Public Knowledge, Attitudes, and Perceptions Towards Dolphins and Dolphin Conservation

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By

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DEDICATION

This is dedicated to my boyfriend, Bryant, for all the love and support. I could not have done it without you.
ACKNOWLEDGEMENTS

I would first like to thank my boyfriend, Bryant, my mom, and my family for supporting, encouraging, and believing in me through this entire experience. My thesis would not have been possible without the support, guidance, and expertise of my committee members, Drs. Peters-Burton and Rockwood. To my advisor, Dr. Parsons, thank you for guiding me over the years and working with me on this project.
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ABSTRACT

PUBLIC KNOWLEDGE, ATTITUDES, AND BEHAVIOR TOWARDS DOLPHINS AND DOLPHIN CONSERVATION

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In 2015, an online survey was conducted to investigate public attitudes toward key cetacean (whale, dolphin, and porpoise) conservation and 'hot topic' issues such as legislative protection, whaling, and captivity (n=858). Importance of the use of social media by scientists and conservationists and its accuracy was also addressed. When given a list of whale and dolphin species, 24.01% participants thought the blue whale was the most endangered, 22.14% thought it was the humpback whale, and 23.43% stated the killer whale. Additionally, participants were also asked which species listed was the most important to conserve: 39.74% indicating the bottlenose dolphin was the most important. Only 6.29% highlighted the most endangered cetacean (the Vaquita or Gulf of California harbor porpoise) and 5.01% noted the endangered North Atlantic right whale. More members of the public highlighted non-existent (fake) species as being of conservation concern than certain species of genuine concern (e.g. Pygmy short-finned whale, Lump-headed dolphin, and Majestic spotted dolphin). The majority of participants considered
dolphins and whales to be "under protected" or only "slightly protected" (29.95%; 41.96%, respectively) and expressed that marine mammal conservation laws and policies were "very important" or "important" (47.43%; and 37.88%, respectively). In addition, 86.83% of participants expressed opposition to the hunting of dolphins and whales (57.93% "strongly opposed" and 28.90% "opposed"); however, only 47.44% of participants were aware that several countries are still involved in whaling. Participants were divided on opposition or support of dolphins and whales in marine parks and aquariums (54.43%; 45.57% respectively). But 86.01% or 6 times as many members of the public preferred to view cetaceans in the wild via-whale watching than in captivity, and a majority noted that cetaceans should only be kept in captivity when dolphins are sick or injured, for conducting research relevant to dolphin conservation in the wild, and for conducting research on captive dolphin rearing and breeding (husbandry). A lack of awareness of the conservation status of whales and dolphins and continued whaling activities suggests that greater outreach to the public about the conservation status of whale and dolphin species is needed.
CHAPTER 1: PUBLIC ATTITUDES

Attitudes towards marine conservation can vary considerably depending upon what issue is being discussed. 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 (pp. 694)." A person's attitude is characteristic of his or her evaluation of the representative object (Ajzen and Fishbein, 1977). Furthermore, Rosenberg (1956) stated that "a strong and stable positive affect toward a given object should be associated with beliefs to the affect that the attitude object tends to facilitate the attainment of a number of important values, while strong negative affect should be associated with beliefs to the effect that the attitude object tends to block the attainment of important values (pp. 367)."

Several different variables can affect the attitudes people have towards the natural environment including gender, locality, ethnicity, age, income, and wildlife activities. Kellert (1976) found that people’s attitudes significantly change with age. Attitudes of children, ranging in ages from 6 to 9, tend to focus around emotional relationships towards animals. They then shift to cognitive or factual attitudes upon becoming a young adolescent (ages 10-13) and then shift again in post-adolescence to attitudes encompassing ethical concern and ecological awareness of the role of animals in their natural habitats (Kellert, 1976). Kellert and Berry (1980) found significant differences
between male and female attitudes, knowledge, and behavior towards animals, concluding that gender lies among the most important demographic factors that influence attitudes about animals. The results showed that males tended to value animals for practical and recreational reasons, in contrast to females who were more inclined to express concern for the consumptive exploitation of wildlife and value animals as objects of affection (Kellert and Berry, 1980).

Overall, education is the factor found most likely to change people's attitudes and perceptions (Kellert, 1996; Thompson and Mintzes, 2002). A direct link was also found between an individual's education level and that individual's level of interest, awareness, and concern for environmental issues (Kellert and Berry, 1980; Thompson and Mintzes, 2002). A study by Barney et al. (2005) looked at the effects of education level on knowledge, attitude, and harassment behavior towards bottlenose dolphins and the effects of knowledge structure and attitude on harassment behavior. The study used concept maps to measure the level and complexity of knowledge each individual had regarding dolphins and then had individuals respond to a Likert-type attitudinal inventory to assess their attitudes towards dolphins. Respondents for the tests were students in grades 5, 8, and 11 along with first year university students in general psychology, third year university students in marine biology, and graduate students in the MS program in marine biology. Furthermore, Barney et al. (2005) found that knowledge of dolphins increased with education level and that with increased knowledge, individuals were more likely to have an environmentally friendly attitude towards dolphins and less likely to have a
negative attitude. Similar findings were made in a preceding study looking at public knowledge, attitude, and behaviors towards sharks (Thompson and Mintzes, 2002).

Thompson and Mintzes (2002) also used concept maps to judge knowledge in a comparable group of students and found that knowledge did increase with grade level. The study concluded an overall positive correlation between scientific and naturalistic\(^1\) attitudes and knowledge complexity, in contrast to a negative correlation between utilitarian\(^2\) and negative attitudes and knowledge complexity (Thompson and Mintzes, 2002). It should be noted that almost all of the college level students that participated in either study were either taking a marine biology class or were in a marine biology MS graduate study program and had received information regarding these animals prior to participation in the study, which could insert a bias in the results (Barney et al., 2005; Thompson and Mintzes, 2002).

The attitude a person holds towards any animal seeking protection is important because it can affect their behavior towards those animals (Thompson and Mintzes, 2002). Kraus (1995) stated that attitudes in some fashion can guide, influence, direct, shape, or predict a person’s behavior. Furthermore, perceptions of a particular species can be influenced by demographic characteristics, fear of, and empathy toward an animal (Kellert, 1985). Karaffa et al. (2012) asked whether the name used for an animal influenced respondents’ opinions regarding its conservation and found that on average species names with negative connotations prompted less support for conservation

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1 Interest in direct experience with animals and the exploration of nature (Thompson and Mintzes, 2002).
2 Concern for the environment as a system; for inter-relationships between wildlife species and natural habitats (Thompson and Mintzes, 2002).
compared to charismatic sounding names which roused greater support for conservation. They suggest alternative names might make social marketing campaigns more effective and that renaming a species could be a more cost effective way to enhance conservation support (Karaffa et al., 2012).

Attitudes can also be shaped on whether a person has encountered the species first hand (Dobson, 2007). Charismatic megafauna such as the bottlenose dolphin, the koala (Phascolarctos cinereus), the blue whale (Balaenoptera musculus), and the giant panda (Ailuropoda melanoleuca), have been utilized by environmental educators to attract the public and direct their attention towards conservation and preservation of the natural environment (Barney et al., 2005). The awareness and knowledge of wildlife among residents and tourists could indicate what level of support there is for wildlife conservation issues (Barney et al., 2005). Typically, the effects of attitudes and knowledge toward marine mammals are examined in areas where whale-watching is established and where local changes to the economy and conservation may already be evident (Draheim et al., 2010). However, despite not having marine mammal related tourism at the time of the study, Luksenburg and Parsons (2013) investigated the attitudes of residents and tourists in Aruba towards marine mammals and their conservation. The study found that support for marine mammal conservation issues did not depend on extensive knowledge of the local marine mammal community or on the availability of whale-watching activities (Luksenburg and Parsons, 2013).

While many of these species are threatened or endangered, some are also used to focus concern and awareness on less visible problems of ecosystem degradation (Barney
et al., 2005). Dolphins and many other marine mammals typically generate positive and aesthetic public attitudes (Kellert, 1999); much of this can be credited to mass media outlets including films, television, and articles in magazines and newspapers (Barney et al., 2005). However, studies have shown a lack of awareness of other high profile threatened species such as whales, penguins, and polar bears (Scott and Parsons, 2004; Scott and Parsons, 2005; Howard and Parsons, 2006; Parsons et al., 2010c; Sitar-Gonzales and Parsons, 2012; Luksenburg and Parsons, 2013;). Unfortunately, scientists suggest that these attitudes often encourage human-animal encounters that can be harmful or even fatal to the dolphins (Barney et al., 2005). Barney et al. (2005) found that more knowledgeable and environmentally responsible individuals were the least likely to participate in potentially disruptive or harmful harassment behavior towards dolphins.

The purpose of this study is to:

1. Assess the participants' opinion on dolphin and whale conservation issues, whaling, and captivity;
2. Determine if there was a significant relationship between knowledge, attitude, and behaviors as they pertain to dolphins and whales;
3. Assess the participant's usage of social media and opinion of usefulness/accuracy for dolphin and whale information;
4. Explore the effects of gender and education level on a participant's behavior, attitude, and knowledge.
CHAPTER 2: COMMON BOTTLENOSE DOLPHINS

Common bottlenose dolphins (*Tursiops truncatus*) are the most common and well-known cetacean species found in all temperate subtropical and tropical waters worldwide except for the Arctic and Antarctic Oceans (Wells and Scott, 1999; Reynolds, *et al.*, 2000; Reynolds and Wells, 2003). Dolphins in geographically dispersed locations may differ greatly in size, coloration, number of teeth and other features (Reynolds and Wells, 2003.) They also have a history of association with humans in near-shore waters and are the most common cetaceans in aquariums (Defran and Pryor, 1980; Reynolds and Wells, 2003).

Utilizing 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 abundant in bays, sounds, estuaries, and along open shorelines. They can also be found over the continental shelf and on the shelf edge and slope. Inshore groups can spend hours to days to weeks in freshwater lakes or rivers that are connected to the ocean while offshore groups can be seen hundreds of miles at sea (Ridgway, 1990). The "bottlenose" in the name refers to the dolphin's short, robust, cylindrical beak or rostrum (Reynolds and Wells, 2003). The beak contains about 20-25 cone-shaped teeth in each upper and lower jaw (Reynolds and Wells, 2003). Characterized by their gray coloring, bottlenose dolphins exhibit a counter-shading
coloration generally dark gray on the dorsal to shades of gray on the sides and white on the belly (Connor et al., 2000a; Reynolds and Wells, 2003). These cetaceans are medium sized ranging from approximately 2 to 4 meters in length and weigh between 135-635 kg. Body size typically varies between habitats, as larger body size is generally associated with colder water (Cockcroft and Ross, 1990; Wells and Scott, 1999). In Spencer Gulf, South Australia, mature individuals in some populations have been measured at approximately 2 to 2.25 meters in length compared to the largest individuals measured the northeast Atlantic Ocean between 3.3 to 4.1 meters in length (Connor et al., 2000a). Inshore Atlantic bottlenose dolphins are generally smaller, lighter in color, and have larger flippers than offshore Atlantic bottlenose variations (Wells and Scott, 2002). Adult coastal bottlenose dolphins in Florida range up to 2.9 meters in length and up to about 270 kg in weight (Reynolds and Wells, 2003). Bottlenose dolphins found in deep offshore waters of Florida tends to be larger and darker in color with a longer, more slender tailstock (Reynolds and Wells, 2003). Adult males are slightly longer and heavier than females. The average life span for bottlenose dolphins is approximately 40-50 years, with females tending to live slightly longer lives (50+ years) than males (40-45 years) (Wells and Scott, 1999).

The largest natural predators of bottlenose dolphins are sharks but in some areas where killer whales exist pose potential threats (Wells and Scott, 2002). Globally, the primary predators of bottlenose dolphins are bull sharks (Carcharhinus leucas), tiger sharks (Galeocerdo cuvier), great white sharks (Carcharodon carcharias) and dusky sharks (Carcharhinus obscurus) (Wood et al., 1970; Corkeron et al., 1987; Long and
Jones, 1996; Connor et al., 1999). The only known predators to bottlenose dolphins in Florida waters are tiger, bull, and dusky sharks (Reynolds and Wells, 2003). According to Reynolds and Wells (2003), sharks are probably a greater threat to small dolphins rather than larger ones given that more of a small individual can fit into a shark's mouth. Reynolds and Wells (2003) further suggest that shark predation may not be nearly as important today as it was years ago because of tremendous reductions in shark populations through overfishing. Stingrays could be of greater concern today as barbs from these fish account for an increasing number of deaths and injuries to dolphins. Bottlenose dolphins in Florida are occasionally seen "playing with" small rays, a behavior that may create an opportunity for the dolphin to become seriously injured (Reynolds and Wells, 2003).

Bottlenose dolphins are considered opportunistic-generalist feeders (Shane, 1990). Inshore dolphins feed primarily on fish while more open water dolphins can also feed upon squid (Reynolds and Wells, 2003). Along the central west coast of Florida, bottlenose dolphins primarily feed on pinfish (Lagodon rhomboides), pigfish (Orthopristis chrysoptera), spot (Leiostomus xanthurus), and mullet (Reynolds and Wells, 2003). 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 utilize a variety of techniques to capture prey either individually or through coordinated, cooperative feeding with other dolphins (Reynolds and Wells, 2003). Dolphins will sometimes tail-slap repeatedly to stun or disorient their prey (Connor et al., 2000a). Some dolphins utilize a shallow-water
technique "fishwhacking" in which they slap fish with their flukes, often launching stunned fish into the air (Reynolds and Wells, 2003). Another shallow-water technique is "kerplunking" which creates a loud spray of water on the surface and a bubble stream below the surface attempting to flush prey out from hiding places (Reynolds and Wells, 2003; Connor et al., 2000b). In the Florida Keys, bottlenose dolphins may create mud plumes, which serve as a barrier to some fish (Reynolds and Wells, 2003).

