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AMBASSADORS FOR ANIMALS

The Pivotal Position of Zoos and Aquariums and Next Steps
in Ensuring the Welfare of Animals in Human Care



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EXECUTIVE SUMMARY

The world is in the middle of what experts believe is a sixth mass extinction, with a rate eight to 100 times higher than expected since 1900.^{1,2} While the previous five die-offs were driven by natural events such as the one that brought about the end of the dinosaurs (and also exterminated 75 percent of all species on the planet), the current mass extinction is driven by humans. An ever-expanding human population—which is expected to increase to 10 billion in the coming decades—has meant that there are fewer and fewer truly “wild” places left. This in turn has put pressure on both habitats and conservation efforts.

Animals enrich our planet, and our lives, and humanity has a moral obligation to preserve wild and endangered animals. In response to these challenges and duties, zoos and aquariums have become modern day arks of hope for many species. Zoos and aquariums not only fund thousands of conservation projects, but they are vessels themselves to safely house and help sustain populations of critically endangered animals.

People won't protect what they don't love and they can't love what they don't know. Zoos and aquariums are the ambassadors between wildlife and humans. According to the Association of Zoos and Aquariums, over 181 million people visit U.S. zoos and aquariums it accredits every year, which is more people than go to NFL, NHL, NBA, and MLB games combined.³ Globally, 700 million people visit zoos and aquariums every year, or about 10 percent of the world population.⁴ Zoos and aquariums are positioned today not only to take a leading role in conservation, but to educate the next generations about the importance of Earth's animals.

Zoos and aquariums don't just help us appreciate animals that we might otherwise never see in person. They also provide

vital research that helps these animals continue to exist on the planet and contribute to jobs and economies across the world.

Of the estimated 10,000-12,000 zoos and animal parks in the world, only an estimated 2.3 percent or less were accredited or recognized as of 2008.⁵ As we face 21st Century challenges in caring for the Earth and its creatures, zoos and aquariums—especially those accredited to meet professional standards—will play critical roles at every step. We must make sure that the outstanding work already being done by many facilities is recognized, that substandard institutions are improved or closed, and that more institutions worldwide are brought to the highest level for animal welfare.

While there are accreditation programs for zoos and aquariums, there has not been an effort devoted solely to verifying the welfare of animals in human care. Furthermore, in today's society where the public is skeptical and demands independent certifications, accreditation programs are based on older models such as those offered by trade membership associations where independence is certainly not assured nor guaranteed.

In contrast, American Humane Association's new Humane Conservation program offers an improved model that allows for independent, third-party certification of the humane treatment of animals in human care, based on rigorous science and evidence-based practices. Humane Conservation audit teams are independent from the institution, and the focus is solely on the humane treatment of the animals, and not other factors outside of animal welfare. With more and more Americans concerned about the treatment of animals, Humane Conservation certification standards are 100 percent focused on animal welfare, and have been developed by leading scientists and ethicists. It is the first program of its kind—the new gold standard for animals in zoos, aquariums, dolphinariums, and in human care.

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To ensure the humane treatment of animals, we must bring new welfare certification systems into being that focus solely on the treatment and well-being of animals in our vital global network of zoos, aquariums, dolphinariums, and conservation centers. This task, as well as an in-depth examination of the value of the institutions that play the greatest role in preserving the world's disappearing species, is the subject of this paper.

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BENEFITS

Animal Welfare

Zoos and aquariums care both about the animals in their care and broader populations through conservation. All animals should be treated humanely, whether they are in zoos and aquariums, households, on farms, performing service to law enforcement or the military, or anywhere else. Animal welfare is more than simply access to food, water, and shelter—these are just the basics. The “Five Freedoms,” the internationally accepted social contract with animals adopted by the Royal Society for the Prevention of Cruelty to Animals and animal welfare professionals worldwide, outline a more comprehensive consideration for animal welfare: Freedom from pain, freedom from hunger and thirst, freedom from discomfort, freedom to express normal behavior, and freedom from fear and distress.⁶

For zoo animals, “the truly important step is ensuring that conditions exist so each animal...has the potential to experience great welfare.”⁷ More than just meeting basic life needs, the emotional well-being of zoo (and aquarium) animals is paramount to animal welfare. Animals should be able to make choices: Where to spend their time, how to engage with environmental enrichments, and when to spend time with other animals.

In this context, zoos have developed handling programs and exhibits that provide for animals’ needs, changing in the past few decades to provide better habitats. The very first zoos provided barren environments for the animals. Many larger animals were kept in concrete enclosures with bars and little environmental enrichment. In these earlier generations of zoos, the focus was on the satisfaction of visitors, meaning “[t]he human field of vision became the standards measure...Small enclosures and cages may have robbed animals of a normal physiological

and psychological life and provoked stress and high mortality rates, but they ensured spectators a quick and certain sighting.”⁸ Beginning in the 20th Century, some environmental enrichments such as flora and rocks were used in enclosures.⁹ But even these environments left something to be desired.

Today, zoos try to mimic natural environments for the animals. Vegetation and open areas, combined with toys, climbing areas, and scent trails provide enrichment for the animals and an opportunity for visitors to see the animals engage in natural behaviors. Some zoos and aquariums use shows and public feeding demonstrations as attractions to engage animals and visitors.

Examples of environmental enrichment for zoo animals are many. The National Zoo in Washington, D.C. has the O-Line, a nearly 500-foot long, 50-foot high cable that allows orangutans to swing and walk between towers and the zoo’s Great Ape House.¹⁰ The Bronx Zoo has the Congo Gorilla Forest, a 6.5-acre area mimicking a Central African rainforest complete with more than 15,000 tropical plants. The Dallas Zoo’s Wilds of Africa is a 25-acre area with several different habitats, from bush to woodlands. The Mystic Aquarium in Connecticut has one of the largest habitats for beluga whales in the world.

In addition to providing animals rich lives, zoos and aquariums have also improved the health care for and medical treatment of animals. Zoos are living longer, and animals are provided preventive health plans that include prescriptions and procedures such as those afforded to humans, including CT scans and anti-inflammatory medication.¹² As a result, animals can live longer, healthier lives than their forebears did in the wild. For instance, Shedd Aquarium in Chicago has an 85-year-old Queensland lung fish named “Granddad.”

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Looking forward, researchers have encouraged some changes to benefit the animals. Strengthening the existing relationship between zoos and aquariums and university graduate departments and behavioral analysts can promote animal welfare improvements by increasing our understanding of species behavior. This can be especially helpful as behavioral problems may result from animal welfare problems.¹³ Meanwhile, a researcher with the Zoological Society of London, noting that marine mammals such as dolphins and sea lions have cognitive skills close or equal to great apes, has suggested cognitive challenges such as obstacle courses be introduced to help stimulate animals in aquariums and provide further enrichment.¹⁴

Researchers with the Detroit Zoological Society's Center for Zoo Animal Welfare have outlined the framework for zoos to consider animal welfare.¹⁵ The framework includes institutional philosophy and policy, or an institution's goal to ensure animals are thriving, not just surviving; programmatic structure and resources; execution of the framework; and evaluation, or a means from within or without an institution to evaluate animal well-being using science-based criteria.

In building on this framework, we believe one thing must be emphasized: Third-party evaluation. As discussed below, the public yearns for transparency, whether in consumer products, food production, or governance. The same is true with animals in human care.

Conservation and Research

Wild animals face threats to their habitats and to their existence. Today, there are very few “natural” places left. Antarctica and small parts of Africa and the Amazon basin are the only true wild places, meaning they are generally untouched by human activity, remaining on Earth.

As humanity's numbers have grown to more than 7 billion—and are expected to keep growing to 10 billion in the coming decades—people are increasingly encroaching on wild spaces to the detriment of wild animals. Tiger habitat has been lost to rice fields and aluminum mining;¹⁶ lions and other big mammals face pressure from agricultural expansion in Africa.

