Developing a Strategic Conservation Project for the Oregon Coast Aquarium

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Abstract

This study developed a strategic conservation project for the Oregon Coast Aquarium in Newport, Oregon focusing on a signature species and this aquarium's conservation focus areas (i.e., marine debris, sustainable fisheries, water quality, climate change). This study also examined the potential for incorporating an ecotourism or wildlife tourism component to enhance this project and provide visitors with a unique field experience. The first phase involved species identification using database analysis and informal interviews with Association of Zoos and Aquariums (AZA) staff, research institutions, and government agencies. The second phase focused on suggestions for implementation based on these discussions and an internal stakeholder meeting with aquarium staff to assess institutional support for identified projects. This second phase also included input from the tourism industry to examine the potential for incorporating a field experience into the project to help generate personal connections with the environment, inspire public stewardship, and mitigate impacts in coastal areas. Main objectives were to: (a) determine how and where this aquarium could best meet the needs of local species and ecosystems, (b) identify any preferred AZA methods for development of a conservation project, and (c) explore the potential for incorporating a tourism related field experience to enhance the project.

The database analysis identified 23 potential species for the project, and identification criteria subsequently refined the list (e.g., species conservation status; Phase I). Interviews revealed three overarching themes: (a) what this aquarium's conservation project should be and how it should be implemented, (b) project research and development, and (c) incorporating a field experience. Many respondents suggested species listed within the database analysis,

including rockfish and sea otters. AZA interviewees reported benefits of focusing on a species housed on-site at the aquarium. Although there are no existing AZA protocols for developing a strategic conservation project, this organization's accreditation questionnaire was recommended as a guide. Researchers who were interviewed also noted the importance of incorporating key stakeholder groups (e.g., fishing community) and policies into the plan. All interviewed groups agreed that database analyses of federally listed species coupled with interviews with stakeholders are important for creating a baseline for project identification. Respondents from the AZA and tourism industry favored incorporating a field experience into the project for providing benefits such as project enhancement and marketing. Some interviewees, however, were concerned about necessary resources (e.g., funding) and potential competition among industries for attracting tourists. These findings were reported to aquarium staff during a meeting (Phase II) where it was observed that internal consensus of project goals and objectives had not yet been reached. Regardless, staff interest in conservation of rockfish, North Pacific Albatross, and sea otters were taken into consideration during final project assessment.

Based on these results, the primary project recommended to this aquarium is North Pacific Albatrosses, including laysan (*Phoebastria immutabilis*), black-footed (*Phoebastria nigripes*), and short-tailed albatross (*Phoebastria albatrus*). The alternative project focuses on sea otters (*Enhydra lutris*). Recommendations for project implementation and measurement are also provided and based on a content analysis of existing conservation projects and management initiatives for these subjects (e.g., U.S Fish and Wildlife Species Conservation Plans). Suggestions for a field component related to each project are also included.

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Introduction

This report describes research conducted to help identify a signature conservation project for the Oregon Coast Aquarium, provide suggestions for implementation of this project, and explore the potential for incorporating a tourism field experience to enhance project effectiveness. At the beginning of the 20th century, zoos and aquariums began to include conservation as a primary component of their overarching mission. An important part of conservation efforts is the incorporation of public education in an effort to develop citizens who are "knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve these problems, and motivated to work toward their solution" (Simmons, 1991, p. 16). When attempting to develop effective conservation programs, therefore, it is important that zoos and aquariums include education components seeking to engage the public, and provide methods for reinforcing conservation messages learned by visitors.

Two common areas of focus for zoo and aquarium conservation projects are ecosystems and single species "shortcuts" (i.e., flagship, indicator, umbrella, keystone species; Simberloff, 1997). The focus on ecosystems (i.e., ecosystem based management) is an interdisciplinary strategy considering cumulative impacts relevant to activities on regional systems (Lubchenco, 2009). This approach may provide methods for collaboration and responsible decision making associated with activities and their impacts on entire ecosystems (Lubchenco, 2009). Conversely, a single species shortcut, such as focusing on a flagship species, refers to a single symbolic species (e.g., a large mammal). The presence of an indicator species is used to measure the health of an ecosystem, whereas umbrella species are used as proxies for entire communities and systems. Keystone species are those "having particularly strong, ramifying interactions, the strength of which is disproportionate to their population densities" (Soule, Estes, Berger, & Rio,

2003, p. 1239). Although discrepancies over which project approach (i.e., ecosystem, single species) is most effective for promoting conservation, each has the potential to aid management and understanding of biota and community structures.

In addition to these different focus areas, zoo and aquarium conservation projects also utilize a variety of approaches, including in-situ (i.e., in the wild) and ex-situ methods (i.e., in the institution). An example of an ex-situ project focusing on a flagship species is the formation of a seahorse breeding laboratory at the National Aquarium in Baltimore, Maryland following an announcement by the Convention on International Trade in Endangered Species (CITES) to protect seahorse species. The Zoological Society of London (ZSL) and London Zoo have developed both in-situ and ex-situ programs devoted to conservation of Amur and Bengal Tigers, which are umbrella species in parts of Russia and Bangladesh (ZSL London Zoo, 2012). The in-situ Asian Elephant Project at the Australia Zoo was designed to minimize poaching, educate local communities on how to reduce human-elephant conflicts, and facilitate collaboration between local and national governments and stakeholders to improve land use and management (Australia Zoo, 2012). Potential broader implications of these types of projects include engaging people across local, national, and international scales, and linking public and stakeholder input with scientific knowledge for the purpose of conservation (McLeod & Leslie, 2009).

Although zoos and aquariums receive some public controversy and concern (e.g., stress on animals from captivity), these institutions provide benefits such as promotion of conservation and environmental education. Through the use of interactive exhibits, interpretive tours, and outreach programs, these institutions may serve as one tool for educating the public about environmental issues and influencing conservation attitudes and behavior. A study of zoos and aquariums nationwide, for example, found that 61% of visitors believed that their on-site

experience supported and reinforced their values and attitudes toward conservation, and 54% reconsidered their role in environmental problems and conservation actions by seeing themselves as part of a solution (Falk et al., 2007). Given the interactions between human and ecological systems, it is important that zoo and aquarium education projects address broader cumulative connections and impacts relevant to human activities on ecosystems (O'Neill & Nicholson-Cole, 2009). However, communicating these connections and impacts to the general public in an effort to promote behavior modification can be difficult and research lacks a definitive answer to why gaps exist between environmental awareness and sustainable behaviors. It has been proposed that constraints exist on both individual and societal levels (O'Neill & Nicholson-Cole, 2009).

The inherently complex nature of ecosystems may be one specific constraint preventing the general public from grasping an understanding of human interactions and impacts on environments, and this may limit an individual's emotional engagement and willingness to behave in a sustainable manner (Kollmuss & Agyeman, 2002). Emotional engagement has the ability to impact individual values, attitudes, and beliefs toward the environment, leading to reactions when made aware of impacts such as environmental degradation (Manfredo, 2008). Emotions may also influence motivations for why individuals follow careers in environmental and resource management (Vining & Ebreo, 2002). This suggests the potential benefits of focusing on species affected by human activities as one method of communicating and simplifying complex information, as well using emotional messages to promote behavior change. For example, the Virginia Aquarium and Marine Science Center collaborated with the City of Virginia Beach to develop "Brainwaves on the Beach." This education project includes a series of interpretive panels posted along a boardwalk that are designed to educate the public about local coastal wildlife and how human actions impact these species (Virginia Aquarium and

Marine Science Center, 2011). A popular species used for symbolizing connections between ecosystem health and human activities is the polar bear, as people can relate to and feel empathy toward a species faced with climate change and how human activities impact species (O'Neill & Nicholson-Cole, 2009).

Another factor hypothesized to impact environmental behaviors (i.e., behaviors contributing to conservation, sustainability, preservation) is an individual's "locus of control." This factor represents the belief of whether an individual has the ability to change situations through his or her own behavior (Kollmuss & Agyeman, 2002). This issue suggests the need to provide the public with a chance to engage in conservation efforts. The Monterey Bay Aquarium, for example, developed the Seafood Watch Program in an effort to offer individuals the "opportunity to act" (Monterey Bay Aquarium, 2012). Printable pocket or mobile device guides were developed for the public to access readably available consumer information about purchasing sustainable seafood. It is important for zoo and aquarium visitors to be given a chance to "gain awareness of their environment and acquire the knowledge, values, skills, experiences, and also the determination which will enable them to act to solve present and future environmental problems" (Simmons, 1991, p.16). Given the emotional benefits of human-animal bonds and the growing demand for humans to reconnect with nature (Orams, 2002; Vining, 2003) there is potential value for incorporating an ecotourism and / or wildlife tourism field experience within zoo and aquarium conservation projects.

The International Ecotourism Society has defined ecotourism as "responsible travel to natural areas that conserves the environment and improves the well being of local people" (Orams, 1995, p. 5). Wildlife tourism can be one form of ecotourism that specifically focuses on encounters with non-domesticated animals and can be further classified based on diverse

experiences and attributes (Higginbottom, 2004). Similar to wildlife tourism, ecotourism often focuses on specific "charismatic megafauna" such as large mammals (Weaver, 2001). For the purposes of this report, wildlife tourism will be restricted to non-consumptive viewing and interacting with free-ranging species. Both ecotourism and wildlife tourism have the potential to inspire participation in related zoo and aquarium conservation efforts and persuade individuals to make behavior changes benefiting the environment. The goals of this study are to research and identify a signature conservation project for the Oregon Coast Aquarium utilizing an educational approach, provide suggestions for implementation, and explore the potential for incorporating a wildlife tourism field experience in an effort to enhance the overall effectiveness of this project.

Literature Review

Zoo and Aquarium Conservation

Using various approaches, zoos and aquariums are capable of tackling fundamental conservation issues that some other institutions may not be able to address. Ex-situ programs such as research, public education, outreach, and political advocacy, as well as in-situ programs such as species tagging and habitat restoration allow these institutions to support conservation of some animal populations and their natural habitats. According to the International Union for Conservation of Nature (IUCN), "ex-situ conservation should be considered only as an alternative to the imperative of in-situ management in exceptional circumstances" and "effective integration between in-situ and ex-situ approaches should be sought wherever possible" (Maunder & Byers, 2005, p. 96-97). These approaches reflect the capability of some zoos and aquariums to operate as institutions using a combination of environmental, economic, social, and political disciplines for the purposes of conservation. Integrated conservation can be best understood by categorizing activities into two main groups – internal and external activities (WAZA, 2005). Internal

activities relate to how an organization operates with special emphasis on its visitor related actions, including ex-situ efforts such as animal exhibits and education programs. External activities involve off-site programs such as field research (i.e., in-situ) and fundraising (Sergio, Newton, Marchesi, & Pedrini, 2006).

Zoo and aquarium conservation projects have been applied on local, regional, and global scales. The World Association of Zoos and Aquariums (WAZA), for example, is comprised of over 300 members including zoos, aquariums, associations, affiliate organizations, and corporate partners around the world that have devoted efforts to over 200 global conservation projects (WAZA, 2005). Similarly, the Association of Zoos and Aquariums (AZA) have included conservation within its accreditation standards in an effort to promote environmental action. These standards require that institutions include the word "conservation" in their mission statement, develop a conservation plan and strategy, and participate and support wildlife conservation programs (AZA, 2011a). The AZA (2011b) has defined conservation as "securing the long-term survival of the species in natural ecosystems and habitats" and involves direct action, research, education, advocacy, fundraising, and attracting grants.

A number of zoo and aquarium conservation programs use both in-situ and ex-situ approaches focusing on a single species. The Monterey Bay Aquarium, for example, works on species issues such as tuna conservation. In collaboration with Stanford University's Hopkins Marine Station and Tuna Research and Conservation Center, this aquarium currently focuses on Atlantic and Pacific bluefin tuna, as well as white sharks. Laboratory and field research conducted by these institutions has aided various ecosystem-based management policies for the species (Monterey Bay Aquarium, 2011). Similarly, the Seattle Aquarium has developed programs focusing on sea otters, red rock fish, six-gilled sharks, the leafy sea dragon, and the

giant Pacific octopus. Taken together, these projects exemplify the use of a single species within aquariums to generate public interest in conservation and educate the general public about often complicated and confusing ecosystem processes (Dietz, 1994).

According to some geneticists and ecologists, zoos and aquariums have also been valuable for maintaining species biodiversity. In particular, genetic management strategies of zoos and aquariums have led to endangered species captive breeding programs with the goal of reintroducing animals into the wild. Various zoo federations and the International Species Inventory System (ISIS) assist in these types of breeding programs in over 54 countries with the goal of securing "self-sustaining captive collections that can act as insurance for wild populations" (Tribe & Booth, 2003, p. 67). Although captive breeding may help to increase species population numbers, the use of this conservation strategy may overlook the importance of issues such as ecosystem management and may potentially lead to a loss in genetic diversity, as well as species fitness and survival. Captive breeding, therefore, is controversial and heavily debated in the field of conservation biology (Tribe & Booth, 2003).

In addition to zoo and aquarium conservation programs focusing on a specific species, there are also projects focusing on ecosystem health, such as the Wetlands Restoration Project at the National Aquarium in Baltimore. This initiative works to provide a sanctuary for Chesapeake Bay aquatic life including blue crabs, oysters, and otters. Serving as a community-based project, participants are offered a unique volunteer and wildlife experience to further enhance environmental education and inspire conservation support and action (National Aquarium, 2011). Similarly, the Brevard Zoo in Florida partnered with the Department of Environmental Protection to assist their Indian River Lagoon Shoreline Restoration program. Through this program, the zoo collects local wash-back red mangrove propagules and hosts public planting

workshops. The zoo also works to teach the community about red mangroves and the ecosystem services that it provides to local people, exemplifying the importance of incorporating education and outreach components into conservation projects (Brevard Zoo, 2012). Increasing awareness and knowledge is one component recognized in the conservation psychology literature for leading to environmental attitudes and conservation oriented behaviors.

Conservation Psychology

To encourage conservation behaviors among zoo and aquarium visitors, it is important to understand the various social, environmental, and psychological factors influencing human actions. Conservation behaviors can be defined as activities supporting sustainable societies and natural resources (Monroe, 2003), and these behaviors can be categorized into direct (e.g., bicycling instead of driving) or indirect (e.g., policy initiatives making hybrid vehicles more affordable) individual or societal behaviors (e.g., purchasing local produce). Each of these behaviors plays an important role in environmental conservation and several factors influence these behaviors, including situational and contextual forces (e.g., advertising, governmental regulations, community expectations), past experiences, cognitions (e.g., norms, values, beliefs, motivations), emotions, and personal identity (Clayton & Brook, 2005; Kollmus & Agyeman, 2002; Monroe, 2003; Saunders, Brook, & Myers, 2006; Steg & Vlek, 2009; Stern, 2000; Vining & Ebero, 2002). Institutional and social factors such as lack of time, money, and information may also impact the extent that people engage in environmental behaviors. In addition, social and demographic characteristics such as education, culture, religion, family, and community may play a role in continuing a specific behavior or willingness to make a change toward more environmental actions (Kollmuss & Agyeman, 2002). These characteristics may help to identify

"environmentally literate" individuals and their likelihood of engaging in environmental stewardship behaviors.

Environmental literacy refers to having "knowledge, attitudes, skills, and behaviors to be competent and responsible" (Monroe, 2003, p. 116). Three types of values (i.e., concepts about desired end states) that help to develop a foundation for environmental attitudes, beliefs, and engagement are: egoistic, humanistic, and biocentric (Manfredo, 2008; Saunders et al., 2006). Egoistic values focus on one's self interest, humanistic values focus on other humans, and biocentric values tend to be those emphasizing nature. Values are concepts in both the cognitive hierarchy (Manfredo, 2008) and value-belief-norm theory (Stern, 2000), which describe a series of general and specific cognitions leading to environmental behavior. Biocentric individuals, for example, are often concerned about conditions threatening species and ecosystems, and may be more likely to engage in behaviors that do not deteriorate the environment.

Some studies testing these theories have incorporated the norm activation theory, which proposes that people are more likely to engage in environmental behaviors if they are aware of negative impacts of other behaviors on the environment (i.e., awareness of consequences [AC]; Saunders et al., 2006; Schwartz, 1977; Stern, 2000). This theory also suggests that individuals who ascribe some degree of responsibility for these impacts (AR) and believe that they can make a difference in mitigating a given impact may develop personal investment to take action. Understanding cognitions such as values and norms (i.e., shared understandings of how individuals should behave under a given circumstance; Chen, Lupi, He, & Liu, 2009) may be important for promoting environmental action and literacy among zoo and aquarium visitors.

These theories are useful for explaining environmental behavior and willingness to change, and are based on the assumption that individuals make reasoned choices (Stern, 2000).

Individuals, however, sometimes also act out of habit, and there are at least three important characteristics of habits: (a) they require a goal to be achieved, (b) the same action is likely to be repeated if the outcome is mostly satisfactory, and (c) habitual responses are triggered by mental processes that are learned, stored, and retrieved from memory (Steg & Vlek, 2009). Habits may help to explain the way that environmental behavior choices are made (e.g., recycling, riding a bicycle instead of a car, purchasing energy efficient light bulbs). To promote behavior change, it is important to understand how habits are created and further reinforced, as this may help to identify effective strategies to encourage environmental behaviors among the public.

There are two primary types of intervention strategies that may be useful for encouraging environmental behavior change – antecedent and consequence strategies, and informational and structural strategies (Steg & Vlek, 2009). Antecedent strategies target factors that precede behavior (e.g., education), whereas consequence strategies refer to changing consequences following a behavior (e.g., rewards). Generally, individuals will increase their frequency of participating in behaviors that are reinforced, and decrease participation frequency if they are not reinforced. Changing the antecedents and consequences of behaviors may present stimuli that trigger behavior changes (Vining & Ebreo, 2003). Informational strategies attempt to change motivations, norms, and attitudes, whereas structural strategies work to change how behavioral choices are made. Informational strategies are often used by informal science institutions and may focus on increasing knowledge and awareness and changing attitudes and norms, which may lead to behavior change (Kollmuss & Agyeman, 2002).