Bottlenose dolphins tend to be social animals and live in fission-fusion societies, the social organization of the population is constantly changing, often daily or hourly, due to the fluid movement of individuals in and out of groups. This social behavior is similar to other social mammals such as African elephants (Loxodonta africana), common chimpanzees (Pan troglodytes), spider monkeys (Ateles paniscus), and the spotted hyena (Crocuta crocuta). (Connor et al., 1992, 2000a; Smolker et al., 1992; Reynolds and Wells, 2003; Couzin, 2006; Smith et al., 2007). Group size also depends on geographic location. Offshore populations form groups of up to 1000 individuals at a time, while inshore populations tend to form smaller groups ranging from two to 15 individuals (Wells et al., 1999). Bottlenose dolphins can occur in groups of up to 20 to 30 or more individuals in the inshore waters of Florida, but smaller groups of four to seven are more common, and individuals are sometimes seen alone (Reynolds and Wells, 2003). Typical observed groups consist of females with their most recent calves, juvenile groups including young dolphins of both genders up to their mid-teens, or adult males including single individuals or members of strongly bonded pairs (Reynolds and Wells, 2003). Groups of females with calves of similar age, regardless of kin relationships, tend
to be the largest groups seen and composition of the groups varies frequently. Calves remain with their mothers for three to six years. As males reach sexual maturity, they begin to form pair bonds with other males of similar age; once pairs are formed, they remain intact for the lives of the males (Reynolds and Wells, 2003).

Conservation

Under the International Union for Conservation of Nature and Natural Resource's (IUCN) 2012 Red List update, bottlenose dolphins are listed under the "least concern" category; however, specific populations are near depletion or in decline due to anthropogenic activities including habitat destruction and degradation, disturbance and harassment, prey depletion, pollution, and indirect takes (Hammond et al., 2008; Parsons et al., 2010b, 2013). Given that the extent of mortality can only be roughly estimated in most instances and the sizes of the affected populations are largely unknown, it is difficult to accurately assess the severity of these threats to dolphin populations (LeDuc, 2002).

Many cetacean species are either killed or injured indirectly through activities that do not specifically target cetaceans (Parsons et al., 2010b). Dolphins are routinely caught as by-catch in gillnets, driftnets, trawls, long-lines, purse seines, and on hook-and-line gear used in commercial and recreational fisheries, with mortality rates poorly documented (Wells and Scott, 1999). Bycatch affects nearly every cetacean species and can occur with almost any fishery with gill nets (including drift nets) and tuna seines causing the greatest mortality (IWC, 1994; Wade, 1995; Read 1996). Bycatch, not
surprisingly, is a major source of cetacean mortality killing at least 300,000 whales and dolphins annually (Parsons et al., 2013). For the Vaquita (or Gulf of California harbor porpoise, *Phocoena sinus*) by-catch is the primary threat to species survival (Whitehead et al., 2000). In some areas, large-scale fishing operations are in direct competition with dolphins for prey; they also alter the region's ecology, adversely affecting dolphin habitat (LeDuc, 2002).

Bottlenose dolphins have been subject to boat collisions that have led to severe injuries and death of the animal (Reynolds and Wells, 2003; Samuels and Bjeder, 2004). In Sarasota Bay, 4 to 5 percent of resident dolphins have scars from boat collisions (Wells and Scott, 1997). Risk of collision for bottlenose dolphins (as well as manatees and sea turtles) has increased with greater use of personal watercrafts and small low recreational fishing boats designed to operate in shallow areas such as sea grass beds, providing no opportunity for the dolphin to dive beneath the vessel (Reynolds and Wells, 2003). In addition to collisions, studies on whale-watching and whale-watching boat traffic have recorded changes in cetacean behavior including changes in surfacing, acoustic and swimming behavior, and changes in direction, group size, and coordination (Parsons, 2012a). However, it is difficult to determine the long-term negative effects, if any, of these short-term behavior changes (Nowacek et al., 2001; Parsons, 2012a). Disturbance has also been associated with cetaceans temporarily or permanently abandoning areas (Lusseau, 2005; Bejder et al., 2006; Carrera et al., 2008; Parsons, 2012a).
Human interactions can alter the normal behavior of wild cetaceans by creating a dependency on humans, modifying foraging strategies and social relationships and encouraging animals to approach vessels and people (Bryant, 1994). In several places in Florida, free-ranging bottlenose dolphins are subjected to illegal harassment or other disruptions by people attempting to feed them or swim with them (Reynolds and Wells, 2003). Such activity can place them at greater risk to other adverse human interactions by attracting them to dangerous situations or by causing them to ingest inappropriate and dangers items or by possibly exposing them to bacterial pathogens from contaminated or improperly handled fish which can result in sickness or death (Reynolds and Wells, 2003; Cunningham-Smith et al., 2006).

Habitat loss and degradation is a serious threat to cetacean biodiversity. Pressures from increasing human populations are changing some coastal environments that are important for inshore cetaceans (Kemp, 1996). Harmful human developments include: agricultural runoff, moorings, sewage outfalls, blasting, dredging, dumping, port construction, and hydroelectric projects. In Florida, alteration of shorelines, dredge and fill operations in areas of sea grass or mangrove fringing forests to create waterfront real estate, and blockage of natural water flows dramatically change the habitat of dolphins and their prey (Reynolds and Wells, 2003).

Pollution and environmental contaminants can also negatively affect cetacean species, particularly in coastal areas, either by direct poisoning effects or by making the animals more susceptible to pathogens and parasites (LeDuc, 2002; Reynolds and Wells, 2003). Whether it is from agricultural, residential, or industrial runoff, or from
deposition from the air, chemicals of human origin find their way into dolphins range (Reynolds an Wells, 2003). Chemicals of concern include: heavy metals (such as lead, cadmium, and mercury), organochlorine pollutants (including polychlorinated biphenyls or PCBs and pesticides such as DDT (dichlorodiphenyltrichloroethane) and their metabolites), and PAHs (polycyclic aromatic hydrocarbons) (Reynolds and Wells, 2003; O'Shea, 1999; Johnston et al., 1996). Dolphins are known to accumulate high concentrations of organochlorines in their tissues such as blubber (Reynolds and Wells, 2003). Additionally, bottlenose dolphin mothers pass 80 percent 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; Wells and Scott, 2002; Wells et al., 2005). Studies suggest that high concentrations of PCBs and DDT may be related to reduced immune system function in male bottlenose dolphins in Sarasota Bay (Reynolds and Wells, 2003).

Direct exploitation is usually driven by demand for products either food to be consumed or exchanged at the local, household level, or meat, blubber, oil, and other commodities to be sold in national and international markets ( Reeves et al., 2003). Many cetacean species are still directly taken today by commercial whale hunts, aboriginal or subsistence hunts, culls or drive fisheries, or lethal takes under the pretense of scientific purposes (Parsons et al., 2010b). The commercial whaling industry is still active in Norway, Iceland (which have lodged reservations against the current commercial whaling
ban), and effectively Japan. Japan conducts extremely controversial direct lethal takes of cetaceans for scientific purposes, with the use of the term “scientific” being very deceptive (Clapham et al., 2003; Gales et al., 2005). The Japanese Government using a loophole in the International Convention on the Regulation of Whaling (Article 8), which allows lethal takes of whales for "scientific purposes" and circumventing the current moratorium on commercial whaling, but the meat from these takes is then sold commercially. Japan currently takes northern minke whales and other species in the North Pacific. Between 1987 and 2013 (and 2013/14 Antarctic season), Japan has taken approximately 18 fin whales, 56 sperm whales, 1089 Sei whales, 658 Bryde’s whales, and 13352 minke whales for scientific purposes, compared to all other nations who have only killed 920 whales collectively for scientific purposes between 1986 and 2013 (IWC, 2015a). Between 1986 (and 1986/87 Antarctic season) and 2013, Norway caught 11164 minke whales (IWC, 2015b). In 2009, 125 fin whales and 79 minke whales were caught by Icelandic whalers with 1,500 tones of fin whale meat planned for export to Japan (Parsons et al., 2013). In 2014, Icelandic whalers caught 137 fin whales and 24 minke whales, compared to 134 fin whales and 35 minke whales in 2013 (IWC, 2015b; WDC, 2015).

Bottlenose dolphins are still culled for human consumption, bait, and for reduction of competition with commercial fisheries, particularly in the Black Sea, Japan, Peru, and Sri Lanka (Wells and Scott, 2002; Reeves et al., 2003). Past hunting, incidental catches, and environmental degradation have caused population declines in the Mediterranean and Black seas (Reeves et al., 2003). In the Black Sea off of Turkey at
least 24,000-28,000 bottlenose dolphins were culled during 1946-1983 (Buckland et al., 1992). Fishermen in Peru and Sri Lanka use harpoons and gillnets to capture and kill bottlenose dolphins for human consumption and bait (Reeves et al., 2003; Hammond et al., 2008). More than 20,000 cetaceans are culled each year in Japan for human consumption and to decrease fishery competition mostly by the drive fishery of Taiji and Futo (Wells and Scott, 1999).

Indigenous communities in the Russian Federation, the United States, Greenland (Denmark), and Bequia (St. Vincent and the Grenadines) are permitted to hunt a quota of whales for subsistence purposes (Reeves et al., 2003; Parsons et al., 2013). The International Whaling Commission (IWC) determines aboriginal subsistence whaling quotas for certain whale stocks (to include endangered species like the bowhead whale) which are used by indigenous peoples who “demonstrate a traditional, nutritional, and cultural need for hunting whales,” (Reeves et al., 2003; Parsons et al., 2013); however, some of these hunts include endangered species, such as the bowhead whale. Aboriginal hunting is aimed at providing food and other products for local consumption however it is not always sustainable (Whitehead et al., 2000). During the last few decades several populations of belugas (Delphinapterus leucas) in Canada and Greenland have been severely depleted by over hunting (Reeves and Mitchell, 1989).

Parsons et al. (2010b) highlighted the fact that the significance of virtually all of these threats is poorly known, and the situation is compounded by the fact that very little is known about the distributions and habitat needs of these animals. As more people continue to inhabit coastal areas, especially in developing countries, human-generated
impacts will continue to threaten coastal populations of dolphins (Dawson et al., 2008). It is likely that anthropogenic activities will negatively alter population statuses unless sufficient knowledge of the life history and status of these populations is obtained (Parsons et al., 2010b).

Captivity

Animals are kept captive for a variety of reasons including for display in zoos and aquariums, military work, scientific research, and temporary maintenance for rehabilitation for injured or sick animals (Corkeron, 2002). At least 19 cetacean species are currently held in captivity around the world with the most common cetacean species being orcas (Orcinus orca), beluga whales (Delphinapterus leucas), bottlenose dolphins, and Pacific white-sided dolphins (Lagenorhynchus obliquidens) (Marino, 2014). Dolphin shows are heavily promoted in Canada, Central and South America, Asia, some European countries, the Middle East, and the United States (WDC, 2010). Approximately 125 million people (40% of Americans) have visited a marine park, aquarium, or zoos each year (Alliance of Marine Mammal Parks and Aquariums, 2012)- although only a minority of these host cetaceans. There are approximately 600 whales and dolphins kept in 34 facilities in North America alone (Grimm, 2014). The total number of captive bottlenose dolphins world wide is approximately 800 (Marino, 2014). In a study conducted by Kellert (1999), 37% of the members of the public sampled reported visiting a zoo or aquarium 1-2 times, 22% visited 3-5 times, and 19% visited more than five times in the
past five years- although again not all of these facilities hosted cetaceans. Moreover, observing marine mammals in the wild has also greatly increased with whale/dolphin watching being the most popular (Kellert, 1999). Kellert (1999) found that 12% of Americans indicated they have been whale watching 1-2 times and 5% of Americans have been more than 3 times in the past five years.

Historically, bottlenose dolphins were captured from the wild for public display, research, and military applications (Leatherwood and Reeves, 1982). Florida was the site of extensive commercial collection with over 1200 dolphins collected from Florida waters since the 1930s (Leatherwood and Reeves, 1982) with the most recent collection occurring in 1988 (Reynolds and Wells, 2003). The Marine Mammal Protection Act (MMPA) prohibited the take of wild animals in U.S. waters in 1972; however, exemptions were made to allow marine mammal takes and captive display for education and conservation purposes by the marine mammal display industry. The MMPA did not define what constituted a valid educational reason or how and why public display furthers conservation. Furthermore, the MMPA gave no justification for why the public display of marine mammals would be necessary to fulfill such educational deficiencies (Rose et al., 2009). A quota system was also put in place by the MMPA to limit collections by gender as young females were often repeatedly selected from localized areas in Florida, posing a threat to resident communities (Reynolds and Wells, 2003). In Sarasota Bay, long-term observations of dolphin social structure and reproductive success suggest that the removal of certain age or sex classes of dolphin has significant consequences for the remaining dolphins of the community (Reynolds and Wells, 2003). Individuals within the
group have different social roles and the removal of "key socially connected individuals" could collapse the entire social network (Marino, 2014).

Live captures of cetaceans including dolphins, belugas, and orcas continue today in areas such as around the islands of the Caribbean Sea (Reynolds and Wells, 2003), China (Wells and Scott, 1999), Japan, the Solomon Islands (Parsons et al., 2010a), the Black Sea, and Russia (Birkun, 2006). Most cetaceans are captured after traumatic high-speed boat chases, wrestled into submission, pulled onto a boat, and eventually put into a shallow temporary holding tank (Rose et al., 2009), a process that is undoubtedly stressful for the captured animals. In 2002, eight bottlenose dolphins were captured from the coastal waters of the Parque Nacional del Este (Eastern National Park) for display by Manati Park, a local dolphinarium in the Dominican Republic - a time when the capture of wild cetaceans from the coastal waters of the Dominican Republic was illegal (Parsons et al., 2010d). At the time of the captures, the size and status of the local wild bottlenose dolphin population was unknown making it difficult to if the captures were sustainable (Parsons et al., 2010d). Subsequent analysis has shown that had not the Dominican Government (largely as the result of pressure from domestic NGOs) then the wild population could have likely faced local extinction (Roland, 2013).

In the United States, marine parks have focused on captive breeding to maintain display populations; however, the infant mortality rate for captive cetaceans is too high to be self-sustaining (Rose, 2004). Mortality rates for some species such as killer whales have been especially high (Jett and Ventre, 2015) In 2013 NOAA Fisheries denied a request by the Georgia Aquarium to import 18 wild-caught belugas from Russian seas.
(NOAA Fisheries, 2013). The captive beluga population is declining because these animals do not breed well or survive well in captivity (Marino, 2014). The Georgia Aquarium, SeaWorld, and the Shedd Aquarium continue to advocate, for the purposes of education and conservation, to bring these wild whales into their facilities for public display (Marino, 2014).