A major purpose of zoos and aquariums is to promote the conservation of animals. To this end, these institutions conduct major, global research efforts that span everything from biological sciences such as genetics to in-the-field research to research of institutions' effectiveness at educating its constituents.¹⁷ Zoos and aquariums may sponsor research or fund journals; hold symposiums to disseminate research; or conduct research internally with or without partners. There are five academic journals dedicated to zoos and aquariums: *Zoo Biology*, *Journal of Zoo and Aquarium Research*, *Der Zoologische Garten (the official journal of the World Association of Zoos and Aquariums)*, *Journal of Zoo and Wildlife Medicine*, and *International Zoo Yearbook*.

Conservation

The International Species Information System estimates that 82 percent of all new mammals, 64 percent of birds, and a majority of reptiles are born in captivity. “The survival of many of the world's species,” it notes “rely on their ability to reproduce in captivity – for some, zoo populations may be all we have left.”¹⁸

Institutions accredited by the Association of Zoos and Aquariums—which only account for 230 out of over 10,000 zoos, aquariums, and animal parks in the world—contributed \$160 million to 2,650 conservation projects in 130 countries in 2013.¹⁹ For butterfly conservation alone, a partnership of zoos spent \$2 million between 2010 and 2013.²⁰ Zoos are also involved in collaborative breeding programs.

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The programs are science-based and rigorous. Zoos share genetics, ancestry, and other information on individual animals in order to have the most robust program for breeding.

Zoos are responsible for a number of programs to reintroduce species to the wild, using breeding to build up a healthy population of animals. The Phoenix Zoo, with funding from the World Wildlife Fund, successfully reintroduced the Arabian Oryx to the wild. Breeding is being used to bolster wild populations of the Whooping Crane; one of the three primary facilities is the Calgary Zoo.²¹ The Black-Footed Ferret and California Condor have been reintroduced into the wild through a partnership between state and federal U.S. agencies, zoos, and other non-governmental organizations.^{22,23} Meanwhile, the National Zoo helped lead reintroduction of the golden lion tamarin, which has helped increased the wild population from 100 in 1991 to 1,000 in 2012.²⁴

Other success stories include Partula snails, the European bison, Przewalski's horse, the red wolf, and the Oregon spotted frog.^{25,26}

Zoos and aquariums have also built centers for research and propagation of species. The Pittsburgh Zoo & PPG Aquarium created the International Conservation Center (ICC), a 724-acre facility in Somerset County, Pennsylvania and will provide an opportunity for research and breeding of elephants.²⁷ The ICC eventually plans to add cheetahs, zebras and rhinos.²⁸ The Houston Zoo founded the El Valle Amphibian Conservation Center in Panama, which works to conserve local amphibian species that have been disappearing at an alarming rate.²⁹

Broadly, the International Species Information System is a network of close to 1,000 zoos and aquariums in 90 countries that share information about animals in their care, in-

cluding medical and husbandry records. This information-sharing allows institutions to control the genetic makeup of their facilities and find appropriate breeding animals to propagate species while maintaining genetic diversity. It also allows zoos and aquariums to connect with other institutions that have experience raising or studying certain animals. Over 40 years, the International Species Information System has shared data on 6.8 million animals covering 21,000 species. Nearly a quarter (about 23 percent) of the species in zoos that are a part of the International Species Information System network are threatened.

Along with hands-on work, zoos and aquariums are frequent contributors to the literature on conservation. A review of published articles in Conservation Biology found that nearly one in ten (8.3 percent) had an author with a zoo or aquarium affiliation.

Other Research

Zoos also provide a base of operations for research into infectious and zoonotic diseases, and other matters. Zoo research, according to the St. Louis Zoo, provides opportunities for scientists to:

- *Conduct clinical, nutritional, pathological and epidemiological studies of diseases of conservation concern*
- *Monitor diseases in free-living wild animals where they interface with domestic animals and humans*
- *Perform studies that contribute to the field of comparative medicine and the discovery of life forms, from invertebrates and vertebrate species to parasites and pathogens*

The St. Louis Zoo established the Institute for Conservation Medicine (ICM) in 2011. The role of the ICM is to

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help scientists “study the origin, movement and risk factors associated with diseases so they can better understand the impact of diseases on the conservation of wildlife populations; the links between the health of zoo animals and free-living wildlife populations; and the movement of diseases between wildlife, domestic animals and humans.”³³ Zoonotic diseases have accounted for 75 percent of all emerging infectious diseases among humans over the last few decades, according to ICM’s director, making the center’s work vital to both animals and people.³⁴

Research can yield benefits to humans, as well as to our wild neighbors. The St. Louis Zoo and the University of Missouri’s College of Veterinary Medicine examined the health benefits of zoos to people, including reduced stress, lower blood pressure, and increased energy.³⁵

One major frontier in zoo research is the area of intelligence. The Think Tank at the Smithsonian National Zoo in Washington, D.C. provides an exhibit for visitors to discuss the intricacies of what defines intelligence and thinking. The Think Tank also conducts research on memory in orangutans and cognition and emotional state in apes.³⁶

Zoo Atlanta supports research at its facility as well as at zoos in China to learn more about Great Pandas, including that on reproductive behavior, the effects of transporting pandas from China to the United States, and foraging behavior. The zoo also runs the Great Ape Heart Project, aimed at studying the cardiovascular health of gorillas, orangutans, chimpanzees and bonobos.³⁷

Zoonotic diseases including West Nile virus, salmonella, and Lyme disease are the subjects of numerous zoo research projects. The San Diego Zoo has a staff of nearly 20 dedicated to combatting wildlife disease and removing it as a

barrier to conservation. The Cleveland Metroparks Zoo has researched treatments for iron-storage disease in Egyptian bats and monitored disease in the deer herds that frequent the park. The Zoological Society of London is developing methods to assess the risk of disease occurrence during relocation and reintroduction of animals to the wild.³⁸

Looking Forward

Zoos and aquariums can help with a number of key problems in the future. Issues include diseases and biosecurity; global water shortages and food insecurity; markets for wildlife products; the need for simultaneous and integrated management of animals in the wild and in human care; the impact of political instability and human conflict on wild animal populations; and the need for animal preserves.³⁹

Zoos and aquariums are already addressing some of these issues. Pittsburgh Zoo and Aquarium’s development of a reserve for elephants in Pennsylvania will serve as a tool to promote conservation breeding. This reserve could also serve as a refuge for imperiled elephants in the wild, such as those in Swaziland, where there are too many elephants for the amount of land, and where the government has offered to ship elephants to American zoos.⁴⁰

Freshwater fish also face challenges, according to researchers affiliated with the International Union for the Conservation of Nature. Only 0.3 percent of the available water in the world is in lakes, ponds, rivers, fresh water estuaries, and wetlands, yet these areas support about 50 percent of all fish species. Freshwater areas face threats from pollution, overfishing, invasive species, and habitat loss and modification. Public aquariums can help educate the general public and visitors through their marketing and exhibit materials; help develop conservation policies that involve many stakeholders; encourage the application and enforcement of conserva-

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tion laws; support breeding in facilities; and support habitat restoration and species reintroductions in the wild.⁴¹

Zoos and aquariums are vital and necessary partners for multi-stakeholder programs benefitting conservation and biodiversity

Economic Impact

We believe animals improve and enrich our lives physically, emotionally, spiritually, and in many other ways. In fact, zoos have often been an important part of civilization and modern urban development. For centuries in Europe, “zoological gardens often formed part of the urban renovation programmes being implemented...and characterized by the creation of broader streets, boulevards, squares and embankments to ease the movement of people and good, to open out horizons, to encourage people to wander a little and look at monuments, and to improve air circulation and the general quality of life.”⁴² These parks were often established in wealthy areas of cities, and when established on the outskirts of town accelerated or drove those areas to become residential zones for aristocracy and bourgeoisie. While many facilities restricted admittance to the wealthy, over time, zoological gardens became more accessible to other classes starting in the second half of the 19th Century.

