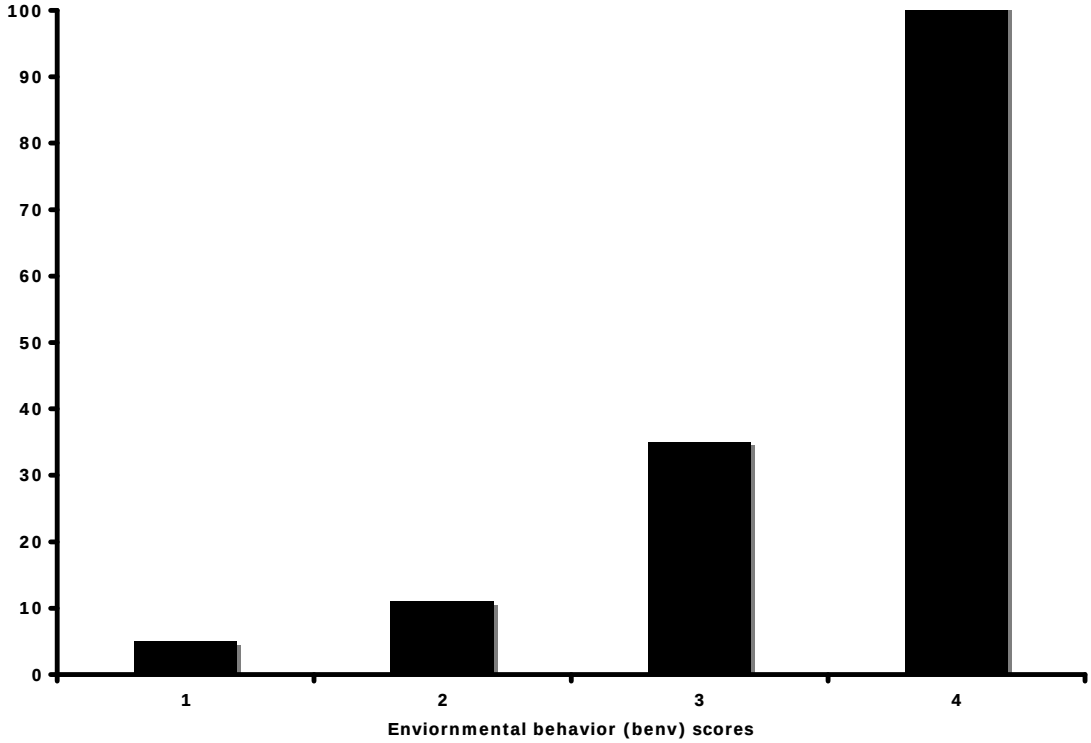

Figure 12. Range of respondent's environmental behavior scores; higher scores indicated that participants are more likely to behave in environmentally conscious ways (n=163).

Figure 15. Reponses to environmental behavior sub-index questions. The "pro-environmental" behaviors are represented emboldened and all answers are represented as percentages.

	Yes	No	N
Do you recycle on a weekly basis?	**93.33**	6.67	165
Do you use energy-saving light bulbs?	**85.89**	14.11	163
Would you be willing to pay higher prices in order to protect the environment?	**92.64**	7.36	163
Would you be willing to pay higher taxes in order to protect the environment?	**84.05**	15.95	163

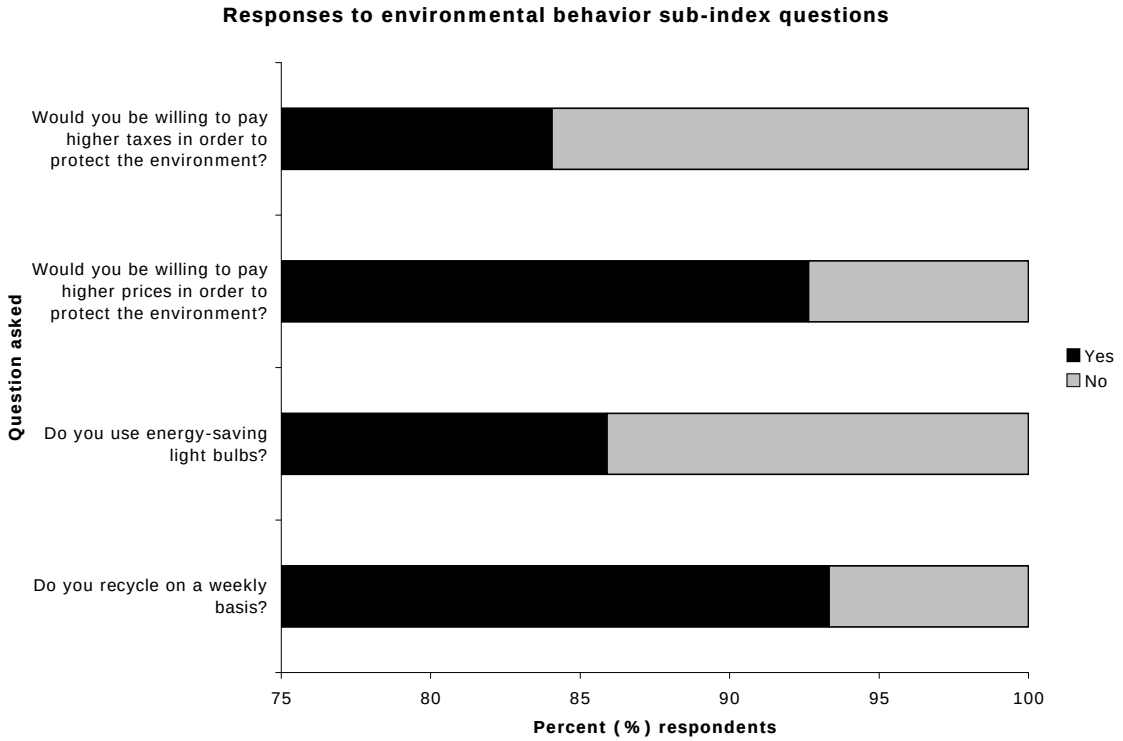

Figure 13. Reponses to environmental behavior sub-index questions (n=163).

Question cap10, which asked "Would you be more or less likely to go to a captive dolphin facility over observing dolphins from a whalewatch vessel?" was examined independently because it loaded individually during the factor analysis and was the only behavior question related to captivity in this batch of questions (Table 1). An overwhelming majority of participants stated that they would be less likely to visit a captive dolphin facility and would be more likely to observe dolphins in the wild (Fig. 14 and Table 16).

Table 16. Responses to the question "Would you be more or less likely to go to a captive dolphin facility over observing dolphins from a whalewatch vessel?" The response deemed to be "anti-captivity" is emboldened and all answers are represented as percentages (n = 164).

	More likely	Less likely
Percentage of respondents	6.71	**93.29**

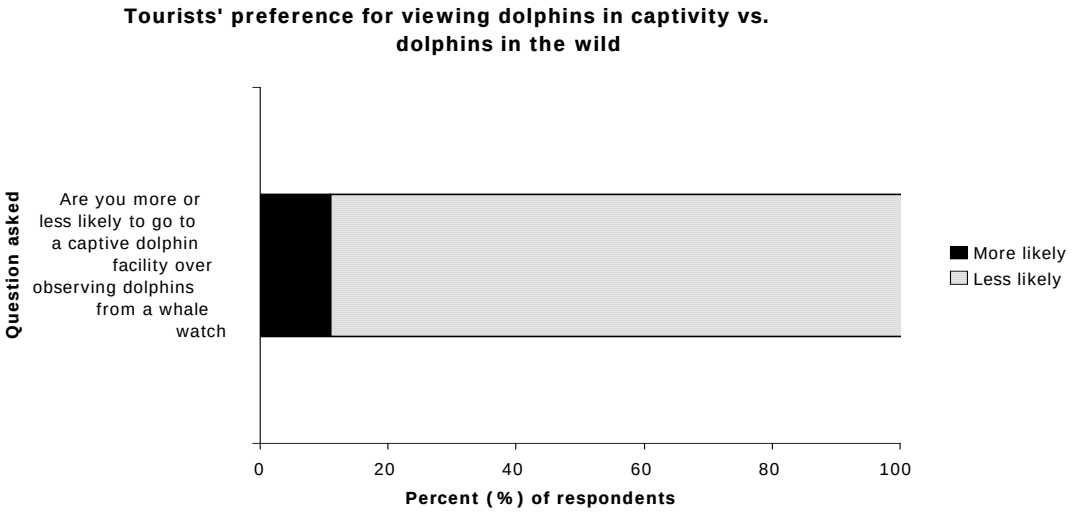

Figure 14. Response to the question "Would you be more or less likely to go to a captive dolphin facility over observing dolphins from a whalewatch vessel?" (n=164).

Individual standard linear regressions examined the relationship between each behavioral index and the independent variables: age, gender, education, and whether or not dolphins were seen (dolphin observation) (Table 17).

Table 17. Summary of individual standard linear regression tests conducted on the behavior indices.

	Behavior (ball)	Behavior modification (bmod)	Whaling behavior (bwha)	Environmental behavior (benv)
Age	F(1, 147)= 2.14 R^2= 0.014 b= (-0.15) SE= 0.01	**F(1, 150)= 9.76** **R^2= 0.061*** **b= (-0.02)** **SE= 0.01**	F(1, 147)=0.31 R^2=0.002 b= (-0.003) SE= 0.004	**F(1, 150)= 5.01** **R^2= 0.032*** **b= 0.007** **SE= 0.003**
Gender	F(1, 156)= 1.09 R^2= 0.007 b= (-0.46) SE= 0.44	F(1, 159)= 3.00 R^2= 0.019 b= (-0.48) SE= 0.28	**F(1, 159)=4.16** **R^2=0.026*** **b= 0.37** **SE= 0.18**	F(1, 159)= 1.19 R^2= 0.008 b= 0.15 SE= 0.13
Education	F(1, 153)= 0.22 R^2= 0.002 b= (-0.08) SE= 0.16	**F(1, 156)= 4.42** **R^2= 0.028*** **b= (-0.22)** **SE= 0.10**	F(1, 155)=0.01 R^2=0.000 b= 0.01 SE= 0.07	**F(1, 156)= 5.52** **R^2= 0.034*** **b= 0.12** **SE= 0.05**
Dolphin observation	**F(1, 136)=7.42** **R^2=0.052*** **b= 1.20** **SE= 0.44**	**F(1, 139)= 14.91** **R^2= 0.093*** **b= 1.07** **SE= 0.28**	F(1, 139)=0.86 R^2=0.006 b= 0.18 SE= 0.19	F(1, 139)= 0.03 R^2= 0.000 b= 0.02 SE= 0.14

***equals p<0.05**

The individual regression analyses revealed that physically viewing the dolphins in the wild was the only significant predictor for the ball index (p=0.007). This means that participants that had viewed dolphins in the wild on this trip exhibited significantly more pro-environment and pro-conservation behaviors than those that never saw dolphins. Although significant, the relationship between dolphin observation and behavior was weak (R^2=0.052).