According to the theory of reasoned action, behavior change is influenced by behavioral intentions, which are subsequently influenced by attitudes toward the behavior and subjective norms (Fishbein & Ajzen, 1975). Attitudes are an evaluation of a behavior that it leads to certain

outcomes (e.g., like, dislike, favor, disfavor), whereas subjective norms are the extent that an individual believes that other people or groups think that he or she should or should not perform the behavior coupled with their motivation to comply with these people or groups (Fishbein & Ajzen, 1975). Individuals may be more likely to practice environmental behaviors if they favor the environment, believe that they can make a difference, and are influenced by other important people to practice these behaviors. Several studies have found that attitudes and norms have a significant influence on environmental behaviors, such as participating in land conservation programs and voting in favor of wildland or wildlife protection initiatives (see Manfredo, Teel, & Bright, 2004 for a review). These studies have suggested the potential for increasing education and engagement activities to promote changes in attitudes, norms, intentions, and behaviors.

Although emotions have received somewhat less attention in conservation psychology, they may be a fundamental reason for practicing environmental behaviors. For example, a state of cognitive dissonance (i.e., when actions and attitudes are inconsistent) may be created by negative emotions, leading to a lack of action regardless of one's environmental values and attitudes (Saunders et al., 2006). Self-conscious emotions (e.g., pride, guilt, empathy) may be important for motivating conservation behaviors because they result from evaluating the self and behavior due to internal and / or external factors (Manfredo, 2008; Vining & Ebreo, 2003). This suggests the importance of considering emotions when communicating conservation information. Taken together, environmental education and engagement activities at institutions such as zoos and aquariums may benefit from incorporating relevant information and stories that generate emotional responses, impact visitor attitudes, and subsequently influence future behaviors.

Zoo and Aquarium Education

Education programs are important for conservation projects and influencing these cognitions and behaviors. To improve public understanding of the term "conservation" and human impacts on the environment, for example, it is important that people first understand aspects of the interdependency of species, physical environments, and societies (Patrick, Matthews, Ayers, & Tunnicliffe, 2007). Although zoos and aquariums continue to be sites for leisure and tourism, many of these institutions have adopted education as another attribute to provide an opportunity for reaching out to the public in ways that other conservation efforts and education materials may not (e.g., books, television). According to WAZA, over 700 million people visit zoos and aquariums annually and this is important given the growing research that recognizes the importance of informal science institutions, in addition to formal settings, for educating the public (Bell, Lewenstein, Shouse, & Feder, 2009; Falk & Needham, 2011; Fraser, Sickler, & Jessica, 2008; Ogden, Boyle, & Atkins, 2011). A personal understanding of scientific concepts develops from numerous sources and experiences, including zoos and aquariums (Falk & Needham, 2011). Through the use of exhibits, interpretive talks with artifacts and / or live animals, and other interactive and educational approaches, many zoos and aquariums are able to communicate with visitors outside of classroom settings about species and dynamic ecosystems.

According to AZA, "the use of program animals has been demonstrated to result in lengthened learning periods, increased knowledge acquisition and retention, enhanced environmental attitudes, and the creation of positive perceptions concerning zoo and aquarium animals" (Ballantyne, Packer, Hughes, & Dierking, 2007, p. 373). The flying birds of prey show at the Oregon Zoo, for example, increased visitor agreement with conservation oriented statements from 55% pre-show to 87% post-show (Ballantyne et al., 2007). Similarly, viewers of

an elephant presentation at Zoo Atlanta were found to be more willing to sign a petition in opposition of eliminating a moratorium on elephant ivory trading compared to visitors who did not watch the program (Fernandez, Tamborski, Pickens, & Timberlake, 2009). Another study found that 81% of zoo visitors recalled hearing conservation actions during zoo presentations and 54% intended to increase their commitment to conservation or start new actions (Smith, Broad, & Weiler, 2008). These studies suggest the importance of incorporating animals into conservation messages and programs for presenting meaningful stories that "connect" with the audience, and may serve as one effective method for educating the public about ways that they may assist in conservation associated with wild species. In fact, one study found that visitors of AZA accredited institutions believed that their experience promoted the reconsideration of their personal role in the environment and conservation (Fraser et al., 2008).

Educational messaging coupled with safe interactions between visitors and live animals often not easily encountered in the wild presents an opportunity for the public to develop connections with animals and the environment (Orams, 2002). There are concerns, however, regarding negative impacts of captivity on these animals and whether certain anthropocentric assumptions about the "proper place" of animals may be reinforced by captivity (Vining, 2003). Questions about zoos and aquariums include: what constitutes the conservation obligations of these institutions, what is the moral and scientific basis of these institutions, and should these institutions exist at all (Mazur & Clark, 2001)? The debate over whether zoos and aquariums act as entertainment sites rather than scientific and conservation institutions will likely continue with changing public values and ecological, political, and social contexts (Manfredo, 2008).

Regardless, messaging tactics are important aspects of zoo and aquarium conservation and education programs aimed at garnering public support and improving awareness of

conservation issues. In 2000, the AZA Conservation Education Committee developed general conservation messages to be used throughout accredited institutions to help ensure that consistent messages are being presented across institutions. Popular messages include "all life on Earth exists in an ecosystem," "human beings are responsible for dramatic changes to ecosystems at a rate unprecedented in Earth's history," and "the human experience requires a connection to nature; these experiences in wild places in our community enrich our lives and inspire our choices for future generations" (AZA, 2000). Messages such as these are reflected in various conservation programs developed by individual zoos and aquariums. Rather than provide educational reinforcement, however, it has been argued that these messages are simply a political tactic of zoos and aquariums to address corporate demands, budget constraints, and other socioeconomic pressures (Mazur & Clark, 2001). Although some contend that these messages promoted throughout AZA institutions may serve as propaganda (Mazur & Clark, 2001), others point to the importance of reinforcing conservation messages in an effort to generate attitude and behavior change (Christensen, Needham, & Rowe, 2009). This issue relates to social marketing, a well known tool to promote behavior change among specific audiences (e.g., consumer product choice). An important first step to designing successful social marketing efforts is to identify and understand the target audience (Monroe, 2003).

Studies have revealed that factors such as demographics (e.g., age, social group, race / ethnicity) and identity-related motivations impact individuals when visiting zoos or aquariums by influencing their use of institutional messaging, long-term learning, and satisfaction with the experience (Falk et al., 2007; Fraser et al., 2008). According to Falk (2006), motivations or expectations of visitors can be categorized into one or a combination of groups – the "Experience Seeker," "Professional / Hobbyist," "Spiritual Pilgrim," "Facilitator," or "Explorer."

“Facilitators**”** focus on enabling experiences and learning of others in their own social group, “Professionals / Hobbyists” feel a connection between the institutional material and their professional and hobbyist interests, “Experience Seekers” find satisfaction primarily from just visiting the site, and “Spiritual Pilgrims” seek a contemplative and / or restorative experience (Falk, 2006). This “personal context” of visitors may impact the ability of zoos and aquariums to connect with visitors, so it may be beneficial for these facilities to identify and cater to their target audience. Although these personal differences among visitors may impact their experiences, so too may the animals being observed. One study, for example, found that 42% of individuals interviewed a year after a specific zoo visit mentioned a particular animal or species as the highlight of their experience (Falk et al., 2007). The physical size, symbolism, and / or the conservation status of the animal or species may influence this focus.

Some professionals, however, argue that relying too heavily on particular species or visitor characteristics may inhibit efforts to educate the public about the “diversity and complexity of the planet’s fauna,” and may sustain an image of the zoo as an “old-fashioned institution operating on the margins of conservation” (Mazur & Clark, 2001, p.188). Although public affinity for particular animals or species may potentially limit the effectiveness of conservation education efforts at zoos and aquariums, it may also provide an opportunity to utilize management “shortcuts” (i.e., keystone, flagship, indicator, umbrella species) to potentially generate emotional responses, attitude shifts, and behavioral changes. If linked with broader ecosystem conservation issues, these species “shortcut” strategies may help to develop public awareness and subsequently lead to future protection of these and other species and their habitat. The Monterey Bay Aquarium, for example, developed the Sea Otter Research and Conservation Program (Monterey Bay Aquarium, 2011). Sea otters are considered a keystone

species and act as a limiting factor for their main prey of sea urchins, which feed on kelp. Without sea otters, kelp systems may become deforested by unmanaged urchin populations, leading to a shift in the ecosystem and ultimately impacting marine resources and people dependent on these resources (Soule et al., 2003). Through public outreach and captive and field research initiatives, this program focuses on a single species, but also links efforts to communicate broader related ecology concepts, human activities impacting the species and its ecosystem, and best management practices (Monterey Bay Aquarium, 2011).

A more recent trend in the zoo and aquarium industry involves incorporating types of field experiences into their conservation programs. These efforts may serve as valuable tools when attempting to integrate culture and wildlife appreciation outside the borders of zoos and aquariums. To promote additional support and awareness of orangutan conservation, for example, the Cheyenne Mountain Zoo in Colorado offers a limited number of visitors an opportunity to experience the rainforests of Indonesia based on the idea that tourist dollars create an incentive to preserve rainforests otherwise destined for deforestation or transformation into plantations. Another goal of this program is to promote the creation of sustainable jobs in the local community (Cheyenne Mountain Zoo, 2011). A second example is the marine biology reef trip offered by the Shedd Aquarium in Chicago, Illinois. Beginning as early as 1977, this aquarium conducted summer field trips to the Bahamas for high school students, and has recently expanded the program to invite several grade school teachers to provide additional marine science education tools and personal experiences to take back to their classrooms (Furnweger, 2009). These are two examples of zoos and aquariums offering field experiences for visitors.

It has been thought that wildlife encounters, such as these field experiences, can contribute to environmental learning and awareness of the importance of conservation (Zeppel &

Muloin, 2008). In addition, these encounters may promote public engagement and potentially lead to a greater willingness to participate in environmental behaviors. The "citizen science" project managed by the Seattle Aquarium and partnering schools in Puget Sound, Washington, for example, works to map and survey the intertidal zone of a local marine reserve to identify any biophysical changes over time (Seattle Aquarium, 2011). There are few accepted definitions for "citizen science," but it commonly refers to participation between scientists and volunteers in an effort to improve scientific research and community understanding (AZA, 2012). Another example of these types of encounters is the AZA's FrogWatch USA program, which allows the public to not only learn about local wetlands, but also collaborate with scientists to help conserve amphibians by reporting frog and toad calls (AZA, 2012). These direct experiences and conservation engagement opportunities may help to develop personal connections with the environment and may inspire participants to support additional conservation efforts.

In addition to inspiring environmental behaviors, field experiences have the potential to reinforce the conservation and education messages of zoos and aquariums. Retention of educational messaging from informal science institutions and field experiences may vary among visitors, thus influencing their values, attitudes, emotions, and behaviors (Adelman, Falk, & James, 2000). Furthermore, behavior modification strategies may only be effective short-term. A study at the National Aquarium in Baltimore, for example, found that visitor interest to participate in conservation efforts dramatically decreased after their visit (Adelman et al., 2000). For the purposes of reinforcing conservation education programs and messages, zoos and aquariums may need to develop more synergistic relationships with field experiences. The tourism industry may offer one potential avenue for improving these relationships.

Ecotourism, Wildlife Tourism, Conservation, and Education

Both ecotourism and wildlife tourism are components of nature based tourism due to their reliance on activities in relatively natural environments (Weaver, 2001). According to Honey (1999), ecotourism should specifically aid the environment by minimizing travel impacts, generating environmental awareness, and providing direct financial benefits toward conservation efforts and local people. The three major components of ecotourism include it being nature-based, sustainable, and educational (Weaver, 2001). Wildlife tourism is a form of ecotourism when conducted in an environmentally responsible manner and when it provides environmental interpretation (Higginbottom, 2004). Both ecotourism and wildlife tourism offer the chance for individuals to develop personal connections with the environment and may also provide economic justification in some countries for protecting regions and species not otherwise proposed for protection (Orams, 2002). The estimated value of non-consumptive viewing of wild elephant herds in Amboseli National Park in Kenya, for example, totals over US $610,000 annually, and the value of wildlife viewing is more than US $40 per hectare compared to only US $0.08 per hectare for potential agricultural activities that might occur if this park had not been established (Boo, 1990). This economic value of wildlife viewing has been realized in other areas. Whale watching in Tonga, for example, provides the small Vava'u community with over US $600,000 revenue per year (Orams, 2000).

In addition to these economic benefits, wildlife tourism combined with education may inspire visitors to change specific behaviors, including minimizing individual impacts, donating money, and supporting other conservation efforts (Moscardo, Woods, & Saltzer, 2004). With the addition of education during wildlife viewing and ecotourism trips, visitors can receive information about the environment while associating it with nature experiences, potentially

inspiring public support for conservation efforts. This strategy is being integrated into various regulatory bodies such as the New Zealand Marine Mammal Protection Regulations, which state that "commercial operations should have sufficient educational value to participants or to the public" (Lück, 2008b, p. 334). Environmental education differs from interpretation in that environmental education offers in-depth information for the purposes of awareness and commitment to improve natural resource impacts and problems, whereas interpretation typically just presents issues (Wiener, Needham, & Wilkinson, 2009). For the purposes of this report and consistent with most studies, however, these two terms will be considered synonymous.

Research supports the notion that educational efforts coupled with tourism experiences can encourage behavior modification (Orams, 2000). Rather than control visitor behavior, the goal of educational programs is to "provide a cognitive basis to encourage appropriate low impact visitor behavior in recreation settings" (Marion & Reid, 2007, p. 6). One study, for example, found that interpretation offered during scuba diving excursions increased diver awareness about adverse impacts caused by this activity, such marine life stress and pollution (Dearden, Bennett, & Rollins, 2007). Likewise, a study of whale watchers showed that listening to educational messages associated with whales and their habitat increased participant awareness of impacts of their own personal activities on this species and marine environments (Christensen et al., 2009). This suggests that education is an important strategy for helping to enhance and manage tourism, and associated impacts on broader ecosystems.

In addition to these types of interpretation offered on trips, off-site information (e.g., guidebooks, promotional videos, internet) can also be valuable for influencing decisions to visit particular sites and generating expectations about experiences and appropriate behaviors (Weaver, 2001). Educational messages at zoos and aquariums can serve as one form of off-site

interpretation, influencing tourist decisions to visit ecosystems and species that they viewed at the institution. Use of scientific data and education during tours that is provided by or modeled after zoos and aquariums may also help to reduce negative impacts caused by tourism (e.g., loss of biodiversity, harassment to marine life, increased eutrophication; Jones & Phillips, 2011).

Some studies have found, however, that the full value of education is not always met by ecotourism and wildlife tourism due to a number of factors such as the lack of structured educational tools, programs, and materials, as well as improper training of many environmental educators and guides (Beaumont, 2001). Interpretation is one of the leading strengths of institutions such as aquariums and zoos (Falk & Needham, 2011), which suggests that the tourism industry may benefit from modeling aquarium and zoo education and conservation messages, or even partnering with these institutions. In addition, zoos and aquariums may have the potential to serve as one link between science and tourism, as scientists are often required to provide easily accessible and understandable research to stakeholders and the general public (Hanson, Palutikof, Dlugolecki, & Giannakopoulos, 2006). Establishing relationships between these entities may not only promote tour operations while aiding management of impacts, but they may also help to support zoo and aquarium education and conservation programs.

According to WAZA (2005), education at institutions such as zoos and aquariums should: (a) excite and interest people about the natural world; (b) encourage understanding of conservation issues and visitor roles in these issues; (c) develop public support and action to address conservation concerns; (d) provide a range of experiences, materials, and resources for a diversity of visitors to enable them to make informed choices benefitting the environment and wildlife; and (e) develop a sense of place as humans in the natural world and an understanding of the relevance of conservation to everyday life. Despite these goals, however, research at

institutions such as the Monterey Bay Aquarium found that conservation exhibits are often unsuccessful at providing the public with suggestions to alternative styles of living and behavior (Yalowitz, 2004). This may potentially lead to a negative influence on visitor confidence in having the ability to help with conservation efforts. A method for these institutions to help address this issue is to partner with the ecotourism and wildlife tourism industries to offer visitors firsthand experiences, examples, and options of how they may participate in conservation efforts. This may provide zoo and aquarium visitors with the "opportunity to act," and motivate them to practice more environmentally responsible behaviors (Orams, 1996).

It may be possible for a field or tourism experience to be applied directly to each of these educational goals outlined by WAZA for the purpose of enhancing conservation education and behavior. The Wild Dolphin Ecotour offered by the Florida Aquarium, for example, helps to educate visitors about the local bay and this aquarium's conservation efforts. This wildlife experience demonstrates responsible viewing and advertising of wild dolphins to its clientele. In 2011, this program received "Dolphin Smart" recognition, a conservation program developed by the National Oceanic and Atmospheric Administration (NOAA) Fisheries Service and Office of National Marine Sanctuaries, Whale and Dolphin Conservation Society, and Dolphin Ecology Project. Benefits resulting from partnerships between aquariums and these tourism operations were best described in a statement by NOAA's Dolphin SMART Regional Coordinator, "the Florida Aquarium's participation will help us spread important dolphin conservation messages to thousands of visitors annually" (Florida Aquarium, 2011). Education provided during these experiences has been found to increase visitor satisfaction and positively influence conservation attitudes, and these benefits are becoming increasingly realized among tour operators (Lück, 2008a; Marion & Reid, 2007; Orams, 1997). A study by Rodger, Moore, and Newsome (2007),

for example, found that 53% of operators perceived education to be a critical tool for protecting wildlife and ecosystems that they depend on for business. There seems to be potential, therefore, for incorporating an ecotourism and / or wildlife tourism component within conservation and education plans initiated by zoos and aquariums such as the Oregon Coast Aquarium**.**

Study Context and Objectives

The Oregon Coast Aquarium is located along Yaquina Bay in Newport, Oregon and is a private, not-for-profit marine science institution that is accredited by AZA. Over 500 species found in the Pacific Northwest are housed at this aquarium. Exhibits are located both indoors and outdoors, and are internationally valued for the promotion of visual and tactile exploration. Outside of the Oregon Coast Aquarium, the surrounding woodland and estuary provide visitors with an opportunity to view many of the exhibited species in their natural habitat. Considered to be a world-class marine educational attraction, this aquarium receives over 40,000 students annually (Oregon Coast Aquarium, 2011a, 2011c). As a member of the Northwest Zoos and Aquariums Alliance (NWZAA), the aquarium also works in collaboration with regional counterparts, such as the Oregon Zoo and Seattle Aquarium, to focus on conservation of local Pacific Northwest species and ecosystems.