Today, zoos and aquariums are important assets to their communities—of all economic stripes. They serve not only as educational opportunities, but in many cities, as huge economic boons. **A study of AZA members calculated that they support 142,436 jobs in the U.S. and 10,840 internationally (for only 11 international members). In 2012, nearly 170 million people visited zoos and aquariums in the United States – that’s more attendance than the NFL, NHL and MLB combined. Together, zoos and aquariums contributed almost \$20 billion to the U.S. economy in 2012.**⁴³

Worldwide, more than 700 million people visit zoos and aquariums every year.⁴⁴ There are more than 300 substantial public aquariums across the globe, with more than 100 opening since the early 1990s. The expansion of aquariums is “often associated with the multi-million dollar regeneration of cities, docklands and other run-down, previously industrial areas. Such large-scale investments bring about highly beneficial economic, employment and social impacts.”⁴⁵

Tourism Dollars

In more than a few cities, zoos and aquariums serve as the main driver of tourism dollars, bringing people into town, who then spend money at other establishments. According to a study commissioned by the Association of American Zoos and Aquariums (AZA), **people who visited zoos and aquariums spent an additional \$2.4 billion before and after their visit at surrounding businesses.** In Memphis, for example, two-thirds of out-of-town visitors – more than 300,000 – went to the city primarily to visit the Memphis Zoo, according to a University of Memphis study.⁴⁶

Similarly, the National Aquarium in Baltimore (NAIB) has helped to revitalize the city’s downtown area by attracting more than 1.5 million visitors annually, according to an economic impact study conducted by Sage Policy Group. Maryland Governor Martin O’Malley called the aquarium “a driving force for our state’s economic engine.”⁴⁷ Baltimore Mayor Stephanie Rawlings-Blake said the aquarium “is an institution that has helped the city grow and thrive.”⁴⁸

Almost 90 percent of NAIB visitors cited the aquarium as their primary reason for visiting the city. The average tourist on a day-trip to the aquarium spent \$109.80, while an overnight visitor spent \$372.18 per trip.⁴⁹ The researchers estimate that visitors to the NAIB spend more than \$205 million per year on things like food, lodging and transportation.

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The Tennessee Aquarium in Chattanooga has been credited as the driving force behind the downtown area's revitalization over the last two decades. When the world-class aquarium was being built in the early 1990s, it was seen by residents and tourists alike as a beacon of hope for the economically struggling city.⁵⁰ The aquarium continues to fuel growth in the city's downtown, contributing a more than \$101 in million annual impact.⁵¹ In 2014, the aquarium drew 710,513 out-of-town visitors to Chattanooga, with the average family spending \$710 for an overnight stay. Area businesses see an increase of \$67.7 million as a direct result of goods and services purchased by aquarium visitors. One paper calculated an economic benefit of aquariums by studying day trips, and determined these trips brought economic activity that otherwise would not have occurred.⁵²

The Phoenix Zoo has also played a significant role in bolstering the economy of Arizona since it opened its doors in 1962. In 2012, the zoo contributed an additional \$92 million to economic activity in the local area.¹ In 2012, 183,000 people visited the Lincoln Children's Zoo in Nebraska, pumping an additional \$6.31 million into the local economy.⁵³ The Vancouver Aquarium contributes \$43 million in economic output annually.⁵⁴ The Brookfield Zoo in Chicago generates \$150 million in economic activity every year and supports 2,000 jobs.⁵⁵ And the Georgia Aquarium has contributed \$1.9 billion to the state's gross domestic product and has helped drive \$1.7 billion in new investment in Atlanta since 2005, drawing more than 1 million visitors from out of state annually.⁵⁶

Employment Opportunities

Zoos and aquariums are very large operations, and as such, require large staffs with diverse skillsets to keep them up and running. Aside from day-to-day operations, construction crews are also needed to build and expand operations. Each year, according to the AZA study, **zoos and aquariums in America generate personal earnings upwards of \$6.4 billion and support 193,986 jobs.**⁵⁷

The size and complexity of zoo and aquarium operations require the services of both full- and part-time workers. The NAIB directly employs 2,257 full- and part-time employees, and also supports another 279 jobs throughout the city through the purchase of services provided by area businesses to support aquarium operations. The aquarium supports an additional 378 jobs in Baltimore City by enhancing spending in the local economy, according to the Sage study.⁵⁸

The Minnesota Zoo is in the process of completing a five-year expansion project that will completely transform many of its exhibits and create several new ones. According to a study conducted by researchers at the University of Minnesota, the new construction will create 680 temporary jobs at a cost of \$103.4 million.⁵⁹

Between 2000 and 2007, Louisville's nature attractions saw an increase in payroll expenses of 49 percent – due primarily to the Louisville Zoo, which had a 16 percent increase in earned revenue.⁶⁰

Reliable Tax Base

The sheer size of zoos and aquariums and the permanence of their structures make them a reliable tax base for the municipalities they call home. The NAIB contributes \$11.7 million in annual tax revenue to the state of Maryland and an additional \$5.9 million to the city of Baltimore. Similarly, the Magnetic Hill Zoo in Canada's New Brunswick province contributes \$1 million in tax revenue to the federal government and another \$800,000 to the provincial government.⁶¹ Each year, the Chattanooga Aquarium contributes \$6.3 million in tax revenue for the city of Chattanooga and Hamilton County.⁶²

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In so many ways, these institutions, which are significant investments in the care and future of the world's animals, also pay handsome dividends to the communities in which they reside.

Education

Zoos and aquariums draw 181 million visitors a year in the United States, which is over half the population, and an estimated 700 million worldwide. According to the AZA, **most U.S. visitors are between the ages of 25 and 35, a prime demographic. Not only are these people future leaders of the country in promoting conservation, but they are often parents who can teach the next generation about the value of conservation.** Two-thirds of adults who visit zoos do so with children, as do half of adults who visit aquariums.

It's not just foot traffic that zoos attract. In August 2015, the National Zoo's "Panda cam" drew 868,000 views in one weekend after a panda gave birth to twins.⁶³ Visitors to the zoo also increased by 15 percent the year a panda was born.⁶⁴ While pandas are an iconic image of zoos—and the importance of conservation—they aren't the only draw. A general increase in interest in exotic animals is correlated to an increase in the number of zoos.⁶⁵

Zoos also are able to educate visitors about the threats to species. As understanding of threats increase, visitor attitudes towards these species improve.⁶⁶ In fact, "visits to zoos and aquariums almost always result in enhanced scientific understanding and strengthened beliefs in the value of nature conservation."⁶⁷

How zoos do this is a matter of study and ongoing refinement. The National Zoo, for instance, has a tug-of-war game that visitors can play with an orangutan. But

it's also important to make sure these enrichments are improving the educational experience for visitors.

One study examined visitors to Zoo Atlanta viewing an animal training exercise with otters, performed by zoo staff with interpretations for the audience. The research concluded that exposing audiences to animal training increased visitor satisfaction and the amount of time they spend at exhibits.⁶⁸ The Edinburgh Zoo provides an opportunity for visitors to watch ongoing primate research. A review of this design found that it increased visitor engagement.⁶⁹

Good zoos and aquariums are more than just places where animals are on display. They are places where animals and humans can engage.

Efficacy

How effective are zoos and aquariums at educating the public? The AZA conducted a three-year study in the United States to determine the impacts of visiting zoos and aquariums.⁷⁰ Conducting surveys of thousands of visitors, they were able to determine that zoos and aquariums help reinforce visitors' values and attitudes and cause visitors to see themselves as part of the solution to environmental and conservation issues. Importantly, the benefits lasted. Months after their visit, 61 percent of visitors questioned by researchers were able to talk about what they learned from their visit, and 35 percent said their visit reinforced beliefs about the importance of animals and conservation.