Age, education level, and dolphin observation were all significant predictors of behavior modification. Younger participants whom had not obtained higher degrees but had seen dolphins were more likely to donate to environmental organizations, return to Belize on vacation, and continue going on dolphin-watching or dolphin research excursions in Belize or abroad based on the experiences the participants had on their trip

(p=0.002; p=0.037; p<0.001, respectively). However, the R^2 for all of these tests (R^2=0.061; R^2=0.028; R^2=0.093, respectively) shows that the relationship between the behavior modification sub-index and the three independent variables are weak.

Additionally, gender was the only independent variable that significantly predicted behaviors that were influenced by a country's whaling stance (p=0.043). Males were more likely to boycott visiting Belize or any other country that was involved in or supported whaling. However, this relationship was also considered weak as only 2.6% of the variance in whaling behaviors could be explained.

Lastly, age and education both significantly predicted the environmental behavior sub-index (p=0.027; p=0.020, respectively), showing that older individuals with higher levels of education possessed more environmentally conscious behaviors than younger participants with less education. Both of these relationships were also weak (R^2=0.027; R^2=0.034, respectively).

One-way ANOVAs were conducted in order to examine whether or not there were differences in behaviors among the three whalewatching categories or between the two tour types (Table 18).

Table 18. Summary of one-way independent ANOVA results between type of whalewatching category and tour type and the behavioral indices.

	Behavior (ball)	**Behavior modification (bmod)**	**Whaling behavior (bwha)**	**Environmental behavior (benv)**
Whalewatching category	**F(2, 155)= 7.99, η^2= 0.094****	**F(2, 158)= 12.83, η^2=0.140****	**F(2, 158)= 5.11, η^2=0.256****	F(2, 158)= 1.54, η^2=0.019
Tour type	F(1, 156)= 0.28, η^2= 0.002	F(1, 159)= 1.69, η^2= 0.011	F(1, 159)= 1.94, η^2=0.121	F(1, 159)= 1.43, η^2=0.008

****equals p<0.01**

These analyses showed that behavior levels differed significantly among the three whalewatching categories in three of the behavior indices, behavior (ball) ($p<0.001$), behavior modification (bmod) ($p<0.001$), and whaling behavior (bwha) ($p=0.007$). Although significant, the relationships between the ball and behavior modification indices and the whalewatching categories were considered weak ($\eta^2=0.094$; $\eta^2= 0.140$, respectively), while the relationship among whalewatching categories and whaling behavior were considered strong ($\eta^2= 0.256$).

When examining the means of each group in the ball index to better understand the ANOVA, dedicated cetacean researches had the highest mean behavior score (M=8.76, SD=2.23). The scores for incidental whalewatchers were second highest mean score (M=7.45, SD=2.27), and the other marine tour group had the lowest mean score (M=6.94, SD=2.61). A Scheffé post hoc comparison further revealed that there were significant differences in behavior mean scores (ball) between the dedicated research and other marine tour categories ($p=0.002$), and between the dedicated research and incidental whalewatching categories ($p=0.010$).

The mean score for the dedicated cetacean research category was also highest (M=3.31, SD=1.22; M=1.93, SD=1.16, respectively) in the ANOVAs that compared the behavior modification and environmental behavior indices'. The mean score for the incidental whalewatching category came second (M-2.26, SD=1.54; M=1.49, SD=1.24, respectively), and the other marine tour category's mean score was once again lowest (M=1.86, SD=1.73; M=1.62, SD=1.28, respectively). A Scheffé post hoc comparison further revealed that were significant differences in behavior modification mean scores

(bmod) between the dedicated research and other marine tour categories ($p<0.000$) and between the dedicated research and incidental whalewatching categories ($p=0.001$). Only the dedicated cetacean research and incidental whalewatching categories were found to be significantly different ($p=0.009$) in the Scheffé test for the whaling behavior sub-index.

Attitude

The environmental attitude index (aall) (Cronbach's Alpha = 0.750) had a minimum possible score of zero and a maximum possible score of twenty-six. Higher scores for this index represented the likelihood that a participant's attitudes would be conservation oriented and environmentally positive. The participants' scores ranged from 11 to 26 and the mean score was 19.85 (SD = 0.245) (Fig. 15).

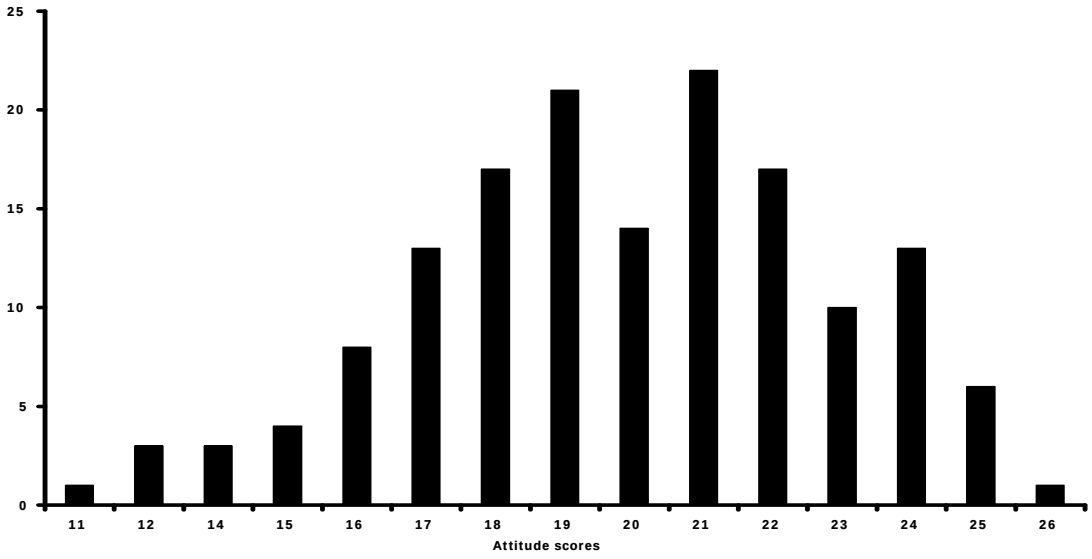

Figure 15. Range of respondent's attitude scores, showing how pro-conservation and/or pro-environmental their attitudes are likely to be. Higher scores represent a more pro-conservation and/or pro-environment attitude. (N=153).

The conservation attitude (acon) sub-index (Cronbach's Alpha = 0.786) had a minimum possible score of zero and a maximum possible score of twelve. The participants' scores ranged from five to twelve and the mean score was 10.82 (SD = 0.126) (Fig. 16). Higher scores indicated that a participant is more likely to think that cetacean conservation issues, such as harassment and legislation, are very important (Table 19 and Fig. 17).

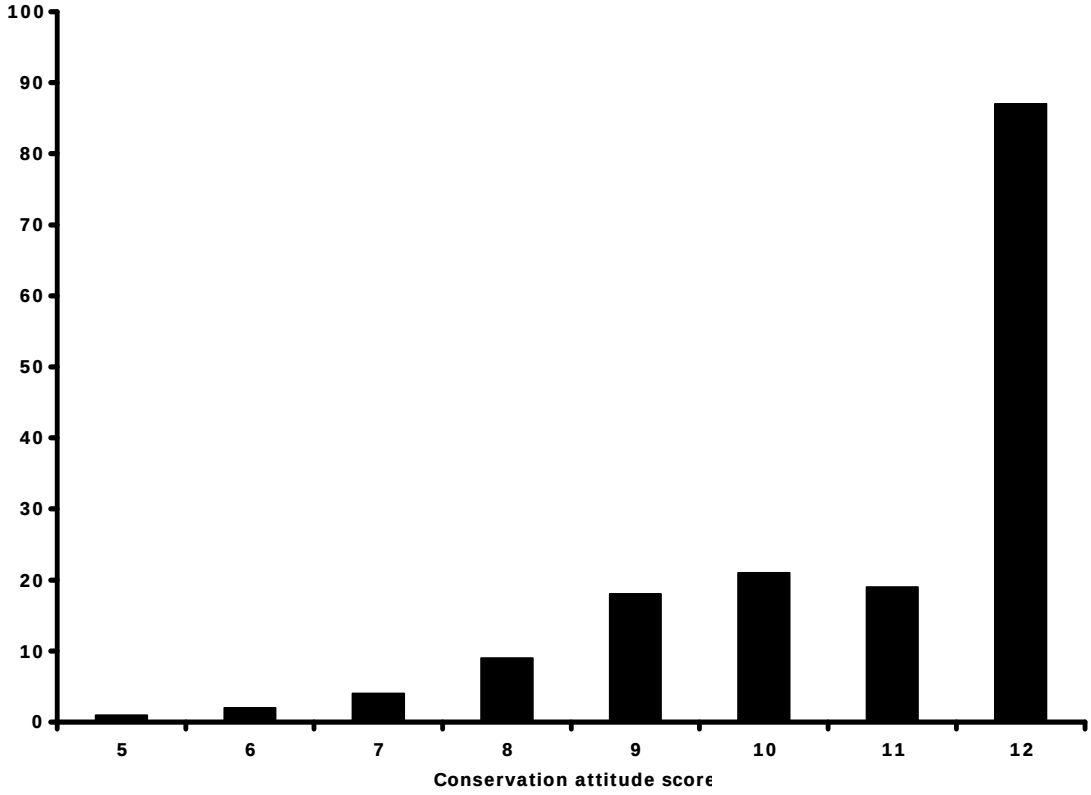

Figure 16. Range of respondent's conservation attitude scores, showing how important cetacean conservation is to the participants; higher scores represent a higher level of importance. (N=161).

Table 19. Reponses to conservation attitude sub-index questions. Answers are represented as percentages.

	Very Important	Important	Unimportant	Very unimportant	N
How important is it to you that your trip does not disturb or harass the dolphins being watched?	80.86	16.67	2.47	0.00	162
How important is it to you that your trip works locally with dolphin conservation efforts?	60.13	32.28	6.96	0.63	158
How important is it to you that Belize has a strong commitment to whale and dolphin conservation?	70.37	27.78	1.85	0.00	160
How important do you think marine mammal conservation laws and policies are?	83.12	16.88	0.00	0.00	160

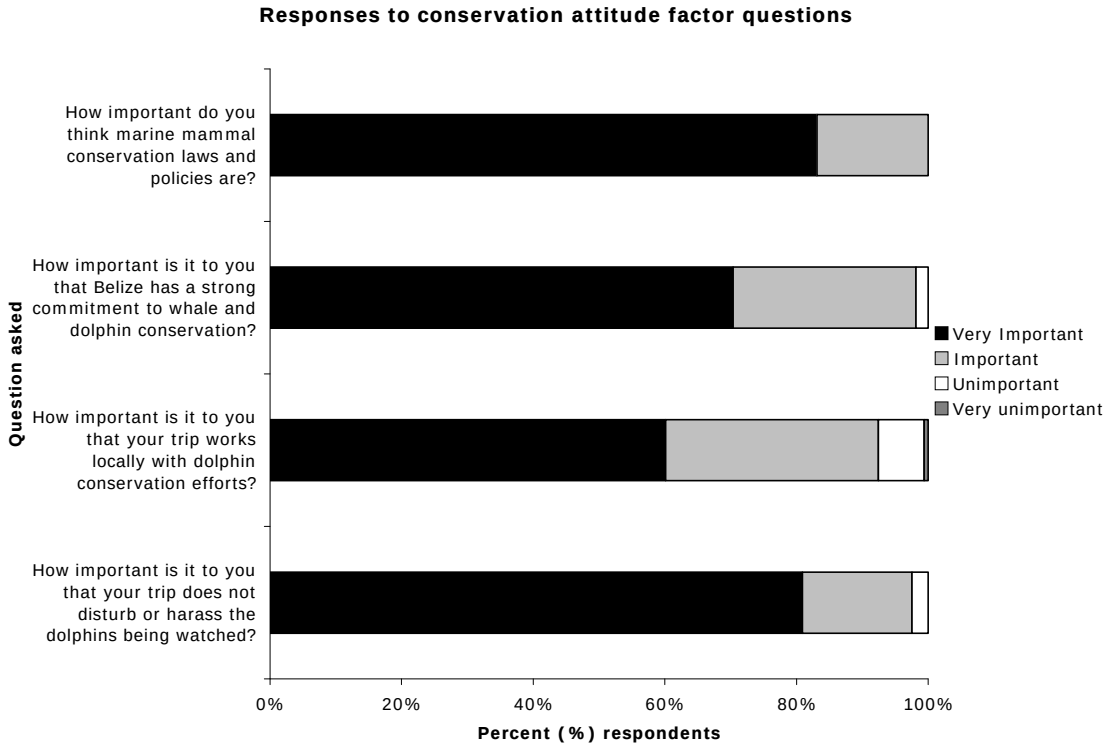

Figure 17. Reponses to conservation attitude sub-index questions (n=158).