Since opening in 1992, the Oregon Coast Aquarium has concentrated primarily on natural history projects and exhibits. This institution, however, is in the process of shifting some of its focus to support more conservation efforts. In 2006, this aquarium developed a Conservation Committee to define conservation for the institution, create related messages, and support projects. During this time, five broad elements of the aquarium's conservation goals were identified: (a) develop a signature conservation effort surrounding one or two key species, (b) continue fostering partnerships with other conservation organizations in the community, (c)

become more involved in research that contributes to the husbandry and welfare of collection animals and in-situ management, (d) raise donor resources to support these efforts, and (e) allocate more staff time to conservation efforts. Although this committee defined conservation (i.e., preservation, protection, and sustainable use of the Earth's natural resource) and its messages, it was disbanded soon after due to logistical challenges. This event lead to individual aquarium departments focusing on various conservation efforts, including the Animal Husbandry Department's species-specific conservation efforts and the Education Department's initiatives to include conservation messaging in educational programs and exhibits. Given its mission statement of "inspiring the public to better understand, cherish, and conserve marine and coastal ecosystems," the Oregon Coast Aquarium plans to contribute to the long-term survival of local Oregon species and habitats through a signature conservation project focused on one or two key species (Oregon Coast Aquarium, 2011).

Three phases of this conservation project were identified in this aquarium's 2011 Vision Statement: (a) Phase I – identify signature conservation project, (b) Phase II – develop conservation and funding plans, and (c) Phase III – begin project implementation. The purpose of this study and report is to help complete Phase I and provide suggestions for implementation (i.e., Phase III). The primary criteria for this project's chosen species will follow the four main topic areas outlined by the Oregon Coast Aquarium's Education Department – marine debris, water quality, sustainable fisheries, and climate change. Due to several reasons such as limited staff and resources, the aquarium has identified the primary approach of this conservation project to be education based and inspire environmental behavior changes among its visitors.

The potential for incorporating an ecotourism or wildlife tourism component related to this project will also be examined for the purposes of enhancing the aquarium's conservation

messaging and providing visitors with a unique field experience. Incorporation of this experience may also serve as a model for developing formal partnerships between AZA aquariums and the tourism industry. Understanding potential benefits of partnerships between aquariums and the tourism industry may be useful for reinforcing conservation messages provided by AZA aquariums, improving environmental education, and mitigating any potential negative impacts caused by the tourism industry and its clientele.

Three objectives are addressed in this study. The first objective involves determining how and where the Oregon Coast Aquarium could best meet the needs of local species and their ecosystems through development and implementation of a signature conservation project. The second objective is to identify any preferred AZA methods for development of a zoo / aquarium conservation project. The third objective involves exploring the potential for incorporating an ecotourism or wildlife tourism field experience to enhance this conservation project.

Methods

Data Collection

This study used several methodological approaches for assessing and prioritizing local species and habitats of concern for the purposes of identifying potential aquarium conservation projects. Database analysis was the main approach and the primary databases examined were: Rare, Endangered, and Threatened Species of Oregon (2010); Oregon Conservation Strategy (2006); Oregon Nearshore Strategy (2006), and species listed under the International Union for Conservation of Nature (IUCN) Red List and the Endangered Species Act of 1973 (ESA). The ESA was reviewed under both the National Oceanic and Atmospheric Administration (NOAA) Fisheries Office of Protected Marine Resources (OPR) and the Oregon Department of Fish and Wildlife (ODFW) species lists for the purposes of remaining consistent with U.S. federal law

dividing ESA implementation responsibility between NOAA and the U.S. Fish and Wildlife Service (USFWS). In 1987, ODFW entered into the Endangered Species Act Section 6 Cooperative Agreement with USFWS to conduct research and conservation efforts. Therefore, ESA listed species were reviewed under ODFW specifically (Oregon Biodiversity Information Center, 2010). The Oregon Conservation Strategy and the Oregon Nearshore Strategy were chosen because of their approach for identifying marine resource and wildlife concerns within social and ecological contexts, reflecting an ecosystem-based approach. Each document provides a list of species related to these concerns. Based on these documents, the species conservation status, population trends, threats, and existing conservation efforts were recorded for comparison. As potential project targets were identified, they were reported to this aquarium's Director of Education.

In addition to assessing documents produced from these databases, informal interviews were conducted to assist with identifying priorities and possible project themes. Discussions with representatives of research institutions, government agencies, and AZA were conducted, and respondents were given pseudonyms to help ensure anonymity (Table 1). On the basis of availability, interviews with these individuals were conducted over the telephone and in person, lasting approximately 30-40 minutes in duration, and were recorded verbatim using written transcriptions. These interviewees were selected based on purposive and snowball sampling methods (i.e., project research, referrals made by interviewees and the aquarium's Director of Education). Interview questions relevant to each individual's organization were embedded within broader question topic areas designed to gather information on how to approach development of the aquarium conservation project, effective and manageable project foci, and potential partnering organizations. The three primary interview questions included: (a) what is the most

tactful way to produce an aquarium conservation plan, (b) can you provide any species and / or habitat project suggestions, and (c) where do you see your organization potentially playing a role in the Oregon Coast Aquarium's project? In addition to these interview questions focusing on project identification, potential avenues for implementation and possibilities for incorporating a field experience for visitors were discussed with the AZA respondents.

Informal telephone interviews were also conducted with four representatives from the ecotourism and wildlife tourism industries. Purposive sampling was used for selecting these interviewees to ensure that particular operations were included such as those located within relative proximity to the aquarium and focusing on the project's prospective target species or habitat. Initial background research conducted on these tour operations focused on three topic areas: (a) operation characteristics (e.g., activity itineraries, wildlife viewing opportunities, relevance to the aquarium project), (b) company mission, and (c) whether the company offers a strong environmental education / interpretation component in their itineraries. Similar to the interviews with representatives of agencies and scientists, these interviews lasted 30-40 minutes and were recorded verbatim using written transcriptions. Interview questions investigated each operation's interest in supporting the aquarium's conservation project, potential for developing a partnership with the aquarium, prospective costs and benefits resulting from any partnerships, and specific project suggestions based on tour operator field experience. In total, 10 interviews were conducted for this study (agencies, scientists, AZA staff, tourism operators) from January to March, 2012 (Table 1).

Table 1. Interviewee identification pseudonyms and short descriptions

Pseudonym and number	Respondent attributes
AZA representatives	
A1	Aquarium director of conservation and research
A2	AZA conservation and education employee
A3	Aquarium curator of conservation research
Scientific researchers	
R1	ODFW employee
R2	Oregon State University assistant professor and researcher
R3	NOAA NMFS employee
Tourism representatives	
T1	Owner, whale research and tour company in Oregon
T2	Owner, wildlife and ecotourism operation in Hawaii
T3	Owner, kayak tour operation in Oregon
T4	Owner, marine wildlife tour operation in Oregon

Once the database analysis and interviews were conducted and a refined target list of potential species and / or habitats was determined, an Oregon Coast Aquarium internal stakeholder meeting was held to present preliminary findings, further identify institutional goals and objectives for the conservation project, and discuss potential support for the project. The target list was subsequently refined for project selection. Following identification of the recommended project focus areas, a content analysis of existing conservation project documents and management initiatives for the species was conducted. These documents included aquarium species and habitat specific conservation projects such as the annual Research and Conservation Report of the Seattle Aquarium (2009) and the Monterey Bay Aquarium (2011), as well as state and federal management plans such as the USFW Species Conservation Plans, NOAA Species Recovery Plans, and the Pacific Region Partners for Fish and Wildlife and Coastal Program Strategic Plan. This document review gathered additional information to compare other aquarium projects and assess the potential for the Oregon Coast Aquarium to be complementary to or

model after these projects, and identify potential institutional support for the project. The final product includes two recommended signature conservation projects for this aquarium – one primary and one alternative project.

Project Data Analysis

Over 300 species were documented using the selected databases and then compiled into a Microsoft Excel spreadsheet for comparison. To effectively analyze the list, various factors in addition to the prevalence of being listed were utilized, including: habitat; current threats related to the Oregon Coast Aquarium Education Department's focus areas (i.e., marine debris, water quality, sustainable fisheries, climate change); existence of institutional conservation projects on the selected topics (e.g., governmental, non-governmental, aquariums, zoos); availability of potential partners; species currently housed on-site; taxonomic uniqueness to the aquarium's existing collection; project value without housing a live species; internal staff interest, expertise, and support; and potential to inspire public behavior change. The purpose of assessing potential project targets using these factors was to help ensure a thorough project evaluation and to produce an achievable, affordable, and acceptable project recommendation for this aquarium. Although all of these decision criteria were crucial for assessing potential projects, not all factors were weighed equally. Special emphasis was given to the conservation status of species, this aquarium Education Department's four focus areas, direct connection to public behavior / activities, and internal support among aquarium personnel. Opportunities for live animal viewing both on and off-site, as well as potential alternatives (e.g., webcams) were also highly weighed. These factors were given priority for the purposes of recommending a valuable project that would assist the aquarium with achieving its goal of supporting the long term survival of local Oregon species and habitats in need, as well as addressing the specific focus of both the

Husbandry and Education Departments (i.e., species-specific conservation and conservation messages targeting public behavior change, respectively). Assessing internal support (i.e., interest, expertise) was critical for ensuring that the recommended project is both appropriate and manageable for this aquarium.

Analysis of the interview transcripts involved a series of systematic readings of the transcripts and then inductive coding to identify themes. In other words, through an immersive analysis of interview content, data were examined using inductive coding, allowing themes to emerge from the data through repetitive close readings of transcriptions (Bernard, 2006). Coding involves the application of a label to a segment of text relating to an identified theme or category with the goal to "discover variation, portray shades of meaning, and examine complexity…by portraying it in the words of the interviewees" (Rubin & Rubin, 2005, p. 202). Qualitative data analysis typically consists of two stages – coding transcripts to identify themes or analytic concepts, followed by comparing and linking emergent themes or concepts across respondents to identify a theory of what has been learned, frequently through examining concepts identified in literature (Rubin & Rubin, 2005). The purpose of using this approach in this study was to condense the data into a summary format, establish clear links between the research objectives and findings, and develop a model to help explain the data (Thomas, 2006).

Results

Database Results

A target list of potential conservation projects resulted from initial documentation and comparison of the listed species (Table 2). This list served as a manageable baseline to present project options to aquarium staff during the internal meeting held with representatives of several departments, including Education and Husbandry. Of the databases reviewed, 23 species of fish,

mammals, birds, reptiles, and plants were listed most frequently. After additional research and assessments based on the identified project criteria (i.e., species conservation status, at least two of the four aquarium conservation focus areas), however, only a select number of species were highlighted for further review: rockfish species (canary and bocaccio), sea turtle species (e.g., leatherback), western snowy plover, tufted puffin, North Pacific albatross species (laysan, black-footed, short-tailed), stellar sea lion, sea otter, gray whale, and pink-sand verbena.

Table 2. Refined Species Target List

Common Name	Scientific Name
Fish	
Bocaccio Rockfish	*Sebastes paucipinis*
Canary Rockfish	*Sebastes pinniger*
Green Sturgeon	*Acipenser medirostris*
Chinook Salmon	*Onochorhynchus tshawtscha*
Coho Salmon	*Onocorynchus kisutch*
Chum Salmon	*Onocorynchus keta*
Steelhead Trout	*Oncorynchus mykiss*
Reptiles	
Leatherback Turtle	*Dermochelys coriacea*
Loggerhead Turtle	*Caretta caretta*
Hawksbill Turtle	*Eretmochelys imbricate*
Green Turtle	*Chelonia mydas*
Birds	
Western Snowy Plover	*Charadrius alexandrinus nivosus*
Marbled Murrelet	*Brachyramphus marmoratus*
Tufted Puffin	*Fratercula cirrhata*
California Brown Pelican	*Pelecanus occidentalis californicus*
Short-tailed Albatross	*Phoebastria albatrus*
Black-footed Albatross	*Phoebastria nigripes*
Laysan Albatross	*Phoebastria immutabilis*
Mammals	
Sea Otter	*Enhydra lutris*
Northern (stellar) Sea Lion	*Eumetopias jubatus*
Gray Whale (Eastern Pacific sp.)	*Eschrichtius robustus*
North Pacific Right Whale	*Eubalaena japonica*
Vegetation	
Pink Sand Verbena	*Abronia umbellata var. breviflora*

Interview Results

Three main themes relevant to the research objectives were identified from the informal interviews: (a) what the aquarium's conservation project should be and how it should be implemented, (b) project research and development, and (c) incorporation of a field experience. Sub-themes were also identified after further analyzing and categorizing interview transcripts. Sub-themes for what the aquarium's project should be and how it should be implemented include: (a) communicating messages using live animals, (b) project suggestions, (c) fisheries stakeholder involvement, and (d) policy incorporation. Sub-themes identified for project research and development involved AZA protocols and project identification process. Sub-themes for incorporation of a field experience focused on benefits and costs of ecotourism and wildlife tourism involvement. Similarities and differences among respondent groups (i.e., AZA, scientists, tourism representatives) were noted in several of these themes and sub-themes.

What the Project Should Be and How it Should be Implemented

Communicating Messages Using Live Animals. The majority of interviewees acknowledged the benefit of choosing a project focusing on a live species housed at the aquarium. This was most evident in A1's response, "conservation messages are difficult to get across to the public; it makes a more compelling case to have a live species." This theme was mentioned most often by individuals representing the AZA interview group. There was also consensus among AZA and tourism respondents in their belief that the viewing of live animals (captive or wild) may enhance conservation efforts and promote visitor engagement. Emphasizing the potential for project support, T3 mentioned that "we need to make a difference in conservation. We need to get people out there and experience the wildlife." Tourism

representatives specifically noted benefits to viewing a species in the wild and connecting these benefits back to targeted conservation messages at the aquarium. T2, for example, stated:

> We have all these people in the world that now live in cities with little wildlife. So how do they get exposed to it? TV, media, and school. What we've all discovered is a flat screen is not the same. What's the next best thing? Get them to a park, [and] then get them to a zoo or aquarium for education. But in a sense, this is not the natural habitat, so there is a limitation. This brings us to the next level [for] people's appetite [that] has been netted by experiences like these [and] want more. So this [ecotours and wildlife tours] can be viewed as a step into nature.

The research group did not directly comment on the benefits of wildlife viewing for the purposes of promoting conservation, but R1 did acknowledge the importance of viewing species and ecosystems for public education and awareness purposes by stating that "maybe a component that makes the Oregon Coast Aquarium special is it gives people a window into a world they don't normally see."

Project Suggestions. Interviewees suggested a number of specific conservation projects, with all three respondent groups (i.e., AZA, research, tourism) listing projects targeting specific species. A3, for example, explained that "sea otters are starting to pop up in Oregon from the Washington population, making this a perfect opportunity for them [the aquarium] to become a leader in otter education and rehabilitation." T3 mentioned the importance of managing fisheries species by stating, "what stands out to me are the species targeted in the fisheries, species [that] we don't have stock assessments for. I worry about all of those critters." An example listed by respondents was rockfish. Although rockfish were mentioned as a potential project topic, some respondents noted concerns over their less "charismatic" nature. A1, for example, stated that "fish are less compelling than species with feathers or fur, which is very important to consider." Other species commonly listed by interviewees included shorebirds such as the western snowy plover, auklets such as the tufted puffin, albatross including the black-footed albatross, sea

turtles, and marine mammals such as the stellar sea lion and gray whale. R1 approached the discussion about potential projects by reviewing existing management plans that may provide support for an effective aquarium project devoted to species conservation. This individual explained, for example, that "state and federal plans don't normally focus on specific species, but some do such as the black-footed albatross."

Specific projects not focusing directly on a particular species were also discussed during several interview sessions with members from all three respondent groups. The topic of marine reserves was a common project suggestion among AZA and research groups, as illustrated by A3: "The Oregon Coast Aquarium is in an exciting position with the newly established reserves and they have the opportunity to lead this initiative using divers, boat, and monitoring gear."

Fisheries issues were also discussed by various interviewees, especially the scientific research group. R3, for example, explained:

> From a fisheries standpoint, it's important for the aquarium to acknowledge the different types of fisheries in Oregon and the management around them. The public is often not aware of how this is prosecuted, how fishery science works to create information based tools for management. There is a gap between what the public should know and what they do know. This [the aquarium project] would help them understand, for example, traveling, species often impacted by their [the public] activities, and their resource use.

Specific fisheries issues mentioned during several interviews include bycatch and derelict fishing gear. R2, for example, stated that "fisheries bycatch is really beginning to get a footing on the Oregon coast. Section 7 of [the] NMFS was just released that covers a recent short-tailed albatross bycatch incident."

Concerns about marine debris were also expressed by all respondent groups. For example, when referring to the tsunami that stuck off the coast of Japan in 2011, T1 mentioned:

> There is monthly monitoring of [marine] debris, clean-ups, and measuring [of] radio activity. This is right about public awareness and fear. We're all connected by marine debris. So I think more public awareness of this connection and marine

> debris needs to increase in the near future. [A way to] develop more ties with marine debris is obviously whales, turtles, and albatross.

When listing multiple species and non-species focused project options, R3 mentioned that "there are so many good stories out there." Building on this statement, A1's emphasized that "what's most important is to choose a meaningful project focus that gets the message across."

Fisheries Stakeholder Involvement. Interviewees primarily from the AZA and scientific research group mentioned the importance of including the fishing community in the aquarium conservation project to create more integrated and collaborative conservation efforts. A2, for example, stated that "it's important to communicate with working groups such as fishermen [*sic*.]." According to R1:

> The Pacific Fishery Management Council is a hot topic, focusing on depleted stocks. In looking for specific examples in printed materials, it's important for the Oregon Coast Aquarium to not alienate fisheries, but speak to the conservation issues. Therefore, an important player and partner to bring to the table are fishermen [*sic*.]. The more that you [*sic*.] can partner with local Oregon communities and fisheries, the better.