Research also indicates that visitors to zoo and aquariums value these institutions more and more for the education and conservation benefits, rather than solely as a place for entertainment. For most

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visitors, learning was one of the top reasons for visiting a zoo or aquarium, and animal welfare—knowing that animals were well cared for and kept in enriched environments—as well as experiential factors contributed most greatly to their satisfaction with a visit. Seventy-four percent of respondents indicated that an institution’s role in promoting conservation and environmental issues was at least as or more important than an institution’s role in providing a fun time.⁷¹

British researchers, in conjunction with the World Association of Zoos and Aquariums (WAZA), examined the effectiveness globally of zoos and aquariums in contributing to visitor understanding of biodiversity—a goal laid out in the United Nations’ Aichi Biodiversity Targets. After surveying more than 5,600 visitors in 19 countries, they measured a significant increase in understanding of biodiversity and actions they could take as individuals to protect biodiversity.⁷²

Aquariums also engage and encourage individuals to use their purchasing power to effect change in a way that benefits endangered species. Aquariums around the country are promoting campaigns to support “sustainable seafood.” These initiatives are intended to address overfishing, water pollution, and other environmental issues that arise from seafood cultivation and harvesting. Due to the wide range of problems they’re meant to solve, sustainable seafood initiatives are often multifaceted in nature.

The Monterey Bay Aquarium in California, for example, runs a program called “Seafood Watch,” which rates seafood and sushi on a three-tier scale: “Best Choices,” “Good Alternatives,” and “Avoid.” The best are those “caught or farmed in ways that cause little harm to habitats or other wildlife,” while the worst involve species that are overfished or caught/farmed in harmful ways.⁷³

These seafood ratings are released to influence consumers in the store. Since 1999, the aquarium has distributed more than 56 million consumer guides featuring its ratings and launched an app that has been downloaded more than 1.5 million times. Through “Seafood Watch,” the aquarium has partnered with more than 400 aquariums, nonprofit organizations, and food suppliers to promote sustainable seafood harvesting and consumption.⁷⁴

They are not alone. Shedd Aquarium in Illinois is known for its “Right Bite” program, the leading sustainable seafood program in the Midwest. It involves research projects on Great Lakes fisheries, regular conferences with restaurant and food service professionals, and Fish of the Month recipe promotions among other initiatives. The aquarium is also one of Monterey Bay Aquarium’s most vocal partners. New England Aquarium is another: It promotes sustainable seafood on its website, offering “ocean-friendly” seafood options, recipes, and events at local restaurants.⁷⁵

Aquariums also have opportunities to promote sustainability in the pet fish trade, which in turn promotes the health and conservation of populations in an industry that trades in more than 1,000 species and imports 190 million animals annually. Writing in *Zoo Biology*, authors from the New England Aquarium and other institutions argue that public aquariums are in a unique position to promote sustainability in several fields. As nonprofits, aquariums are more likely to be trusted than businesses in the aquatic pet trade; as such, they can develop social media campaigns or market-based initiatives to help ensure best practices are used by businesses. Aquariums have the technical and scientific expertise to suggest improvements in the transportation and breeding of fish. And finally,

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aquariums can also offer an educational message to their own visitors—many of whom are interested in keeping pet fish.⁷⁶

Culture

Zoos and aquariums are important institutions in American culture. Far from the private menageries of exotic animals of the past that were showpieces of the upper class, today's organizations have a role that serves both society and animals. These institutions “encourage visitors to care for natural resources, maintain local habitats for wildlife and participate in local community-based efforts to restore and protect the environment.”⁷⁷

Zoos also provide for bonding in families and development of children. One study of zoo visitors found that parents, even if they don't like zoos that much, appreciate the time they allow them to spend with their children. Zoos also provide a way for urban parents to take their kids to see animals firsthand while living in an environment with limited access to the natural world. Visiting a zoo provides an opportunity to develop a child's moral compass by teaching children how to be “good citizens of the world.” The benefits aren't limited to children: Parents who had personal issues with abandonment benefited from appreciating the “family” groups of zoo animals.⁷⁸

Zoos benefit not just visitors but those who work there. Volunteering at zoos provides an important outlet for people who view conservation as part of their personal identity.⁷⁹ Zoos and aquariums as institutions provide opportunities for people with similar values to meet and collaborate.

Zoos also bring cultures together. International collaboration on conservation projects is regular, especially

as zoos and aquariums focus on *in situ*, or in the wild, work such as habitat preservation or restoration. Cross-cultural collaboration is a necessary result of the global effort to protect species.

Such efforts increase tourism, as well. The Ninoy Aquino Park and Wildlife Center, which operates a “mini-zoo,” receives 400,000 tourists a year, whose payments for admission and parking help fund the Center's work.⁸⁰ Zoo tourism can bring local zoos together with international partners, can raise funds for zoos, and can bring benefits for conservation by involving breeding and reintroduction of animals to the wild for tourists to see.⁸¹

The Need for Accreditation and Animal Welfare Certification

Zoos and aquariums do worlds of good for global conservation. Yet, AZA-accredited institutions only amount to 230 out of more than 10,000 zoos and animal parks worldwide—or just 2.3 percent. In an age when consumers demand transparency and third-party verification, most zoos and aquariums are lagging behind the times.

Unfortunately, the lack of common accreditation opens the door for those who would remove animals from our lives to paint a misleading picture of zoos and aquariums with a broad and ill-informed brush. People for the Ethical Treatment of Animals (PETA), for instance, refers to zoos and aquariums as “prisons” and calls for their closure. Certainly there are examples of zoos and aquariums that fail to maintain high standards. Zoos in conflict areas face the dangers of violence and under-funding. The Kiev Zoo was expelled from the European Association of Zoos and Aquaria in 2007 over poor conditions for animals and has been linked to financial malfeasance. In the United States, so-called “roadside” zoos may lack resources and proper environmental enrichments for their animals.

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However, as this paper lays out in detail, zoos and aquariums provide vital roles. Researchers believe that the world is in the midst of a sixth mass extinction. According to the World Wildlife Fund, global populations of vertebrates dropped 50 percent between 1970 and 2010.⁸² According to the IUCN, nearly 25,000 species globally were considered threatened in 2015. Moreover, the trends are not encouraging. Mammals, birds, and amphibians have all been faring worse on the IUCN Red List index of species survival. Without zoos and aquariums, a number of species that are success stories—such as the California condor, the European bison, Przewalski's horse, and the red wolf—might instead be history.

While groups such as PETA have an ideological opposition to animals living in any institution or even in individual human care as pets, this dogma ignores key realities. Most zoo animals are born in zoos. They don't have the means to live successfully in the wild, but they do have the ability to sustain their species under human care.

Keeping some animals in zoos and aquariums serves to help the entire species. Therefore, we should support the best actors and encourage other institutions to meet best standards.

Importance of Third-Party Certification

Third-party certification can make the difference between consumers trusting a product or service and forcing them to look for alternatives. For instance, according to a 2011 survey from the Food and Drug Administration and other government agencies, consumers have a “high positive attitude” toward certified food products. The national survey found

that a majority of Americans believe they are safer than their non-certified counterparts.⁸⁴

One reason is the public's general skepticism, especially of business. According to Edelman's most recent Global Trust Barometer, only 53 percent of people across the globe trust business leaders, with more than two-thirds claiming CEOs focus too much on short-term financial results compared to other objectives.⁸⁵ Meanwhile, a 2015 Gallup poll is even more striking: Fewer than nine percent of Americans trust corporations a “great deal,” while a mere 12 percent trust Big Business “quite a lot.”⁸⁶

Consider also the characteristics of millennials. Pew found that only 19 percent of millennials say most people can be trusted. And polling from Harvard discovered that a significant majority of millennials expressed distrust of the press (88%), Wall Street (86%), the federal government (74%); and so on for other institutions.