The captivity attitude (acon) sub-index (Cronbach's Alpha = 0.754) had a minimum possible score of zero and a maximum possible score of seven. However, in

this index, the *lowest* score demonstrated "anti-captivity" attitudes, which reflected a pro-conservation and pro-environment attitude. The participants' scores ranged from five to twelve and the mean score was 2.66 (SD = 0.151) (Fig. 18).

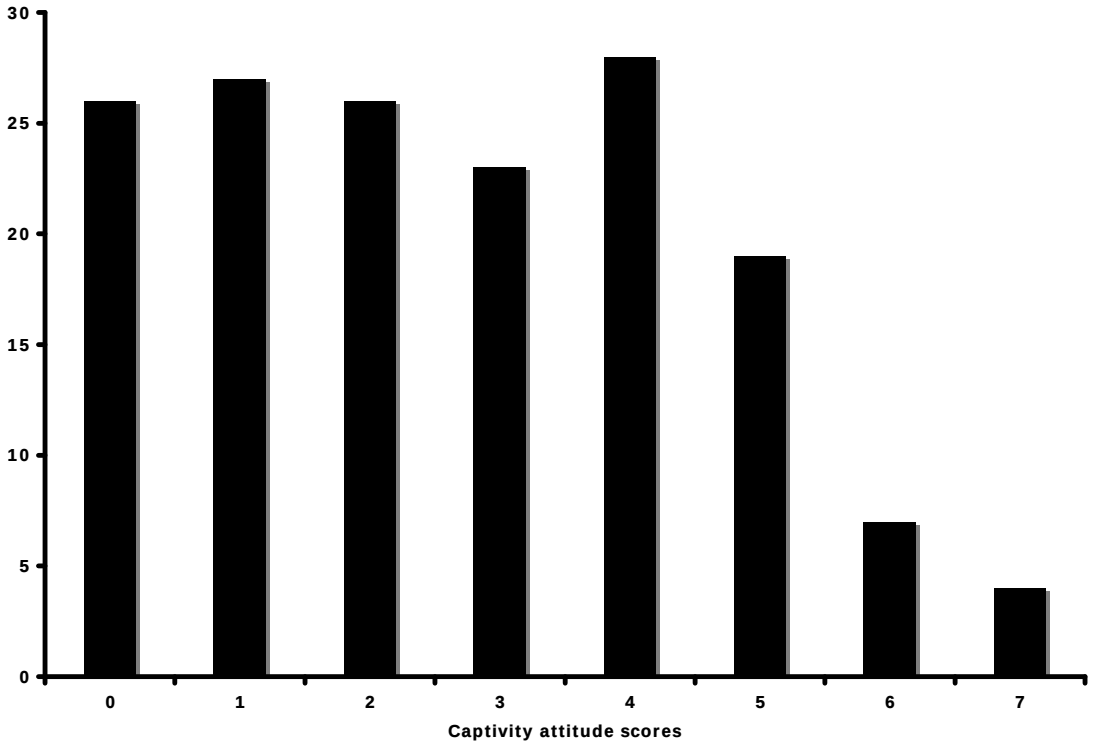

Figure 18. Range of respondent's captivity attitude scores, showing how pro-captivity or anti-captivity the participants were; *lower* scores reflect an anti-cavity viewpoint. (N=160).

Participants were given seven different scenarios in which they were asked to indicate whether or not they felt it was right to keep a dolphin(s) in captivity under that circumstance or in that environment (Table 18 and Fig. 20). Additionally, when given the choice of visiting a captive facility or observing dolphins in the wild, only 6.71% of participants stated that they would be more likely to go to a captive facility while an

overwhelming majority (93.29%) declared that they would be more likely to observe dolphins in their natural habitat.

Table 20. Reponses in percentages to captivity attitude questions. The answers that reflect an "anti-captivity" stance are represented emboldened and all answers are represented as percentages.

Do you believe it is right to keep dolphins in captivity when…?			
	Yes	No	N
When the dolphins are captured from the wild?	4.35	**95.65**	161
When the dolphins are captive bred?	60.00	**40.00**	155
When the dolphins are kept in a dolphinaria (aquarium/tank)?	21.94	**78.06**	155
When the dolphins are in their natural habitat, but are confined to an area by nets?	33.12	**66.88**	160
For human enjoyment to perform shows involving tricks?	19.62	**80.38**	158
For conducting research relevant to dolphin conservation in the wild?	75.16	**24.84**	157
For conducting research on captive dolphin rearing and breeding (Husbandry)?	51.63	**48.37**	153

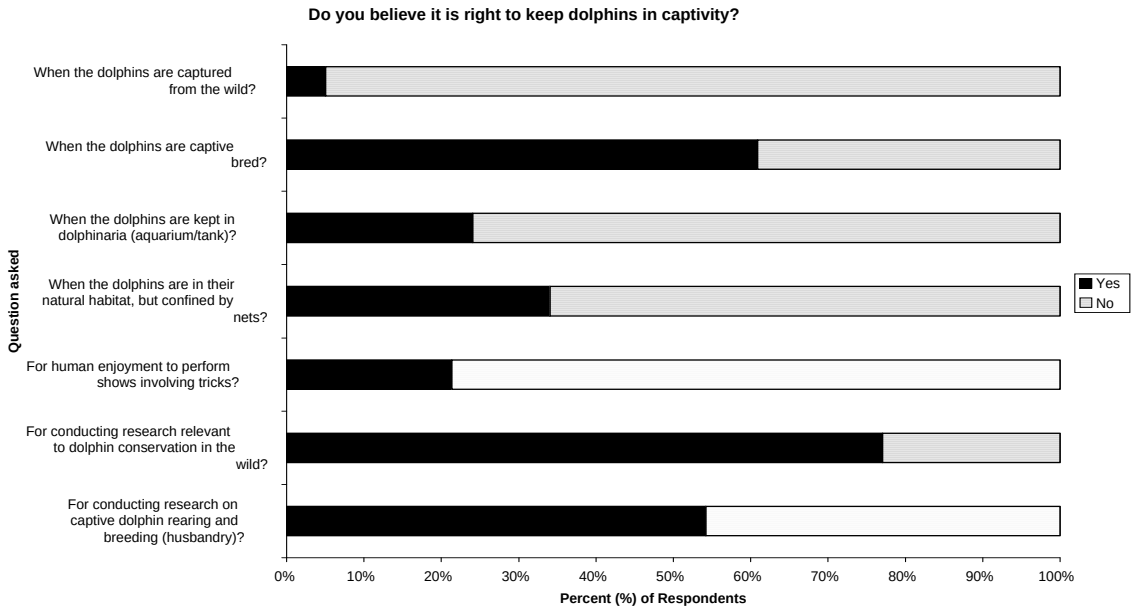

Figure 19. Responses to the question "When do you believe it is right to keep dolphins in captivity, under various conditions and circumstances?" (n=153)

The environmental attitude (aenv) sub-index (Cronbach's Alpha = 0.642) had a minimum possible score of zero and a maximum possible score of nine. The participants' scores ranged from two to eight and the mean score was 5.63 (SD = 0.01) (Fig. 20); where higher scores indicated that participants were more likely to think that green consumerism practices are important (Tables 21a-21b and Figs. 21a-21b).

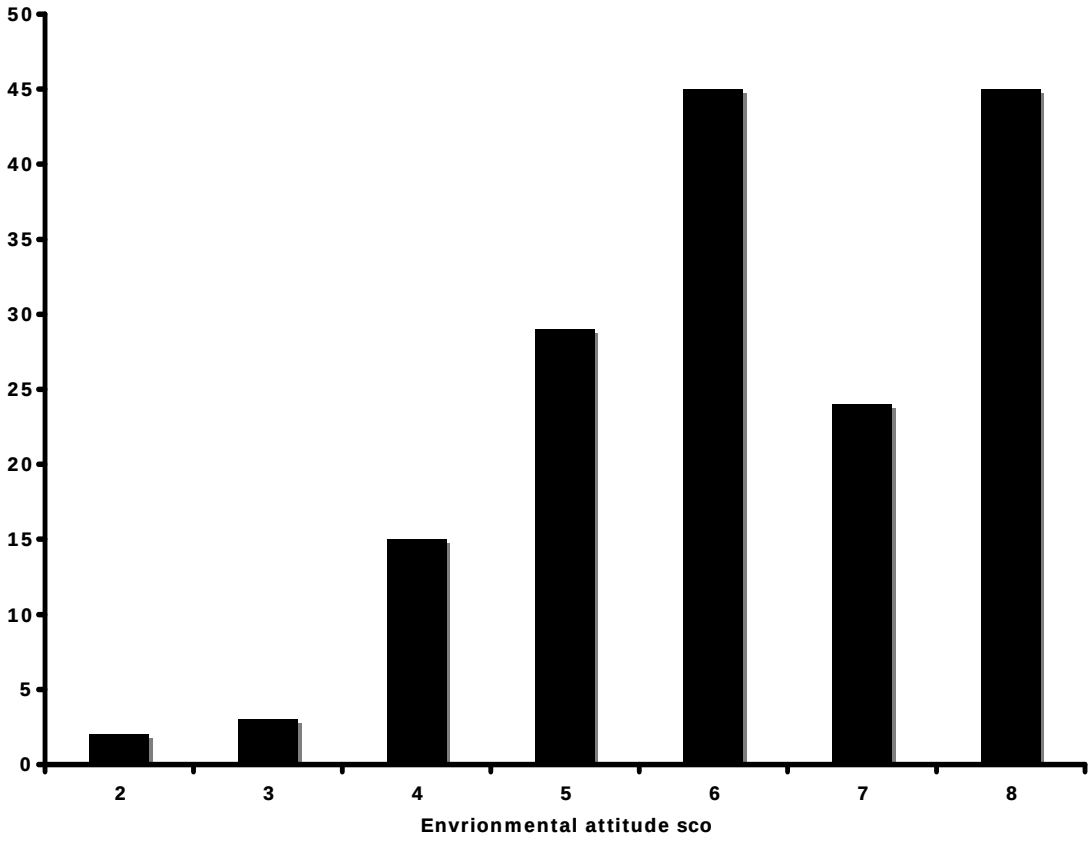

Figure 20. Range of respondent's environmental attitude scores, where higher scores indicated that participants were more likely to think green consumerism practices are important. (N=160).