Likewise, R3 mentioned the importance of communicating with the fishing community and working to address both the social and ecological components related to marine resource use:

> There is a lot of outreach right now trying to reduce bycatch and help fisheries impacted by the Catch Shares Program and annual catch limits to efficiently fish. The hope is to inspire creativity to avoid fishing species that limit their share. That would be one area where the Oregon Coast Aquarium can help. It [the aquarium project] would be in the eyes of the public and fishing industry, showing how the aquarium is helping to mitigate the situation.

Policy Incorporation. The greatest difference observed between the research group and the other two interview groups regarding this broader theme about marine politics and policy was that it was not mentioned by either the AZA or tourism group. Two interviewees within the scientific research group, both of whom are state or federal employees, directly stressed the importance of policy for the aquarium conservation plan, especially incorporating policy into the

project to be used as a guide, and informing the public about policy related to the aquarium project. R3, for example, explained:

> It is important for the public to understand what state and federal agencies are doing. There are generalizations that the public hears from different groups with specific agendas. This [policy incorporation] might be good for an aquarium located within a fishing port.

Project Research and Development

AZA Protocols. There was consensus among AZA interviewees regarding the nonexistence of any AZA preferred protocols to help guide development of a strategic conservation plan or project. For example, A1 stated that "to my knowledge, AZA does not have specific protocols for developing a conservation plan. However, AZA has an idea of what progress should look like." This idea is reflected in AZA's accreditation questionnaire, which all AZA respondents mentioned could serve as a project guideline. It was evident from this interview group that rather than a specific protocol, institutional goals and attributes were the leading principles guiding development of their institution's conservation projects. A3, for example, stated that "we did not use any protocol; we started our species-specific plans based on our expertise and interests." Interviewees from the research and tourism groups were unfamiliar with any existing AZA protocols, so they did not raise this issue during the interviews.

Project Identification Process. Unlike the tourism group, a common topic raised by AZA representatives and scientific researchers included the identification process for the Oregon Coast Aquarium conservation project. Both groups mentioned the importance of assessing and identifying endangered species and ecosystems as starting points. Referring to the methods followed in this research project (i.e., database analysis, interviews), A3 stated:

> I think both approaches are great and you should incorporate both of them into your research. I think that once you identify where the aquarium can best meet the needs of local species and ecosystems, then you should see if the aquarium has the interest and expertise to actually create a viable conservation program.

Identifying project boundaries was another issue raised by several AZA and research interviewees. Interestingly, there were differences in opinions about project uniqueness between two of the scientific researchers who represent state and federal governments. R1, for example, stated that "it is always good to build on what other people have done and often difficult to reinvent the wheel." R3, on the other hand, stated that "one thing that concerns me is that there are so many efforts like this [the aquarium conservation project] going on, so you would have to make sure that this project is not a duplication."

Incorporation of a Field Experience

Benefits. Although this objective was not reviewed in depth with the research / science interview group, respondents from the AZA and tourism groups favored incorporating a field experience into the Oregon Coast Aquarium's conservation project. In particular, these interviewees supported incorporating an ecotourism and / or wildlife tourism component. Common keywords reflecting this positive attitude toward a field component included: "two-way street," "win-win," "feedback loop," "shared knowledge," and "interpretation enhancement." Specific benefits often listed by these interviewees included complementary support for the tourism and aquarium industries, connecting to different public interests, and providing public engagement opportunities and more personalized wildlife experiences to aquarium visitors. A2, for example, mentioned, "if the public were to take action and experience the species in the wild, I would encourage this [ecotourism or wildlife tourism component]." The tourism representatives in particular mentioned the increase in financial support. T5, for example, stated that "in addition to providing free marketing to the tour companies and generating more income, it [an aquarium-tour operation partnership] could close the loop by benefiting the aquarium." The benefit most often documented by interviewees from both the AZA and tourism groups was the increase in

outreach and education. T3, for example, claimed that "I imagine as the aquarium's goal is to educate people, an ecotour would enhance visitor learning."

Costs. Although these potential benefits of incorporating a field component into the aquarium's conservation project were mentioned, several interviewees also stated potential costs associated with this experience. In particular, individuals in the AZA group had concerns about the availability of ecotourism or wildlife tourism opportunities and required resources. A3 stated:

> Ecotourism is great, but it takes enormous resources. You basically need to double your staff, as you still need to do the fieldwork and then you need a separate staff to do the ecotourism component. It is great for outreach, but it can negatively impact the conservation work if you do not have enough staff to handle the tourists.

This statement, however, highlights the potential for developing partnerships between aquariums and tourism operators to help reduce resource and time burdens. A2, for example, suggested that "I don't know if this is too much for the aquarium to bite off, [but] either they [the aquarium] could provide the trips themselves, or partner with tour operations.

The tourism group was most enthusiastic about developing a partnership with aquariums such as the Oregon Coast Aquarium. The only cost frequently mentioned by this group was potential competition over tourism dollars, but interviewees admitted that they found this to be highly unlikely. T2, for example, mentioned, "I see a real value in this partnership; however, there may be competition for people's pocketbooks, or tourist dollars. Another potential limitation may be visitor interest." No interviewees mentioned concerns regarding potential negative impacts on marine environments caused by enhanced tourism promotion and visitation.

Internal Stakeholder Meeting Results

The internal stakeholder meeting at the Oregon Coast Aquarium revealed institutional interest and potential support for projects regarding North Pacific albatross species, sea otters,

and pink-sand-verbena. Institutional support for these species played an important role in the final recommendations for the conservation project. Rockfish were also a discussed, but concerns over their indirect connection to public activities, opportunities for enhancing behavior change, and their less than charismatic nature were mentioned. It was evident from the meeting that a consensus for the aquarium's project goals and objectives, both short-term and long-term, had not yet been reached. There appeared to be some difficulty establishing internal preferences for either enhancing current conservation efforts (e.g., invasive tunicate research) or developing a new project highlighting a unique aquarium species housed on-site.

Discussion

This study assessed and prioritized potential conservation projects for the Oregon Coast Aquarium. Specifically, it focused on three main objectives: (a) determine how and where this aquarium could best meet the needs of local species and their ecosystems, (b) identify any preferred AZA methods for development of a zoo / aquarium conservation project, and (c) explore the potential for incorporating a field experience in an effort to enhance the conservation project. Data were obtained from database analysis, informal interviews, and an internal aquarium stakeholder meeting. A content analysis of existing institutional conservation programs was then used for gathering additional information for the selected projects, provide suggestions for implementation, and identify potential outside institutional support (see Appendices A, B).

In addition to several other selection criteria (e.g., species conservation status), the four conservation focus areas of this aquarium's education department (i.e., marine debris, water quality, sustainable fisheries, climate change) served as guides for project assessment. According to Zacharias and Roff (2001), a logical approach for utilization of focal species is to first establish the target of the conservation effort (e.g., the aquarium's conservation focus areas) and

then identify species that can be used for designing the conservation project. A total of 23 species were identified following the initial database analysis, but after additional research that compared project options, this list was reduced to: rockfish species including the canary and bocaccio rockfish, sea turtle species including the leatherback, western snowy plover, tufted puffin, North Pacific albatross species (i.e., laysan, black-footed, short-tailed), stellar sea lion, sea otter, gray whale, and pink-sand verbena. Although some of these project options may provide taxonomic uniqueness for the aquarium, others have the potential to serve as additional support for the promotion of currently housed species and this institution's research efforts.

Interviews with AZA, scientific research, government, and tourism representatives were also conducted to identify and elaborate further on conservation project options. During discussions about project options, the majority of respondents mentioned the value of focusing on a single exhibited species for aquarium visitors. Respondents believed that the presence and visualization of a live species would support the aquarium's conservation efforts and help to relay this information to aquarium visitors. The presence of live animals may help to generate various beliefs, attitudes, and emotions, which have been hypothesized to have an impact on conservation oriented behaviors (Manfredo, 2008; Vining & Ebreo, 2003).

All three interview groups independently listed several species that were identified within the reviewed databases. Special emphasis was given to rockfish species and sea otters, both of which are already housed on-site at the aquarium. Interviewees also recommended seabird species, including North Pacific albatrosses particularly related to the Oregon Coast Aquarium's focus areas (e.g., marine debris). Research has found that instead of focusing on a series of individual facts about a species, communicating a particular theme (e.g., an exhibited species and related conservation issues) may increase impacts of interpretive media on visitor attitudes and

behaviors (Smith et al., 2008). Single-species conservation may be applied across a geographic range, benefiting multiple taxa and ecosystems facing similar social and ecological threats (IUCN, 2008). In addition to ecosystems, this approach can be applied to non-species-specific conservation issues such as resource use. Non-species-specific projects listed most frequently by interviewees included fisheries issues (e.g., bycatch), marine reserves, and marine debris. These particular suggestions are capable of being addressed and further enhanced through the focus on several of the species identified in the refined target list.

Respondents also emphasized the importance of incorporating stakeholders and policy into the conservation project. In particular, AZA and scientific research representatives mentioned the need for collaboration with working communities such as the fishing community. Although there was no clear disagreement among interview groups, the research representatives differed from the others by mentioning the importance of also including a policy aspect in the project. The main purpose for this inclusion would be to communicate current policy and management actions to the public and resource users in an effort to promote political transparency, reduce user conflicts, and ensure more informed and collaborative decision making. As recognized by the White House Council on Environmental Quality (2010) within the Final Recommendations of the Interagency Ocean Policy Task Force, improved stewardship and sustainable use of oceans, coasts, and lakes requires "a comprehensive, integrated, transparent, science-based, and ecosystem-based planning process" (p. 9). Furthermore, strong stakeholder and public education and engagement may reduce the level of uncertainty involved in conservation and management implementation (The White House Council on Environmental Quality, 2010).

Project research and development was also discussed with interview respondents. The interviews revealed a lack of current AZA conservation project protocols, but the majority of AZA representatives noted the existence of accreditation questions that can be used as guidelines for project development. Standards for conservation outlined in the AZA Accreditation Standards and Related Polices (2011a) state that conservation activities may include: (a) participation in regional conservation efforts with other AZA institutions; (b) participation in regional, national, or international conservation programs or projects that aim to be multidisciplinary (i.e., one or more applied research, species recovery, conservation awareness and education, local community participation tactics); (c) involvement in capacity building, training, and technology transfer for field conservation efforts; and (d) conservation education programming for public awareness and public participation in conservation activities.

To help achieve these accreditation standards and guide development of a strategic conservation plan, AZA provides questions about institutional mission, project scope (e.g., geography, taxa), organization (e.g., goals, outcomes, project selection criteria, decision making process, department / staff responsibilities), and funding (AZA Field Conservation Committee, 2012). Given the unique attributes and resources of each AZA accredited institution, these guiding questions remain broad. Two interviewees in the AZA group, for example, mentioned that their individual aquarium conservation plans were based heavily on staff expertise and interests, as well as project goals. Institutional disparities may be a main reason preventing the existence of specific AZA conservation project protocols. It is recommended that AZA increase emphasis on utilization of ecosystem-based management strategies within future revised accreditation standards to assist in guiding development of effective conservation projects considering coupled social and ecological systems across accredited institutions.

The AZA and scientific research respondents both agreed with using federally listed species as a baseline for project identification. There was, however, some disagreement within the research group, especially between the government agency representatives. The state representative mentioned the importance of supporting existing conservation plans, whereas the federal representative emphasized the significance of developing a new project and refraining from duplicating previous efforts. This difference between these state and federal employees may imply a disparity between government sector project approaches, but the small sample size prevents being definitive about this finding.

This study also examined the potential for incorporating a field experience as part of the aquarium's conservation project. AZA and tourism representatives generally favored incorporating an ecotourism and / or wildlife tourism experience as part of the conservation project. Many interviewees mentioned benefits of this idea such as providing complementary support for the tourism and aquarium industries, increasing financial support for both of these industries, reaching out to different sociodemographic groups through increased education and field opportunities, and offering more personalized wildlife experiences to aquarium visitors. Orams (1996) suggested that marine tours coupled with education may create longer term attitude and behavioral changes, so partnerships between the Oregon Coast Aquarium and tourism operators may help this aquarium achieve its goal of developing a conservation project that inspires behavior change among citizens. Tourism representatives specifically mentioned the benefit of providing marketing for both the tourism and aquarium industries. Wildlife viewing along the Oregon Coast is an important tourism sector for both residents and visitors, as observed in one study, which documented the economic significance of wildlife viewing and other outdoor recreation activities in 36 Oregon counties in an effort to improve wildlife and recreation

planning and management (Dean Runyan Associates, 2009). Wildlife viewing was found to have contributed over US $1.03 billion to Oregon in 2008 (Dean Runyan Associates, 2009).

Several interviewees also mentioned the importance of creating opportunities for sharing knowledge for the purpose of conservation. Aquariums, for example, may provide the tourism industry information about particular species and ecosystems and related conservation issues they are targeting in an effort to minimize impacts from the operation. In return, the tourism industry may provide the aquarium with local knowledge of marine resources that they use for the purposes of improving the effectiveness of their conservation efforts. Local knowledge or local ecological knowledge is defined as "knowledge of the local residents of a community, often users of the resource" (Kliskey, Alessa, & Barr, 2009, p. 146). An exchange between aquariums and marine tourism operators may be essential for representing the cumulative social, economic, and biophysical perspectives involved in marine ecosystems. Although quality education has been found to increase visitor satisfaction during tourism and aquarium experiences (e.g., Moscardo et al., 2004), this benefit was not mentioned by any interviewees.

Although the majority of interviewees believed that there would be little to no costs related to incorporating a field experience component within the conservation plan, several AZA interviewees were concerned that this addition may be too much for the aquarium to undertake at this time for reasons such as additional staff, funding, and time. It is possible, however, that through a small-scale citizen science project such as a beach cleanup or a partnership with local marine tourism industries, the aquarium may be able to reduce resource costs for the project. Regardless, tourism interviewees responded enthusiastically to the idea of potentially partnering with the aquarium to successfully and resourcefully incorporate a field experience. Although

these tourism representatives mentioned the possibility of competition over tourist dollars between the two industries, they believed that it was highly unlikely.

Following the interview sessions and a refinement of the project target list, the Oregon Coast Aquarium internal stakeholder meeting revealed institutional interest and potential support for projects concerning North Pacific albatross species, sea otters, pink-sand-verbena and rockfish. It was evident from the meeting, however, that consensus for the aquarium's short term and long term project goals and objectives has not yet been reached and this may be partly responsible for the observed differences in project interest between this aquarium's departments. Although the Husbandry Department seemed to take greater interest in enhancing current aquarium research and conservation efforts (e.g., invasive tunicate research), the Education Department struggled to find clear conservation messaging and visitor behavior change opportunities related to such projects. This led to difficulty establishing internal preferences for either enhancing current conservation efforts or developing a new project highlighting a unique aquarium species. To execute an effective and clearly identified conservation project that receives support from all departments, it is recommended that the Oregon Coast Aquarium identify these project attributes before moving forward with the recommended conservation projects discussed below. This will help to ensure internal department support and cooperation for the conservation project. Identifying both short-term and long-term timelines for the project may assist with clarifying these goals and objectives.

Conclusion

Project Recommendations and Rationale

Although there were many potential species-specific projects identified through the database analysis and informal interviews, tradeoffs among unique attributes of each project needed to be

made, and only two were ultimately chosen for recommendation. Each recommendation (primary and alternative) will be largely education-based, providing an ex-situ conservation project for the Oregon Coast Aquarium. These recommended projects remain species specific, but it is crucial that aquarium personnel recognize the broader ecosystem-based connections relating to these targets, as well as potentially less "charismatic" species sensitive to similar conservation focus areas. It is advised that as the Oregon Coast Aquarium moves forward with development of the conservation project, they use a comprehensive approach considering the social and ecological components involved (e.g., ecosystem services, resource use, related policies and management). In terms of project implementation, it may be beneficial for this aquarium to consider various stakeholder groups for the purposes of sharing knowledge and technical experience, promoting collaboration, and increasing interest group investment to conserve marine resources. These stakeholder groups include, but are not limited to, the fishing community, local residents, Oregon Department of Fish and Wildlife (ODFW), National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS), the tourism industry, other zoos and aquariums, and non-governmental organizations such as the SurfRider Foundation and Ocean Conservancy. Potential challenges to promoting stakeholder engagement include lack of clarity and support, cultural or interest group differences, and high expectations (F. Conway, personal communication, 2012). Despite these recommendations for implementation, the most urgent next step for the Oregon Coast Aquarium is to select one of the recommended projects and begin to develop clear project goals and objectives, which may help to reduce these potential challenges and increase stakeholder collaboration and support.

Based on study results, the primary conservation project recommended for the Oregon Coast Aquarium focuses on North Pacific albatross species, including the laysan (*Phoebastria*

immutabilis), black-footed (*Phoebastria nigripes)*, and short-tailed albatross (*Phoebastria albatrus)*. There are several main reasons for selecting this species as the primary target, and these are outlined in Table 3. The conservation status of these three species of North Pacific albatross warrants the need for conservation support. According to the International Union for Conservation of Nature (IUCN), laysan and short-tailed albatrosses are both listed as "vulnerable" and black-footed albatrosses are listed as "endangered" (IUCN, 2012a, 2012b & 2012c). Short-tailed albatross are currently listed as "endangered" under the ESA (USFWS, 2005a). Details of the conservation status of each species under international, federal, and state jurisdictions are in Appendix A.

The primary ecological and anthropogenic threats to these species directly relates to at least three of the Oregon Coast Aquarium Education Department's focus areas, particularly marine debris, sustainable fisheries, and climate change. Specific threats regarding these themes, for example, include increased mortality due to marine debris ingestion, incidental fishery bycatch, and habitat / nesting ground degradation due to sea level rise (Arata, Sievert, & Naughton, 2009; USFWS, 2005a). Marine debris and fisheries bycatch concerns were suggested by several interviewees as potential non-species specific conservation projects. Additional threats to albatrosses are discussed in Appendix A.