It is often thought that people who have experienced living marine mammals in close proximity are more likely to develop or enhance their marine conservation ethic (Corkeron, 2002). However, the only peer-reviewed scientific study to investigate this provides evidence to the contrary (Jiang et al., 2007) and despite increased public interest, viewing marine mammals in the wild and in captivity has become a topic of extreme controversy (Kellert, 1999).

Kellert (1999) found that a majority of Americans opposed the captive marine mammals in zoos and aquariums unless the animals were well cared for and demonstrated educational and scientific benefits. Almost all the individuals who responded to the survey indicated that captive marine mammals should be kept under the most natural conditions possible, even if it meant the animals were more difficult to observe. An additional 75% of respondents indicated a preference for marine mammals displaying natural behaviors verses performing "tricks and stunts" (Kellert, 1999). There is no actual evidence that people who experience cetaceans when visit zoos and aquariums gain any long-lasting sentiments or knowledge that benefit either the animals in captive environments or their wild counterparts (Bekoff, 2002; Jiang et al., 2007; Marino et al., 2009). In fact, the controversy was such that there was a congressional
review of whether cetaceans in captivity confer any educational benefits (Parsons, 2012b).

Captivity negatively impacts both wild-caught and captive-born cetaceans. There are concerns about high rates of accidental injuries, psychological distress, fatalities, and shortened life spans (Kellert, 1999). Furthermore, those individuals brought into captivity cannot help maintain their natural populations (Reeves et al., 2003). Without scientific research, management, and monitoring, live-captures can be a serious threat to local cetacean populations (Reeves et al., 2003).

Compared with most terrestrial mammals, marine mammals are expensive and challenging to maintain in captivity. They require an extensive amount of logistical support including high-quality food sources, specialized medical care, large enclosures, and expensive water-quality maintenance systems (Corkeron, 2002). It has been argued that limited movement, hard concrete tanks, almost constant exposure to humans, noise, and threats or actual violence from keepers jeopardizes the animals' well being (Marino et al., 2009). Particularly amongst captive orcas infighting is often worsened because there is no place to escape in an enclosure, as they would have in the wild (Jett and Ventre, 2011). Moreover, it has been argued that in captivity, natural patterns of social organization comprised of group size and composition are lost along with evolved foraging and migration patterns. For practical reasons, group sizes may be much smaller in captivity and the animals cannot choose when and where to rest as they would in the wild (Bekoff, 2002). For orcas, social strife and aggression can be common in captivity;
individuals higher in social standing often cut, rake, and ram other individuals in the enclosure (Jett and Ventre, 2011).

Captive dolphins and whales follow the same basic daily routine rather than having varied daily movements as a wild cetacean would, rendering studies conducted on captive whales and dolphins inadequate for the purpose of improving conservation of wild cetaceans (WDC, 2005). Captivity degrades autonomy through enforced schedules, it has been argued that it causes "boredom", induces frustration and inhibits incentives and abilities to carry out natural behaviors including hunting and traveling (Marino, 2014). Research has been conducted for basic reproductive information on pregnancies and sexual maturity on some captive marine mammal species; however, utilizing this information to dictate conservation management strategies of wild populations could drastically over estimate species reproductive capacities (WDC, 2005). Additionally, it is difficult to accurately track movements of captive dolphins between facilities. According to WDC (2010), dolphins captured in Cuba have ended up in countries across Europe, South America, Asia, and the Caribbean. Van Waerebeek et al. (2006) found that from 1986-2004, 238 bottlenose dolphins were exported from Cuba (and it is unknown whether this capture is sustainable due to a lack of data on wild Cuban populations), of which 60% went to facilities in Latin America and the Caribbean, 32% to Europe, and the remaining to Canada and Israel.

Despite suffering from stress-related diseases due to confinement and loss of autonomy (Marino, 2014), bottlenose dolphins have a higher survivorship rate in captivity than orcas, which most do not survive past 20 years of age (Williams, 2001),
and beluga whales, which routinely die before 30 years of age (Marino, 2014). To evaluate orca lifespan in captivity, Jett and Ventre (2011) introduced the mean duration of captivity (MDC). MDC and lifespan are the same for captive born orcas but not equivalent to lifespan of captured individuals; however, it is an acceptable approximation based on historical preference of selection younger orcas from a given clan or pod (Jett and Ventre, 2011). Of 152 orcas that have lived and died in captivity, the MDC was found to be 2413 days or 6.6 years, which is low compared to the longevity of free-ranging orcas (Jett and Ventre, 2011). The MDC only looked at deceased whales for which data existed. To examine captive orca survival, Jett and Ventre (2011) incorporated dead (n=152) and living (n=41) orcas utilizing the Kaplan-Meier method and found with 95% confidence that the true median duration of captivity falls between 998 and 3250 days (2.7 and 8.9 years, respectively).

The estimated average maximum life span for captive and wild bottlenose dolphins is about 25 and 45 years respectively (Small and DeMaster, 1995). However, survivorship statistics from captive facilities often exclude periods of drastic increased mortality including times of capture and transfer (Marino, 2014). Bottlenose dolphins faced a six-fold increase in risk of mortality immediately after capture from the wild and immediately after every transfer between facilities (Small and DeMaster, 1995). Additionally, many developing or non-Western countries were not included in these studies possibly causing artificially inflated survivorship data (Marino, 2014).

Facilities that offer the opportunity to watch marine mammals and to interact with them have become increasingly popular (Curtin and Wilkes, 2007). The belief that close
encounters with dolphins can help relieve daily stresses, but can also provide a cure for physical and mental illness and disabilities has encouraged the expansion of interactive programs by commercial groups and alternative therapists (WDC, 2005).

"Petting pools" consist of a small group of dolphins competing for small dead fish fed by tourists (WDC, 2010). While zoos normally prohibit the feeding of captive animals, petting pools pose challenges to regulating the amount of food fed to the dolphins leading to over-weight dolphins, teasing/harassing by patrons, and increased bites from dolphins while attempting to get fish from people (WDC, 2003; WDC, 2010). Non-food objects, including keys, sunglasses and paper containers, are often dropped into the pool; these items can cause gastrointestinal blockage, poisoning, even death if the dolphins ingest them (WDC, 2003). Swim-with-dolphin (SWD) exhibits are very much the same in that dolphins are kept in a small pool and are forced to interact with humans on a daily basis. Costs range from $200 to $500 depending on the level of interaction with the dolphins (Marino, 2014). Most of these facilities focus on husbandry and captive activities leaving out information about the natural lives of dolphins, but claim that visitors learn about behavior and protection of these animals, which leads to increased conservation attitudes (Marino, 2014). According to Marino et al. (2010) and Stewart and Marino (2009), there is no evidence to support these claims that visitors develop greater or lasting knowledge about whales and dolphins or become more conservation-minded as a result of watching dolphin and whale shows or participating in SWD attractions.

Dolphin-assisted therapy (DAT) involves swimming and interacting with dolphins, usually in captivity, and has become a popular treatment method for illness,
disability, and psychopathology in adults and children (WDC, 2005; Marino and Lilienfeld, 2007). Despite numerous claims, no evidence exists that DAT has any therapeutic value (Humphries, 2003; Marino and Lilienfeld, 2007). Marino and Lilienfeld (2007) conducted a follow up reviewed from their 1998 study in which five papers describing studies using DAT were examined. They concluded that such studies are vulnerable to placebo and novelty effects and contain methodological weaknesses, which render the conclusions doubtful (Marino and Lilienfeld, 2007). WDC (2010) and Marino and Lilienfeld (2007) site several cases of whales and dolphins displaying aggression towards humans and other dolphins in captivity, which often result in injuries. Marino and Lilienfeld (2007) further suggest that DAT poses ethical questions regarding human and captive dolphin welfare and that DAT programs should be required to inform parents and/or participants of the “absence of evidence for DAT’s enduring effects on psychological symptoms.” Additionally, health and safety standards for both humans and dolphins are not regulated for DAT (Marino, 2014).

As ‘petting pool,’ SWD, and DAT programs have expanded in popularity, they have also become increasingly controversial. Evidence has shown that the stress associated with these programs may have long-term effects on the dolphins (Bekoff, 2002). Along with the fact that dolphins are large and strong animals, they are sometimes unpredictable which could pose risks to humans participating in the swim with dolphin programs (Bekoff, 2002). Dolphins in a captive environment are made to interact with species they would try to avoid in the will, thus causing stress, discomfort, and possibly provoking aggressive behavior in them (WDC, 2005). The dolphins may be
fed foreign objects that can harm them, and the water in which humans and dolphins interact may be heavily chlorinated which may be unhealthy for both the dolphins and humans (Bekoff, 2002). It is possible that these programs could teach people to expect the same type of interactions from free-ranging wild animals (Bekoff, 2002). WDC (2005) indicates that insufficient regulations exist in relation to encounters between captive dolphins and patrons. Bekoff (2002) suggests that more research is needed to determine if contact with dolphins actually changes people's attitudes about them since there is no solid evidence that interactive programs with dolphins are more effective educationally than non-interactive programs. Marino et al. (2009) disagree with a study performed by the Association of Zoos and Aquariums (AZA), which concluded, "Visiting accredited zoos and aquariums in North America has a measurable impact on the conservation attitudes and understanding of adult visitors." Marino et al. (2009) stated that AZA and other groups have not demonstrated how zoos and marine parks promote conservation of wild populations and enhance public education.

Social media

Social media encompasses a vast range of online, word-of-mouth forums including social networking sites, sites containing digital audio, images, movies, or photos, blogs, company-sponsored discussion boards and chat rooms, and internet discussion boards (Mangold and Faulds, 2009). Because it is relatively easy to use and allows a user to communicate to another person across the globe in a short period of time, social media is changing social discussions in topics that range from the environment and
politics to technology and the entertainment industry. More than half of teens and young adults in America along with one-third of all Internet users send text messages and use social networking sites (Correa et al., 2009). In 2009, three out of four adult Internet users under age 25 and 35% of adult Internet users (as compared to only 8% in 2005) have a profile on a social networking site (Correa et al., 2009). As of January 2014, 74% of adults online use social networking sites (Pew Research Center, 2014).

The evolution of online social networks offers new possibilities for collecting data about public interest and plays an increasing role in conservation research (Roberge, 2014). Recently scientists and science communicators have expressed interest to the scientific community to engage in social media to connect with other scientists and to connect with the public (McClain and Neeley, 2014). According to Neal Lane (1999), the former director of the National Science Foundation, scientists who involve themselves in the public discourse are "civil scientists- those that step beyond their campuses, laboratories, and institutes and into the center of their communities to engage in active dialogue with their fellow citizens." Lane (1997) stated that:

"It is now more vital than ever for us, the research community, to make a convincing case to the public about the tangible societal benefits that flow from science and technology, and the importance of investing adequately in research and education."

Rodrigues et al. (2006) suggest that much of current global conservation work is concerned with securing species populations as shown by the development of lists of species at risk and subsequent use in environmental policy and management. Data from online social networks could be used to study the attitudes of people toward proposed conservation or restoration actions, the occurrence of specific behaviors having positive
or negative impacts on the environment, the strategies used by governmental agencies and NGOs in public conservation education, and the spreading of false information (Roberge, 2014).

Twitter was used at the 2011 and 2013 International Congress for Conservation Biology (ICCB) meetings to share conservation messages with a wider audience outside of those present at the conferences (Parsons et al., 2014). At the 2011 meeting in Auckland, New Zealand, there were 1731 conference related posts (i.e. tweets) with the official hashtag #ICCB; while over 1000 scientists were present for the conference, fewer than 10% of tweeters actually attended the meeting (Parsons et al., 2014). The number of unique tweets almost doubled, reaching 3217, for the 2013 ICCB meeting in Baltimore, Maryland (Parsons et al., 2014). Offsite participants could ask questions on Twitter and the presenter would then tweet back the answer to the Twitter community. Additionally, presenters at the 2013 ICCB meeting provided a tweetable abstract that could be easily understood and demonstrated the ability to communicate conservation science in a brief and effective way (Parsons et al., 2014).

Twitter (and social media) increase(s) the ability to share pictures (including figures and graphs) and links to the most recent research findings (Parsons et al., 2014). Additionally, increased use of social media for ocean conservation can enable greater sharing of scientific findings, create new opportunities for marine protected area (MPA), funding and increase public mobilization, engagement, and ownership (IUCN WCPA, 2012). In the Bahamas, a social media "crowdfunding" campaign raised almost US$500,000 for MPA management (Davis et al., 2012). Additionally, social media
allows the user to immediately connect with people. By utilizing text messaging, Facebook, and Twitter, over 100 volunteers came together within two hours to help a pygmy killer whale stranded on a beach in Kota Kinabalu, Sabah, Malaysia (IUCN WCPA, 2012).

Currently, numerous environmental non-governmental organizations (NGOs), conservation and applied science journals, and professional societies are active on Twitter including the World Wildlife Fund (@WWF), the Wildlife Conservation Society (@TheWCS), Conservation Biology (@ConBiology), the Journal of Applied Ecology (@JAppliedEcology), the Society for Conservation Biology (SCB) (@Society4ConBio), and the SCB Marine Section (@SCBmarine) (Parsons et al., 2014). Engaging with Twitter (or any social media) can be a way for conservation scientists to interact with journalists, policy makers, and the general public (Parsons et al., 2014). Social media can promote wider recognition of threats and impacts to the environment and can allow for scientists along with environmental advocates, managers, and policymakers to connect communities with local environments and build communities of interest or concern (IUCN WCPA, 2012).
CHAPTER 3: METHODOLOGY

The distribution of the survey instrument (Appendix I) used in this study was conducted using Amazon Mechanical Turk (MTurk). MTurk boasts a large and diverse workforce of over 100,000 from over 100 countries who complete thousands of tasks daily (Buhrmester et al., 2011). The site "brings together the people and tools that enable task creation, labor recruitment, compensation, and data collection" (Buhrmester et al., 2011). Within the MTurk site, individuals have the option to register as task creators (requesters) or paid task completers (workers). Task creators can create and post surveys, experiments, writing, etc. using technical scripts or simple templates or linking workers to external online survey tools (Buhrmester et al., 2011). Task completers can select available tasks and are subsequently paid upon successful completion of a task.