Table 21a. Reponses to environmental attitude sub-index questions. The answers considered to be "pro-environmental" are emboldened and all answers are represented as percentages.

	Yes	No	N
Do you prefer to purchase household chemicals such as detergents and cleaning solutions that are environmentally friendly?	**82.21**	17.79	163

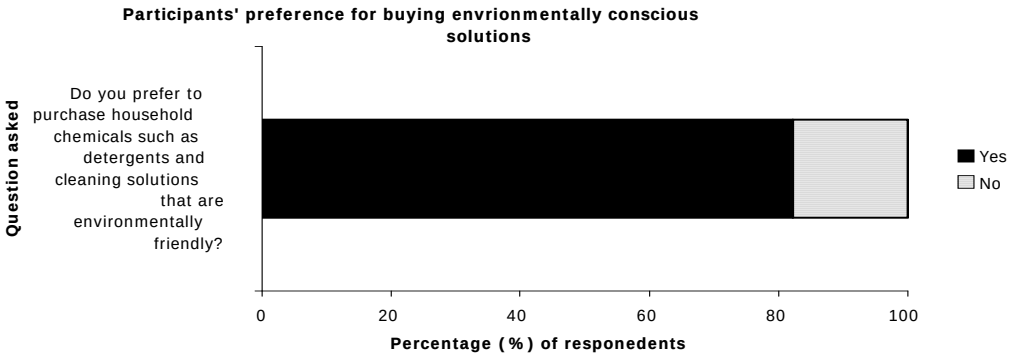

Figure 21a. Preferences for buying green products such as detergents and cleaning solutions (n=163).

Table 21b. Reponses to environmental attitude questions continued. The answers considered to be "pro-environmental" are emboldened and all answers are represented as percentages.

	Very Important	Important	Unimportant	Very unimportant	N
How important is it to you to buy paper and plastic products that are made from recycled products?	**44.79**	49.69	5.52	0.00	163
How important is it to you to avoid buying products form a company that you know might be harming the environment?	**48.45**	45.96	5.59	0.00	161

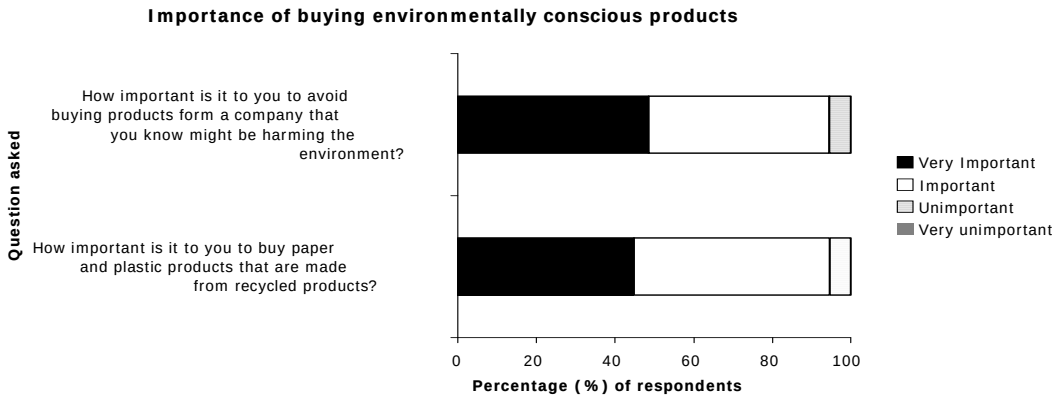

Figure 21b. Preferences for buying green products (n=161).

In addition, question wha8 was examined separately because it loaded independently during the factor analysis (Table 3). The participants' responses are noteworthy because 95% of participants said that they opposed the hunting of whales (26.54% opposed; 68.52% strongly opposed) (Tables 22 and Fig. 22).

Table 22. Responses to the question "Please indicate whether you support or oppose the hunting of whales." (N = 162)

	Strongly support	Support	Oppose	Strongly oppose
Percentage of participants	1.23	3.70	26.54	68.52

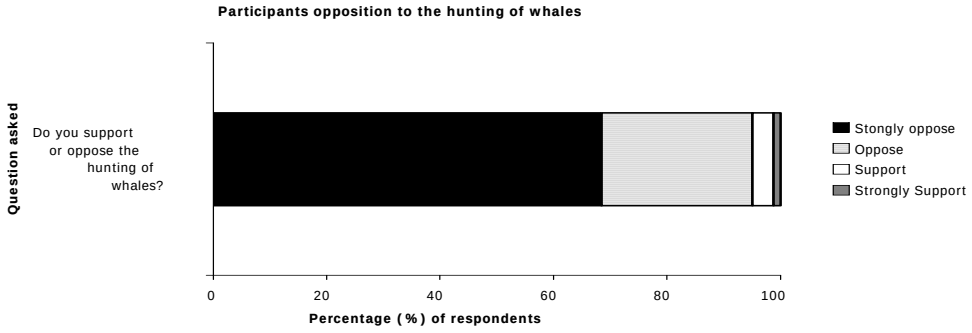

Figure 22. Responses to the question "Please indicate whether you support or oppose the hunting of whales" (n=162).

Lastly, question cap5 was dropped from the captivity sub-index because the question did not specify whether or not the dolphins would be released back into the wild once they recovered or were rehabilitated. The wording of this question may have implicated that the animals would be released after rehabilitation, making the question unreliable (Table 23 and Fig. 23).

Table 23. Responses to the questions "Do you believe it is right to keep dolphins in captivity when the dolphins are sick and/or injured?" Answers are represented as percentages.

	Yes	No	N
Do you believe it is right to keep dolphins in captivity when the dolphins are sick and/or injured?	89.57	10.43	163

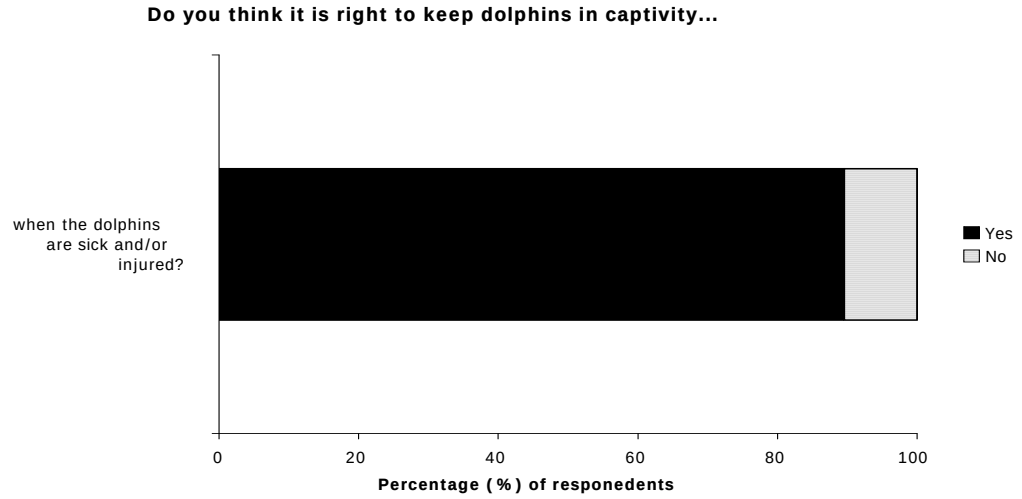

Figure 23. Responses to the questions "Do you believe it is right to keep dolphins in captivity when the dolphins are sick and/or injured?" (n=163).

The standard linear regression analyses examined the relationship between each attitudinal index and the independent variables: age, gender, education, and whether or not dolphins were seen (dolphin observation) (Table 24).

Table 24. Summary of individual standard linear regression tests conducted on the attitude indices.

	Attitude (aall)	**Conservation attitudes (acon)**	**Captivity attitudes (acap)**	**Environmental attitudes (aenv)**
Age	F(1, 144)= 0.11 R^2= 0.008 b= (-0.004) SE= 0.01	F(1, 147)= 0.02 R^2=0.000 b= 0.001 SE= 0.007	F(1, 147)= 0.02 R^2= 0.000 b= (-0.001) SE= 0.008	F(1, 150)= 0.53 R^2= 0.004 b= (-0.004) SE= (0.005)
Gender	F(1, 149)= 0.70 R^2= 0.005 b= (-0.44) SE= 0.53	**F(1, 157)= 14.02** **R^2= 0.082*** **b= (-1.02)** **SE= 0.27**	**F(1, 156)= 9.42** **R^2= 0.057*** **b= 1.01** **SE= 0.33**	**F(1, 159)= 6.37** **R^2= 0.039*** **b= (-0.55)** **SE= 0.22**
Education	F(1, 146)= 0.23 R^2= 0.002 b= 0.09 SE= 0.19	F(1, 153)= 0.26 R^2= 0.002 b= (-0.05) SE= 0.11	F(1, 152)= 1.68 R^2= 0.011 b= 0.16 SE= 0.12	F(1, 156)= 0.02 R^2= 0.001 b= (-0.01) SE= 0.08
Dolphin observation	**F(1, 129)= 4.32** **R^2= 0.032*** **b= 1.11** **SE= 0.53**	F(1, 137)= 0.38 R^2= 0.003 b= 0.26 SE= 0.30	F(1, 136)= 1.11 R^2= 0.008 b= 0.38 SE= 0.36	**F(1, 139)= 5.05** **R^2= 0.035*** **b= 0.49** **SE= 0.22**

*** equals p<0.05**

The overall attitudes of the participants who had observed the dolphins in the wild on their trip were significantly different than those who had not seen dolphins while on their trip (p=0.039); therefore, one can conclude that seeing dolphins brings about more environmentally or pro-conservation attitudes in the public. Although significant, only 3.2% of the variance in attitudes could be explained.

Out of the four independent variables, gender was the only one that was a significant predictor of conservation and captivity attitudes (p<0.001; p=0.003,

respectively). In both cases, females were more likely to indicate that cetacean conservation issues were very important to them, while males were less likely to find such issues very important. Females were also more likely to be against keeping dolphins in captivity. However, only a small percent of the variance in conservation and captivity attitudes could be explained (R^2= 0.082; R^2= 0.057, respectively).

Lastly, gender and dolphin observation were both significant predictors of the participants environmental attitudes, meaning that the female participants and the participants who saw dolphins were more likely to consider the purchase or use of environmentally friendly products as very important (p=0.026; p=0.013, respectively). However, the R^2 for both of these tests (R^2=0.039; R^2=0.035, respectively) shows that the relationship between these environmental attitudes and the independent variables are weak. Education was not found to be a significant predictor of any of the attitudinal indices.