There are also clear conservation messages associated with the target species that could potentially encourage changes in visitor behavior (e.g., responsible disposal of waste in an effort to reduce marine debris). The use of albatrosses as flagship species to communicate often complex interactions among marine ecosystems (coastal, pelagic) and society may increase visitor environmental literacy and reduce potential barriers of engagement. Through the use of informational intervention strategies, conservation messages can influence visitor motivations,

norms, and attitudes, potentially leading to behavior change (Kollmuss & Agyeman, 2002). Following the norm activation theory, for example, increasing awareness and understanding of certain actions responsible for impacts and consequences on the environment may inspire behavior change (Saunders et al., 2006; Schwartz, 1977; Stern, 2000). Providing individuals with the information and opportunity "to act" may further influence their belief that they can have an impact on certain conservation issues (i.e., locus of control; Manfredo et al., 2004).

Both internal and external support, particularly relating to the Oregon Coast Aquarium's focus areas such as marine debris, was expressed among interviewed stakeholders. Albatrosses are also considered unique taxa for the aquarium and would broaden this institution's focus on species that are not able to be exhibited on-site at this time. The charismatic features of these seabirds (e.g., long-lives, large wing span, long distance migration routes) may serve as tools for the aquarium to "connect to" the public through meaningful stories. The potentially positive emotional responses generated by these stories may help to reduce development of a cognitive dissonance between visitors' environmental attitudes and their actions (Saunders et al., 2006; Schwartz, 1977; Stern, 2000). There are also several existing governmental and non-governmental conservation efforts and expertise related to albatrosses that the aquarium may want to partner with, support, or compliment, including the USFWS Seabird Conservation Action Plan for the Pacific region (2005) and the 1918 U.S Migratory Bird Treaty Act (Arata et al., 2009; USFWS, 2005b; Appendix A).

A conservation project focusing on albatross would also serve as a unique project that is not currently offered at large aquariums located along the U.S. west coast (e.g., Monterey Bay, Oregon Coast, Seattle) or at NWZAA institutions. The project target is also considered to be "charismatic" in nature (e.g., long-lived species), a potential key attribute for fostering visitor

interest and emotional engagement as expressed by several interviewees and suggested by the conservation psychology literature. Dismissal of non-charismatic species that are potentially more sensitive to environmental change, however, may limit the Oregon Coast Aquarium's ability to communicate the existence of biological diversity to aquarium visitors, as well as consider cumulative impacts and interactions involved in environmental conservation. Therefore, it is critical that the aquarium also educate visitors on less than charismatic species, such as those commonly interacting with albatross and facing similar ecological and anthropogenic threats (e.g., albatross prey, squid, *Ommastrephes sloani)*.

Although results provided by the informal discussions revealed the importance of viewing a live species for enhancing the aquarium conservation project, it is unlikely that a live albatross could be housed at the Oregon Coast Aquarium at this time due to several reasons, including staff and financial limitations. Tradeoffs, however, were made between the prospective targets and strong justification for this primary project recommendation was found (Table 3). The establishment of live webcams stationed at albatross nesting sites (e.g., Kilauea Point National Wildlife Refuge, HI; USFWS, 2012) may serve as an effective alternative to a live albatross exhibit and provide species viewing opportunities for aquarium visitors. The neighboring Hatfield Marine Science Center is equipped with research expertise focusing on albatross and free-choice learning, which may provide the necessary support for developing an interactive exhibit that connects to conservation messages learned on-site and enhances a possible webcam viewing experience. Although a consensus has not been reached among the Oregon Coast Aquarium's departments, there was internal interest expressed for albatrosses, especially by the Education Department. A full status report on albatrosses, as well as implementation and monitoring recommendations is in Appendix A.

Table 3. Primary Project Recommendation Justification

Number	Rationale
1	Supported by database analysis
2	Species conservation status warrants the need for support
3	Primary threats relates to the Education Department's focus areas
4	Clear conservation messages associated with the target
5	Charismatic features may "connect" to public
6	Existing conservation efforts for project support
7	Serve as a unique conservation project for this aquarium, NWZAA, and large U.S. west coast aquariums
8	Internal and external support expressed
9	Wildlife viewing opportunities available
10	Potential alternative on-site viewing opportunities

The alternative recommended strategic conservation project for the Oregon Coast Aquarium focuses on sea otters (*Enhydra lutris).* Appendix B provides a full recommendation report for this keystone species (Soule et al., 2003). In contrast to the primary conservation project (i.e., albatrosses), this alternative project was chosen for several reasons (Table 4). A number of interviewees, for example, identified this species as one of the most desirable for the conservation project and the conservation status of this species justifies the need for conservation support. Sea otters are currently listed as "endangered" by the IUCN and "threatened" under the ESA (IUCN, 2012d; USFWS, 2003).

The primary ecological and anthropogenic threats to this species also directly relates to at least two of the Oregon Coast Aquarium education department's focus areas, including water quality and sustainable fisheries (a common non-species specific topic mentioned by several interviewees). For example, oil spills are considered to be the greatest threat to sea otters, potentially leading to hypothermia and lung damage from inhalation of toxic fumes. Incidental

entanglement in commercial fishing gear (gill and trammel nets) has also been responsible for increased sea otter mortality (IUCNd, 2012; Lance, Richardson, & Allen, 2004). Unlike the relationships between albatross and marine debris, common sea otter threats may not be as directly related to aquarium visitors' daily activities. This may lead to potential difficulties: (a) developing clear conservation messages that generate feelings of public responsibility for environmental consequences, and (b) inspiring behavior change (Christensen et al., 2009). Therefore, sea otters were selected as the alternative project.

Sea otters are also currently housed on-site at this aquarium. This provides up-close sea otter viewing for visitors, potentially generating positive emotional responses and "connection" to the species, lengthened learning periods, and more informed attitudes (Ballantyne et al., 2007; Orams, 2002). This presence of sea otters on-site may be crucial for the aquarium conservation project to promote visitor engagement and increase the Oregon Coast Aquarium's otter conservation efforts. Information panels displayed at the otter exhibit, for example, currently lack conservation messages about the species and may serve as one informational intervention strategy for influencing visitors' environmental motivations, norms, and attitudes (Kollmuss & Agyeman, 2002). Similar to the primary project recommendation (i.e., albatross), sea otters are considered to be "charismatic" and important for fostering visitor interest and emotional engagement as indicated by several interviewees and suggested by the conservation psychology literature. It is critical, however, that the aquarium educate visitors on less than charismatic species as well, such as those interacting with sea otters and are sensitive to similar threats.

Rather than developing a new conservation initiative, this project would highlight current sea otter research efforts at the aquarium (e.g., captive sea otter research, wild rehabilitation) and enhance collaboration with partnering institutions and their otter conservation programs (e.g., the

NWZAA, Monterey Bay Aquarium, Seattle Aquarium, Alaska SeaLife Center, Woods Hole). There are several existing governmental and non-governmental conservation efforts and expertise that the aquarium may want to partner with, support, or compliment. These include the USFWS Southern Sea Otter Recovery Plan and the Washington Department of Fish and Wildlife Recovery Plan for the Northern Sea Otter (USFWS, 2003, 2004). Large sea otter populations, however, are not currently found off the coast of Oregon, creating a potential disconnect between visitor conservation awareness and actions. These issues are other reasons why this target species is recommended as the alternative project.

Table 4. Alternative Project Recommendation Justification

Number	Rationale
1	Supported by database analysis
2	Species conservation status warrants the need for support
3	Primary threats relates to the Education Department's focus areas
4	Otters housed on-site at the aquarium to provide visitor viewing opportunities
5	Highlights current aquarium sea otter research efforts
6	Charismatic features may "connect" to public
7	Existing conservation efforts for project support
8	Internal and external support expressed

Although rockfish species, particularly bocaccio (*Sebastes paucispinis)* and canary (*Sebastes Pinniger)* rockfish, were supported by interviewees as a project target and heavily considered during the final analysis, they were not chosen for project recommendation. The rationale for this decision was based on several factors. Most importantly, the Oregon Coast Aquarium plans to develop a conservation project promoting visitor behavior change, but the primary threat known to impact rockfish is fisheries bycatch. As a result, this issue could potentially create challenges for aquarium personnel to develop clear conservation messages

encouraging public behavior change. In addition, this study showed stakeholder concerns over difficulties involved with inspiring public support and engagement for fish compared to an arguably more "charismatic species" such as albatrosses and sea otters. The limited data and / or uncertainty involved in several studies regarding rockfish (e.g., parameter uncertainty of stock assessment models) also present potential difficulties for implementing an effective conservation project and measuring its longitudinal success (Field, Dick, Pearson, & MacCall, 2009; Wallace & Cope, 2011). The Oregon Coast Aquarium currently collaborates with Oregon State University, the NMFS, and the Seattle Aquarium to monitor rockfish populations, and about 17 certified divers under the American Academy of Underwater Scientists work with this aquarium on this effort. Therefore, although this project was not chosen for recommendation, the aquarium is encouraged to increase public promotion and education of their rockfish research and conservation efforts.

Implications for a Field Component

Findings also supported incorporating a field experience into the Oregon Coast Aquarium's conservation project. Given that both of these proposed ex-situ projects (i.e., albatrosses, sea otters) would be primarily education-based, incorporating a field experience may be vital for reinforcing conservation learned on-site, promoting public engagement, and assisting with this aquarium's mission to "inspire the public to better understand, cherish, and conserve the marine environment" (Zeppel & Muloin, 2008). Furthermore, incorporating a field component may provide visitors with information about the environment while associating it with nature experiences, potentially inspiring public support for conservation efforts (Lück, 2008b). It is recommended, therefore, that a field component in the form of an ecotourism, wildlife tourism, and / or citizen science program be included within both the primary and

alternate conservation projects. All tourism representatives interviewed in this study expressed their willingness to support this conservation plan. The primary (i.e., albatrosses) and alternative (i.e., sea otters) conservation projects would provide different conservation messages to visitors, opportunities for public behavior change, and species viewing opportunities both on and off-site. These two projects, therefore, present different field experience opportunities. Given the difficulty of housing a live North Pacific albatross species on-site at the aquarium as this time, offshore wildlife viewing opportunities may be necessary to connect this species to aquarium visitors (Orams, 2002). While one of the tourism companies interviewed offers pelagic (i.e., open ocean) wildlife tours to view the seabirds, another operation interviewed is not equipped to travel far offshore. Regardless, these operators expressed their willingness to review the presence and importance of the species for marine ecosystems during their nearshore tours. In addition, one tour operation located in Hawaii would also consider offering a partnership with the aquarium to provide its visitors with the opportunity to view the birds within their native breeding grounds (primarily laysan, black-footed albatrosses). Although off-site wildlife viewing is encouraged for the goal of enhancing the Oregon Coast Aquarium's conservation efforts, there are concerns regarding potential negative impacts on the environment caused by increased visitation (e.g., species stress, habituation, dependency). It is crucial, therefore, that partnering wildlife tourism operations utilize best management practices or voluntary standards (e.g., maintaining a specified distance from species) to reduce these potential negative impacts.

Organizing small-scale citizen science projects, such as beach clean-ups, could also provide visitors with "opportunities to act" and engage in conservation of albatross currently facing threats from issues such as marine debris. A citizen science project could also be applied to the alternative conservation project (i.e., sea otters), focusing on water quality monitoring

efforts. Given the currently low number of sea otter sightings in Oregon, off-site wildlife viewing opportunities may not be feasible at this time (OSU Marine Mammal Institute, 2012; USFWS, 2005b). The Oregon Coast Aquarium, however, currently houses the largest collection of sea otters in Oregon, already providing visitors with a chance to view this species. The interviews and internal aquarium staff meeting suggested that there have been some reports of Northern and Southern sea otters sighted off the coast of Oregon, which suggests the potential for viewing opportunities in the future. Sea otter viewing and conservation messages learned on-site at the Oregon Coast Aquarium may serve as one form of off-site interpretation, influencing aquarium visitor decisions to travel to sites where sea otters currently range (e.g., Washington, California), and provide examples of appropriate tourist behaviors (Weaver, 2001). The goal of incorporating a field experience into both plans is to achieve this aquarium's mission of inspiring visitors to engage in collective conservation efforts and become "cooperative, recuperative, and restorative agents of ocean change" (Shackeroff, Hazen, & Crowder, 2009, p. 43).

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Appendix A: Primary Project Recommendation

North Pacific Albatrosses (Laysan, Black-footed, Short-tailed)

Laysan albatross
(*Phoebastria immutabilis)*

Black-footed albatross
(Phoebastria nigripes)

Short-tailed albatross
Phoebastria albatrus

Species Overview

Species Description

Albatrosses are birds that tend to live for a long time (i.e., oldest laysan albatross was recorded breeding at 55 years) with a slow rate of maturity (Naughton, Romano, & Zimmerman, 2007). Fledged chicks will remain at sea for two to five years, returning to the same nesting colony years later to breed. Although breeding can occur as early as five years, most have been found to breed after eight to nine years of age. Albatrosses are monogamous and lay a single egg. If an egg is lost, another will not be laid to replace it (Arata, Sievert, & Naughton, 2009; Birdlife International, 2012; Naughton, Romano, & Zimmerman, 2007; USFWS, 2005b;). Pacific albatrosses are surface feeders, eating primarily squid (in particular, *Ommastrephes sloani*), shrimp, miscellaneous fish, flying fish eggs, and other crustaceans. These seabirds are also known to follow ships to scavenge for food. The diet of short-tailed albatross is not well-known, but it is likely to be similar to that of the laysan and black-footed albatross (USFWS, 2005a).

Laysan Albatross. The current taxonomy for the laysan albatross is *Phoebastria immutabilis*. There are no subspecies recognized at this time. The laysan albatross is considered medium-sized (approximately 79–81 cm in length and 195–203 cm wingspan) compared to other species of albatrosses (Arata et al., 2009). The upper wings, back, upper rump, and tail are dark brown in color, compared to the white head, lower rump, and under parts. The sides of the head are often light grey, the bill is pinkish-orange with a grey tip, and the feet are slightly pink (Arata et al., 2009; Naughton et al., 2007).

Black-footed Albatross. The current taxonomy for the black-footed albatross is *Phoebastria nigripes*. There are no subspecies recognized at this time, but a recent study identified significant genetic differences between Hawaiian and Japanese populations (Naughton

et al., 2007). The black-footed albatross is also considered to be a medium-sized albatross (approximately 68–74 cm in length and 193–213 cm wingspan) compared to other albatross species (Naughton et al., 2007). The coloration for all developmental stages consists of blackish bill, legs, and feet. Juveniles look similar to adults, but they often have less grey coloration on the face. Adults differ from the fledglings by their dusky brown color, white under the eye, and white feathers over the base of the tail and undertail-coverts (i.e., flight feathers). Fledglings are uniformly dark brown with little to no white coloration (Arata et al., 2009; Naughton et al., 2007;).

Short-tailed Albatross. The current taxonomy for the short-tailed albatross is *Phoebastria albatrus.* This species is considered to be the largest of the North Pacific albatrosses (approximately 84–94 cm in length and 213–229 cm wingspan). Coloration observed on the juveniles consists of blackish-brown body with flesh-colored legs. Compared to the other species of North Pacific albatrosses, the short-tailed albatross is the only one to develop an entirely white back. In addition, the head is white with a golden-colored crown and nape (i.e., head and neck respectively). All ages have large pink bills, with a blue-tinted tip (BirdLife International, 2012; USFW, 2005a).

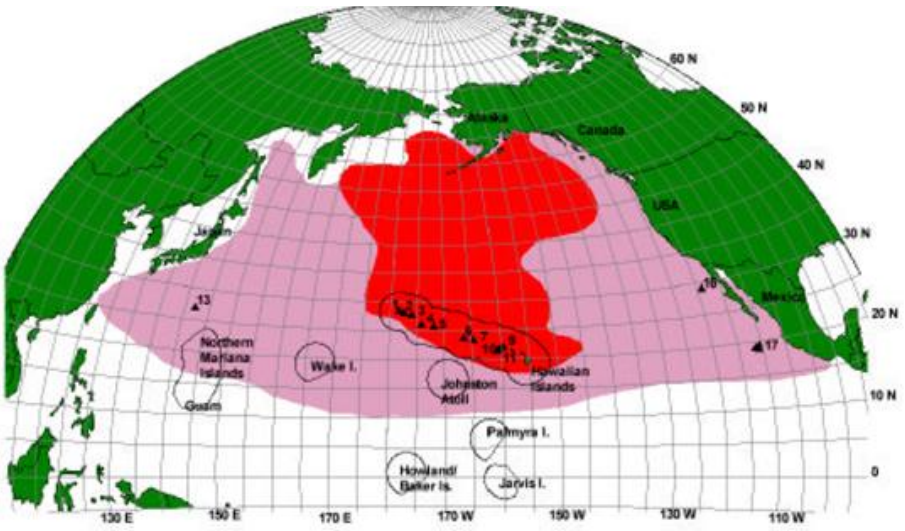
Geographic Distribution

Albatrosses are pelagic (i.e., open ocean) species that return to land specifically to breed and phases of the breeding cycle influence their foraging range. The core distribution of the laysan, black-footed, and short-tailed albatross during breeding and non-breeding seasons are described below.

Laysan Albatross. Laysan albatrosses breed primarily on oceanic islands within the tropical and subtropical North Pacific from Mexico to Japan, between 16° and 31° N latitude

(Figure 1; Naughton et al., 2007). Greater than 96% of the population breeds primarily on low-tying, sandy beaches of the Northwestern Hawaiian and laysan albatross have been found to travel to waters off the coast of Alaska or the west coast of the U.S (along the California Current) during the breeding season (November to June). During the non-breeding season, adults are often seen near the Aleutian Islands and western Gulf of Alaska. Although Hawaiian colonies migrate to the northern and western Pacific, Mexican colonies remain in the eastern Pacific. Juvenile laysan albatrosses have also been observed off the coast of eastern Japan (Arata et al.,2009; BirdLife International, 2012; Naughton et al., 2007; IUCN, 2012a).