Surveys were available on MTurk from March to April 2015 to any MTurk task completer that had 1000 or more Human Intelligence Task's (HITs) approved. No specific individuals were sought out for questioning, and individuals were asked to indicate whether they agreed or declined to participate in the survey. If they declined, the task completer was unable to view the survey questions or submit the survey. The survey instrument in this study as well as the procedure for its distribution was in accordance to the requirements and guidelines of the Human Subjects Review Board at George Mason University, and was approved by this body.
The response rate to the survey was \( n=1020 \) individuals and an incentive of $0.25 USD was offered to each task completer if the survey was approved. Buhrmester et al. (2011) found that participation in surveys on MTurk is affected by compensation rate and task length; however, participants can still be recruited rapidly and inexpensively. Realistic compensation rates after successfully completing a survey do not affect data quality, and the data obtained from a survey conducted on MTurk is at least as reliable as the data obtained from traditional methods. Some surveys that were submitted were not filled out in their entirety (\( n=162 \)) and information that was provided was not used in this study. For the purpose of this study, 858 completed surveys were utilized.

Raw data were downloaded from MTurk in Excel format and the incomplete surveys were removed from the data. The data within the Excel spreadsheet were then rearranged to follow the order of the original survey. The answers that were given by participants were then number coded into another Excel spreadsheet. Following this, the author of the study reviewed the inputted answers within the Excel spreadsheet to correct any errors that may have occurred.

A variety of topics are covered in this survey including conservation, captivity, whaling, and social media, with the number of questions devoted to each issue varying considerably. For many questions, no distinction was made among dolphin and whale species. Twelve attitude questions were included in the survey. Six additional questions focused on knowledge of whales and dolphins. Six behavioral questions were also included on environmental organization membership, subscription to environmental/scientific/animal magazines, participation in whale watching, watching
animal programs, preference on observing whales and dolphins, and travel to countries involved in whaling. Demographic questions elicited information on respondent's age, place of residence, occupation, education, and gender.

After the data from the survey had been coded in the Excel spreadsheet they were transferred to the statistical program SPSS. The data in the SPSS program were then checked against the data from the Excel spreadsheet by random comparison of cells from both programs to ensure that no errors were caused during the transfer. Any errors that were found in the SPSS data were then corrected and that entire column of data was then checked against that of the Excel spreadsheet. The program SPSS was then used for all statistical analysis of the data. The coded survey used in this study can be found in the Appendix II.

The survey questions were partitioned into attitude, behavior, and knowledge categories in order to create indexes that would measure a person's knowledge level, attitude, and behavior towards dolphins and dolphin conservation. An index was not created for the demographic and social media questions.

The knowledge index consists of three questions (survey questions 2, 16, and 18) that were each coded into binary inputs. These questions did not have a logical hierarchy, and therefore could not be put into a sequential number input. Question 2 asked which dolphin/whale species listed was the most important to conserve including five known dolphin/whale species, three fake species, one non-cetacean species, and the category "not applicable". The five known dolphin/whale species were coded as one and all other choices as zero. To create the knowledge index these questions were added
together to give a number out of three, with higher scores representing more dolphin/whale knowledge.

The attitudinal index is made up of 12 questions (survey questions 1, 14, 15A-H, 19, and 20), and used to judge a participant's attitudes towards dolphins and dolphin conservation. Question 1 asked how important participants thought dolphin/whale conservation was from very important, important, slightly important, slightly unimportant, unimportant, to very unimportant. This question was scored as a Likert item (scale using levels of agreement or disagreement) with very urgent being worth three and not at all urgent being worth zero. Question 20 was also scored in the same manner. Questions 14 and 19 were scored with an answer of strongly oppose worth two and strongly support as zero. To create the attitude index these questions were added together to give a number out of 18, with higher scores representing a more pro-dolphin/whale attitude.

The behavior index is made up of six questions (survey questions 4, 5, 6, 13, 17, and 27) and used to measure a participant's general behavior towards dolphins. Question 13 asked in which way the individuals would prefer to see dolphin/whales if costs were similar and all options available in a given location. This question was not coded into binary. A selection of dolphin/whales in the ocean from a land-based vantage point received a two, on a dolphin/whale watching boat trip a one, and in a marine park or aquarium a zero. The sum of these questions was used to create an index with a scale of zero to seven with higher scores representing a more pro-dolphin/whale behavior.
As previously mentioned, the demographic questions (survey questions 22 through 26) from the survey were not used to create another index, but rather were used separately for analyses.

A bivariate correlation was used to test for significant relationships between the knowledge, attitude, and behavior indexes. Univariate analysis of variance (ANOVA) tests were used to determine if there was a significant difference between level of education and knowledge, attitude, and behavior indexes. Independent T-tests were also used to see if the mean attitude, knowledge, and behavior indexes of females differed from that of the males who took the survey and if the mean attitude, knowledge, and behavior indexes of participants with a social media account(s) differed from that of participants without a social media account.
CHAPTER 4: RESULTS

Demographics

The majority of the participants were male (60.96%; n=523), with females making up the remaining 39.04% (n=335). The age range of the sample population was from 19 to 73 years of age with a mean age of 35 years (SD = 10.9) (Figure 1).

Figure 1. Distribution of ages, separated by males and females, of survey participants (n=858).
The vast majority of the participants in this study indicated their permanent residence was the United States (n=577). Approximately 1/4th of the participants indicated their permanent residence was in India (n=251) and the remaining participants indicated that their permanent residence was in Canada (n=3), Croatia (n=2), United Kingdom (n=2), France (n=1), Greece (n=1), Lithuania (n=1), Macedonia (n=2), Mexico (n=1), New Zealand (n=1), Nigeria (n=1), Pakistan (n=1), Poland (n=1), Romania (n=3), Serbia (n=1), Slovenia (n=1), South Africa (n=1), Sri Lanka (n=1), Taiwan (n=1), and Thailand (n=1) (Figure 2).
In terms of education, approximately half of the participants (n=441) had completed at least an associate's degree, while the remaining half was divided between participants who obtained a higher degree (Masters, Ph.D., M.D, or other terminal degree) (18.53%; n=159) and participants who had up to some college but no degree (30.07%; n=258) (Table 1).
Table 1. Responses to the question "Please indicate the highest level of education that you have completed." Answers are represented as percentages (n=858).

<table>
<thead>
<tr>
<th>Education Level</th>
<th>Less than High School</th>
<th>High School Diploma/GED</th>
<th>Some college, no degree</th>
<th>Associate/Bachelors Degree</th>
<th>Masters Degree</th>
<th>Ph.D., M.D., or other terminal degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage (%) of respondents</td>
<td>0.70</td>
<td>7.93</td>
<td>21.44</td>
<td>51.40</td>
<td>17.37</td>
<td>1.16</td>
</tr>
</tbody>
</table>

Social Media

A total of 81.58% (n=700) of the participants indicated they have a social media account with only 18.42% (n=158) indicating they do not (Figure 3). Specifically, 83.54% (n=482) participants from the United States and 77.29% of participants India indicated they have a social media account. Those participants who indicated they had a social media account(s) were then asked which one(s). Almost all the participants said they had a Facebook account, with some indicating they also had accounts on: Twitter, Instagram, Tumblr, Google+, Pinterest, Linkedin, Reddit, Flickr, Whatsapp, DeviantArt, Ello, YouTube, Imgur, Bubblews, Vine, Snapchat, myCBN, myspace, Orkut, Tagged, and Path. Additionally, those participants were asked what type of pages/accounts they followed on social media to include: friends/family/coworkers, media outlets, NGOs/non-profits, Businesses, Celebrities/Hollywood, Marine science/conservation, or other. In total, 16.14% (n=113) of respondents indicated that they follow marine science/conservation pages. Respondents were also asked if they posted information about dolphins/whales on their social media page(s): 9.29% (n=65) of respondents indicated they did post information about dolphins/whales and they gathered the
information from television or newspaper articles or generic Internet sources (some respondents indicating more specifically Google, Facebook, social media, Discovery, Animal Planet, National Geographic, YouTube, blogs, Sea Shepherd Cove Guardians Official Page, and The Humane Society of the United States).

A vast majority of the participants that have social media accounts felt it was very important, important, or slightly important for scientists/conservation professionals to post information about dolphins/whales on social media (94.72%; n=663) (Table 2). Furthermore, 90.87% (n=636) of the participants indicated that information on dolphins/whales posted on social media is either very accurate, accurate, or slightly accurate (Table 3).
Table 2. Responses to the question "How important do you think it is for scientists/conservation professionals to post information about dolphins/whales on social media?" Answers are represented as percentages (n=700).

<table>
<thead>
<tr>
<th>Percentage (%) of respondents</th>
<th>Very important</th>
<th>Important</th>
<th>Slightly important</th>
<th>Slightly unimportant</th>
<th>Unimportant</th>
<th>Very unimportant</th>
</tr>
</thead>
<tbody>
<tr>
<td>37</td>
<td>38.43</td>
<td>19.29</td>
<td>4.14</td>
<td>0.29</td>
<td>0.85</td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Responses to the question "How accurate do you think the information on dolphin/whales posted on social media is?" Answers are represented as percentages (n=700).

<table>
<thead>
<tr>
<th>Percentage (%) of respondents</th>
<th>Very accurate</th>
<th>Accurate</th>
<th>Slightly accurate</th>
<th>Slightly inaccurate</th>
<th>Inaccurate</th>
<th>Very inaccurate</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.71</td>
<td>44.86</td>
<td>37.3</td>
<td>2.00</td>
<td>6.71</td>
<td>0.42</td>
<td></td>
</tr>
</tbody>
</table>

Knowledge, attitude, and behavior

The knowledge index had a minimum possible score of zero and a maximum possible score of three. The participant's scores ranged from zero to three and the mean score was 1.169 (SD = 0.878). Higher index scores reflected a higher level of knowledge about dolphins and whales and related conservation issues (Figure 4).

An independent t-test was conducted to determine if the mean knowledge level of males differed from the mean knowledge index of females. Data were gathered from samples of 335 females and 523 males, with a female sample mean of 1.12 (SD = 0.845) and a male sample mean of 1.20 (SD = 0.845). The independent t-test indicated that the knowledge level means were not significantly different for males and females ($t = -1.405, df = 856, p = .160$).
An independent t-test was also conducted to determine if the mean knowledge level of participants with a social media account(s) differed from the mean knowledge level of those without a social media account. Data were gathered from samples of 700 participants with a social media account(s) and 158 without, with a social media account(s) mean of 1.21 (SD = 0.881) and a without social media account sample mean of 0.98 (SD = 0.841). The independent t-test indicated that the knowledge level means were significantly different for participants with a social media account(s) and without a social media account \((t = -3.084, df = 241.195, p = .002)\). Thus, those participants with a social media account(s) were more likely to report higher knowledge of dolphins and related conservation issues.

A one-way ANOVA was conducted to determine if the mean knowledge level differed by level of education of the participants. The one-way ANOVA was found to not be statistically significant \(F(4, 858) = 0.624, p = .646, \eta^2 = 0.003\).
The attitude index had a minimum possible score of zero and a maximum possible score of 18. Higher scores for this index represented the likelihood that a participant's attitudes would be more dolphin and whale positive and conservation oriented. The participant's scores ranged from one to 18 and the mean score was 10.713 (SD = 3.284) (Figure 5).

An independent t-test was conducted to determine if the mean attitude level of males differed from the mean attitude level of females. Data were gathered from samples of 335 females and 523 males, with a female sample mean of 11.28 (SD = 3.199) and a male sample mean of 10.53 (SD = 3.290). The independent t-test indicated that the attitude level means were significantly different for males and females ($t = 4.065$, $df = 856$, $p < 0.000$). Thus, there is a significant difference in attitudes between genders, with
females being significantly more positive towards cetaceans than males.

An independent t-test was conducted to determine if the mean attitude level of participants with a social media account(s) differed from the mean attitude level of those without a social media account. Data were gathered from samples of 700 participants with a social media account(s) and 158 without, with a social media account(s) mean of 10.81 (SD = 3.234) and a without social media account sample mean of 10.30 (SD = 3.480). Unlike the mean knowledge level, the independent t-test indicated that the attitude level means were not significantly different for participants with a social media account(s) and without a social media account ($t = -1.764$, $df = 856$, $p = .078$).

A one-way ANOVA was conducted to determine if the mean attitude level differed by level of education of the participants. The one-way ANOVA was found to be statistically significant ($F(4, 858) = 4.171$, $p = 0.002$, $\eta^2 = 0.019$). Those participants with Master's Degree were significantly more positive towards cetaceans than a combined group of participants with high school diploma/GED and some college, but no degree.
Figure 5. Range of respondent's attitude levels, indicating how pro-dolphin they are. Higher scores indicate a more pro-dolphin attitude (n=858).

The behavior index had a minimum possible score of zero and a maximum possible score of seven. The participant's scores ranged from zero to seven and the mean score was 2.334 (SD = 1.189) Higher index scores reflected more pro-dolphin/whale and pro-conservation behavior (Figure 6).

An independent t-test was conducted to determine if the mean behavior level of males differed from the mean behavior level of females. Data were gathered from samples of 335 females and 523 males, with a female sample mean of 2.51 (SD = 1.176) and a male sample mean of 2.22 (SD = 1.184). The independent t-test indicated that the behavior level means were significantly different for males and females ($t = 3.553$, $df = 856$, $p < 0.000$). Therefore, female participants more likely to report positive behaviors towards dolphins and dolphin conservation than male participants.

An independent t-test was also conducted to determine if the mean behavior level
of participants with a social media account(s) differed from the mean behavior level of those without a social media account. Data were gathered from samples of 700 participants with a social media account(s) and 158 without, with a social media account(s) mean of 2.40 (SD = 1.183) and a without social media account sample mean of 2.03 (SD = 1.170). The independent t-test indicated that the behavior level means were significantly different for participants with a social media account(s) and without a social media account ($t = -3.570, df = 856, p = .000$). Thus, those participants with a social media account(s) were more likely to report positive behaviors towards dolphins and dolphin conservation.