One-way ANOVA analyses were used to examine whether or not there were differences in attitudes among the three whalewatching categories and between the two tour types.

Table 25. Summary of one-way independent ANOVA results between type of whalewatching category and tour type and the attitudinal indices.

	Attitude (aall)	**Conservation attitudes (acon)**	**Captivity attitudes (acap)**	**Environmental attitudes (aenv)**
Whalewatching category	**F(2, 148)= 6.04, η^2=0.075***	**F(2, 156)= 3.94, η^2=0.048***	F(2, 158)= 0.69, η^2=0.008	**F(2, 158)= 5.14, η^2=0.061***
Tour type	**F(1, 149)= 3.88, η^2= 0.050***	F(1, 157)= 1.32, η^2= 0.008	F(1, 156)= 0.95, η^2=0.006	F(1, 159)= 2.31, η^2=0.014

*** equals p<0.05**

These analyses showed that attitudes differed significantly among the three whalewatching categories for the attitude index ($p=0.003$), conservation attitudes sub-index ($p=0.021$), and environmental attitudes sub-index ($p=0.007$). Although significant, the relationships between all of these indices and the whalewatching categories were considered weak ($\eta^2=0.075$; $\eta^2= 0.048$; $\eta^2= 0.061$, respectively).

When examining the means of each group in the aall index to better understand the ANOVA, dedicated cetacean researches had the highest mean attitude scores ($M=20.26$, $SD=3.00$) and the scores for the other marine tour were slightly higher than the incidental whalewatching group ($M=18.66$, $SD=2.63$; $M=18.55$, $SD=2.63$, respectively). A Scheffé post hoc comparison further revealed that there were significant differences in the mean attitude scores (aall) between the dedicated research and other marine tour categories ($p=0.034$) and between the dedicated research and incidental whalewatching categories ($p=0.007$).

The mean score for the dedicated cetacean research category was also highest ($M=11.271$, $SD=1.30$) in the ANOVAs that compared the conservation attitudes sub-index's mean scores for each whalewatching category. Once again the other marine tour category had the second highest scores ($M=10.78.26$, $SD=1.57$), and the incidental whalewatching category had the lowest scores ($M=10.48$, $SD=1.76$). A Scheffé post hoc comparison that further examined the relationships between the whalewatching categories revealed that the conservation attitude mean scores between the dedicated

research and incidental whalewatching categories was the only significant relationship (p=0.022).

Lastly, the mean scores for the dedicated cetacean research category were once again highest (M=6.03, SD=1.21) in the ANOVA that was conducted on the environmental attitudes sub-index; however, in this test, the incidental whalewatching category (M=5.48.26, SD=1.28) had a higher mean score than the other marine tours group (M=5.30, SD=1.13). Furthermore, the dedicated cetacean research was significantly different than both the incidental whalewatching (p=0.017) and other marine tours categories (p=0.042) according to the Scheffé test for this sub-index.

Knowledge

The knowledge index (know) (Cronbach's Alpha = 0.518) had a minimum possible score of zero and a maximum possible score of four. The participants' scores ranged from zero to four and the mean score was 1.64 (SD = 0.075) (Fig. 24). Higher index scores reflected a higher level of knowledge about cetaceans and related conservation issues (Table 26 and Fig. 25).

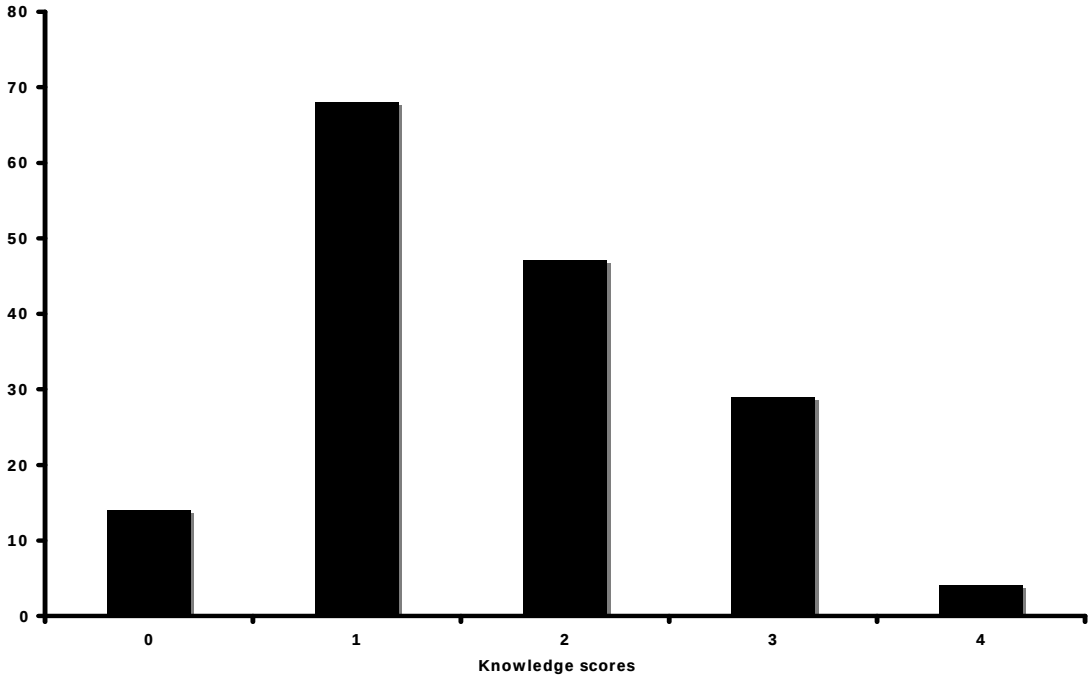

Figure 24. Range of respondent's knowledge scores. Higher scores represent a higher level of knowledge. (N=162).

Table 26. Reponses in percentages to knowledge questions. The correct answer is represented emboldened and all answers are represented as percentages

	Yes	No	N
Were you aware that there are several countries that are still involved in whaling?	**91.30**	8.70	161
Were you aware that currently more than 50% of the countries that are part of the International Whaling Commission support whaling?[38]	15.43	84.57	162
Are you aware of Belize's current stance on whaling?	**11.11**	88.89	162
Have you ever heard of the International Whaling Commission (IWC)?	**45.96**	54.04	161

[38] In 2006, the majority of the IWC member countries had a pro-whaling stance; however, in mid 2007, due to several anti-whaling stance countries joining the IWC, the majority vote reverted to predominately anti-whaling. At the inception of this project the majority was pro-whaling but the majority shifted by the time the surveys began.

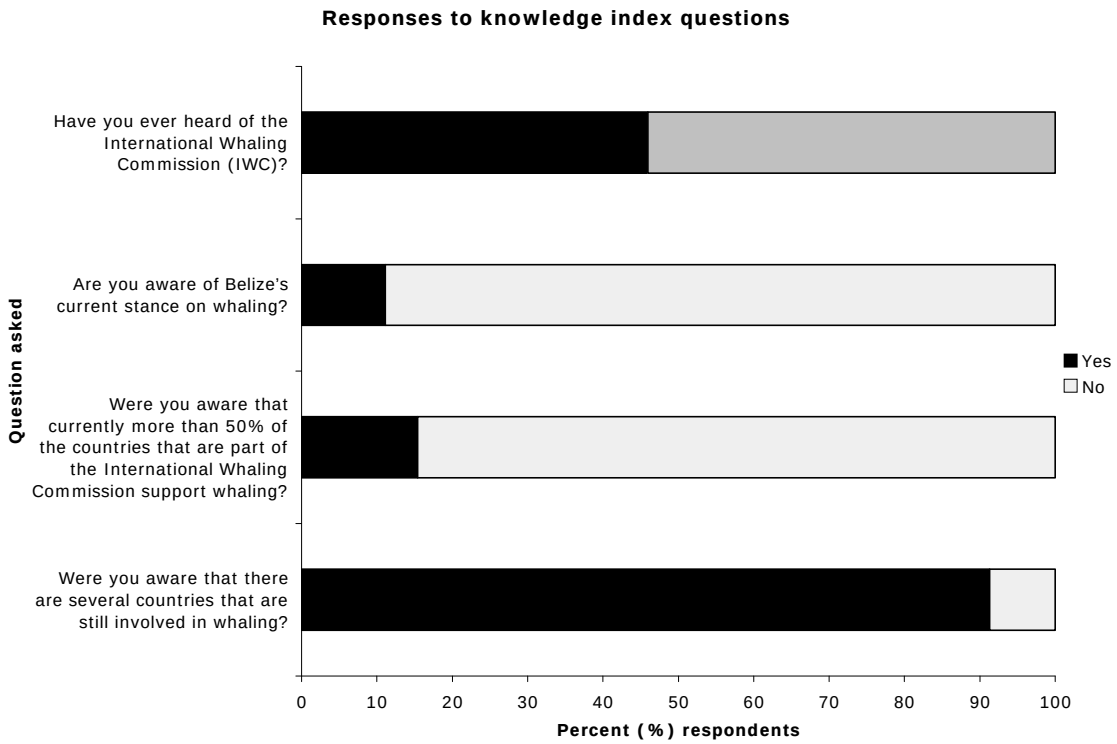

Figure 25. Reponses to knowledge index questions (n=161).

Standard linear regressions were conducted in order to examine the relationship between knowledge and the independent variables: age, gender, education, and whether or not dolphins were seen (dolphin observation) (Table 27).

Table 27. Summary of individual standard linear regression tests conducted on the knowledge index.

	Age	**Gender**	**Education**	**Dolphin observation**
Knowledge	F(1, 148)= 2.73 R^2= 0.018 b= 0.007 SE= 0.004	F(1, 158)= 0.13 R^2=0.000 b= 0.06 SE= 0.17	**F(1, 154)= 5.75** **R^2= 0.036*** **b= 0.15** **SE= 0.06**	F(1, 138)= 0.83, R^2= 0.006 b= (-0.15) SE= 0.16

Education was the only independent variable that significantly predicted the knowledge index (p=0.018), showing that individuals that had obtained higher degrees had higher knowledge scores than participants with less education. However, only 3.6% of the variance in knowledge could be explained.

The one-way ANOVA analyses examined whether or not there were differences in knowledge levels among the three whalewatching categories and between the two tour types. Neither the type of whalewatching category the participants fell under nor the type of tour the participants tour were significant predictors of knowledge (Table 28).

Table 28. Summary of one-way independent ANOVA results between type of whalewatching category and tour type and the knowledge category.