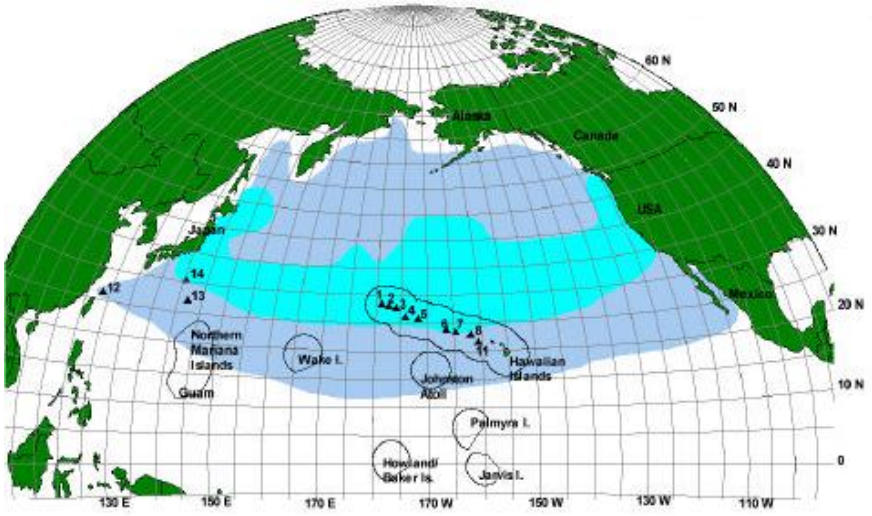
Figure 1. Estimated distribution of the laysan albatross. Darker colors indicate most prevalent sightings, and circled areas indicate recorded breeding sites (Cousins, Dalzell, & Gilman, 2001).



Black-footed Albatross. Similar to laysan albatross, black-footed albatrosses also breed primarily on oceanic islands within the tropical and subtropical North Pacific from Mexico to Japan, between 16° and 31° N latitude (Figure 2; Naughton et al., 2007). Greater than 96% of the population breeds particularly on low-lying, sandy beaches of the Northwestern Hawaiian Islands and approximately two million black-footed and laysan albatrosses breed throughout these islands (USFWS, 2005a). During the breeding season (November to June), adults have

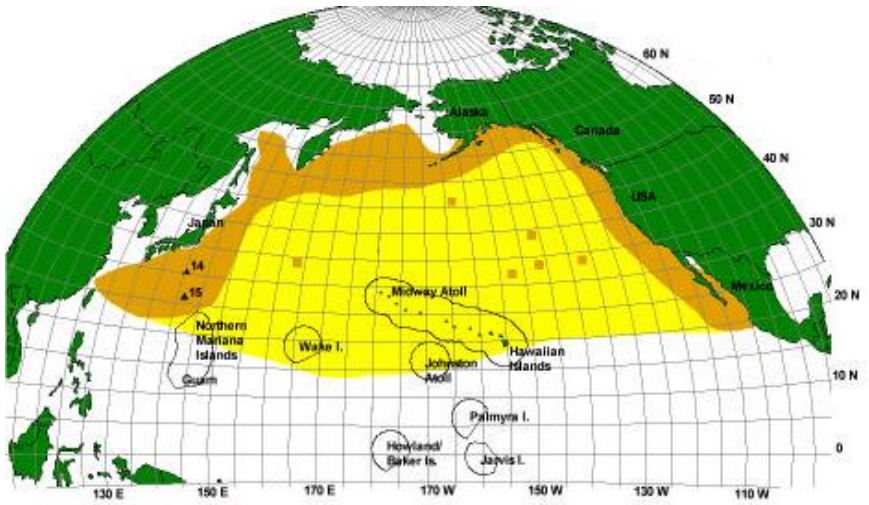
been observed making both long and short foraging trips. One study found that black-footed albatross prefer feeding off the west coast of North America (Cousins et al., 2001). During the non-breeding season, black-footed albatross are seen in greater numbers in the eastern North Pacific Ocean (Arata et al., 2009; Naughton et al., 2007).

Figure 2. Estimated distribution of the black-footed albatross. Darker colors indicate most prevalent sightings and circled areas indicate recorded breeding sites (Cousins et al., 2001).



Short-tailed albatross. The historic range of short-tailed albatrosses included most of the North Pacific Ocean and Bering Sea. Data suggest they may have even nested on Midway Atoll at one time, but current nesting attempts from visiting pairs have been unsuccessful (USFWS, 2005a). Currently, sightings are most prevalent along the coast of Japan, Russia, the Aleutian Islands, the Gulf of Alaska, and the west coast of North America (Figure 3; Cousins et al., 2001). Since 2005, 80-85% of short-tailed albatrosses breed within a single colony on Tsubame-zaki, Torishima Island of Japan and the species is found in highest densities around Japan during the breeding season (December to May). Following the breeding season, however, females are found most often around Japan and Russia, whereas males and juveniles migrate around the Aleutian Islands, Bering Sea, and North America (Birdlife International, 2012; USFWS, 2005a).

Figure 3. Estimated distribution short-tailed albatross. Darker colors indicate most prevalent sightings. Circled areas indicate recorded breeding sites (Cousins et al., 2001).



Habitat

The marine habitat most visited by North Pacific albatross species includes regions of upwelling and high productivity for feeding purposes (USFWS, 2005a). The nesting habitat for each species differs slightly from each other. The nesting habitat for the laysan albatross is typically flat and sheltered regions near the center of the island with vegetation. In comparison, black-footed albatrosses prefer to nest in loose sandy substrate along windswept shores although some have also been found to nest in low-growing vegetation. The nesting habitat for short-tailed albatrosses consists of isolated windswept offshore islands with varied amounts of vegetation (Arata et al., 2009; USFWS, 2005a).

Population Status and Trends

Laysan Albatross. There are insufficient data for laysan albatross populations prior to feather and egg hunting during the late 1800s. Following this period, however, populations were found to dramatically increase from 18,000 in 1953 to over 550,000 in 2005 on French Frigate Shoals, Midway Atoll, and Laysan Island (Table 5). In 2005, the estimated number of breeding

pairs worldwide was 590,000. Although more monitoring is needed, there is concern that population numbers are declining (Arata et al., 2009; Naughton et al., 2007).

Black-footed Albatross. There are insufficient historical data for the black-footed albatross prior to the 1800s. In the 1920s, nesting pairs in Hawaii were estimated at 17,800, whereas 200 pairs were estimated to be in Japan (Naughton et al., 2007). Between 1956 and 1958, it was estimated that black-footed albatrosses increased to 55,000 breeding pairs. Worldwide, the breeding population in 2005 was estimated to be 61,500 individuals (Table 5). A declining trend in Hawaiian Island population numbers have been observed over the past 10 to 15 years (Arata et al., 2009; Naughton et al., 2007; USFWS, 2005b;).

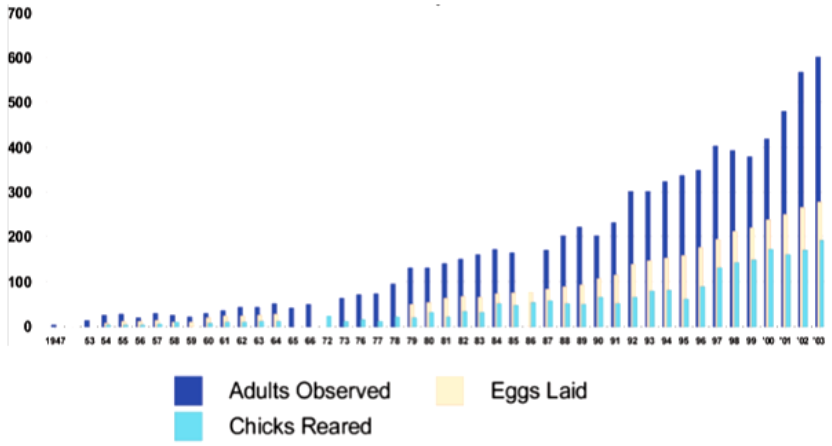
Table 5. Estimates of laysan and black-footed albatross nesting pairs between 1982-2005 (Naughton et al., 2007).

	Black-footed Albatross Pairs			Laysan Albatross Pairs		
Breeding site	1922-1923[1]	1956-1957[2]	1995-2005[3]	1922-1923[1]	1956-1957[2]	1995-2005[3]
Kure Atoll	365	70	2,020	75	350	3,900
Midway Atoll	2,430	8,700 [4]	21,829	3,800	100,055	408,133
Pearl and Hermes Reef	3,650	7,103	6,116	830	17,750	6,912
Lisianski Island	1,810	2,700	3,737	1,270	30,000	26,500
Laysan Island	8,510	34,000	21,006	10,800	130,000	140,861
French Frigate Shoals	730	1,499	4,259	200	584	3,226
Necker Island	180	370	112	950	2,500	500
Nihoa Island	110	50	31	3	500	0
Kaula		100	0	0		63
Lehua			10			12
Niihau					500	175
Kauai			0			159
Oahu			0			56
Total	**17,785**	**54,592**	**59,120**	**17,928**	**282,239**	**590,497**

***Short-tailed Albatross*.** Prior to feather and body exploitation, population counts for the short-tailed albatross were not available. At the beginning of the 20th century, hunting of breeding colonies in Japan led to a dramatic population decline and near extinction of the species (USFWS, 2005a, 2005b). Following the declaration of their extinction, several breeding pairs were found on Torishima, Japan and it was theorized that these pairs were at sea during the end of the hunting period (USFWS, 2005a). Through various management strategies, population

numbers increased to an estimated 600 breeding pairs on Torishima in 2004-2005 (Figure 4). The annual population increase is estimated at > 6% (USFWS, 2005b).

Figure 4. Short-tailed albatross population trend on Torishima Island, Japan from 1923-2005 (USFWS, 2005a).



Threats

Historically, albatrosses were subject to large-scale hunting for their feathers and eggs, leading to a dramatic decline in numbers. Currently, however, these seabirds face additional ecological and anthropogenic threats. The leading natural predator for albatross is considered to be sharks (Arata et al., 2009, USFWS, 2012a). Crows are also known to feed on albatross eggs and juveniles. Non-native predators introduced to common breeding grounds include dogs, cats, pigs, mongooses, and rats. In addition, invasive plants such as Golden crown-beard (*Verbesina encelioides*) found on the Northern Hawaiian Islands may reduce the total area of the breeding grounds if unmanaged, and potentially lead to chick entanglement (USFWS, 2007). Disease such as avian pox (a viral disease transmitted by mosquitoes) is known to particularly increase mortality rates of laysan albatross chicks (Arata et al., 2009; USFWS, 2005a, 2005b).

Habitat loss due to both anthropogenic activities (e.g., urban and military development) and natural disasters (e.g. volcanic eruptions, tsunamis, monsoon rains) pose additional threats to albatrosses. For example, the 1902 and 1939 eruptions on Torishima destroyed a large portion of the original breeding grounds for the short-tailed albatross (BirdLife International, 2012; USFWS, 2005a). Climate change models predicting a net increase in sea level rise over the next century threatens many low-lying breeding colonies of all three albatross species (BirdLife International, 2012; USFWS, 2005b). Changes in ocean and atmospheric conditions (e.g., pressure, temperature, salinity) can lead to alterations in marine primary production. This ocean regime shift may ultimately affect higher trophic levels, including albatrosses (USFWS, 2005a).

Incidental capture in commercial fisheries (i.e., bycatch) is the leading cause of mortality for albatrosses (IUCN, 2012a, 2012b; USFWS, 2005a). This includes longline fisheries such as pelagic (gear set close to sea surface) and demersal (gear set on or near the sea floor), as well as trawl fisheries. For example, approximately 664 laysan and 221 black-footed albatrosses were taken in Alaska demersal longline fisheries between 1993 and 2001 (USFWS, 2005b). Between 1978 and 1992, a driftnet fishing period, bycatch was estimated at 27,800 albatrosses. The primary fisheries threat results from albatrosses attempting to catch baited hooks before they enter the water. During this time, the seabirds can become hooked or snagged themselves, being pulled under the water and drowning. Cable strikes and entanglement in equipment poses additional fisheries-related threats to albatrosses (Arata et al., 2009; BirdLife International, 2012; Naughton et al., 2007; USFWS, 2005a, 2005b).

Contaminants including toxic metals (e.g., lead, mercury), pesticides, and polychlorinated biphenyls (PCBs) have been found to adversely impact albatrosses. Contamination can lead to impaired reproduction, decreased immune function, genetic mutation, and mortality (Arata et al.,

2009; USFWS, 2005a). Oil can also affect albatrosses (e.g., direct toxicity, oiling of eggs, reduced thermoregulation ability; USFWS, 2005a). Marine debris is considered to be a significant threat to albatrosses, often mistaking fragments for food. Albatross chicks are particularly vulnerable to ingested contaminants, as they are often fed debris by adults prior to developing the ability to regurgitate foreign materials. One study, for example, conducted necropsies on 251 laysan albatross and found 97% of chicks contained plastic in their bodies (e.g., fishing line, buttons, beverage bottle caps, cigarette lighters, golf tees, toys; USFWS, 2005a). Malnutrition and dehydration often results from large amounts of ingested debris. Furthermore, sharp contaminants can lead to internal injuries and even direct mortality (Arata et al., 2009; BirdLife International, 2012; IUCN, 2012a, 2012b, 2012c; Naughton, Romano, & Zimmerman, 2007; USFWS, 2005a, 2005b).

Conservation

Migratory birds such as albatrosses are protected under migratory bird treaties within the United States, Canada, Japan, Russia, and China. These treaties include the Migratory Bird Treaty Act in the United States, Migratory Bird Convention Act in Canada, Wildlife Protection and Hunting Law in Japan, Protection and Use of Wild Animals in Russia, and the Wildlife Protection Law in China (Arata et al., 2009). Legal protection applied to specific North Pacific albatross species (i.e., laysan, black-footed, short-tailed) are summarized below.

There are also several conservation and management actions dedicated to North Pacific albatrosses, including marine debris and fisheries mitigation strategies. In addition, the production of streamer lines, otherwise known as bird scaring or tori lines, were designed to keep the seabirds away from longline hooks as they are being set into the water (Naughton et al., 2007). Since 2006, the Western and Central Pacific Fisheries Commission has required all large

tuna and swordfish longline vessels to use at least two seabird bycatch mitigation measures when fishing north of 23°N. Furthermore, the U.S. West Coast Fishing Vessel Owners Association (FVOA), representing halibut and sablefish longlining, requires members to use streamer lines to mitigate albatross bycatch (Naughton et al., 2007). Additional conservation strategies include population monitoring and land-based management such as restoration of breeding grounds (Life of Birds, 2012).

Laysan Albatross. In 2003, the International Union for the Conservation of Nature (IUCN) listed the laysan albatross as "vulnerable" (IUCN, 2012a). The species is currently listed as "threatened" in Mexico, as well as listed in the Bird Conservation Regions 5, 67, and 68 by the USFWS (Arata et al., 2009). The Hawaiian breeding sites for both laysan and black-footed albatrosses are considered part of the U.S. National Wildlife Refuge system and State of Hawaii Seabird Sanctuaries. Around the Northwestern Hawaiian Islands, a Protected Species Zone (50 nautical miles) was established, prohibiting longline fishing (Arata et al., 2009).

Black-footed Albatross. In 2003, the IUCN listed the black-footed albatross as "endangered" (IUCN, 2012b) and in 2004, Earth Justice submitted a petition to list the species under the ESA (Arata et al., 2009). The USFWS is currently reviewing this petition. Black-footed albatrosses are, however, listed as a Bird of Conservation Concern at national and regional levels, as well as "threatened" by Hawaii and Mexico. In 2007, they were listed as a "Species of Special Concern" by the Committee on the Status of Endangered Wildlife in Canada (Naughton et al., 2007).

Short-tailed Albatross. In 1994, the IUCN listed the short-tailed albatross as "endangered," but the species was down-listed to "vulnerable" in 2000 (IUCN, 2012c). The species is legally protected in Japan, Canada, and the United States. In 1970, the species was

listed as "endangered" under the U.S. Species Conservation Act of 1969 (prior to establishment of the ESA). Although the short-tailed albatross was listed as "endangered" throughout its distribution, it was excluded from the United States due to an administrative error. This, however, was corrected in 2000 and the species is now listed as "endangered" throughout the country (USFWS, 2005a).

Oregon Coast Aquarium Project Implementation Suggestions

In response to the Oregon Coast Aquarium's mission to "inspire the public to better understand, cherish, and conserve the marine environment," and this aquarium's current shift to devote some of its efforts to additional conservation efforts, it is recommended that this aquarium focus on the three North Pacific Albatross species. The growing concern for the cumulative threats to laysan, black-footed, and short-tailed albatrosses may benefit from an education-based ex-situ conservation project at this aquarium. Below is a summary of potential partners, guiding programs, and important stakeholders providing potential support for the implementation of the project. Establishing partnerships with outside organizations and agencies is essential to execute an effective project that: (a) utilizes skills and resources of different institutions to manage a comprehensive conservation project, (b) distributes various conservation efforts among several organizations to reduce the requirement load on one organization, and (c) allows for the aquarium to participate in outside field research efforts that may be too resource consuming to conduct individually.

Potential Project Partners and Guiding Programs

National Oceanic and Atmospheric Administration (NOAA) Marine Debris Program.

The NOAA Marine Debris Program (MDP) supports global efforts to mitigate marine debris. With collaboration from NOAA; additional federal, state, and local agencies; tribes; non-

governmental organizations; academia; and industries, this program works on various projects, including: marine debris removal (land-based and sea), education and outreach, natural disaster marine debris emergency response, and marine debris survey and assessments (NOAA, 2012). These programs may provide effective resources for the aquarium conservation project, including interpretive materials (e.g., brochures, marine debris toolkit, education action campaigns) and marine debris data sets. Promotion of NOAA's Oregon Derelict Gear Recovery Project may allow the aquarium to further "connect to" and enhance the ocean literacy among its local visitors impacted by marine debris. Awareness of the consequences of marine debris on albatross and their marine environment has the potential to generate self-conscious emotional responses (e.g., empathy, guilt) and inspire behavior changes (Manfredo, 2008; Vining & Ebreo, 2003). The NOAA MDP also offers updated tracking data of the marine debris resulting from the 2011 tsunami that struck the coast of Japan, projecting its arrival to the nation's west coast in the near future. These materials can be applied onsite at the aquarium, as well as promoted on the aquarium's website (e.g., develop a "Conservation Portal"). It may provide interpretive support for citizen-science fieldwork (e.g., beach clean-up program), reducing the potential development of visitor cognitive dissonance through increased conservation awareness and public engagement opportunities.