Third-party validation by a trusted organization with verifiable and impartial science-based systems can do much to earn and deserve the confidence that an institution is meeting the humane standards rightly demanded by the public. American Humane Association, a 140-year-old humane organization that has been at the forefront of virtually every major advance in the protection of children and animals, and is the largest certifier of animals in working environments, has taken it upon itself to develop strong, science-based standards for the humane conservation of animals in humane care at zoos, aquariums, dolphinariums, and conservation parks. Developed by

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independent, respected veterinarians and experts in the fields of animal welfare, animal science, zoology, and ethics, these standards will serve as a benchmark of humane care to which institutions can aspire, providing verification of good practices at deserving zoos and aquariums, and long-overdue assurances that the public can support in good conscience as those of us who love animals seek to enjoy and preserve the rich web of life essential to the survival of Mankind – and all the creatures of the Earth.

Conclusion

Far from being the private menageries of the past, which captured wildlife for private viewing and pleasure, today's zoos and aquariums operate for the benefit of the public and the animals for which they care. Animal welfare, conservation, research and education are the missions of these

institutions, and many are succeeding in their goals, but there still is a long way to go, with room for change and growth, in solving the challenges faced by Earth's creatures.

The American Humane Association launched the Humane Conservation certification program for zoos and aquariums to drive improvement among these institutions. The Humane Conservation Certification Program is the only certification program focused 100 percent on animal welfare administered by independent third-party auditors. American Humane Association is the oldest national animal welfare group in the United States, and its expertise and independence will be a powerful force in the future success of zoos and aquariums – one that will provide benefits to both animals and people.

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WHAT THE EXPERTS SAY

“WWF has long supported the legitimate role of zoos in conservation, education, and research. Captive breeding programmes managed by zoos can provide positive benefits for species conservation if designed and used appropriately, and if they are part of a science-based conservation management plan for the species. Such programmes may act as a platform for zoologists, veterinarians and others to conduct research designed to enhance understanding of the biology of the species.”

—*World Wildlife Fund position statement*

“[M]ost kids first learn about wildlife from their local zoo. The very best zoos not only focus on wildlife education, but conservation of endangered species via captive breeding and responsible re-introduction programs.”

—*Joan Embery, animal and environmental advocate*

“Every aquarium and zoo I work with believes its mission includes raising awareness about the challenges faced by animals around the world. We know animals have the power to touch our hearts, and when this happens, it opens the door to education that can inspire people to participate in protecting animals and conserving their environments.”

—*Jack Hanna*

“All in all with the ongoing global threats to the environment it’s hard for me to see zoos as anything other than being essential to the long-term survival of numerous species. Not just in terms of protecting them and breeding them for reintroduction, but to learn about them to aid those still in the wild, as well as to educate and inform the public about these animals and their world.”

—*Dr. Dave Hone, paleontologist*

“Zoos have an essential role in conservation.”

—*Christina Russo, Ph.D.*

LEADING EXPERT ENDORSEMENTS

“Beginning in the 1970s, society became increasingly aware of the ethical issues arising in animal use. Matters never even considered in the past have achieved major prominence. These issues range from the use of animals in food production and scientific research to their use in entertainment. American Humane Association pioneered assuring the well-being of animals used in cinema production. Now the organization is turning its attention to animals kept in zoos and aquaria, an area that has again elicited major social concern. The auditing standards developed by American Humane Association represent a robust and salubrious beginning to regulating these operations.”

—*Bernard E. Rollin, PhD, University Distinguished Professor, Colorado State University*

“I endorse the American Humane Association’s Humane Conservation certification program. This is entirely aligned with the veterinary profession’s mission to be certain that animals used for the purposes of benefiting animalkind and humankind are treated with highest levels of humane welfare care and health care. No entity has done more to reduce suffering and inhumane treatment or prevent and treat disease than the veterinary profession and American Humane Association.”

—*Joe M. Howell, DVM, Past President and Chairman of Board, American Veterinary Medical Association, and Current President, Western Veterinary Conference*

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“I applaud American Humane Association for this tremendous program to certify the humane treatment of animals in our zoos and aquariums nationwide. This unique program is especially exciting as accreditation programs run by membership organizations are peer-reviewed and can often be influenced by politics and favoritism. The American Humane Association program is unique in that it offers the first third-party, independent review and certification. This is definitely needed in our industry, as we all work to improve the level of care of animals.”

—*Barbara Baker, DVM, President & CEO, Pittsburgh Zoo & PPG Aquarium*

“The Chicago Zoological Society/Brookfield Zoo fully endorses the American Humane Association Humane Conservation program. The world’s zoos and aquariums lead the efforts to develop the highest standards of welfare for animals under professional care through science based research. Having the most honored and prestigious humane organization in the world act independently to evaluate and certify those efforts and results will tremendously aid in bringing about a renewed confidence by the public in our work and relevancy as centers of education and conservation.”

—*Stuart D. Strahl, Ph.D., President and CEO, Chicago Zoological Society/Brookfield Zoo*

“I have been associated with domestic and exotic animals since the 1960’s and professionally for the past 45 years. I am continually impressed by the commitment of the American Humane Association and their dedication to ensure the humane treatment of animals in the care of humans. Their staff is talented, passionate and

absolutely dedicated to providing the highest levels of science-based animal management in the design of their certification programs. I express my respect and gratitude to American Humane Association for their leadership and scientific approach in the development of this new Humane Conservation initiative for animals in the world’s zoos and centers of conservation.”

—*David R. Blasko, Director of Animal Care, The Mirage Hotel and Casino*

“Every animal in a zoo, aquarium or marine park deserves humane treatment and care. American Humane Association’s exciting Humane Conservation Initiative, with its independent audits, science- and evidence-based standards, and the organization’s more than a century of experience provides added assurance of the humane treatment and welfare of animals in zoological settings throughout the world.”

—*Kathleen Dezio, President & CEO, Alliance of Marine Mammal Parks & Aquariums*

“The American Humane Association Humane Conservation certification program ensures the highest standards of animal welfare for animals in professional care at zoos and aquariums. This lays the foundation for continued and future efforts for zoos and aquariums to learn as much about the animals in their care as possible through research in order to help conserve species in the wild, and to educate and engage the public in conservation of species and their habitats.”

—*Tracy Romano, Ph.D., Chief Scientist & Vice President of Research, Mystic Aquarium*

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“I fully endorse the American Humane Association Humane Conservation program. Animal welfare should be a priority for modern zoos and aquaria, and the American Humane Association program, which is based on science and best practice, will make an important contribution to develop and implement animal welfare standards in zoological institutions. This will in turn help them realize their education and conservation roles.”

—*Xavier Manteca, Ph.D., Professor, School of Veterinary Science, Autonomous University of Barcelona, Spain*

“Zoos and aquaria offer people the opportunity to meet a variety of animals up close and personal. These animals are true ambassadors for their species in nature. Human beings will only protect what they love, and they will only love what they know. They will only know what they are taught: Zoos and aquaria teach people about animals, their needs and the need for their conservation. The fact that American Humane Association is willing to champion a program to assess the welfare of animals who call zoos and aquaria home is a testament to the importance of these facilities and their required survival.”

—*Kathleen Dudzinski, Ph.D., Director, Dolphin Communication Project*

“The new Humane Conservation program is a unique and bold initiative for ensuring animal welfare in zoological institutions. This program will honor institutions that consider animal welfare and humane practices as a fundamental part of their daily operations and existence, while raising the bar of expectations for all zoological institutions. Wildlife and the humans who care for them will inevitably benefit from this program and the humane standards that it establishes.”