	Whalewatching category	**Tour Type**
Knowledge	$F(2, 157)= 1.29$, $\eta^2=0.016$	$F(1, 158)= 1.08$, $\eta^2=0.007$

CHAPTER 4: DISCUSSION

Demographics

A relevant study conducted by Parsons *et al.* (2003b), demonstrated that whalewatchers in Scotland generally have a more affluent and well educated background, tend to be female, and are typically more environmentally aware than the average tourist (defined as a visiting person from the general public who did not go on a whalewatch), who spends substantially less on holidays. The demographic picture of the participants in the current study are parallel to those found by Parsons *et al.* (2003b) in that the participants of this study also showed a higher level of education, were predominantly female, and came from an affluent background. Similar female majorities were also found in whalewatchers from Queensland, Australia (Muloin, 1998), British Columbia, Canada (Duffus, 1988; Finkler, 2001), California (Tilt, 1987), Japan (Hoyt, 2001) and New Zealand (Lück 2003). Likewise, whale-watchers in California, Hawaii and British Columbia were also described as "affluent" (Tilt 1987; Forestell & Kaufman 1990). Moreover, higher levels of education (i.e. a master's degree or equivalent) were possessed by the majority of whalewatchers in similar demographic studies in Argentina (Fundación Cethus, 1999), California (Tilt 1987), British Columbia (Finkler & Higham, 2004) and New Zealand (Lück 2003).

This study found the mean age of participants to be 53, which is similar to studies from Queensland, Australia (Muloin, 1996), British Columbia (Duffus, 1988), the Dominican Republic (Draheim *et al.,* in press; Parsons & Draheim, 2009) and Scotland (Parsons *et al.* 2003b), where the majority of their participants were "middle-aged" (mid-thirties to mid-fifties). However, the marine tourists in Belize were much older than whalewatchers in New Zealand who were more likely to be in their twenties and early thirties (Pearce & Wilson 1995; Lück 2003).

The age profiles between the current study and the study conducted by Parsons *et al.* (2003b) differed in that the participants in this study were slightly older. Only 30% of the population in the study conducted by Parsons *et al.* (2003b) were over the age of 50, while individuals over the age of 50 comprised 64% of the current study's population. This difference can be explained by the marketing methods used by the Oceanic Society in partnership with Elderhostel. Bottlenose dolphin and coral reef research excursions are both offered directly through Elderhostel, whose participants are mostly over the age of 50 and come from a variety of backgrounds and from all over the United States and Canada (Elderhostel, 2010).

Participant categories

The type of visitors that came down to the field station influenced the demographic break down of the whalewatching categories and the two tour groups. Because the dedicated cetacean research group had the youngest mean age and was comprised by the fewest number of people that had obtained a higher degree, it is not

surprising that the research excursion group had similar results. Many university research courses came down to the field station to utilize its resources and access to the surrounding diverse marine ecosystems, and therefore these groups greatly reduced the mean age of the research categories. On the other hand, Oceanic Society's partnership with Elderhostel could explain why both the incidental whalewatching and other marine tour categories, as well as, the natural history group had an older mean age. Moreover, each Elderhostel trip has an associated activity level rating. The bottlenose dolphin research excursion has a higher activity level than the coral reef research trip, which may make members from the Elderhostel community more inclined to participate in the coral reef program, therefore minimizing the likelihood these individuals would encounter dolphins and fall into the incidental whalewatching or dedicated cetacean research category. As expected, the gender breakdown of each category was parallel to the entire sample population, which was majority female.

Behavior

The results of this study showed that viewing dolphins in the wild significantly affected the participants' behaviors, which could be due to the idea that bottlenose dolphins often produce positive, aesthetic, and humanistic views (Kellert, 1999). Younger participants with lower education levels, who saw dolphins, were more likely to change the examined behaviors based on their experiences on this trip. The results of this study showed that 46.01% of the participants had the highest behavior modification score, and these results are similar to those found by Rawles and Parsons (2005), who

discovered that Scottish whalewatchers were more environmentally motivated than the general public. The high percentage of participants in this study could be explained by the fact that these individuals maybe less set in their ways and are more adept to change due to their younger ages and lower education levels. For example, the participants in this study maybe more likely to donate to environmental organizations simply because they have not had the opportunity to do so yet. Additionally, younger participants may be more inclined to return to Belize on vacation, where as older participants may be more inclined to travel to different places. Regardless, the majority of participants stated that they would be more likely to continue going on dolphin-watching or dolphin research excursions in Belize or abroad based on the experiences they had on the current trip to Belize. Therefore, one can conclude that the majority of the participants had a positive experience.

Participants with higher degree levels scored significantly higher on the environmental behavior index than participants with less education. Because, these participants are more knowledgeable, the participants maybe more aware of the consequences of their actions and their associated impacts on the environment. Although age was not a significant factor for this index, it could be playing an indirect role as participants with a higher level of education would also be older. As a result, perhaps participants with higher education levels may have witnessed the degradation of the environment throughout their lifetime and therefore are more environmentally conscious.

Furthermore, the behaviors amongst the three whalewatching categories significantly differed in the behavior index, the behavior modification sub-index, and the behaviors affected by whaling activities sub-index. The dedicated cetacean researchers had the highest mean score for all three indices and this group's score was followed by the incidental whalewatching group, and then the other marine tour group, which emphasizes the fact that the whalewatchers and researches have more pro-environmental and pro-conservation behaviors than the general public. Moreover, further studies are needed to understand what independent factors could be responsible for these differences.

Attitudes

The results of this study showed that viewing dolphins in the wild also significantly affected the participants' attitudes. This study also showed that conservation issues were very important to an overwhelming majority of the participants. Possible explanations for this could be that participants who came down to the field station were perhaps already interested in conservation or more aware about cetacean conservation issues. Additionally, whalewatchers as a whole may be more inclined to protect the dolphins that they encountered due to their positive experiences with the species (Dobson, 2007). Furthermore, females had significantly stronger conservation attitudes than males. These results are concurrent with Kellert and Berry's (1980) findings that females possess a greater concern for animal cruelty issues (harassment) and seem to value animals as objects of affection, therefore motivating women to have stronger conservation attitudes.

The participants in this study also felt that using or purchasing products that were environmentally safe or were constructed from recycled materials was very important. Specifically, female participants and those who saw dolphins had significantly more positive environmental attitudes than males and the participants that had no interaction with dolphins. Females may think about the environment in a nurturing way and therefore are more likely to protect the environment in order to keep it safe for their children and future generations. Lastly, the mean scores for the dedicated cetacean research category in the ANOVA analyses were also highest for attitudes as it was for the behavior indices, adding additional support to the claim that people who view cetaceans in the wild also have more positive attitudes than those that do not.

Knowledge

Education was the only significant predictor of knowledge, where people with higher degrees exhibited a higher level of knowledge about cetaceans and cetacean conservation issues. These findings are supported by a study conducted by Kellert and Berry (1980) who found a direct relationship between education level and concern, interest, and awareness of environmental issues. Although, the knowledge questions asked in this study were not questions that would generally reflect a person's overall intelligence or knowledge level, education was still a significant factor in this study which can be supported by a study conducted by Kellert (1996) that determined that education was the most powerful force shaping perception of nature and biodiversity.

Whaling

In a study conducted on secondary school students (ages 10-17) in Singapore by Ivy *et al.* (1998), 68.7% of students identified "over-hunting by man" as the reason for the near extinction of certain species of whale. One of the objectives of this survey was to determine whether tourists in Belize opposed or supported the hunting of whales and whether a country's whaling stance, specifically a pro-whaling vote at the (IWC), could affect its tourism revenues. Almost all of this study's participants (95%) stated that they were opposed to the hunting of whales. However, four people in this study answered yes to every question in the survey, which could provide an explanation for the 1.23% of respondents that stated they strongly supported whaling. Actual attitudes may show that no participants truly support whaling.

A similar study in Scotland that surveyed the general public general public found that almost all participants were opposed to the hunting of whales (96.4%); with the vast majority (75%) responding with a strong opposition to whaling and the remaining participates (21.4%) stating that they were merely "against" the activity (Scott & Parsons, 2005). Of the remaining 3.6%, only 0.8% of participants stated a general approval for whaling, while no participants were in strong support (Scott & Parsons, 2005). Furthermore, the results showed that males were more likely to boycott whaling countries than females, which is contradictory to Kellert and Berry's 1987 study, which found that males were more likely to endorse exploitation of animals.

The current study also found that 68.1% of participants said that they would actively boycott visiting pro-whaling countries and, more specifically, 59.5% of

participants stated that they would boycott visiting Belize if the country supported whaling. Additionally, 40.4% of participants stated that they would be less likely to visit Belize if the country supported whaling at the IWC, which has considerable implications for Belize's position and policies at the IWC. Similarly, in a study conducted by Parsons and Draheim (2009) in the Dominican Republic, the majority (71%) of participants stated that if a Caribbean country supported the hunting or capture of whales or dolphins they would be less likely to visit it on holiday. A study conducted by Parsons & Rawles (2003) showed that 79% of whale-watchers in Tobermory, Isle of Mull, Scotland, would boycott a country that conducted hunts for cetaceans. Based on the findings of the current study, a 59.5% loss of tourists could have great economic impacts on Belize's GDP as tourism comprises 16.8% of the country's GDP.

Whalewatching worldwide has become an increasingly important economic sector of tourism. In 1998, an estimated nine million people participated in 492 communities across 87 countries, netting an estimated $299.5 million in direct expenditures and $1,049 million in total expenditures (Hoyt, 2001). In the eight years prior, total global participation witnessed a 12.1% annual increase and an annual expenditure increase of 18.6% (Hoyt, 2001). This marked surge was particularly prevalent in the greater Caribbean. Hoyt and Hvenegaard (2002) reported that in 1991 approximately 1,900 individuals participated in Caribbean whalewatching related activities, spending $1.7 million in associated expenditures. By 1998, whalewatching tourism in the Caribbean had increased to 39,000 individuals annually, comprising a 20.2% annual increase, and totaling over $10 million dollars in associated expenditures

Although there are no commercial whale or dolphin watching companies currently in Belize, many tour destinations advertise dolphin watching or dolphin encounters during S.C.U.B.A. dives as tour highlights, producing indirect economic benefits to the nation. Any activities that disrupt the ability of tour destinations that offer these resources could result in economic losses to Belize.

Captivity

The respondents in this study had overwhelmingly "anti-captivity" attitudes, where females were more likely to have stronger anti-captivity views than males, which could be due to the fact that females have more moralistic attitudes then males (Kellert & Berry, 1987). Findings from a survey on the U.S. public by the World Society for the Protection of Animals (WSPA) in 2007 showed that only 11% of respondents believed that capturing wild dolphins for display was acceptable. Similarly, only 4.4% of participants in the current study believed that it was right to keep dolphins that were captured from the wild in captivity. It was interesting to find that participants were against keeping dolphins in captive facilities that provided an artificial environment for dolphins, such as dolphinaria, and those that provided semi-natural habitats, through sea pens and enclosed lagoons, as many of the participants had admitted that they had been to SeaWorld or swim-with-the-dolphins (SWTD) facilities. Although the number of respondents that had visited captive facilities was not specified in this study, the author requested a show of hands during the nightly lectures the participants attended to get an informal estimate. These conflicting attitudes should be examined in a future study.