U.S. Fish and Wildlife Service (USFWS). In 2005, the USFWS developed a comprehensive Seabird Conservation Action Plan for the Pacific region. The purpose of this document was to identify priorities for management, monitoring, research, outreach, and planning of Pacific seabirds. This document may serve as a guide for the aquarium to implement a regional conservation project that considers the cumulative impacts on North Pacific albatross species, including social, political, and ecological components. In coordination with various

partners, the USFWS currently works to remove invasive species, mitigate adverse albatross-fisheries interactions, and respond to oil spills and contaminants threatening Pacific seabirds (USFWS, 2005b). In addition, they work to execute a seabird monitoring program, providing supportive field and data resources for the aquarium conservation project.

Managed under the USFWS, the Kīlauea Point National Wildlife Refuge (1985) may provide a wildlife viewing opportunity for aquarium visitors, using webcams strategically positioned to view albatross nests located on the 203 acres of protected land (USFWS, 2012). Live animal viewing opportunities may help to generate positive emotional responses related to albatrosses and encourage the understanding of complex seabird conservation issues and visitor roles within these issues (Yalowitz, 2004). The USFWS, along with partnering groups and stakeholders (e.g., state and federal governments, tribal governments, NGOs / working groups, watershed councils, industries) also developed the Coastal Program as part of the Pacific Region Partners for Fish and Wildlife and Coastal Program Strategic Plan (2007). The primary purpose of the Coastal Program is to conserve threatened and endangered species, migratory birds, and inter-jurisdictional fish through voluntary habitat restoration projects in the Pacific Northwest (Washington, Oregon, Idaho, California) and the Hawaiian Islands. Participating in this collaborative effort may assist the aquarium's conservation efforts for North Pacific albatrosses, remaining comprehensive in approach. In return, the aquarium may provide the "alliance" methods for enhancing public participation and behavior changes through an education-based conservation project focused on albatrosses.

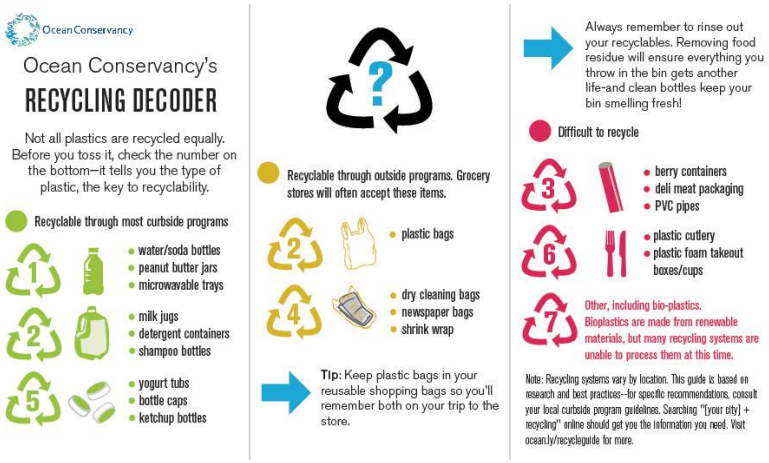
Oregon Department of Fish and Wildlife (ODFW). In 2006, ODFW developed the Oregon Nearshore Strategy, a comprehensive approach to managing marine fish and wildlife issues. The purpose of the strategy is to "promote actions that will conserve ecological functions

and nearshore marine resources to provide long-term ecological, economic, and social benefits for current and future generations of Oregonians" (ODFW, 2006, p. i). Through this strategy, ODFW may provide the aquarium resources and methods to promote conservation actions for North Pacific albatross species, as well as other species living in shared marine ecosystems.

American Bird Conservancy, BirdLife International, and the Pacific Seabird Group. The American Bird Conservancy (ABC Birds), a 501(c) (3) nonprofit organization; BirdLife International, a global partnership of conservation organizations; and the Pacific Seabird Group (PSG), a group of professional seabird researchers and managers, are all dedicated to the study and conservation of birds. Developing a partnership with these three ornithological organizations may provide current research and tracking data of North Pacific albatrosses, outreach opportunities, and policy tools to be used in the aquarium's conservation project (ABC Birds, 2012; BirdLife International, 2012; PSG, 2012).

Ocean Conservancy and SurfRider Foundation. The Ocean Conservancy and SurfRider Foundation are nonprofit organizations that may serve as valuable partnering organizations for the Oregon Coast Aquarium. These groups have the potential to provide the aquarium marine debris and seabird conservation education support, specifically in the form of field and outreach campaigns. In addition, the Ocean Conservancy developed printable, pocket-sized "Recycling Decoder" pamphlets (Figure 5), similar to the Monterey Bay Aquarium consumer's guide to seafood. These may be distributed to aquarium visitors in an effort to reinforce conservation messages learned on-site at the aquarium, inspiring public behavior changes regarding marine debris. The use of these pamphlets may influence visitors' internal locus of control (Kollmuss & Agyeman, 2002), inspiring the belief that they can make a difference regarding marine debris issues currently threatening albatross species and their habitat.

Figure 5. Example of the Ocean Conservancy's Recycling Decoder



Papahânaumokuâkea Marine National Monument, HI. In 2006, Papahânaumokuâkea Marine National Monument was established and is considered the largest conservation area in the country (Papahanaumokuakea, 2012). Approximately 80% of nesting laysan and black-footed albatrosses are found at this site. Since 1991, this facility actively surveys nesting sites and has recently joined individuals from USFWS, NOAA, State of Hawaii, and the U.S. Forest Service to study and provide public education about albatrosses (Papahanaumokuakea, 2012). A partnership with this facility may provide up to date research on the species, additional interpretation guidance, and other opportunities for establishing a webcam station for aquarium visitors to view live albatrosses.

Monterey Bay Aquarium. The Monterey Bay Aquarium has developed several species-specific conservation programs in an effort to promote marine conservation. Although it is not considered a "conservation project," the aquarium currently houses a rehabilitated laysan albatross, educating public audiences about marine debris issues. This seabird serves as an "ambassador" for wild seabird populations during live encounters (Monterey Bay Aquarium, 2012). It is unclear, however, if the aquarium reviews additional albatross threats (e.g., fisheries-related interactions, climate change) during these programs. The aquarium's conservation

education messages (e.g., importance of recycling, carrying re-useable bags) and interpretation programs focused on albatrosses may serve as a guide during initial developmental stages of the Oregon Coast Aquarium conservation project.

Hatfield Marine Science Center, Oregon State University. Hatfield Marine Science Center (HMSC), Oregon State University's campus for research, education, and outreach in marine and coastal sciences, is in close proximity to the Oregon Coast Aquarium and may provide several resources for supporting the albatross conservation project (e.g., research, outreach tools, education reinforcement). In collaboration with the university, the aquarium may receive additional staff and volunteer services for project implementation. Currently, an albatross research and education exhibit is on display at HMSC, potentially providing a basis for the aquarium to compliment such work (HMSC, 2012).

Center for Microbial Oceanography: Research and Education (C-MORE). C-MORE is a National Science Foundation (NSF) sponsored Science and Technology Center. The center works toward developing a comprehensive understanding of the diverse microorganisms in the sea (e.g. genetic basis) and the biogeochemical processes interconnected with the marine environment (C-MORE, 2012). Education is a main component of C-MORE. A three-lesson kit (for ages 8-12) was developed to examine causes, geographical distribution, and biological impacts of marine debris. This kit can be modified for diverse age groups and may provide a unique hands-on activity either onsite at the Oregon Coast Aquarium, or as a component of a beach clean-up citizen science program to increase visitor understanding of marine threats.

Recommended Implementation Items

Table 6 presents recommended implementation actions for the Oregon Coast Aquarium strategic conservation project. Potential partners for each action are highlighted in an effort to

provide institutional support (i.e., scientific data resources, monitoring and field assessments, financial and volunteer support, exhibit guidance). To increase overall success of each implementation item, internal aquarium participation is crucial.

Table 6. Primary Conservation Project Implementation Items

Action	Implementation Item	Potential Partners
1	Install live webcams stationed at various albatross nesting sites (e.g., Papahânaumokuâkea Marine National Monument, Kilauea Point National Wildlife Refuge) to provide live albatross viewing for aquarium visitors	USFWS & Papahânaumokuâkea Marine National Monument
2	Construct an exhibit with information panels and images, enhancing public understanding of albatrosses' connection to Oregon marine environments, and current ecological and anthropogenic threats to the species	USFWS, HMSC, Monterey Bay Aquarium, ABC Birds, Birdlife International & PSG
3	Increase visitor-staff interactions through the use of interpretive artifacts (e.g., albatross bolus filled with marine debris, derelict fishing gear, bird scaring / tori lines) to reduce potential barriers of engagement	NOAA MDP, USFWS, Papahânaumokuâkea Marine National Monument
4	Distribute Ocean Conservancy Recycling Decoder pamphlets to inspire visitor stewardship of the ocean	Ocean Conservancy
5	Organize reoccurring beach clean-up citizen science program and use the C-MORE marine debris kit for support	HMSC, C-MORE, Ocean Conservancy, SurfRider
6	Hold community marine debris and sustainable fisheries workshops to educate the public and stakeholders. Artifacts and activities are encouraged to enhance engagement (e.g., NOAA marine debris tracker, C-MORE marine debris kit)	NOAA MDP, USFWS, HMSC & C-MORE
7	Promote wildlife viewing of North Pacific albatrosses to foster visitor engagement. Tour operations may also be able to provide the aquarium with data logs of albatross sightings	Local marine tourism operations

Next Steps for Aquarium Personnel and Measuring Success

If the primary project recommendation is selected by Oregon Coast Aquarium personnel, an urgent next step for the aquarium is to identify clear conservation project goals and objectives. Additionally, before implementing the project, aquarium personnel are encouraged to clearly specify measurable indicators for success (e.g., increased visitor engagement) and collect data from the outset measuring these indicators to ensure effective monitoring and evaluation. It is critical to evaluate the performance of the Oregon Coast Aquarium conservation project to determine responsibility and accountability for success (or failure), as well as how it can be improved. Internal and external assessments of projects can vary due to the specific activity being measured, methods, time scale used, and existence of project standards and criteria (Kleiman et al., 2000).

According to AZA Accreditation Standard (3.2.2), conservation programs should be evaluated on a regular basis (AZA, 2011). Therefore, it is recommended that the Oregon Coast Aquarium actively measure the success of their strategic conservation project. Examples of measurable indicators and respective data collection methods include: (a) on-site surveys to assess visitor response to conservation messages and their attitudes and intent to change behaviors related to the conservation project; (b) off-site surveys to assess visitor retention of conservation messages and active behavior changes post-visit; (c) partner with outside research and government organizations (e.g., USFWS, PSG) to monitor the status and trends of North Pacific albatross species; and (d) record trends in public engagement (e.g., participation of citizen-science projects, workshop programs, field experiences). A written annual report may assist the aquarium in measuring the longitudinal success of the project and provide direction for

creating an adaptive management strategy to achieve both short-term and long-term goals for the project.

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U.S. Fish and Wildlife Service. (2012). *Kīlauea Point National Wildlife Refuge*. Retrieved from http://www.fws.gov/kilaueapoint/aboutus.html

Albatross Images

http://kenai.fws.gov/overview/notebook/2011/june/3june2011.htm

http://directoryofkauai.net/blog/tag/black-footed-albatross

http://www.abcbirds.org/newsandreports/releases/110909.html

Appendix B: Alternative Project Recommendation

Sea Otter

(*Enhydra lutris)*

Species Overview

Species Description

The current taxonomy for the sea otter is *Enhydra lutris*. Three subspecies have been identified, including: *Enhydra lutris lutris* (Russia, Japan), *Enhydra lutris kenyoni* (Alaska, with translocations to SE Alaska, Pribilof Islands, Alaska, British Columbia, Canada, Washington, Oregon), and *Enhydra lutris nereis* (California; Doroff, 2010; IUCN, 2012; Lance, Rischardson, & Allen, 2004). There are five sea otter stocks currently recognized in the United States, including one stock in both California and Washington, and three stocks in Alaska (Southeast, Southcentral, Southwest). According to the Marine Mammal Protection Act Section 3 (11) (16 U.S.C 1361), a population stock is defined as "a group of marine mammals of the same species or smaller taxa in a common spatial arrangement that interbreeds when mature" (Lance et al., 2004, p.13).

Sea otters are considered the largest species of otter in the world, and the only species that remains in the marine environment throughout all life stages. Therefore, they possess unique adaptations for survival, including hind flippers, flattened premolars and molars for consuming hard-shelled marine invertebrates, and enlarged kidneys to counteract high levels of salt ingestion. When foraging for food, sea otters have been known to remain under water for approximately 1.5 to 4 minutes, and they can dive between 2 and 75 m hunting for benthic invertebrates (e.g., clams, crabs, sea urchins, snails) and occasionally fish (USFWS, 2005). Sea otters are considered a keystone species, having a fundamental ecological importance for the nearshore community structure. Researchers, for example, believe that sea otter predation on sea urchins helps to manage urchin populations that feed primarily on kelp beds (Jessup et al., 2004; Lance et al., 2004). Furthermore, they serve as effective "conditional indicator species,"

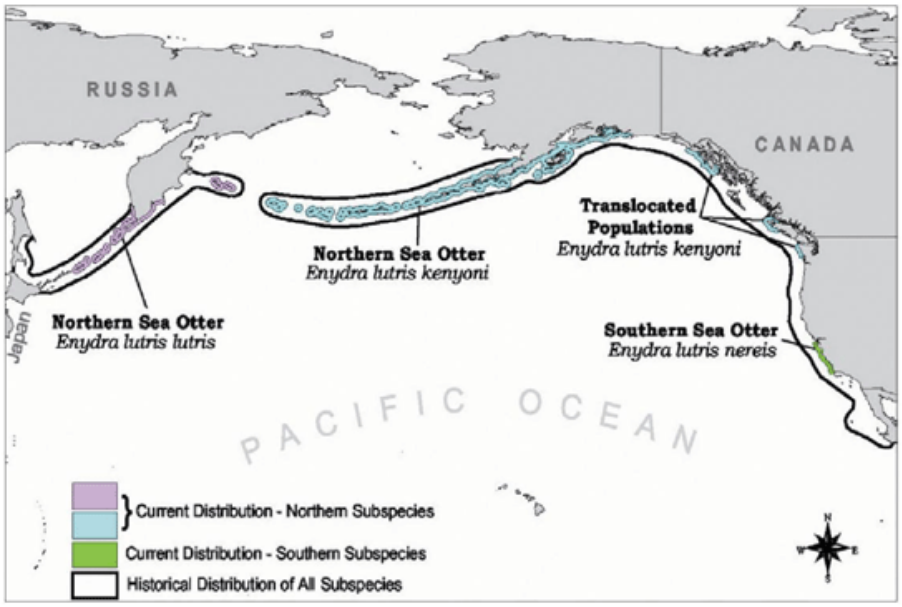
otherwise known as “sentinel species,” assessing the health of nearshore marine ecosystems influenced by various ecological and anthropogenic disturbances (Monterey Bay Aquarium, 2011; Zacharias & Roff, 2001).

Sea otter molting occurs throughout the year, ranging from dark to red-brown body coloration, and pale faces, neck and shoulders (Lance et al., 2004; USFWS, 2005). Rather than containing blubber for insulation similar to other marine mammals, sea otters have thick fur that is coated in oil for water-proofing purposes. Adult sea otters reach an average length of 1.4m and weigh and average of 32 to 41kg. They also live quite a long time, averaging from about 15 to 20 years for females and 10 to 15 years for males. Sea otters are polygynous species (i.e., males mate with multiple females) and usually give birth to a single pup (Sanctuary Integrated Monitoring Network, 2012; USFWS, 2005).

Geographic Distribution

Historically, sea otters were found in nearshore waters of the North Pacific from Japan to Russia, and along the west coast of the United States (including Washington, Oregon, California). Following large-scale commercial harvesting of sea otters, however, populations dramatically declined (IUCN, 2012; Lance et al., USFWS, 2005). Today, populations remain in the coastal waters of Alaska, British Columbia, Washington, California, Russia (including Kuril Islands, Kamchatka Peninsula, Commander Islands), and Japan (Doroff, 2010; IUCN, 2012; USFWS, 2005). Figure 6 illustrates the historic and present range of sea otters.

Figure 6. Historical and present geographic distribution of sea otter subspecies, *Enhydra lutris* (Sanctuary Integrated Monitoring Network, 2012)



Habitat

Sea otters prefer shallow coastal waters, including bays, tidal estuaries, and outer coasts (Doroff, 2010; IUCN, 2012; USFWS, 2005). According to Laidre (2001), the marine topography of sea otter habitats consists of a variety of substrates from sandy to rocky reefs with little to moderately-sized kelp beds. Sea otters remain almost exclusively in the water, occasionally hauling out during low tide. This species is considered rarely territorial, but males may establish territories extending approximately 16km along the coastline. Although they usually maintain permanent home ranges, sea otters are known to migrate long distances from their core population. The affinity to migrate may vary by sex and age (often sub-adult and adult males). If an ideal habitat is discovered, sea otters will settle permanently in the new location (Lance et al., 2004; Sanctuary Integrated Monitoring Network, 2012).

Population Status and Trends

Prior to mass commercial harvesting, worldwide populations were estimated between 150,000 and 300,000 sea otters (IUCN, 2012). Unregulated maritime fur harvesting began in the mid-1700s and continued until the near extinction of sea otters during the early 1900s (Lance et al., 2004). Although populations in Mexico and British Columbia became extinct, small groups in Russia, the Aleutian Islands, other parts of Alaska, British Columbia, and California survived. Following numerous conservation efforts, the worldwide population in 2000 increased to approximately 126,000 sea otters. According to a three-year survey running from 2006-2008, the Southern sea otter population totaled to 2,286 individuals and is slowly increasing (USFWS, 2008a). A stock assessment of the South Central Alaska population estimated 15,090 sea otters and is considered to be stable (USFWS, 2008b). As of 2008, the Southeast Alaskan population was estimated at 10,563 sea otters and also appears stable (USFWS, 2008c). The Southwest Alaskan sea otter population, however, is thought to be declining with an estimated 47,676 individuals (USFWS, 2008d). The stock assessment for the Washington population estimated approximately 1,125 individuals during 2007 and is thought to be slowly increasing (USFWS, 2008e).