—*David S. Miller, DVM, Ph.D., DACZM, Consultant*

“I think it is fantastic news that American Humane Association, one of the most highly recognized animal welfare advocates in the world, has launched the Humane Conservation certification program. As Mahatma Gandhi said, ‘The greatness of a nation can be judged by the way its animals are treated,’ and it is great news that the American Humane Association has decided to support another great step forward with this program and provide tools to recognize excellence and the best animal care standards in selected zoos and aquaria. This new animal welfare certification audit is dedicated to verifying humane and ethical treatment for all animals maintained in zoos and aquaria. American Humane Association’s commitment to fighting for animals and ensuring professional care for animals is a welcome addition to our existing efforts. American Humane Association will provide tools to evaluate and assess the best animal care practices and procedures and we are grateful for their efforts and commitment to develop this incredibly important initiative. A key component of this new accreditation program is a focus on the well-being of each individual rather than other indirect indicators of welfare. We believe in any case, it is critical to use scientifically validated criteria to determine animal welfare rather than impressions or opinion. The professionals involved in this new Humane Conservation Scientific Advisory Committee are animal care experts putting all together over 500 years of experience in the zoo and aquarium fields.”

—*Daniel García Párraga, DVM, DECAAH, DECZM (Zoo Health Management), Director of Animal Health, Oceanogràfic Valencia*

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“I wholeheartedly endorse the American Humane Association’s Humane Conservation certification program. This program will assure the humane treatment and welfare of animal’s living in our zoos and aquaria.”

—*Jim McBain, DVM, Veterinarian Consultant*

“Kudos to American Humane Association for initiating a program to assure the well-being of animals in managed-care conservation venues. In private practice my husband and I provided veterinary care for animals ranging from gerbils to elephants. We have been able to offer our children and grandchildren unique opportunities to interact with a myriad of species. The American Humane Association Humane Conservation program is designed to assure future generations that the animals they care about are experiencing good welfare in their respective zoos and aquariums.”

—*Linda Reeve Peddie, DVM*

“American Humane Association’s Humane Conservation certification audit is the first professional assessment of its kind to evaluate the welfare of zoological species from the perspective of the animals. As such, this evidencebased, landmark program complements other well-established, highly regarded, and science-based professional accreditation programs by the leading trade associations representing zoological facilities and animal care and training professionals alike.”

—*Grey Stafford, Ph.D., Incoming President of the International Marine Animal Trainers’ Association, and author of the book on reward-based training: ZOOMility: Keeper Tales of Training with Positive Reinforcement*

“I am pleased to wholeheartedly endorse American Humane Association’s Humane Conservation certification program for zoos and aquariums. Providing an objective third-party auditing program from an organization with the long history of the protection of animals as the American Humane Association has can only help position zoos and aquariums for the future.”

—*Tom Otten, Principal, ReefExperience, LLC*

“Today, more than ever, it has become clearly evident that humanity must turn its knowledge and resources to a better and deeper understanding and care of our environment and the species that inhabit this unique and wonderful planet we call home. For decades zoos and aquariums and the people behind them have dedicated their lives to conservation, research and education, and together with governments and citizens from all parts of the world, these experts must lead the way towards sustainability in an ever-evolving and development-driven society. The Humane Certified program of American Humane Association is a breakthrough in the unbreakable and developing bond that has and will always exist between animals and human beings. The AMHMAR proudly supports these efforts and achievements by American Humane Association and all the professional and ethical people and institutions behind the program.”

—*Rodrigo Constandse Córdova, President, AMHMAR / Mexican Association of Habitats for the Protection and Interaction with Marine Mammals*

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"Having had a career spanning 50+ years which included being a veterinarian who treated all species of animals, an educator for a nationally known program which focused on the humane care of all species of animals and caring for all species of animals used by the entertainment industry, I have observed a major shift in public opinion regarding animal welfare. Welfare standards for pets, livestock and other farm animals have kept pace with these societal changes, but one major group of animals has until now not been formally addressed. These are the animals kept for public display. With the introduction of the American Humane Association Humane Conservation program, a science-based platform for the systematic evaluation of an animal's welfare from the animal's perspective now exists. This program was developed utilizing an international pool of talent including animal scientists, zoo and aquarium professionals, veterinarians, behaviorists and ethicists. The results of their efforts can be applied to any facility housing non-domestic animal life. The sole intent of this cornerstone program is to improve the care of animal life and thereby assure the public that this facility and its staff has been evaluated by a third party and has been graded with respect to the welfare needs of its animal collection. I fully and completely support this American Humane Association's program and applaud this organization's courage and determination to develop and offer this flagship program."

—James F. Peddie, D.V.M. *Distinguished Faculty Chair, Exotic Animal Training and Management program, Moorpark College, retired*

American Humane Association is the most highly regarded and longest-running animal welfare organization in North America. Its leadership and oversight in protecting the health and welfare of animals is increasingly important to the conservation of species and natural ecosystems. There has never been a time when humans have needed to connect more deeply to animals, to care and to take steps to protect species at risk. Established with a stringent set of science-based standards, the Humane Conservation certification upholds those who bear its name to the highest level of animal welfare in the continent.

—John Nightingale, PhD, *President and CEO, Vancouver Aquarium Marine Science Centre*