Participants felt that it was only appropriate to keep dolphins in captivity when the dolphins were captive-bred, for the specific purpose of conducting research relevant to dolphin conservation in the wild, for research on captive breeding and husbandry programs, or when the dolphins were sick or injured. These results were interesting and responses may have been invoked due to the language used and the ambiguity of the question. The use of the term "captive bred" may have lead the respondents to believe that because the dolphins were born in captivity it was acceptable for such animals to remain in captivity. Additionally, the public display industry often advertises its conservation efforts through captive breeding programs, therefore, the general public may associate this terminology as being positive. The use of the word "research" when participants were asked if they thought it was right to keep dolphins in captivity when research relevant to dolphin conservation in the wild was being performed may have triggered a positive response, as research is intrinsically associated as a positive action.

Using the terms "captive" and "captivity", although standard descriptors for animals being kept *ex situ*, may have led to negative connotations that perhaps influenced the participants. Marine theme parks (such as Seaworld) and dolphinaria sometimes use the term "in human care," presumably because this sounds more positive, although this term implies somewhat that the animals require "care" and human intervention. However, this study used the term "captive", as this is the term used most frequently by the larger zoo community, such as the National Zoo in Washington DC (e.g. http://nationalzoo.si.edu/SCBI/EndangeredSpecies/ManageSmallPops/default.cfm) or

Brookfield Zoo in Chicago (http://www.czs.org/czs/Animal-Care/Species-Survival-Plans.aspx).

As previously discussed, the criterion of keeping dolphins in captivity when the animals are sick or injured was dropped from the captivity index because of the ambiguity of the question. This question did not specify whether or not the dolphins would be released back into the wild once they recovered or were rehabilitated, which may have been an assumption of the survey participants. Treatment of injured and sick animals in a captive setting certainly seems to have more public support, than other reasons for keeping *ex situ* cetacean populations. Further research could investigate whether this acceptance is contingent on the release of animals after treatment.

Lastly, informal interviews were conducted after all surveys were completed in order to determine how Belize tourists felt about the HPAL dolphin facility. According to a researcher at HPAL, this captive facility was not a "swim-with-dolphin" park as was often misrepresented (name withheld, a). However, several guests that had visited HPAL argued that they were allowed to get into the enclosure with and "pet" the dolphins. The dolphins also performed tricks for the guests - flips, spins, and tail walks as one guest noted (name withheld, b)- and the guests were given the opportunity to pose for pictures while receiving kisses from the dolphins. A different guest commented on the enclosure the dolphins were kept in as "shallow! It seemed small but the most startling thing was that it seemed really shallow" (name withheld, b). One guest of the facility stated the she "had mixed feelings about the Hugh Parkey dolphin encounters," and continued that "while the biologists there were extremely knowledgeable and clearly loved and cared for

the dolphins well" she state that she "always found it hard to deal with wild animals being in enclosures such as the one at Hugh Parkey" (name withheld, c). Lastly, one guest concluded that "All in all the dolphins seemed very happy but I would prefer to see them out in their natural habitat, rather than in such a small enclosure" (name withheld, c). Based on the findings of this study and the fact that HPAL was not able to financially support the facility, the Government of Belize should not approve future approvals to re-open the facility.

Study Limitations

Due to financial limitations, this study was limited to one field site and sample size was severely limited by a decrease in tourism due to a downturn in the economy. Although it is possible to criticize the sample population of this study as being biased due to the type of programs offered by Oceanic Society, the results of this study are comparable to others that have been conducted internationally on the general public. It is recommended that future studies of this nature in Belize should include a cross-comparison of participants' behaviors, attitudes, and knowledge between eco-tourism areas and areas with high levels of "mass" tourism, such as Ambergris Caye, Caye Caulker, or the Caye Caulker water taxi terminal in Belize City as originally proposed by the author.

CHAPTER 5: CONCLUSION

Implications of this study

As developing countries such as Belize continue to grow, it is suggested that sustainability plans such as the Singapore Green Plan be a key component in development. Singapore's Green Plan spelled out the need to become "a city with high standards of public health, with clean air, land, water, and a quiet living environment; a city conductive to gracious living, with people who are concerned about and take a personal interest in the care of both the local and global environment; and a city that will be a regional center for environmental technology" (Ministry of Environment, 1993). The Green Plan also highlighted that environmental education was crucial for the building of an environmentally proactive society (Ministry of Environment, 1993). The need for environmental education is not only limited to the local population but can also be translated into the tourism arena.

Because the government of Belize is dedicated to promoting environmentally sustainable tourism (Grossberg, *et al.*, 2003), this study can be used as a case study to encourage Belize to continue its efforts in developing strong environmental and conservation initiatives. Moreover, 95% of participants in this study felt that it was important that their trip include an education component, providing considerable

evidence that illustrates that it is in the country's best interest to include environmental education components in their management plans.

In addition, this survey provides data that could assist the Belizean government with conservation-oriented decision-making about cetaceans. For example, 98.2% of participants felt that it was important that Belize has a strong commitment to dolphin conservation and 100% of participants felt that marine mammal conservation laws and policies were important. Most respondents (97.4%) stated that it was important that dolphins were not disturbed or harassed while being observed. As dolphin and whalewatching in Belize is often opportunistic and unregulated, it is recommended that Belize adopt a whalewatching code of ethics or guidelines and require its implementation in all marine tourism operations that frequently encounter dolphins or highlight dolphin watching experiences as a component of their tour.

Because Turneffe Atoll is facing increasing development pressures, there has been considerable recent interest in designating parts of the atoll as a national park (Platt & Thorbjamarson, 1996; Zisman, 1996; Platt *et al.*, 1999; Holguin, 2004; Granek 2006; Dick, 2008). In the mid-1990's, local non-governmental organizations, in collaboration with the Belizean government, submitted an International Man and the Biosphere Reserve application to UNESCO for Turneffe. The Biosphere Reserve concept was formerly recommended by the Turneffe Islands Coastal Advisory Committee to the Coastal Zone Management Authority and Institute, however efforts stalled there in 2005. A new initiative is in the preliminary stakeholder consultation process. If successful, it

would give Belize a presence on the world conservation stage through the creation of a new large, highly visible marine protected area (B. Winning, pers. comm.).

This study provides significant evidence that viewing bottlenose dolphins in their natural environment elicits positive behaviors and attitudes from visitors, and increases the level of knowledge these individuals possess. By protecting the habitat of this keystone species through the implementation of long-term protective measures at Turneffe Atoll, Belize can further secure its national resources that, in turn, benefit the nation economically over the long term.

Conclusion

Preventing damage to Belize's reefs and coastal areas is critically important in maintaining Belize's pristine environment and failure to do so could result in severe economic loss. The Belize Barrier Reef comprises 30% of Belize's Gross Domestic Product through revenue from its commercial fisheries, tourism (general tourism, eco-tourism, and cruise ship tours), and private coastal development. Income generated by tourism expenditures represents $199.4 million USD, or 16.8% of Belize's GDP (Belize Tourism Board, 2010). Failing to protect Belize's natural resources will ultimately result in fewer tourist dollars toward the nation's income, in addition to its impact in the form of further environmental degradation. Furthermore, this study suggests that highly visible national policies towards cetacean conservation, and against captive cetacean facilities, in addition to preserving its anti-whaling stance at the IWC, would be beneficial in attracting tourists (Parsons & Rawles, 2003; Parsons, 2003; Parsons &

Draheim, 2009). Failure to base future policies and decisions on the environmental attitudes of tourists may result in a substantial economic loss and further environmental degradation, but basing future policies and decisions on the environmental attitudes of tourists can secure the country's economic tourism potential and the viability of species populations.

APPENDIX I
Questionnaire

George Mason University
Department of Environmental Science and Policy

Attitudes Towards Cetacean Conservation

Please indicate your answer for the following statements.

Part I. – Dolphin Watching

1. Prior to this trip, have you ever visited Belize before?
   □ Yes □ No

   If Yes, how many times: _____

2. Do your experiences on this trip make you more likely to visit Belize again?
   □ Yes □ No

3. Was dolphin research the main reason for you coming on this trip?
   □ Yes □ No

   If No, please explain: _____

4. Did you see dolphins, or any other whale species on this trip?
   □ Yes □ No

****IF YOU ANSWERED "NO" PLEASE SKIP TO QUESTION #8****

5. Prior to this trip, have you ever gone on a dolphin research expedition or dolphin watching trip before?
   □ Yes □ No

   If Yes, where?: _____

6. Do your experiences on this trip make you more likely to visit Belize and participate in a dolphin research expedition again?
   □ Yes □ No

7. Do your experiences on this trip make you more likely to go on a dolphin or whale research expedition abroad or dolphin/whalewatching?
   □ Yes □ No

   If Yes, which one:
   □ Dolphin/Whale Research Expedition □ Dolphin/Whalewatching

****YES RESPONDANTS TO QUESTION 4, PLEASE SKIP QUESTION 8****

8. Has this trip made it more likely for you to go on a dolphin watching excursion?
   □ Yes □ No

9. How important is it to you that your trip does not disturb or harass the dolphins being watched?
   □ Very Important □ Important □Unimportant □ Very Unimportant

10. How important is it to you that your trip has an educational component?
   □ Very Important □ Important □Unimportant □ Very Unimportant

Part II. – Cetacean Conservation

11. How important is it to you that your trip works locally with dolphin conservation efforts?
   □ Very Important □ Important □Unimportant □ Very Unimportant

12. How important is it to you that Belize has a strong commitment to whale and dolphin conservation?
   □ Very Important □ Important □Unimportant □ Very Unimportant

13. How important do you think marine mammal conservation laws and policies are?
   □ Very Important □ Important □Unimportant □ Very Unimportant

14. How well do you think bottlenose dolphins and other whale and dolphin species are protected?
   □ Overprotected □ Protected □ Slightly Protected □ Under Protected

Part III. - Whaling

15. Were you aware that there are several countries that are still involved in whaling?
   □ Yes □ No

   If yes, which countries: _____

16. Were you aware that currently more than 50% of the countries that are part of the International Whaling Commission support whaling?
   □ Yes □ No

17. Would you boycott visiting a country involved in whaling?
   □ Yes □ No

18. Are you aware of Belize's current stance on whaling?
   □ Yes □ No

   If yes, what is Belize's current stance on whaling?
   □ Pro-whaling □ Anti-whaling

19. Have you ever heard of the International Whaling Commission (IWC)?
   □ Yes □ No

20. If Belize supported whaling at the International Whaling Commission (IWC), would it make you less likely or more likely to travel to the country?
□ More likely □ Less Likely □ No Difference

21. Would you travel to Belize and still whalewatch if the country supported whaling?
□ Yes □ No

22. Please indicate whether you support or oppose the hunting of whales.
□ Strongly Support □ Support □ Oppose □ Strongly oppose

23. Would you boycott visiting a country that is actively involved in whaling?
□ Yes □ No

Part VI. – Captivity

24. When do you believe it is right to keep dolphins in captivity:

A. When the dolphins are captured from the wild?
□ Yes □ No

B. When the dolphins are captive bred?
□ Yes □ No

C. When the dolphins are kept in a dolphinaria (aquarium/tank)?
□ Yes □ No

D. When the dolphins are in their natural habitat, but are confined to an area by nets?
□ Yes □ No

E. When the dolphins are Sick and/or Injured?
□ Yes □ No

F. For human enjoyment to perform shows involving tricks?
□ Yes □ No

G. For conducting research relevant to dolphin conservation in the wild?
□ Yes □ No

H. For conducting research on captive dolphin rearing and breeding (Husbandry)?
□ Yes □ No

25. Were you aware that there is a captive swim with dolphins program in Belize
□ Yes □ No

26. Would you be more or less likely to go to a captive dolphin facility over observing dolphins from a whalewatch.
□ More Likely □ Less Likely

Part V. – Environmental Behavior

27. Do you recycle on a weekly basis?
□ Yes □ No

a. If Yes, what do you recycle:
□ Aluminum Cans □ Plastic □ Paper □ Glass □ Other

b. If No, has this trip increased the likelihood that you will start recycling when you return home?
□ Yes □ No

28. How important is it to you to buy paper and plastic products that are made from recycled products?
□ Very Important □ Important □Unimportant □ Very Unimportant

29. Do you use energy-saving light bulbs?
□ Yes □ No

If No, has this trip increased the likelihood that you will start using energy-saving light bulbs when you return home?
□ Yes □ No

30. Do you prefer to purchase household chemicals such as detergents and cleaning solutions that are environmentally friendly?
□ Yes □ No

If No, has this trip increased the likelihood that you will start buying environmentally friendly cleaning solutions when you return home?
□ Yes □ No

31. How important is it to you to avoid buying products form a company that you know might be harming the environment?
□ Very Important □ Important □Unimportant □ Very Unimportant

32. Are you a member of an environmental or animal welfare organization?
□ Yes □ No

a. If yes, which one(s)? _____

b. If no, has this trip increased the likelihood of you joining and environmental or animal welfare organization?