A one-way ANOVA was conducted to determine if the mean behavior level differed by level of education of the participants. Unlike with the attitude index above, the one-way ANOVA was found to not be statistically significant for the behavior index ($F(4, 858) = 1.363, p = .245, \eta^2 = 0.006$).
A Pearson correlation coefficient was computed to determine if there is a relationship between knowledge, attitude, and behavior levels. The null hypothesis that the correlation is 0 was rejected at the 0.01 level of significance. Therefore, there is a positive correlation between knowledge level, attitude level, and behavior level (Table 4). Therefore, higher levels of knowledge was linked to more positive attitudes toward cetaceans and the conducting of more cetacean-positive behaviors.
Table 4. Correlation between previously recorded knowledge, attitude, and behavior levels. **Correlations are significant at the 0.01 level (two-tailed)

<table>
<thead>
<tr>
<th></th>
<th>Knowledge</th>
<th>Attitude</th>
<th>Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Knowledge</strong></td>
<td>Pearson correlation</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Sig. (two-tailed)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Attitude</strong></td>
<td>Pearson correlation</td>
<td>0.183**</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Sig. (two-tailed)</td>
<td>.000</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>858</td>
<td>-</td>
</tr>
<tr>
<td><strong>Behavior</strong></td>
<td>Pearson correlation</td>
<td>0.144**</td>
<td>0.260**</td>
</tr>
<tr>
<td></td>
<td>Sig. (two-tailed)</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>858</td>
<td>858</td>
</tr>
</tbody>
</table>

Conservation

Survey participants were asked how important they felt whale and dolphin conservation was. The participant's responses are noteworthy because approximately 95% of participants felt conservation was important at some level, with only 4% stating that it was "unimportant" to them (Table 5). Similarly, 96.41% of participants from the US and 95.49% of participants from India felt whale and dolphin conservation was important at some level (Table 6). Participants were then asked which dolphin/whale species from a given list was the most important to conserve (Figure 7). Figure 8 displays which dolphin/whale species from a given list participants from the United States and India felt was the most important to conserve. Table 7 displays the IUCN Red List and US Endangered Species Act (ESA) listing for each dolphin and whale species respondents were asked to choose from. Of note, approximately 40% of respondents felt the bottlenose dolphin was the most important species to conserve. Over 40% of participants from the US thought the bottlenose dolphin was the most important to
conserve compared to only 31% of participants from India. Despite essentially being the same species, the "Vaquita porpoise" received more votes than the [Gulf of] California harbor porpoise, 3.61% and 2.68% respectively, but both species were highlighted by more than an order of magnitude less members of the public than noted the bottlenose dolphin as the chief species of concern. Additionally, the three "fake" species (the "Lump-headed dolphin"- 6.17%, the "Majestic spotted dolphin"- 7.0%, and the "Pygmy short-finned whale"- 4.2%) received more votes collectively than the "California harbor porpoise", the "Vaquita porpoise", the "Northern right whale"- 5.01%, and the "Fin whale"- 4.9% (17.37% and 16.02%, respectively). Although not a cetacean, 16% of respondents felt the whale shark was the most important dolphin/whale species to conserve. Of note, significantly more participants from India felt the whale shark was the most important to conserve than participants from the United States.

Table 5. Percentage of respondents whose opinion it was that dolphin/whale conservation was very important, important, slightly important, slightly unimportant, unimportant or very unimportant (n=858).

<table>
<thead>
<tr>
<th>Percentage (%) of respondents</th>
<th>Very important</th>
<th>Important</th>
<th>Slightly important</th>
<th>Slightly unimportant</th>
<th>Unimportant</th>
<th>Very unimportant</th>
</tr>
</thead>
<tbody>
<tr>
<td>49.18</td>
<td>32.87</td>
<td>13.76</td>
<td>2.21</td>
<td>0.70</td>
<td>1.28</td>
<td></td>
</tr>
</tbody>
</table>
Table 6. Percentage of respondents from the United States and India whose opinion it was that dolphin/whale conservation was very important, important, slightly important, slightly unimportant, unimportant or very unimportant (US, n=577; India, n=251).

<table>
<thead>
<tr>
<th>Percentage (%) of respondents</th>
<th>Very important</th>
<th>Important</th>
<th>Slightly important</th>
<th>Slightly unimportant</th>
<th>Unimportant</th>
<th>Very unimportant</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>54.18</td>
<td>30.68</td>
<td>11.55</td>
<td>1.99</td>
<td>0.4</td>
<td>1.20</td>
</tr>
<tr>
<td>India</td>
<td>47.66</td>
<td>33.45</td>
<td>14.38</td>
<td>2.43</td>
<td>0.69</td>
<td>1.39</td>
</tr>
</tbody>
</table>

Figure 7. Displays which dolphin/whale species listed respondents felt was the most important to conserve. The whale shark is not a cetacean species. The Pygmy short-finned whale, the Lump-headed dolphin, and the Majestic spotted dolphin were included as “fake” species (n=858).
Figure 8. Displays which dolphin/whale species listed respondents from the United States and India felt was the most important to conserve. The whale shark is not a cetacean species. The Pygmy short-finned whale, the Lump-headed dolphin, and the Majestic spotted dolphin were included as “fake” species (US, n=577; India, n=251).
Table 7. Displays percentage of respondents whom felt the listed dolphin/whale species was the most important to conserve along with the IUCN Red List and US Endangered Species Act (ESA) listing for each species (n=858).
*Not a cetacea
**Fake species name

<table>
<thead>
<tr>
<th>Species</th>
<th>IUCN Red List</th>
<th>ESA Listing</th>
<th>Percentage (%) of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bottlenose dolphin <em>Tursiops truncatus</em></td>
<td>Least Concern</td>
<td>Candidate Species-Fiordland population</td>
<td>39.74</td>
</tr>
<tr>
<td>[Gulf of] California harbor porpoise (alternative name for the Vaquita porpoise)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vaquita porpoise <em>Phocoena sinus</em></td>
<td>Critically Endangered</td>
<td>Endangered-throughout its range</td>
<td>2.68</td>
</tr>
<tr>
<td>Fin whale <em>Balaenoptera physalus</em></td>
<td>Endangered</td>
<td>Endangered-throughout its range</td>
<td>3.61</td>
</tr>
<tr>
<td>Northern right whale (North Atlantic right whale) <em>Eubalaena glacialis</em></td>
<td>Endangered</td>
<td>Endangered-throughout its range</td>
<td>4.9</td>
</tr>
<tr>
<td>Whale shark* <em>Rhincodon typus</em></td>
<td>Vulnerable</td>
<td>Petition to list as either threatened or endangered</td>
<td>5.01</td>
</tr>
<tr>
<td>Pygmy short-fined whale** &quot;fake species&quot;</td>
<td></td>
<td></td>
<td>16.32</td>
</tr>
<tr>
<td>Lump-headed dolphin** &quot;fake species&quot;</td>
<td></td>
<td></td>
<td>4.2</td>
</tr>
<tr>
<td>Majestic spotted dolphin** &quot;fake species&quot;</td>
<td></td>
<td></td>
<td>6.17</td>
</tr>
<tr>
<td>Not Applicable</td>
<td></td>
<td></td>
<td>10.37</td>
</tr>
</tbody>
</table>

Participants were also asked to indicate which species listed in the survey was the most endangered (Figure 9). Table 8 displays the IUCN Red List and US Endangered Species Act (ESA) listing for each dolphin and whale species respondents were asked to choose from. Approximately 75% of respondents felt that the blue whale, the humpback whale, and the killer whale were the most important to conserve (24.01%, 22.14%, and
23.43%, respectively). Of note, significantly more participants from the United States felt the humpback whale was the most endangered and more participants from India felt the blue whale was the most endangered (Figure 10).

Figure 9. Displays which dolphin/whale species listed respondent's felt was the most endangered (n=858).
Figure 10. Displays which dolphin/whale species listed respondents from the United States and India felt was the most endangered (US, n=577; India, n=251).
Table 8. Displays percentage of respondents whom felt the listed dolphin/whale species was the most endangered along with the IUCN Red List and US Endangered Species Act (ESA) listing for each species (n=858).

<table>
<thead>
<tr>
<th>Species</th>
<th>IUCN Red List</th>
<th>US Endangered Species Act (ESA) Listing</th>
<th>Percentage of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue whale <em>Balaenoptera musculus</em></td>
<td>Endangered</td>
<td>Endangered - throughout its range</td>
<td>24.01</td>
</tr>
<tr>
<td>Bottlenose dolphin <em>Tursiops truncatus</em></td>
<td>Least Concern</td>
<td>Candidate Species- Fiordland population</td>
<td>10.49</td>
</tr>
<tr>
<td>Hector's dolphin <em>Cephalorhynchus hectori</em></td>
<td>Endangered</td>
<td>Candidate Species- throughout its range</td>
<td>14.33</td>
</tr>
<tr>
<td>Hourglass dolphin <em>Lagenorhynchus cruciger</em></td>
<td>Least Concern</td>
<td>Not listed</td>
<td>5.60</td>
</tr>
<tr>
<td>Humpback whale <em>Megaptera novaeangliae</em></td>
<td>Least Concern</td>
<td>ESA Proposed Threatened- 2 distinct population segments: - Central America DPS - Western North Pacific DPS ESA Proposed Endangered - 2 DPS - Arabian Sea DPS - Cape Verde Island/Northwest Africa DPS ESA Endangered- throughout its range</td>
<td>22.14</td>
</tr>
<tr>
<td>Killer whale (Orca) <em>Orcinus orca</em></td>
<td>Data Deficient</td>
<td>ESA Endangered- Southern Resident killer whales (J, K, and L pods)</td>
<td>23.43</td>
</tr>
</tbody>
</table>

Less than 5% of respondents thought that marine mammal conservation laws and policies were unimportant (Table 9). Over one-quarter of the respondents felt that dolphin and whale species were under protected and another two-fifths indicated that dolphin and
whale species are only slightly protected (Table 10). Of note, 37.27% of US participants indicated that dolphin and whale species were under protected compared to only 14.34% of participants from India (Table 11).

Table 9. Responses to the question "How important do you think marine mammal conservation laws and policies are?" Answers are represented as percentages (n=858).

<table>
<thead>
<tr>
<th>Percentage (%) of respondents</th>
<th>Very important</th>
<th>Important</th>
<th>Slightly important</th>
<th>Slightly unimportant</th>
<th>Unimportant</th>
<th>Very unimportant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>47.43</td>
<td>37.88</td>
<td>10.50</td>
<td>2.56</td>
<td>0.70</td>
<td>0.93</td>
</tr>
</tbody>
</table>

Table 10. Responses to the question "How well do you think dolphin and whale species are protected worldwide?" Answers are represented as percentages (n=858).

<table>
<thead>
<tr>
<th>Percentage (%) of respondents</th>
<th>Overprotected</th>
<th>Protected</th>
<th>Slightly protected</th>
<th>Under protected</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3.61</td>
<td>24.48</td>
<td>41.96</td>
<td>29.95</td>
</tr>
</tbody>
</table>

Table 11. Participants responses from the United States and India to the question "How well do you think dolphin and whale species are protected worldwide?" Answers are represented as percentages (US, n=577; India, n=251).

<table>
<thead>
<tr>
<th>Percentage (%) of respondents</th>
<th>Overprotected</th>
<th>Protected</th>
<th>Slightly protected</th>
<th>Under protected</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>1.21</td>
<td>15.42</td>
<td>46.10</td>
<td>37.27</td>
</tr>
<tr>
<td>India</td>
<td>9.16</td>
<td>46.22</td>
<td>30.28</td>
<td>14.34</td>
</tr>
</tbody>
</table>

A chi-square test of association was conducted to determine if there was a relationship between how important participants felt dolphin and whale conservation was and the which way they would prefer to see dolphins and whales. Sixty percent of
participants stated that they preferred to see dolphins and whales on a dolphin/whale-watching boat trip. Participants that feel dolphin/whale conservation is "slightly unimportant" to "very unimportant" have a higher percentage of this preference, while the individuals that felt dolphin and whale conservation was very important had a higher preference to view dolphins and whales in the ocean from a land-based vantage point. However, there is not a significant association between how important participants felt dolphin and whale conservation was and which way they would prefer to see dolphins and whales ($\chi^2 = 7.144, df = 6, p = 0.308$).

A chi-square test of association was also conducted to determine if there was a relationship between how important participants felt dolphin and whale conservation was and if they were a member of any type of conservation/environmental group. There appears to be an association or relationship between the level of dolphin and whale conservation importance and membership in a conservation/environmental group ($\chi^2 = 9.693, df = 3, p = 0.021$). Examination of the standardized residuals suggests that respondents who feel dolphin and whale conservation is very important are significantly more likely to be a member of any type of conservation/environmental group (standard residual = 2.2) as compared to all other respondents.

A chi-square goodness-of-fit test was conducted to determine if the sample proportions were the same for how important the respondents felt marine mammal conservation laws and policies were. The study found a statistically significant difference between the levels of importance for marine mammal conservation laws and policies ($\chi^2 = 450.485, df = 3, p = <0.001$).
Survey participant behavior

Table 12 displays responses to four questions pertaining to participant’s environmental related activities. Only 14% of respondents indicated they had ever gone on a dolphin/whale research expedition or a dolphin/whale-watching trip. Approximately half of the respondents indicated they watch animal programs on channels such as Discovery, Animal Planet, BBC, or National Geographic. However, only 6% of respondents indicated they subscribed to any environmental/scientific/animal magazine. Of those participants that subscribed, 33% indicated they receive National Geographic Magazine. An even lower number of participants, approximately 4%, stated that they were a member of any type of conservation/environmental group.

Table 12. Displays responses to four questions pertaining to participant’s environmental related activities. Answers are represented as percentages.

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have you ever gone on a dolphin/whale research expedition or a dolphin/whale watching trip?</td>
<td>14.69</td>
<td>85.31</td>
<td>858</td>
</tr>
<tr>
<td>Do you watch animal programs on channels like Discovery, Animal Planet, BBC, or NatGeo?</td>
<td>48.60</td>
<td>51.40</td>
<td>858</td>
</tr>
<tr>
<td>Do you subscribe to any environmental/scientific/animal magazines?</td>
<td>6.29</td>
<td>93.71</td>
<td>858</td>
</tr>
<tr>
<td>Are you a member of any type of conservation/environmental group?</td>
<td>4.43</td>
<td>95.57</td>
<td>858</td>
</tr>
</tbody>
</table>
Whaling

This section considers participants attitudes towards whaling. Slightly less than half of respondents indicated that they were aware that several countries are still involved in whaling (Table 13). Those participants who said they were aware were then asked to indicate which country(ies) are still involved in whaling. Countries indicated by participants included: Japan, China, Greenland and the Faroes, Norway, Iceland, Canada, Russia, the United States, South Africa, Australia, New Zealand, Vietnam, South Korea, Sri Lanka, Sweden, Finland, Thailand, Somalia, Peru, India, and Indonesia. Of those participants, 56% said Japan and 5% said they were aware of countries participating in whaling but did not know which countries. Approximately half of participants indicated they would boycott visiting a country that was involved in whaling with the other half saying they would not (Table 14). Only 13% of respondents indicated they have heard of the International Whaling Commission (Table 15). Finally, over 85% of respondents indicated that they were opposed or strongly opposed to the hunting of whales (Figure 11). Of note, 23.91% of participants from India supported or strongly supported the hunting of whales as compared to only 8.84% of participants from United States (Figure 12).