ENDNOTES

- 1 Elizabeth Kolbert, "The Sixth Extinction," 25 May 2009, New Yorker Accessed 24 Feb 2016 <<http://www.newyorker.com/magazine/2009/05/25/the-sixth-extinction>>.
- 2 Alan Boyle, "Scientists Build Case for 'Sixth Extinction'... and Say It Could Kill Us," 19 Jun 2015, NBC News, Accessed 24 Feb 2016 <<http://www.nbcnews.com/science/environment/scientists-build-case-sixth-extinction-say-it-could-kill-us-n378586>>.
- 3 Association of Zoos and Aquariums, "Visitor Demographics," Accessed Feb. 23, 2016 <<https://www.aza.org/visitor-demographics/>>.
- 4 World Association of Zoos and Aquariums, "Zoos and Aquariums of the World," Accessed March 4, 2016 <<http://www.waza.org/en/site/zoos-aquariums>>.
- 5 Corazon Catabog-Sinha, "Zoo Tourism: Biodiversity Conservation Through Tourism," *Journal of Ecotourism*, 7 (2008) : 2-3, 160-178, DOI: 10.1080/14724040802140527.
- 6 Association of Shelter Veterinarians, "The Five Freedoms," Accessed 10 Mar 2016 <<http://www.sheltervet.org/five-freedoms>>.
- 7 Ron Kagan, Scott Carter and Stephanie Allard, "A Universal Animal Welfare Framework for Zoos," *Journal of Applied Animal Welfare Science*, 18 (2015) : S2, DOI: 10.1080/10888705.2015.1075830
- 8 Eric Baratay, and Elisabeth Hardouin-Fugier, *Zoo: A History of Zoological Gardens in the West*, (London: Reaktion Books Ltd, 2002) 149.
- 9 R. Ballantyne et al. <http://www.tandfonline.com/doi/pdf/10.1080/13504620701430604> - Correct source? Page?
- 10 America's Best Zoos - According to which publication?
- 11 Ted Gregory, "Medical advances in care of aging zoo animals leads to difficult questions," 4 Mar 2016, Chicago Tribune, Accessed 5 Mar 2016 <<http://www.chicagotribune.com/news/ct-zoos-aging-animals-met-20160304-story.html>>.
- 12 Terry Maple, and Valerie Segura, "Advancing Behavior Analysis in Zoos and Aquariums," *The Behavior Analyst*, 38 (2014) : 77-91, DOI: 10.1007/s40614-014-0018-x
- 13 Fay E. Clark, "Marine mammal cognition and captive care: A proposal for cognitive enrichment in zoos and aquariums," *Journal of Zoo and Aquarium Research*, 1 (2013) : 4.
- 14 Ron Kagan, Scott Carter and Stephanie Allard, "A Universal Animal Welfare Framework for Zoos," *Journal of Applied Animal Welfare Science*, 18 (2015), DOI: 10.1080/10888705.2015.1075830
- 15 Ruth Padel, "Don't let good zoos go extinct," 22 March 2013, The Guardian, Accessed 7 Mar 2016 <<http://www.theguardian.com/books/2013/mar/22/good-zoos-conservation>>.
- 16 World Association of Zoos and Aquariums, "Science and Research," Accessed 7 Mar 2016 <<http://www.waza.org/en/site/conservation/science-and-research>>.
- 17 International Species Information System, "The Animal Residents," Accessed 7 Mar 2016 <<http://www2.isis.org/AboutUs/Pages/Find-animals.aspx>>.
- 18 Association of Zoos and Aquariums, "AZA-Accredited Zoos and Aquariums Generate \$160 million Annually for Wildlife Conservation," 2 Apr 2013, Accessed 13 Mar 2016 <<https://www.aza.org/PressRoom/detail.aspx?id=29199>>.
- 19 Shelley Grow, Ruth Allard, and Deborah Luke, "The Role of AZA-Accredited Zoos and Aquariums in Butterfly Conservation," *Butterfly Conservation in North America*, Ed. Jaret C. Daniels (New York: Springer Dordrecht Heidelberg, 2015), 23-34.
- 20 U.S. Fish and Wildlife Services, "Reintroduction of a Migratory Flock of Whooping Cranes in the Eastern United States," Accessed 15 Mar, 2016 <<http://www.fws.gov/midwest/whoopingcrane/wcraneqanda.html>>.
- 21 National Black-footed Ferret Conservation Center, "Reintroduction," Accessed 16 Mar 2016 <<http://blackfootedferret.org/reintroduction/>>.
- 22 U.S. Fish and Wildlife Services, "California Condor Recovery Program," Accessed 15 Mar 2016 <<http://www.fws.gov/cno/es/CalCondor/Condor.cfm>>.
- 23 International Species Information System, "ISIS and the golden lion tamarin," Accessed 15 Mar 2016 <<http://www2.isis.org/SiteCollectionDocuments/Golden%20lion%20tamarin.pdf>>.
- 24 Zoological Society of London, "How breeding programmes work," Accessed 7 Mar 2016 <<https://www.zsl.org/education/how-breeding-programmes-work>>.
- 25 Association of Zoos and Aquariums, "Reintroduction Programs," Accessed 12 Mar 2016 <<https://www.aza.org/reintroduction-programs/>>.
- 26 International Conservation Center, "About the International Elephant Center," Accessed 11 Mar 2016 <<http://internationalconservationcenter.org/aboutUs.html>>.
- 27 David Highfield, "Inside the Pittsburgh Zoo's Elephant Conservation Program," 17 Nov 2014, CBS Pittsburgh Accessed 12 Mar 2016 <<http://pittsburgh.cbslocal.com/2014/11/17/inside-the-pittsburgh-zoos-elephant-conservation-center/>>.
- 28 Amphibian Rescue and Conservation Project, "Partners," Accessed 11 Mar 2016 <<http://amphibianrescue.org/about/partners/>>. Other partners include the National Zoo, Zoo New England, and Cheyenne Mountain Zoo.
- 29 International Species Information System, "ISIS History," Accessed 15 Mar 2016 <<http://www2.isis.org/AboutUs/Pages/About-International-SpeciesInformationSystem.aspx>>.
- 30 Dalia A. Conde, et al., "Zoos through the Lens of the IUCN Red List: A Global Metapopulation Approach to Support Conservation Breeding Programs," *PLoS ONE*, 18 (2013) : 3. DOI:10.1371/journal.pone.0080311
- 31 World Association of Zoos and Aquariums, "Contribution to Science of Conservation Biology," Accessed 12 Mar <<http://www.waza.org/en/site/conservation/science-and-research/conservation-biology>>.
- 32 Saint Louis Zoo, "Institute for Conservation Medicine," Accessed 11 Mar 2016 <<http://www.stlzoo.org/conservation/institute-for-conservation-medicine/>>.