□ Yes □ No

33. Has going on this trip increased the likelihood that you would donate to an environmental or animal welfare organization?

□ Yes □ No

34. Would you be willing to pay higher prices in order to protect the environment?

□ Yes □ No

35. Would you be willing to pay higher taxes in order to protect the environment?

□ Yes □ No

Part VI. – Demographics

36. Where is your permanent residence (City, State/Province, Country)?

_____

37. In what year were you born? _____

38. What is your Gender?

□ Male □ Female

39. Are you retired?

□ Yes □ No

40. What is / was your occupation? _____

41. At what age did you complete your formal education?_____

42. Please indicate the highest level of education that you have completed.

□ Less than High School
□ High School Diploma / GED
□ Some college, no degree
□ Associate / Bachelor Degree
□ Master Degree
□ Ph.D., M.D., or other terminal degree

43. Have you taken additional adult educational classes since completing your formal education?

□ Yes □ No

If yes, what classes: _____

44. Would you recommend coming on this trip to your friends?

□ Yes □ No

45. Would you recommend dolphin watching to your friends?

□ Yes □ No

46. Approximately how much money do you intend on spending in souvenirs (in USD)?

_____

47. Do you plan to spend any extra days in Belize in addition to this trip?

□ Yes □ No

If Yes, how many additional days do you plan to spend in Belize and what type of activities do you intend on participating in?

_____

THANK YOU FOR PARTICIPATING IN THIS SURVEY ☺

APPENDIX II
Code book

George Mason University
Department of Environmental Science and Policy

Attitudes Towards Cetacean Conservation

CODEBOOK

Please indicate your answer for the following statements.

Part I. – Dolphin Watching

dol1a

1. Prior to this trip, have you ever visited Belize before?

1 Yes **0** No

dol1b

If Yes, how many times: _____

dol2

2. Do your experiences on this trip make you more likely to visit Belize again?

1 Yes **0** No

dol3a

3. Was dolphin research the main reason for you coming on this trip?

1 Yes **0** No

dol3b

If No, please explain: _____

dol4

4. Did you see dolphins, or any other whale species on this trip?

1 Yes **0** No

****IF YOU ANSWERED "NO" PLEASE SKIP TO QUESTION #8****

dol5a

5. Prior to this trip, have you ever gone on a dolphin research expedition or dolphin watching trip before?

1 Yes **0** No

dol5b

If Yes, where?: _____

dol6 – B_{Mod}

6. Do your experiences on this trip make you more likely to visit Belize and participate in a dolphin research expedition again?

1 Yes **0** No

dol7a – B_{Mod}

7. Do your experiences on this trip make you more likely to go on a dolphin or whale research expedition abroad or dolphin/whalewatching?

1 Yes **0** No

dol7b

If Yes, which one:

1 Dolphin/Whale Research Expedition **0** Dolphin/Whalewatching

****YES RESPONDANTS TO QUESTION 4, PLEASE SKIP QUESTION 8****

dol8 – B_{Mod}

8. Has this trip made it more likely for you to go on a dolphin watching excursion?

1 Yes **0** No

dol9 – A_{con}

9. How important is it to you that your trip does not disturb or harass the dolphins being watched?

3 Very Important **2** Important **1** Unimportant **0** Very Unimportant

dol10

10. How important is it to you that your trip has an educational component?

3 Very Important **2** Important **1** Unimportant **0** Very Unimportant

Part II. – Cetacean Conservation

con1 – A_{con}

11. How important is it to you that your trip works locally with dolphin conservation efforts?

3 Very Important **2** Important **1** Unimportant **0** Very Unimportant

con2 – A_{con}

12. How important is it to you that Belize has a strong commitment to whale and dolphin conservation?

3 Very Important **2** Important **1** Unimportant **0** Very Unimportant

con3 – A_{con}

13. How important do you think marine mammal conservation laws and policies are?

3 Very Important **2** Important **1** Unimportant **0** Very Unimportant

con4

14. How well do you think bottlenose dolphins and other whale and dolphin species are protected?

3 Overprotected **2** Protected **1** Slightly Protected **0** Under Protected

Part III. - Whaling

wha1a – Know

15. Were you aware that there are several countries that are still involved in whaling?

1 Yes **0** No

wha1b

If yes, which countries: _____

wha2– Know

16. Were you aware that currently more than 50% of the countries that are part of the International Whaling Commission support whaling?

1 Yes **0** No

wha3 – B_{wha}

17. Would you boycott visiting a country involved in whaling?

1 Yes **0** No

whal4a– Know

18. Are you aware of Belize's current stance on whaling?

1 Yes **0** No

wha4b

If yes, what is Belize's current stance on whaling?

1 Pro-whaling **0** Anti-whaling

wha5– Know

19. Have you ever heard of the International Whaling Commission (IWC)?

1 Yes **0** No

wha6 – B_{wha}

20. If Belize supported whaling at the International Whaling Commission (IWC), would it make you less likely or more likely to travel to the country?

2 More likely **1** Less Likely **0** No Difference

wha7 – B_{wha}

21. Would you travel to Belize and still whalewatch if the country supported whaling?

1 Yes **0** No

wha8

22. Please indicate whether you support or oppose the hunting of whales.

3 Strongly Support **2** Support **1** Oppose **0** Strongly oppose

wha9 – B_{wha}

23. Would you boycott visiting a country that is actively involved in whaling?

1 Yes **0** No

Part VI. – Captivity

cap1 – A_{Cap}

24. When do you believe it is right to keep dolphins in captivity:

A. When the dolphins are captured from the wild?

1 Yes **0** No

cap2 – A_{Cap}

B. When the dolphins are captive bred?

1 Yes **0** No

cap3 – A_{Cap}

C. When the dolphins are kept in a dolphinaria (aquarium/tank)?

1 Yes **0** No

cap4 – A_{Cap}

D. When the dolphins are in their natural habitat, but are confined to an area by nets?

1 Yes **0** No

cap5

E. When the dolphins are Sick and/or Injured?

1 Yes **0** No

cap6 – A_{Cap}

F. For human enjoyment to perform shows involving tricks?

1 Yes **0** No

cap7 – A_{Cap}

G. For conducting research relevant to dolphin conservation in the wild?

□□**1** Yes **0** No

cap8 – A_{Cap}

H. For conducting research on captive dolphin rearing and breeding (Husbandry)?

1 Yes **0** No

cap9

25. Were you aware that there is a captive swim with dolphins program in Belize?

1 Yes **0** No

cap10

26. Would you be more or less likely to go to a captive dolphin facility over observing dolphins from a whalewatch.

1 More Likely **0** Less Likely

Part V. – Environmental Behavior

en1a

27. Do you recycle on a weekly basis?

1 Yes **0** No

en1b

a. If Yes, what do you recycle:

□ Aluminum Cans □ Plastic □ Paper □ Glass □ Other

en1c

b. If No, has this trip increased the likelihood that you will start recycling when you return home?

1 Yes **0** No

en2 – A_{Env}

28. How important is it to you to buy paper and plastic products that are made from recycled products?

3 Very Important **2** Important **1** Unimportant **0** Very Unimportant

en3a

29. Do you use energy-saving light bulbs?

1 Yes **0** No

en3b

If No, has this trip increased the likelihood that you will start using energy-saving light bulbs when you return home?

1 Yes **0** No

en4a – A_{Env}

30. Do you prefer to purchase household chemicals such as detergents and cleaning solutions that are environmentally friendly?

1 Yes **0** No

en4b

If No, has this trip increased the likelihood that you will start buying environmentally friendly cleaning solutions when you return home?

1 Yes **0** No

en5 – A_{Env}

31. How important is it to you to avoid buying products form a company that you know might be harming the environment?

3 Very Important **2** Important **1** Unimportant **0** Very Unimportant

en6a

32. Are you a member of an environmental or animal welfare organization?

1 Yes **0** No

en6b

a. If yes, which one(s)? _____

en6c

b. If no, has this trip increased the likelihood of you joining and environmental or animal welfare organization?

1 Yes **0** No

en7 – B_{Mod}

33. Has going on this trip increased the likelihood that you would donate to an environmental or animal welfare organization?

1 Yes **0** No

en8 – B_{Env}

34. Would you be willing to pay higher prices in order to protect the environment?

1 Yes **0** No

en9 – B_{Env}

35. Would you be willing to pay higher taxes in order to protect the environment?

1 Yes **0** No

Part VI. – Demographics

dem1 **a** **b** **c**

36. Where is your permanent residence (City, State/Province, Country)?

_____

dem2

37. In what year were you born? _____

dem3

38. What is your Gender?

1 Male **0** Female

dem4

39. Are you retired?

1 Yes **0** No

dem5

40. What is / was your occupation? _____

dem6
41. At what age did you complete your formal education?_____

dem7
42. Please indicate the highest level of education that you have completed.

1	Less than High School	**4**	Associate / Bachelor Degree
2	High School Diploma / GED	**5**	Master Degree
3	Some college, no degree	**6**	Ph.D., M.D., or other terminal degree

dem8a
43. Have you taken additional adult educational classes since completing your formal education?
1 Yes **0** No

dem8b
If yes, what classes: _____

dem9
44. Would you recommend coming on this trip to your friends?
1 Yes **0** No

dem10
45. Would you recommend dolphin watching to your friends?
1 Yes **0** No

dem11
46. Approximately how much money do you intend on spending in souvenirs (in USD)?
_____

dem12
47. Do you plan to spend any extra days in Belize in addition to this trip?
1 Yes **0** No

If Yes, how many additional days do you plan to spend in Belize and what type of activities do you intend on participating in?
_____

THANK YOU FOR PARTICIPATING IN THIS SURVEY ☺

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