<table>
<thead>
<tr>
<th>Percentage (%) of respondents</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Percentage (%) of respondents</strong></td>
<td>47.44</td>
<td>52.56</td>
</tr>
</tbody>
</table>
Table 14. Responses to the question "Would you boycott visiting a country involved in whaling?" (n=858)

<table>
<thead>
<tr>
<th>Percentage (%) of respondents</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>48.25</td>
<td>51.75</td>
</tr>
</tbody>
</table>

Table 15. Responses to the question "Have you heard of the International Whaling Commission (IWC)?" (n=858)

<table>
<thead>
<tr>
<th>Percentage (%) of respondents</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>13.52</td>
<td>86.48</td>
</tr>
</tbody>
</table>

Figure 11. Displays percentage of respondents whose level of support was either strongly supportive, supportive, opposed, or strongly opposed to the hunting of whales (n=858).
Figure 12. Displays percentage of respondents from the United States and India whose level of support was either strongly supportive, supportive, opposed, or strongly opposed to the hunting of whales (US, n=577; India, n=251).

A chi-square goodness-of-fit test was conducted to determine if the sample proportions of how supportive respondents were to the hunting of whales were all the same. The study found a statistically significant difference between the levels of supportiveness ($\chi^2 = 265.346, df = 2, p = <0.001$). That is to say, the public was significantly more likely to be opposed to whaling.

**Captivity**

Interest in observing marine mammals in the wild and in captivity has expanded significantly in recent years. In the current study, almost 2/3rd of participants indicated
that if costs were similar and all options available, they would prefer to see dolphins and whales on a dolphin/whale watching boat trip than in a captive setting (Table 16).

A chi-square goodness-of-fit test was conducted to determine if the sample proportions of which way respondents preferred to see whales and dolphins all the same. The study found a statistically significant difference between the ways respondents preferred to see whales and dolphins ($X^2 = 308.224, df = 2, p = <0.001$). That is to say, the public was statistically significantly more likely to prefer watching whales and dolphins from a whale-watching boat than in a captive display facility.

Table 16. Responses to the question "If costs were similar and all options available in a given location, which way would you prefer to see dolphins/whales?" (n = 858)

<table>
<thead>
<tr>
<th>Percentage (%) of respondents</th>
<th>In a marine park or aquarium</th>
<th>On a dolphin/whale watching boat trip</th>
<th>Dolphins/whales in the ocean from a land-based vantage point</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>13.99</td>
<td>60.84</td>
<td>25.17</td>
</tr>
</tbody>
</table>

Table 17. Respondents from the United States and India responses to the question "If costs were similar and all options available in a given location, which way would you prefer to see dolphins/whales?" (US, n=577; India, n=251)

<table>
<thead>
<tr>
<th>Percentage (%) of respondents</th>
<th>In a marine park or aquarium</th>
<th>On a dolphin/whale watching boat trip</th>
<th>Dolphins/whales in the ocean from a land-based vantage point</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>9.19</td>
<td>66.72</td>
<td>24.09</td>
</tr>
<tr>
<td>India</td>
<td>26.29</td>
<td>47.01</td>
<td>26.70</td>
</tr>
</tbody>
</table>

In Figure 13, approximately 55% of respondents indicated some level of opposition towards dolphins and whales in marine parks and aquariums versus 45% of
respondents indicating they are supportive. Of note, only 5.2% of respondents from the United States indicated they strongly supported dolphins and whales in marine parks and aquariums as compared to 20.72% of respondents from India (Figure 14).

A chi-square goodness-of-fit test was conducted to determine if the sample proportions were the same for how supportive or opposed respondents were of dolphins and whales in marine parks/aquariums. The study found a statistically significant difference between the level of supportiveness ($\chi^2 = 213.674$, $df = 3$, $p = <0.001$). Thus, the public was significantly more likely to be opposed to cetaceans being kept in marine parks/aquariums.

![Bar chart showing the percentage of respondents whose level of support was either strongly supportive, supportive, opposed, or strongly opposed to dolphins/whales in marine parks/aquariums (n=858).]

Figure 13. Displays percentage of respondents whose level of support was either strongly supportive, supportive, opposed, or strongly opposed to dolphins/whales in marine parks/aquariums (n=858).
Figure 14. Displays percentage of respondents from the United States and India whose level of support was either strongly supportive, supportive, opposed, or strongly opposed to dolphins/whales in marine parks/aquariums (US, n=577; India, n=251).

Considerable controversy has developed regarding the viewing of marine mammals in the wild and in captivity. Participants were given eight different scenarios in which they were asked to indicate whether or not they felt it was right to keep a dolphin(s) in captivity or in that environment (Figure 15). Almost 80% of respondents objected to capturing wild dolphins and whales for display in zoos and aquariums. Approximately half of the participants indicated that it was right to keep dolphins in captivity when the dolphins were captive bred; but only 19% of respondents indicating captivity approval for dolphins performing shows involving tricks for human enjoyment. Some 70% of respondents objected to dolphins being kept in an aquarium or tank. Forty-
six percent nonetheless approved, although 53% opposed, of dolphins in captivity when they are kept in their natural habitat but confined to an area by nets. Some 85% felt it was right to keep dolphins in captivity when they are sick or injured. Additionally, approximately 80% and 65% of respondents respectively felt it was right to keep dolphins in captivity for conducting research relevant to dolphin conservation in the wild and on captive dolphin rearing and breeding respectively.

Figure 15. Displays when respondents felt it was right to keep dolphins in captivity (n=858).
Eight separate chi-square test of association were conducted to determine if there was a relationship between how important participants felt dolphin and whale conservation was and the eight different sub-questions of when respondents felt it was appropriate to keep dolphins in captivity. It was hypothesized that for each test there was a relationship between the two variables. None of the following results were significant:

- When dolphins are captured from the wild \((x^2 = 5.912, df= 3, p= 0.116)\)
- When the dolphins are captive bred \((x^2 = 4.460, df= 3, p= 0.216)\)
- When dolphins are kept in their natural habitat, but confined to an area by nets \((x^2 = 7.129, df= 3, p= 0.068)\)
- When dolphins are sick or injured \((x^2 = 1.084, df= 3, p= 0.781)\)
- For conducting research on captive dolphin rearing and breeding (husbandry) \((x^2 = 2.369, df= 3, p= 0.499)\)

There appears to be a significant association or relationship between:

- The level of dolphin and whale conservation importance and whether or not respondents believe it is right to keep dolphins and whales in captivity when they are kept in an aquarium/tank \((x^2 = 14.912, df= 3, p= 0.002)\). Examination of the standardized residuals suggests that respondents who feel dolphin and whale conservation is slightly unimportant/unimportant/very unimportant are significantly more likely to feel it is right to keep dolphins in captivity when they are kept in a aquarium/tank dolphin (standard residual = 2.7) as compared to all other respondents. That is to say, members of the public that support cetaceans in
captivity are significantly more likely to believe cetacean conservation is unimportant.

- The level of dolphin and whale conservation importance and whether or not respondents believe it is right to keep dolphins and whales in captivity for human enjoyment to perform shows involving tricks ($\chi^2 = 9.901, df = 3, p = 0.019$). Examination of the standardized residuals suggests that respondents who feel dolphin and whale conservation is only "slightly important" are more likely to feel it is right to keep dolphins in captivity when they are for human enjoyment to perform shows involving tricks (standard residual = 1.9) as compared to all other respondents.

- The level of dolphin and whale conservation importance and whether or not respondents believe it is right to keep dolphins and whales in captivity for conducting research relevant to dolphin conservation in the wild was also statistically significant ($\chi^2 = 12.159, df = 3, p = 0.007$). Examination of the standardized residuals suggests that respondents who feel dolphin and whale conservation is slightly unimportant/unimportant/very unimportant are more likely to feel it is not right to keep dolphins in captivity when it is for conducting research on captive dolphin rearing and breeding (standard residual = 2.8) as compared to all other respondents.
CHAPTER 5: DISCUSSION

Demographics

Trends exist in who responds to surveys and who does not with regard to traditional survey methods (Smith, 2008). In general, younger people are more likely to participate than older people (Moore and Tarnai, 2002); more women are likely to participate than men (Curtin et al., 2000; Moore and Tarnai, 2002); and more educated and more affluent people are more likely to participate than less educated, less affluent people (Curtin et al., 2000). Online surveys are relatively new by comparison but are quickly growing in importance (Dillman et al., 1999).

Most of the participants in this survey were born in the 1981-1990 time frame, which is similar to that of a study by Howard and Parsons (2006) where 21-30 year olds made up 23% of participants. Additionally, in a study looking at potential gender bias in online survey response, Smith (2008) found a difference in the online survey response rates of female and male participants, having higher response rates for females than males. However, the current study found a higher response rate from males (n = 523) than females (n = 335). Notably, there were a larger number of males between 25 and 34 years of age than females.
**Social Media**

In the current study a total of 81.58% of the participants indicated they have a social media account, with almost all of the participants indicating they have a Facebook account. An overwhelming majority of those participants that have social media accounts felt it was very important, important, or slightly important for scientists/conservation professionals to post information about dolphins/whales on social media. Additionally, the mean knowledge and behavior levels were found to be significantly different for those participants that had a social media account(s) than those participants that did not have a social media account.

Social media is a powerful tool that can disseminate information quickly and can stimulate public support even for conservation efforts. In this way public pressure can be applied thus incentivizing improved conservation behavior (Nghiem *et al*., 2012). For example, photos were posted on Facebook of a pregnant endangered douc (*Pygathrix cinerea*) being tortured and killed while Vietnamese soldiers were present; the story generated significant public outcry and such mass mistreatment of an endangered animal had not been previously experienced in Vietnam (Nghiem *et al*., 2012). In response to the severe public pressure, the three Vietnamese soldiers were dismissed (Nghiem *et al*., 2012). Social media is also being used in longer term projects including attempting to decrease the consumption of shark fin in China. As a result a petition to halt the importation of shark fins was successfully lodged with China's legislature (The Nature Conservancy, 2015). Wijedasa *et al*. (2013) noted engaging people through conservation messaging on Facebook social media platforms is most useful when the public is engaged
on a personal and emotional level, noting animal abuse versus deforestation or illegal wildlife trade. Similarly, a study conducted by the Department of Biological Sciences at the National University of Singapore Facility of Science found that articles about climate change or charismatic mammals and those articles with illustrations were more likely to be shared or liked on Facebook and Twitter (Phys.org, 2015). Wijedasa et al. (2013) shared a photo on Facebook of snorkelers harassing an endangered green turtle (*Chelonia mydas*). The photo received over 63,000 views drawing public attention thus prompting the Malaysian Fisheries Department to investigate the incident and causing the tour company of which the snorkelers were part of to issue a public apology. However, they subsequently posted a picture of tiger claws being sold in the Malaysian market, which only received slightly over 1000 views.

Over 90% of participants in the current study who indicated they had social media accounts felt that information on dolphins/whales posted on social media is either very accurate, accurate, or slightly accurate. This is noteworthy as most of the information on dolphins and whales was collectively viewed by participants as accurate regardless of where the information originated, whether it be from scientific journals, documentaries, aquariums, or marine parks. Thus, the public is generally not critical nor discerning about the veracity of information they gain on cetaceans.

**Knowledge, Attitude, and Behavior**

This study showed that marine mammal conservation issues were important to a majority of the participants. It is possible that participants of this online survey had an
interest in conservation or cetaceans and searched for a survey on MTurk using key words such as conservation, cetacean, dolphin, or public attitude. A majority of participants felt that marine mammal conservation laws and policies were important despite a lack of awareness of the conservation status of whales and dolphins. These findings suggest that detailed knowledge of the conservation status of whales and dolphins is not a prerequisite of strong positive attitudes towards cetacean conservation issues. It is possible that strong support for marine mammal conservation issues could be due to the fact that marine mammals are popular among the general public and produce positive, aesthetic, humanistic views (Kellert, 1999).

Additionally, the mean attitude and behavior levels of males and females were found to be significantly different. Kellert and Barry (1980) found that females possess a greater concern for the harassment of animals and seem to value animals as objects of affection, leading to stronger conservation attitudes. The mean attitude level also differed between level of education of the participants with a significant difference between those participants indicating they had a Master's degree and those that had a high school diploma/ GED and some college, no degree. These findings are supported by a study conducted by Kellert (1996) who found that education is most likely to change a person's attitude and perception of nature and biodiversity. Thompson and Mintzes (2002) and Kellert and Barry (1980) similarly found a direct relationship between education level and interest, concern, and awareness of environmental issues.

Consistent with findings by Barney et al. (2005), a positive correlation was observed in the current study between knowledge level, attitude level, and behavior level.
Barney et al. (2005) found a person's knowledge of bottlenose dolphins increased with age and educational exposure and were increasingly more likely to have an environmentally friendly, ecoscientific view of dolphins. Many researchers believe that knowledge and attitude are liked to each other and attitude is further connected to behavior (Flamm, 2006). When discussing the environment it can be assumed "if people become more knowledgeable about the environment and its associate, they will, in turn, become more aware of the environment and its problems and thus, be more motivated to act toward the environment in more responsible ways" (Fahlquist, 2009).

Conservation

Similar to the Howard and Parsons (2006) survey and the Scott and Parsons (2005) survey, the overall public concern reported in this survey regarding dolphin and whale conservation was high. Almost 50% of participants in the current study thought that dolphin and whale conservation was very important; with another 46.63% indicating it was important or slightly important. In a survey investigating the awareness and attitudes of resident Arubans (in the Dutch Antilles, the Caribbean) and tourists towards marine mammals and their conservation, Luksenburg and Parsons (2013) found that 88.4% of participants felt marine conservation issues were important or very important, with only 2.5% indicating they were unimportant or very unimportant, and 9.0% indicated they had no opinion.