Threats

Common natural predators of sea otters include orca whales (*Orcinus orca*), great white sharks (*Carcharodon carcharias*), bald eagles (*Haliaeetus leucocephalus*), coyotes (*Canis latrans*), and brown bears (*Ursus arctos*). It is believed that declines in the orca's preferred pray (e.g. Northern fur seals) may be one factor leading to increased sea otter predation, particularly among Northern stocks (IUCN, 2012; USFWS, 2009). Changes in oceanic and atmospheric conditions are thought to be another threat to sea otters. One study, for example, thought that the dramatic increase in sea otter mortality between 1995 and 2001 may have been largely due to

effects of El Nino and La Nina cycles, including disruption in foraging behaviors and reduction in food availability (IUCN, 2012; Jessup et al., 2004). Climate change may also impact sea otter populations, as the varying environmental conditions (e.g., pressure, temperature, salinity) can alter marine trophic levels. Infectious diseases, including two different protozoans found to breed in cats and opossums (i.e., *Toxoplasma gondii*, *Sarcocystis neurona*), have been identified to be a major cause of Southern sea otter mortality (IUCN, 2012). Naturally occurring marine toxins, such as paralytic shellfish poisoning (PSP) caused by the dinoflagellate *Alexandrium catenella,* may also be a factor in sea otter mortality (Lance et al., 2004).

There are multiple anthropogenic activities threatening sea otter survival. Oil spills are considered to be the greatest threat, potentially leading to immediate issues (e.g., hypotherimia as oil reduces the ability of the fur to provide insulation) and chronic issues (e.g., lung damage from inhalation of toxic fumes). In addition, sea otters continuously groom their fur, leading to the ingestion of oil and other contaminants (Lance et al., 2004; Sanctuary Integrated Monitoring Network, 2012). For example, the 1989 Exxon Valdez spill in Prince William Sound, Alaska lead to large scale sea otter mortality estimated at 2,650 to 3,905 individuals (IUCN, 2012). The bioaccumulation of additional contaminants in the food chain, such as polychlorinated biphenyls (PCBs), chlorinated hydrocarbons (DDT and derivatives), organotins, and heavy metals, have been found to adversely impact sea otters. Incidental entanglement and entrapment of sea otters in commercial fishing gear (gill and trammel nets) is also considered responsible for increased sea otter mortality. For example, between the mid-1970s and early 1980s, approximately 80 sea otters were killed in California due to entanglement (IUCN, 2012; Lance et al., 2004). In addition, recreational activities (e.g. kayaking, boating, scuba diving) have been known to disturb sea otters and impact normal resting, foraging, and breeding behaviors.

Detrimental impacts, such as reoccurring stress and boat strikes, can also lead to sea otter mortality (Sanctuary Integrated Monitoring Network, 2012).

Conservation

Internationally, sea otters are protected under the Treaty for the Preservation and Protection of Fur Seals (37 Stat. 1542, T.S. no. 564), signed by Japan, Russia, the United Kingdom (for Canada), and the United States. Sea otters are currently listed as "endangered" by the IUCN (IUCN, 2012). Within the U.S., sea otters are protected under the Marine Mammal Protection Act (1972) and populations are managed by the USFWS, as designated by the Secretary of the Interior (Lance et al., 2004). The taking of sea otters (i.e., harassment, hunting, capturing, killing) is prohibited, but certain provisions under the Act (16 USC 1371, section 101(b)) allow coastal Alaskan tribes to harvest otters for subsistence and ceremonial purposes (Lance et al., 2004; NOAA NMFS, 2007).

In the U.S., several conservation and management efforts have been created for sea otters. USFWS translocation efforts of the Southern sea otters began in 1987 following their ESA listing as "threatened" in 1997. During the same year, additional otter conservation plans were developed, including the collaboration between NOAA and the U.S. Coast Guard to manage large vessel traffic in the Monterey Bay Sanctuary (USFWS, 2003). The translocation of Northern sea otters began in the early 1980s. Although populations increased in Southeast Alaska, British Columbia, and Washington, efforts were not successful for the Oregon population. In 2005, the Northern sea otter as was ESA listed as "threatened" (USFWS, 2012). In 2009, the USFWS designated a critical habitat for the Southwest Alaska subspecies, extending 15,164km^2 from the tip of the Aleutian Islands to lower western Cook Inlet (USFWS, 2009). Brief summaries of additional sea otter conservation efforts and affiliate organizations are listed in the "Potential Project Partners and Guiding Programs" section below.

Oregon Coast Aquarium Project Implementation Suggestions

Sea otters are recommended as the alternative strategic conservation project for the Oregon Coast Aquarium. In the past, this aquarium has been involved in several sea otter research and conservation-related initiatives, including captive breeding efforts, captive sea otter research (e.g., behavior and olfactory sensitivity), and the rehabilitation of injured wild otters. Alongside the Seattle Aquarium, Point Defiance Zoo and Aquarium, and the Oregon Zoo, the Oregon Coast Aquarium also assisted the Washington Department of Fish and Wildlife (WDFW) in developing a sea otter disaster recovery plan in the event of an oil spill (J. Burke, personal communication, 2012). On-site information panels displayed at the sea otter exhibit in the aquarium currently lack conservation messages regarding the species, warranting the need for the aquarium to develop a conservation project that: (a) addresses the cumulative threats to sea otters, (b) promotes past aquarium research and conservation efforts for the species, and (c) informs the public about the species in an effort to inspire environmental behavior changes. Below is a summary of potential partners, guiding programs, and important stakeholders providing potential support for the aquarium project. Establishing partnerships with outside organizations and agencies is essential to implement an effective project that: (a) utilizes skills and resources of different institutions to manage a comprehensive conservation project, (b) distributes various conservation efforts among several organizations in an effort to reduce the requirement load on a single organization, and (c) allows for the Oregon Coast Aquarium to participate in outside field research efforts that may be too resource consuming to conduct individually.

Potential Project Partners and Guiding Programs

U.S. Fish and Wildlife Service (USFWS). In 1982, the Southern Sea Otter Recovery Plan was developed by the USFWS to research and monitor population status and threats. The primary objective of the plan is to manage human activities that may impact the species in an

effort to remove the sea otter from the ESA. A revised version of the plan was published in 2003, calling for the need to monitor the species demographics and evaluate resource needs, protect populations from human disturbances (e.g., manage petroleum exploration and extraction), research factors limiting population growth, and evaluating failed translocation programs (e.g., within Oregon; USFWS, 2003). This plan may provide guidance for the Oregon Coast Aquarium to develop an ex-situ sea otter conservation project that remains comprehensive in its approach.

The USFWS Coastal Program, part of the Pacific Region Partners for Fish and Wildlife and Coastal Program Strategic Plan (2007), is a collaborative effort comprised of diverse partnering groups and stakeholders (e.g., state and federal governments, tribal governments, NGOs / working groups, watershed councils, industries). The goal of this plan is to conserve threatened and endangered species, migratory birds, and inter-jurisdictional fish through voluntary habitat restoration projects (USFWS, 2007). This effort may help support the Oregon Coast Aquarium sea otter project and offer an opportunity for this aquarium to become involved in and / or promote in-situ projects related to conservation of sea otter habitats. Participating in this collaborative effort may serve as a good example for aquarium visitors to understand how the aquarium is involved in promoting healthy coastal ecosystems, with special regard for preparing for potential sea otter reintroduction efforts in Oregon, as well as provide visitors with "opportunities to act."

U.S. Environmental Protection Agency (EPA): Office of Wetlands, Oceans and Watersheds (OWOW). Beginning in 1990, the EPA has developed a series of manuals guiding volunteer water monitoring programs, including: "Volunteer Stream Monitoring: A Methods Manual" and "Volunteer Water Monitoring: A Guide for State Managers" (EPA OWOW, 1997). These manuals may provide the Oregon Coast Aquarium with guidance for coordinating and

implementing effective aquarium citizen science programs focusing on the water quality of local wetlands and watersheds that may impact potential future sea otter habitats. In addition, the EPA provides resources for outreach programs focusing on water quality. For example, the "Nonpoint Source Outreach Toolkit" provides various education materials, including interactive projects, brochures, and public conservation messages (e.g., methods for preventing household storm water run-off) that may provide support for an aquarium citizen science program in replacement of a wildlife viewing component (EPA OWOW, 2012). These interpretive materials may further enhance the Oregon Coast Aquarium's conservation project, increase visitor environmental literacy, and reinforce conservation messages learned onsite at this institution.

Washington Department of Fish and Wildlife (WDFW). Following the listing of sea otters as "endangered" by the State of Washington, in 2004 the WDFW developed a recovery plan for the Northern sea otter. The purpose of the plan was to promote self-sustaining sea otter populations in Washington and to manage the Washington stock with the goal of downlisting the otter's state status to "threatened" (USFWS, 2004). It is recommended that the Oregon Coast Aquarium promote their role in developing the WDFW sea otter disaster plan on-site (e.g., exhibit panels). In addition, guidance provided by the sea otter recovery plan may assist the aquarium in developing an effective conservation strategy that supports potential future translocation efforts of sea otters in Oregon waters. Without large sea otter populations currently located in Oregon, visitors may develop a personal "disconnect" between their conservation attitudes and actions. Therefore, communicating the value of this aquarium's project for future sea otter translocation efforts may provide visitors with the necessary inspiration to make behavior changes that further assist local otter conservation.

Oregon Department of Fish and Wildlife (ODFW). Oregon's Nearshore Strategy developed by the Oregon Department of Fish and Wildlife considers the social and ecological components involved in the management of marine fish and wildlife issues. The purpose of the strategy is to "promote actions that will conserve ecological functions and nearshore marine resources to provide long-term ecological, economic and social benefits for current and future generations of Oregonians" (ODFW, 2006, p.i). The Nearshore Strategy may serve as an example for the aquarium on how to incorporate an ecosystem-based management component within the sea otter conservation project and include marine stakeholders (e.g., fishing community).

Currently, ODFW is involved in the implementation of two pilot marine reserves off the coast of Oregon at Otter Rock Reserve and Redfish Rocks Reserve and Marine Protected Area (ODFW, 2012). ODFW research conducted in the reserves may provide additional data for the aquarium to utilize as an informational intervention strategy (Kollmuss & Agyeman, 2002), educating the local public about marine ecosystem health and the importance of marine reserves in an effort to influence public attitudes and norms toward the newly established reserves. Increasing environmental awareness of potential consequences resulting from certain behaviors on marine reserves (i.e., norm activation theory) may inspire visitor investment to take action (e.g., responsible use and disposal of pesticides; Saunders et al., 2006; Schwartz, 1977; Stern, 2000). Establishment of these local reserves also provides an opportunity for the aquarium and dive operations to conduct baseline assessments of the local marine ecosystem and its ability to support sea otter populations in the future.

U.S. Geological Survey (USGS). The Santa Cruz Field station, part of the USGS Western Ecological Research Center (WERC), currently conducts long-term research on sea otter

populations in California and Alaska to determine demographic factors involved in population change, identify causes of slow population growth in Southern otter stocks, and impacts of sea otter declines in the Aleutian Islands (USGS, 2012). Research efforts of the USGS and partnering organizations (e.g., Smithsonian Institute, University of California at Davis, California Department of Fish and Game) may provide data for the Oregon Coast Aquarium sea otter conservation project, an opportunity for the aquarium to support field research throughout the sea otter's current range, and gain a better understanding of the natural and anthropogenic factors influencing sea otter survival.

Northwest Zoos and Aquariums Alliance (NWZAA). The Oregon Coast Aquarium has worked with several zoos and aquariums (i.e., Seattle Aquarium, Point Defiance Zoo and Aquarium, Oregon Zoo) on sea otter research and conservation. The Seattle Aquarium also collaborates with the Point Defiance Zoo and Aquarium and Oregon Zoo to monitor population trends and research the endocrinology and reproduction of the sea otter (NWZAA, 2012; Seattle Aquarium, 2009). It is recommended that the Oregon Coast Aquarium increase their participation with the alliance regarding sea otter research, as well as promote efforts of partnering institutions within otter information panels displayed onsite.

Monterey Bay Aquarium. Since 1984, the Monterey Bay Aquarium's Sea Otter Research and Conservation (SORAC) program works to rehabilitate and release injured otters, provide a surrogate program for stranded juveniles, and care for individuals that are not fit to be released (Monterey Bay Aquarium, 2011). In collaboration with the University of California at Santa Cruz and the U.S. Geological Survey, this aquarium also conducts long-term field research assessing causes of mortality and population trends. A partnership with the Monterey Bay

Aquarium may provide useful data and project guidance for development of an education-based sea otter conservation project at the Oregon Coast Aquarium.

The Otter Project, CA. The Otter Project is a 501(c) (3) nonprofit organization that works to protect watersheds and coastal oceans for the purposes of conserving the Southern sea otter and providing benefits for the community. Campaigns, such as the Coastkeeper Alliance addressing storm water and agricultural pollution threats, may provide the Oregon Coast Aquarium science-based policy and advocacy resources for promoting behavior changes within aquarium visitors (Sea Otter Project, 2012).

Alaska SeaLife Center (ASLC). In 2003, the Alaska SeaLife Center developed the Sea Otter Research Program. Alongside several partners, including the Oregon Coast Aquarium, this institution is dedicated to the recovery of sea otters. ASLC currently conducts fieldwork in Russia and the Aleutian Archipelago focusing on ecological and epidemiological factors influencing sea otter populations (ASLC, 2012). It is recommended that the Oregon Coast Aquarium continue this partnership, providing an opportunity to share knowledge on the species and its conservation status.

Oregon State University, Marine Mammal Institute and Hatfield Marine Science Center. Oregon State University's Marine Mammal Institute (MMI) and Hatfield Marine Science Center (HMSC) combine research and academic programs for the purposes of advancing marine scientific understanding and conservation (HMSC, 2012; MMI, 2012). MMI specifically focuses on collaborating with stakeholders (e.g., fisheries, oil industries) that may interact with marine mammals. These two entities may provide the Oregon Coast Aquarium additional resources to communicate with marine stakeholders and support for implementing a conservation project

focusing on the research, recovery, outreach, and potential reintroduction of sea otters along the Oregon coast.

Elakha Alliance. In 2000, the Elakha Alliance became established for the primary purpose of reintroducing sea otters to the Oregon coast. Alliance members represent various tribes, universities, agencies, and organizations, such as the Oregon Coast Aquarium, Oregon State University, Portland State University, Confederated Tribes of the Siletz Indians, and Shoreline Education Awareness (Ecotrust, 2012). Although it remains unclear if the alliance is currently active, it may still serve as a direct connection between the aquarium and partnering organizations for the purposes of gathering additional support for the conservation project (e.g., research data, citizen science program opportunities, community workshops, outreach efforts).

Recommended Implementation Items

Table 7 presents recommended implementation actions for the alternative Oregon Coast Aquarium strategic conservation project. Potential partners for each action are highlighted in an effort to provide institutional support (e.g., scientific data resources, monitoring and field assessment, financial support, exhibit guidance). To increase the overall success of each implementation item, internal aquarium participation is crucial.

Table 7. Alternative Conservation Project Implementation Items

Action	Implementation Item	Potential Partners
1	Construct conservation information panels to be displayed on-site at the sea otter exhibit to enhance visitor conservation awareness. Include aquarium research / conservation efforts, importance of Oregon's newly establish marine reserves, and ways the public can help sea otters (e.g., proper disposal of waste such as parasite-ridden cat litter)	NWZAA, ASLC, USGS, USFWS. Monterey Bay Aquarium
2	Incorporate a conservation piece within "keeper talks" for public during daily otter feedings to inspire emotional responses to the species	NWZAA, Monterey Bay, ASLC
3	Execute ongoing aquarium dive operation baseline surveys of Otter Rock Marine Reserve and Redfish Rocks Reserve and MPA to monitor the suitability of potential future otter habitats	NWZAA, ASLC, Monterey Bay Aquarium, USFWS, USGS, Elakha Alliance
4	Hold community marine debris, water quality, and sustainable fisheries workshops to educate the public and stakeholders about sea otter threats and management efforts, and foster public engagement	USGS, USFWS, NWZAA, the Otter Project, MMI, HMSC, Elakha Alliance
5	Organize water quality monitoring citizen science program to serve as an alternative to wildlife viewing offsite and provide visitors an "opportunity to act"	EPA OWOW, USGS, NWZAA, USFWS, HMSC

Next Steps for Aquarium Personnel and Measuring Success

If the alternative project recommendation is selected by Oregon Coast Aquarium personnel, an urgent next step for the aquarium is to identify clear conservation project goals and objectives. Additionally, before implementing these project recommendations, aquarium personnel are encouraged to clearly specify measurable indicators for success (e.g., increased visitor engagement) and collect data from the outset measuring these indicators to ensure effective monitoring and evaluation. Evaluating the performance of the Oregon Coast Aquarium conservation project to determine responsibility and accountability for success (or failure), and how it can be improved is crucial.

According to AZA Accreditation Standard (3.2.2), conservation programs should be evaluated on a regular basis (AZA, 2011). Therefore, it is recommended that this aquarium actively measure the success of their strategic conservation project. Examples of measurable indicators and respective data collection methods include: (a) on-site surveys to assess visitor response to conservation messages, their attitudes, and their intentions to change behaviors related to the conservation project; (b) off-site surveys to assess visitor retention of conservation messages and active behavior changes post-visit; (c) partner with outside research and government organizations (e.g., USFWS, USGS) to monitor the status and trends of sea otter populations; and (d) record trends in public engagement (e.g., participation of citizen-science projects, workshop programs, field experiences). A written annual report may assist the Oregon Coast Aquarium in measuring the longitudinal success of the project and provide direction for creating an adaptive management strategy in an effort to achieve both short-term and long-term goals for the conservation project.

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Sea Otter Image

http://www.otterspecialistgroup.org/Library/Colloquium_10/Presentations/10-10-14-55_Sea_Otter_Doroff.pdf