Given a list of whale species, 24% of current survey participants thought the blue whale was the most endangered, 22% thought the humpback whale was the most endangered, and 23% thought the killer whale was the most endangered. Of note,
significantly more participants from the United States felt the humpback whale was the most endangered than participants from India (26% and 13.54% respectively) and significantly more participants from India felt the blue whale was the most endangered than participants from the United States (28.69% and 22.01% respectively). Only 14.33% of current survey participants felt the Hector's dolphin was the most important to conserve. In a preliminary study of American college students, Parsons et al. (2010c) found that 39% of participants felt the humpback whale was the most threatened followed by the blue whale with 24.8%; only 4.8% indicated the North Pacific right whale was the most threatened. During the time the Parsons et al. (2010c) survey was conducted, the North Pacific right whale was considered to have one of the worst conservation statuses and considered to be one of the most endangered whale species. In an additional study of college students by Sitar-Gonzales and Parsons (2012) on the perceived conservation status of polar bears and penguins, 69% and 53% of participants felt polar bears and penguins, respectively, were internationally classified as "endangered". At the time of the study, the polar bear was listed as "vulnerable" and five penguins were internationally classified as "endangered" and six as "vulnerable" (Sitar-Gonzales and Parsons, 2012).

The blue whale is highly recognizable to the general public. It is known as the largest animal on earth, possibly leading to its identification in this survey as the most endangered whale and dolphin species. Additionally, the blue whale often frequent the coast of India and is a popular species on whale-watching tours around Sri Lanka, possibly leading to the familiarity of the general public of India and leading to more Indian participants feeling the blue whale was the most endangered. The humpback
whale, also very familiar to the general public, is often the main focus for the US whale-watching industry, and possibly attracts more media attention than any other large whale (Parsons et al., 2010c). The killer whale is listed as "data deficient" by the IUCN but southern resident killer whales are listed as endangered by the US Endangered Species Act (ESA). It is possible that the highly publicized book Death at SeaWorld by David Kirby or the documentary Blackfish could have influenced the high percentage of participants in the current study that felt the killer whale was the most endangered cetacean species. Similar to the Parsons et al. (2010c) study in which only a very small number of participants correctly identified the most endangered listed cetacean, the current study only had a small number of participants indicate that the Hector's dolphin was the most important to conserve. The Hector's dolphin is listed as "endangered" by the IUCN and a candidate species throughout its range by the ESA. It has one of the most restricted distributions of any cetacean and has suffered and is drastic decline over the past 30 years with levels of mortality being unsustainable (Reeves et al., 2013).

Participants in the current study were also asked which species listed was the most important to conserve. Almost 40% of respondents indicated the bottlenose dolphin was the most important to conserve, with more participants from the United States indicating this than participants from India. The bottlenose dolphin is listed as a species of "least concern" by the IUCN and as a candidate species for the Fiordland population (New Zealand) under the US Endangered Species Act. Therefore its identification as the whale and dolphin species most important to conserve was surprising. Similar to the humpback whale, the bottlenose dolphin is very recognizable to the general public,
especially in the United States, being one of the most common cetacean species in captivity. Despite their high media profile, awareness of the bottlenose dolphin conservation status, in the sample population, was low, which is consistent with findings on polar bears and penguins from the Sitar-Gonzales and Parsons (2012) study. It was also notable that 16% of respondents felt the whale shark was the most important to conserve. Additionally, significantly more participants from India indicated the whale shark was the most important to conserve than participants from the United States. While the whale shark is listed at "vulnerable" by the IUCN and is petitioned to be listed as either threatened or endangered by ESA, it is a fish not a cetacean. The whale shark was heavily exploited during the 1990s off the Gujarat coast of India (Pravin, 2000) but as of 2001 it is protected under the Indian Wildlife (Protection) Act (WTI, 2013), thus possibly leading to the increased number of Indian participants who felt the whale shark was the most important to conserve. It is possible that respondents did not accurately read the question, which asked participants to identify the whale/dolphin species most important to conserve, or rather disturbingly, they incorrectly viewed the whale shark as a cetacean. Similarly, Scott and Parsons (2004) found that general awareness of the occurrence and diversity of cetaceans in southwest Scotland was low. Participants were show photographs of the four most commonly occurring species; only 30.2% of participants identified one or more of the species correctly. The species most correctly identified in the study was the bottlenose dolphin (19%), followed by the harbor porpoise (17.5%), minke whale (10.7%), and lastly the common dolphin (7.1%) (Scott and Parsons, 2004).
On the list of species presented during this survey, having one of the worst conservation statuses, the Vaquita porpoise is listed as "critically endangered" by IUCN and endangered by ESA. Despite being the same species, the Vaquita porpoise received more votes than by its common name of [Gulf of] California harbor porpoise. However, only 6.29% of respondents collectively felt it was the most important dolphin and whale species to conserve. The three "fake" species (the Lump-headed dolphin, the Majestic spotted dolphin, and the Pygmy short-finned whale) received more votes collectively than the [Gulf of] California harbor porpoise, the Vaquita porpoise, the Northern right whale, and the Fin whale (17.37% and 16.02%, respectively). Of the three “fake” species, more participants thought the Majestic spotted dolphin was more important to conserve than the Lump-headed dolphin and the Pygmy short-finned whale (7.0%, 6.17%, and 4.2%, respectively). These results might be expected as a study by Karaffa et al. (2012) found that on average species names with negative connotations gathered less support for conservation (51%) whereas charismatic/positive sounding names prompted greater support for conservation (65%). Respondents were twice as likely to not conserve a negative sounding species (14%) than a positive sounding species (7%) (Karaffa et al., 2012).

Scott and Parsons (2005) investigated levels of public awareness of cetacean protection finding that 45.6% of participants felt cetaceans in Scotland were not sufficiently protected. Additionally, participants were asked to comment on the level of threat posed to cetaceans in Scottish waters by a variety of activities; oil spills (43.7%), reduction in available prey (41.8%), marine litter (32%), and sewage bacteria (31.1%)
were indicated by most participants as posing the greatest threat (Scott and Parsons, 2005). Only 0.8% considered whale watching to be a serious threat (Scott and Parsons, 2005). Similarly, Howard and Parsons (2006) found 33% of participants felt cetacean’s protection in Scotland was insufficient. Oil spills (68%), chemical pollution (65%) sewage pollution (63%), depletion of cetacean prey from over-fishing (54%), entanglement in fishing gear (51%), marine litter (44%), and global warming (43%) were considered by participants to be the greatest threats to cetacean populations, with only 3.1% indicating whale watching was a serious threat (Howard and Parsons, 2006). The current study found that 30% of people felt cetaceans were under protected with an additional 42% indicating cetaceans were only slightly protected.

Whaling

Scott and Parsons (2005) noted that 69.4% of participants stated they were aware of commercial and 'scientific' whaling operations being conducted. Almost all participants were against hunting whales (94.4%) with no participants indicating they strongly supported whaling. A large majority of this study's participants (86.83%) indicated they either strongly opposed or opposed hunting with 3.61% of participants strongly supporting whaling. Freeman and Kellert (1992) commissioned Gallup Organization to conduct an opinion poll on whaling in six countries including Australia, England, Germany, Japan, Norway, and the United States. They found that participants from the four non-whaling countries (Australia, England, Germany, and the United States) were highly opposed to whaling as compared to participants from the two whaling countries (Japan and Norway) where only a minority was opposed to whaling. The
public of the whaling countries knew more about whaling, but knowledge about whale populations did not differ between the whaling and non-whaling countries. In 1999, Kellert conducted another study of American attitudes finding that 70% of Americans opposed whaling.

Only 48.25% of respondents indicated they would not visit a country involved in whaling, with slightly more Americans indicating they would not visit than Indians (49.05% and 48.61%, respectively). This is contrary to a study by Parsons and Rawles (2003) who found that 79% of whale-watchers in Tobermory, Isle of Mull, Scotland, would boycott a country that conducted hunts for cetaceans. Parsons and Draheim (2009) also found the 77.1% of tourists in the Dominican Republic would be less likely to visit a Caribbean country on vacation that supported the hunting or capture of whales and dolphins.

Captivity

Approximately 55% of respondents in the current study either opposed or strongly opposed dolphins and whales in marine parks and aquariums. More survey participants from India strongly supported dolphins and whales in marine parks and aquariums than did survey participants from the United States (20.72% and 5.20% respectively). Findings from a 2014 public opinion poll of over 1000 Americans regarding the confinement of orcas in captivity conducted by WDC and the Animal Welfare Institute (AWI) found that half of all Americans are against killer whales in captivity (WDC, 2014), thus this study independently confirms the results of this survey. Approximately one-fifth of respondents in the current study believed it was appropriate to capture wild
dolphins and whales for display in zoos and aquariums. Of those respondents, over half of the respondents indicated their permanent residence was in India. In a 2007 survey of the U.S. public by the World Society for the Protection of Animals (WSPA), only 11% of respondents felt it was acceptable to capture wild dolphins for display (Rose et al., 2009).

WDC and AWI also found from the 2014 public opinion poll that the number of Americans conflicted or uncertain about how they feel about captivity has decreased from 34% in 2012 to 29%. Participants in the current study felt that it was only appropriate to keep dolphins in captivity when the dolphins are sick or injured, for research on captive breeding and husbandry programs, and for the specific purpose of conducting research relevant to dolphin conservation in the wild. Additionally, half of the participants felt it was appropriate to keep dolphins in captivity when the dolphins were captive-bred, but only 19% of respondents indicated approval for dolphins in captivity for the purpose of performing shows involving tricks for human enjoyment. It is possible that the term "captive bred" led respondents to believe that because the dolphins/whales were born in captivity it was acceptable for these animals to remain in captivity, or perhaps that they were unreleasable. Additionally, the marine mammal display industry advertises their captive breeding programs as conservation and educational tools possibly influencing the general public and invoking a positive response. Over 85% of participants in the current study stated they would prefer to see whales and dolphins in the wild (on a dolphin/whale watching boat trip or dolphins/whales in the ocean from a land-based vantage point), a result that was statistically significant with less than 15% indicating they would prefer to see whales and dolphins in a marine park or aquarium, with a stronger preference by
participants from India than from the United States (26.29% and 9.19% respectively). Similarly, Draheim et al. (2010) found that 91.6% of survey participants in the Dominican Republic would prefer to see dolphins in the wild, 2.5% preferred to see dolphins in an aquarium, and 5.9% of participants had no opinion. Additionally, a majority of participants in the Luksenburg and Parsons (2013) study indicated they preferred to watch marine mammals in the wild rather than in a dolphinarium, with a stronger preference for this in tourists compared to Aruban residents (61.9% and 41.6% respectively).

A major argument from the captive cetacean industry for their continuance is that they argue watching cetaceans in their facilities encourages the public to be more pro-cetacean conservation. The only previous study to investigate this found that this was not in fact the case (Jiang et al., 2007). This study reinforces this latter finding, as members of the public who preferred to see cetaceans in a marine theme park were significantly more likely to think that cetacean conservation was less or unimportant.

Study Limitations

This survey was conducted in an online format with a sample size of 858 MTurk users 18 years and older. Wright (2005) examined the advantages and disadvantages related to conducting online surveys by reviewing current features, issues, pricing, and limitations associated with products and services including online questionnaire features and services used to facilitate the online survey process. One advantage of conducting internet-based survey research is the ability to reach thousands of people regardless of
distance (Bachmann and Elfrink, 1996); data can be collected while other tasks are being performed thus saving time (Llieva et al., 2002; Andrews et al., 2003; de Leeuw, 2012). Additional advantages include the possibility of the survey being more cost effective by eliminating the cost of paper, printing, data entry, and postage (if applicable) (Bachmann and Elfrink, 1996; Llieva et al., 2002; de Leeuw, 2012) and the ability of the survey to reach groups that only exist in cyberspace and do not require face-to-face meetings (Wright, 2005). However, there are concerns surrounding the design, implementation, and evaluation of an online survey. Non-response is problematic in any type of survey. Compared to other methods, including in person interviews and postal surveys, online surveys generally yield a lower response rate (de Leeuw, 2012). Additionally, excessive survey length, lack of interest, and poor survey design can hurt online survey response rates (Dillman et al., 2009). Internet coverage/accessibility of the general population can also be an issue, especially under-coverage of certain sub-groups including the elderly and the lower educated (de Leeuw, 2012).
CHAPTER 6: CONCLUSIONS

This study represents an overview of how participants view dolphins and whales, including such issues as conservation of cetaceans, whaling, cetaceans in captivity, and the use of social media for conservation. Additionally, many issues and topics were addressed in this survey resulting in limited coverage of any one topic. This study provides an initial indication of online survey participant views toward dolphins and whales and their conservation.

The results of this study revealed high public concern regarding dolphin and whale conservation. Most participants felt marine mammal conservation laws and policies were important with a large portion of participants indicating that dolphin and whale species are only slightly protected or are under protected.

Social media

Social media is a powerful tool that can spread information rapidly and can encourage public support for cetacean conservation efforts. Social media also increases the ability to share personal pictures and research figures and graphs along with links to the most recent research findings. A majority of participants in the current study indicated they had a social media account(s) and an overwhelming majority of those participants felt it was important for scientists/conservation professionals to post information about dolphins/whales on social media. However, an overwhelming majority of survey
participants felt that information on dolphins and whales posted on social media was accurate regardless of where the information originated from. As the number of individuals using social media and the number of social media outlets continue to increase scientists and conservationists need to embrace the full potential of social media as a way to increase public awareness of cetacean conservation issues.

Conservation

An overwhelming majority of survey participants felt that whale and dolphin conservation was important; however, similar to previous studies, this study suggests a lack of awareness of the actual conservation status of several high profile species including the bottlenose dolphin, humpback whale, and killer whale. Additionally, the results suggest there is a lack of public awareness of the conservation status of the “critically endangered” Vaquita porpoise, the “endangered” Northern right whale, and the “endangered” Fin whale. Furthermore, the Vaquita porpoise received more votes than by its common name of [Gulf of] California harbor porpoise suggesting that an alternative name or the use of just one name might make social marketing campaigns more effective. Public concern for the three “fake species” exceeded that of actual species of conservation concern. This study noted a public misconception about the whale shark being a cetacean rather than a fish species. This study suggests that support for marine mammal conservation issues does not depend on detailed knowledge of the actual conservation status of cetacean species; however, the lack of connection between public awareness and the conservation status of whales and dolphins is concerning and certainly
makes conservation efforts more difficult. Greater outreach to the public about the conservation status of whale and dolphin species is recommended.

**Whaling**

Widespread opposition was expressed among most participants toward whaling. This finding is consistent with the results of other studies, although some research has suggested support for the harvest of whale species in countries that currently participate in whaling. Opposition to whaling in the current study occurred among all demographic groups. It is possible that there is an increased awareness that living cetaceans are a valuable resource such as in countries that have whale-watching activities or increased media attention of marine mammals has increased public appeal (Scott and Parsons, 2005). However, only half the participants indicated they were aware that several countries are still involved in whaling. Increased outreach efforts to the general public by groups dealing with whaling issues may be necessary.

**Captivity**

Despite extensive public interest, considerable controversy has developed regarding the viewing of marine mammals in the wild and in captivity. Significant media attention continues to have an impact on public awareness of cetaceans in captivity, individuals may have an increased negative perception of captivity or individuals may continue to patronize captive facilities. The results of the current study were almost evenly split between those individuals that were supportive of dolphins and whales in
marine parks and aquariums to slightly more individuals opposed. A majority of participants were objected to capturing wild dolphins and whales for display in zoos and aquariums while only half of the participants were opposed to dolphins and whales in captivity when they were captive bred. Similar to other studies, a majority of participants indicated that they would prefer to view whales and dolphins in the wild rather than in a marine park or aquarium. It is possible the marine mammal tourism industry could benefit more from “whale ecotourism” defined as cetacean watching that reduces its environmental impacts and provides high-quality educational information (Parsons et al., 2007).

Summary

The current study only surveyed a restricted group consisting of individuals over the age of 18 utilizing MTurk. Participation was not exclusive to individuals in the United States even though a majority of participants reported the US as their permanent place of residence. A larger sample size could increase reliability of the results and conducting an in-person survey could reduce inaccuracies in provided demographic and characteristic information. The current study results nevertheless suggest that there is a lack of awareness of the conservation status of certain whale and dolphin species, the existence of the IWC and countries that participate in whaling, and varied support for whales and dolphins in captivity.
APPENDIX I

PUBLIC KNOWLEDGE, ATTITUDES, AND PERCEPTIONS TOWARDS DOLPHINS AND DOLPHIN CONSERVATION

INFORMED CONSENT FORM

RESEARCH PROCEDURES
This research is being conducted to explore the connection between a person’s knowledge about dolphins and the attitude they hold towards them, along with exploring the different variables that may be affecting the public’s knowledge and or attitudes about dolphins such as gender, education level, age and where they are receiving their information about dolphins. If you agree to participate, you will be asked to complete the following 27 question survey which will take approximately 15 minutes.

RISks
There are no foreseeable risks for participating in this research.

BENEFITS
There are no benefits to you as a participant other than to further research in dolphin conservation.

CONFIDENTIALITY
The data in this study will be confidential. Surveys will remain anonymous and names will not be placed on surveys or research data. Surveys will be assigned a number and the participants responses will be number coded and placed in an Excel spread sheet.

PARTICIPATION
Your participation is voluntary, and you may withdraw from the study at any time and for any reason. If you decide not to participate or if you withdraw from the study, there is no penalty or loss of benefits to which you are otherwise entitled. There are no costs to you or any other party.

Upon full completion of the online survey, participants will receive compensation in the amount of $0.25.

CONTACT
This research is being conducted by Whitney Denham (E.C.M. Parsons- faculty advisor)
in the Environmental Science and Policy Department at George Mason University. She may be reached at 703-993-1033 for questions or to report a research-related problem. You may contact the George Mason University Office of Research Integrity & Assurance at 703-993-4121 if you have questions or comments regarding your rights as a participant in the research.

This research has been reviewed according to George Mason University procedures governing your participation in this research.

CONSENT
I have read this form, all of my questions have been answered by the research staff, and I agree to participate in this study.

☐ Yes, I agree to take the survey

☐ No, I do not agree to take the survey

Survey

Public Knowledge, Attitudes, and Behavior Towards Dolphins and Dolphin Conservation
George Mason University Department of Environmental Science and Policy

1. How important do you think dolphin/whale conservation is?
☐ Very important  ☐ Slightly unimportant
☐ Important  ☐ Unimportant
☐ Slightly important  ☐ Very unimportant

2. Which dolphin/whale species listed below is the most important to conserve?
☐ Lump-headed dolphin  ☐ Bottlenose dolphin
☐ Pygmy short-finned whale  ☐ Fin whale
☐ Whale shark  ☐ Majestic spotted dolphin
☐ Northern right whale  ☐ Vaquita porpoise
☐ California harbor porpoise  ☐ Not Applicable

3. Which dolphin/whale species listed below is the most endangered?
☐ Humpback whale  ☐ Blue whale
☐ Killer whale  ☐ Bottlenose dolphin
☐ Hector's dolphin  ☐ Hourglass dolphin
4. Have you ever gone on a dolphin/whale research expedition or a dolphin/whale watching trip?
   ☐ Yes ☐ No
   If yes, where? ____________________________________________________________

5. Do you watch animal programs on channels like Discovery, Animal Planet, BBC, or NatGeo?
   ☐ Yes ☐ No
   If yes, which programs _______________________________________________________

6. Do you subscribe to any environmental/scientific/animal magazines?
   ☐ Yes ☐ No
   If yes, which magazines? ____________________________________________________

7. Do you have any social media accounts?
   ☐ Yes ☐ No
   If yes, which ones? __________________________________________________________
   If no to question 7, skip to question 12.

8. What type of pages/accounts do you follow on social media? (Check all that apply)
   ☐ Friends/family/coworkers ☐ Media outlets ☐ NGOs/non-profits
   ☐ Businesses ☐ Celebrities/Hollywood ☐ Marine science/conservation
   ☐ Other Explain ____________________________________________________________

9. Do you post information about dolphins/whales on your social media page(s)?
   ☐ Yes ☐ No
   If yes, where do you get the information from?___________________________________

10. How important do you think it is for scientists/conservation professionals to post information about dolphins/whales on social media?
    ☐ Very important ☐ Slightly unimportant
    ☐ Important ☐ Unimportant
    ☐ Slightly important ☐ Very unimportant

11. How accurate do you think the information on dolphin/whales posted on social media is?
    ☐ Very accurate ☐ Slightly inaccurate
    ☐ Accurate ☐ Inaccurate
    ☐ Slightly accurate ☐ Very inaccurate

12. Where do you feel you receive most of your information about dolphins? (Check all that apply)
13. If costs were similar and both options available in a given location, which way would you prefer to see dolphins/whales:
   ☐ In a marine park or aquarium
   ☐ On a dolphin/whale watching boat trip
   ☐ Dolphins/whales in the ocean from a land-based vantage point

14. Please indicate whether you support or oppose dolphins/whales in marine parks/aquariums?
   ☐ Strongly support  ☐ Support  ☐ Oppose  ☐ Strongly oppose

15. 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 dolphins are kept in an aquarium/tank?
      ☐ Yes  ☐ No
   D. When dolphins are kept in their natural habitat, but confined to an area by nets?
      ☐ Yes  ☐ No
   E. When dolphins are sick 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

16. Were you aware that there are several countries that are still involved in whale hunting (whaling)?
   ☐ Yes  ☐ No
   If yes, which countries? ________________________________________________

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

18. Have you heard of the International Whaling Commission (IWC)?
19. Please indicate whether you support or oppose the hunting of whales?
☐ Strongly support  ☐ Support  ☐ Oppose  ☐ Strongly oppose

20. How important do you think marine mammal conservation laws and policies are?
☐ Very important  ☐ Slightly unimportant
☐ Important  ☐ Unimportant
☐ Slightly important  ☐ Very unimportant

21. How well do you think dolphin and whale species are protected worldwide?
☐ Overprotected  ☐ Protected  ☐ Slightly protected  ☐ Under protected

22. What is your gender?  ☐ Male  ☐ Female

23. In what year were you born?  ________________

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

25. Please indicate the highest level of education that you have completed.
☐ Less than High School  ☐ Associate/Bachelor Degree
☐ High School Diploma/GED  ☐ Masters Degree
☐ Some college, no degree  ☐ Ph.D., M.D., or other terminal degree

26. What is your occupation?
______________________________________________________________

27. Are you a member of any type of conservation/environmental group?
☐ Yes  ☐ No
  If yes, which one(s)?__________________________________________________________
APPENDIX II

PUBLIC KNOWLEDGE, ATTITUDES, AND PERCEPTIONS TOWARDS DOLPHINS AND DOLPHIN CONSERVATION
George Mason University Department of Environmental Science and Policy

1. How important do you think dolphin/whale conservation is? (Attitude)
   - 3 Very important
   - 2 Important
   - 1 Slightly important
   - 0 Slightly unimportant
   - 0 Unimportant
   - 0 Very unimportant

2. Which dolphin/whale species listed below is the most important to conserve? (Knowledge)
   - 0 Lump-headed dolphin
   - 0 Pygmy short-fined whale
   - 0 Whale shark
   - 1 Northern right whale
   - 1 California harbor porpoise
   - 1 Bottlenose dolphin
   - 1 Fin whale
   - 0 Majestic Spotted dolphin
   - 1 Vaquita porpoise
   - 0 Not Applicable

3. Which dolphin/whale species listed below is the most endangered? (Knowledge)
   - Humpback whale
   - Killer whale
   - Hector's dolphin
   - Blue whale
   - Bottlenose dolphin
   - Hourglass dolphin

4. Have you ever gone on a dolphin/whale research expedition or a dolphin/whale watching trip? (Behavior)
   - 1 Yes
   - 0 No
   If yes, where? ____________________________

5. Do you watch animal programs on channels like Discovery, Animal Planet, BBC, or NatGeo? (Behavior)
   - 1 Yes
   - 0 No
   If yes, which programs? ____________________________
6. Do you subscribe to any environmental/scientific/animal magazines? (Behavior)
   1 Yes    0 No
   If yes, which magazines?_______________________________

7. Do you have any social media accounts? (Social Media)
   1 Yes    0 No
   If yes, which ones?____________________________________

If no to question 7, skip to question 12.

8. What type of pages/accounts do you follow on social media? (Check all that apply) (Social Media)
   Friends/family/coworkers  Media outlets  NGOs/non-profits
   Businesses  Celebrities/Hollywood  Marine science/conservation
   Other  Explain______________________________

9. Do you post information about dolphins/whales on your social media page(s)? (Social Media)
   Yes       No
   If yes, where do you get the information from?_______________________________

10. How important do you think it is for scientists/conservation professionals to post information about dolphins/whales on social media? (Social Media)
    Very important    Slightly unimportant
    Important    Unimportant
    Slightly important    Very unimportant

11. How accurate do you think the information on dolphin/whales posted on social media is? (Social Media)
    Very accurate    Slightly inaccurate
    Accurate    Inaccurate
    Slightly accurate    Very inaccurate

12. Where do you feel you receive most of your information about dolphins? (Check all that apply) (Knowledge)
    Documentaries  Magazines  Movies  Social media
    Newspapers  Science journals  TV news  Internet
    Sea World  Aquariums  Other people  Not Applicable

13. If costs were similar and all options available in a given location, which way would you prefer to see dolphins/whales: (Behavior)
    0 In a marine park or aquarium
On a dolphin/whale watching boat trip
Dolphins/whales in the ocean from a land-based vantage point

14. Please indicate whether you support or oppose dolphins/whales in marine parks/aquariums? (Attitude)
0 Strongly support  0 Support  1 Oppose  2 Strongly oppose

15. When do you believe it is right to keep dolphins in captivity? (Attitude)
A. When the dolphins are captured from the wild?
   0 Yes  1 No
B. When the dolphins are captive bred?
   0 Yes  1 No
C. When dolphins are kept in an aquarium/tank?
   0 Yes  1 No
D. When dolphins are kept in their natural habitat, but confined to an area by nets?
   0 Yes  1 No
E. When dolphins are sick or injured?
   0 Yes  1 No
F. For human enjoyment to perform shows involving tricks?
   0 Yes  1 No
G. For conducting research relevant to dolphin conservation in the wild?
   0 Yes  1 No
H. For conducting research on captive dolphin rearing and breeding (Husbandry)?
   0 Yes  1 No

16. Were you aware that there are several countries that are still involved in whale hunting (whaling)? (Knowledge)
1 Yes  0 No
If yes, which countries?________________________________________

17. Would you boycott visiting a country involved in whaling? (Behavior)
1 Yes  0 No

18. Have you heard of the International Whaling Commission (IWC)? (Knowledge)
1 Yes  0 No
If yes, what do you think it does?____________________________________

19. Please indicate whether you support or oppose the hunting of whales? (Attitude)
0 Strongly support  0 Support  1 Oppose  2 Strongly oppose
20. How important do you think marine mammal conservation laws and policies are? *(Attitude)*

- 3 Very important
- 2 Important
- 1 Slightly important
- 0 Slightly unimportant
- 0 Unimportant
- 0 Very unimportant

21. How well do you think dolphin and whale species are protected worldwide? *(Knowledge)*

- Overprotected
- Protected
- Slightly protected
- Under protected

22. What is your gender?  
- 1 Male  
- 0 Female

23. In what year were you born? **2015 - year = age** *(Demographics)*

24. Where is your permanent residence (City, State/Province, Country)? *(Demographics)*

________________________________________________________________________

25. Please indicate the highest level of education that you have completed. *(Demographics)*

- 0 Less than High School
- 1 High School Diploma/GED
- 1 Some college, no degree
- 2 Associate/Bachelor Degree
- 3 Masters Degree
- 4 Ph.D., M.D., or other terminal degree

26. What is your occupation? *(Demographics)*

________________________________________________________________________

27. Are you a member of any type of conservation/environmental group? *(Behavior)*

- 1 Yes
- 0 No

If yes, which one(s)? ________________________________________________
REFERENCES


Whitney R. Denham graduated from Stonewall Jackson High School, Manassas, Virginia, in 2005. She received her Bachelor of Science in Biology from George Mason University in 2009. She has been employed as an analyst for seven years and received her Master of Science in Environmental Science and Policy from George Mason University in 2015.