- 33 Sharon Deem, "Health of animals and people is inextricably linked," 16 Apr 2015, St. Louis Post-Dispatch, Accessed 5 Apr 2016 <http://www.stltoday.com/news/opinion/health-of-animals-and-people-is-inextricably-linked/article_f95253f3-4d90-59c5-a244-910c8c3fbb9a.html>.
- 34 Jordan Schau, "Saint Louis Zoo Tackles One health Initiative and Demonstrates the Benefits of Zoos to Human Health," 1 Feb 2016, Huffington Post, Accessed 5 Apr 2016 <http://www.huffingtonpost.com/jordan-schau/saint-louis-zoo-tackles-o_b_9102124.html>.
- 35 National Zoo, "About Think Tank," Accessed 5 Apr 2016 <<https://nationalzoo.si.edu/Animals/ThinkTank/>>.
- 36 Atlanta Zoo, "Research Projects," Accessed 5 Apr 2016 <http://www.zooatlanta.org/home/research_projects>.
- 37 <https://www.zsl.org/science/research/drahs>
- 38 Markus Gusset, et al., "A horizon scan for species conservation by zoos and aquariums," *Zoo Biology* 33 (2014) : 375-380, DOI: 10.1002/zoo.21153
- 39 Jani Actman, "African Elephants On Their Way to U.S. Zoos, Despite Protests," 9 Mar 2016, National Geographic, Accessed 5 Apr 2016 <<http://news.nationalgeographic.com/2016/03/160309-swaziland-zoos-african-elephants-transfer/>>.
- 40 G. McG. Reid, T. Contreras MacBeath, and K. Csarádi, "Global challenges in freshwater-fish conservation related to public aquariums and the aquarium industry," *International Zoo Yearbook* 47 (2013). DOI: 10.1111/izy.12020
- 41 Eric Baratay, and Elisabeth Hardouin-Fugier, *Zoo: A History of Zoological Gardens in the West*, (London: Reaktion Books Ltd, 2002) p. 101.
- 42 Stephen S. Fuller, "The Economic Impact of Spending for Operations and Construction in AZA-accredited Zoos and Aquariums" (Silver Spring: Association of Zoos and Aquariums, 2013) Accessed 5 Apr 2016 <<http://www.congressweb.com/Assets/ActionAlerts/AZA/AZA%20Economic%20Impact%20Report%202013.pdf>>.
- 43 Markus Gusset and Gerald Dick, "The global reach of zoos and aquariums in visitor numbers and conservation expenditures," *Zoo Biology* 30 (2011) : 566–569. DOI: 10.1002/zoo.20369
- 44 M. Penning, G. McG. Reid, H. Koldewey, et. al., Eds, *Turning the Tide: A global aquarium strategy for conservation and sustainability*, Accessed 5 Apr 2016 (Bern: World Association of Zoos and Aquariums, 2009) <http://www.waza.org/files/webcontent/1_public_site/5.conservancy/conservation_strategies/turning_the_tide/Aquarium%20strategy%20EN.pdf>.
- 45 Meagan Nichols, "Study shows economic impact of zoo," 7 May 2015, Memphis Business Journal, Accessed 6 Apr 2016 <<http://www.bizjournals.com/memphis/news/2015/05/07/study-shows-economic-impact-of-zoo.html>>.
- 46 Chris Korman, "Aquarium generates more than \$300 million for Maryland," 5 Dec 2012, The Baltimore Sun, Accessed 6 Apr 2016 <http://articles.baltimoresun.com/2012-12-05/business/bs-bz-baltimore-aquarium-economic-impact-20121204_1_national-aquarium-institute-baltimore-aquarium-aquarium-visitors>.
- 47 Chris Korman, "Aquarium generates more than \$300 million for Maryland," 5 Dec 2012, The Baltimore Sun, Accessed 6 Apr 2016 <http://articles.baltimoresun.com/2012-12-05/business/bs-bz-baltimore-aquarium-economic-impact-20121204_1_national-aquarium-institute-baltimore-aquarium-aquarium-visitors>.
- 48 Sage Policy Group, INC, "The Economic Contributions of the National Aquarium," October 2012, Accessed 7 Apr 2016 <<https://www.aquarium.org/~media/Files/Economic-Contributions-FINALr-2012.pdf>>.
- 49 David Eichenenthal and Tracy Windeknecht, "Chattanooga, Tennessee: A Restoring Prosperity Case Study", 2008, Brookings Institution, Accessed 8 Apr 2016 <http://www.brookings.edu/~media/Research/Files/Papers/2008/9/17%20chattanooga%20eichenenthal%20windknecht/200809_Chattanooga.PDF>.
- 50 Tennessee Aquarium, "Community Impact: Key Social and Economic Benefits Created by the Non-Profit Tennessee Aquarium," 2015, Accessed 8 Apr 2016 <<http://www.tnaqua.org/images/uploads/subpages/Community-Impact-Report.pdf>>.
- 51 Christos Siderelis, "Incidental trips and aquarium benefits," *Leisure Sciences* 23 (2001) : DOI: 10.1080/014904001316896873
- 52 Eric Thompson, "The 2012 Economic Impact of the Lincoln Children's Zoo on Lancaster County," Bureau of Business Research Publications, University of Nebraska-Lincoln, Accessed 8 Apr 2016 <<http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1015&context=bbrrpub>>.
- 53 Greater Vancouver Board of Trade, Vancouver Board of Trade supports the Vancouver Aquarium and its current cetacean policy," 24 July 2014, Accessed 8 Apr 2016 <<https://www.boardoftrade.com/31-news/2014/195-vbot-supports-the-vancouver-aquarium-and-its-current-cetacean-policy>>.
- 54 Chicago Zoological Society, "Economic Impact," Accessed 9 Apr 2016 <<https://www.czs.org/Chicago-Zoological-Society/Community-Impact/Economic-Impact>>.
- 55 Georgia Aquarium, "Georgia Aquarium Bolsters State Economy by \$1.9 Billion," 17 Feb 2016, Accessed Apr 9 2016 <<http://news.georgiaaquarium.org/news/georgia-aquarium-bolsters-state-economy-by-1-9-billion>>.
- 56 Stephen S. Fuller, "The Economic Impact of Spending for Operations and Construction in AZA-accredited Zoos and Aquariums" (Silver Spring: Association of Zoos and Aquariums, 2013) Accessed 9 Apr 2016 <<http://www.congressweb.com/Assets/ActionAlerts/AZA/AZA%20Economic%20Impact%20Report%202013.pdf>>.
- 57 Sage Policy Group, INC, "The Economic Contributions of the National Aquarium," October 2012, Accessed 7 Apr 2016 <<https://www.aquarium.org/~media/Files/Economic-Contributions-FINALr-2012.pdf>>.
- 58 Daniel L. Erkkila, "Economic Impacts from the Minnesota Zoo 2012," 26 Dec 2012, University of Minnesota, Accessed 8 Apr 2016 <<http://conservancy.umn.edu/bitstream/handle/11299/167878/Minnesota%20Zoo.pdf?sequence=1&isAllowed=y>>.
- 59 Paul Coomes and Barry Kornstein, "The Economic Importance of Arts and Cultural Attractions in the Louisville Area," 25 Oct 2007, University of Louisville, Accessed 9 Apr 2016 <<http://usi.louisville.edu/wp-content/uploads/2014/12/The-Economic-Importance-of-Arts-and-Cultural-Attractions.pdf>>.
- 60 "Magnetic Hill Zoo economic spinoffs spur talk of hotel levy," 2 Feb 2016, CBC News, Accessed 9 Apr 2016 <<http://www.cbc.ca/news/canada/new-brunswick/magnetic-hill-zoo-economics-1.3429816>>.
- 61 David Eichenenthal and Tracy Windeknecht, "Chattanooga, Tennessee: A Restoring Prosperity Case Study", 2008, Brookings Institution, Accessed 8 Apr 2016 <http://www.brookings.edu/~media/Research/Files/Papers/2008/9/17%20chattanooga%20eichenenthal%20windknecht/200809_Chattanooga.PDF>.

- 62 Perry Stein, "The numbers are in. Everyone watched the panda cam this weekend," 24 Aug 2015, The Washington Post, Accessed 10 Apr 2016 <<https://www.washingtonpost.com/news/local/wp/2015/08/24/the-numbers-are-in-everyone-watched-the-panda-cam-this-weekend/>>.
- 63 Perry Stein, "Meet the woman coming to D.C. again for a first glimpse of the new panda," 15 Dec 2015, The Washington Post, Accessed 10 Apr 2016 <https://www.washingtonpost.com/local/a-womans-panda-cam-fascination-means-a-second-national-zoo-trip/2015/12/14/d41ab500-b436-4976-90aa-cb3a848160cc_story.html>.
- 64 R. Ballantyne et al. See note 9.
- 65 Elissa Pearson, Jillian Dorrian, and Carla Litchfield, "Measuring zoo visitor learning and understanding about orangutans: evaluation to enhance learning outcomes and to foster conservation action," *Environmental Education Research* 19 (2013) : 823-843.
- 66 John Falk, et al., "Critique of a Critique: Do Zoos and Aquariums Promote Attitude Change in Visitors?" *Society & Animals* 18 (2010) : 415-419. DOI: 10.1163/156853010X524361
- 67 Ursula Anderson, et al., "Enhancing the Zoo Visitor's Experience by Public Animal Training and Oral Interpretation at an Otter Exhibit," *Environment and Behavior* 35 (2003) : 826-841. DOI: 10.1177/0013916503254746
- 68 Mark Bowler, Hannah Buchanan-Smith, Andrew Whiten, "Assessing Public Engagement with Science in a University Primate Research Centre in National Zoo," *PLoS ONE* 7 (2012). DOI:10.1371/journal.pone.0034505
- 69 John H. Falk, et al., "Why Zoos and Aquariums Matter: Assessing the Impact of a Visit", 2007, Association of Zoos & Aquariums, Accessed 11 Apr 2016 <https://www.aza.org/uploadedfiles/education/why_zoos_matter.pdf>.
- 70 Judy Mann, Roy Ballantyne, Jan Packer, "International Research on Zoo and Aquarium Visitors – Some New Perspectives," *World Association of Zoos and Aquariums Magazine* 15 (2014) : 18-21 < https://espace.library.uq.edu.au/view/UQ:338921/post_print_338921.pdf>.
- 71 Gerald Dick, Carole Lecointre, Markus Gusset, "Evaluating the contribution of zoos and aquariums to Aichi Biodiversity Target 1," *Conservation Biology* 29 (2015) : 537-544. DOI: 10.1111/cobi.12383
- 72 Monterey Bay Aquarium, "Seafood Recommendations," Accessed 5 Apr 2016 <<http://www.seafoodwatch.org/seafood-recommendations>>.
- 73 Monterey bay Aquarium, "Our Partners," Accessed 5 Apr 2016 <<http://www.seafoodwatch.org/businesses-and-organizations/partners>>.
- 74 New England Aquarium, "Ocean-Friendly Seafood Species," Accessed 5 Apr 2016 <http://www.neaq.org/conservation_and_research/projects/fisheries_bycatch_aquaculture/sustainable_fisheries/celebrate_seafood/ocean-friendly_seafood/species/index.php>.
- 75 Michael Tlusty, et al., "Opportunities for Public Aquariums to Increase the Sustainability of the Aquatic Animal Trade," *Zoo Biology* 32 (2013) : 1-12. DOI: 10.1002/zoo.21019
- 76 R. Ballantyne et al., citing Rabb, 2004
- 77 J. Fraser and J. Sickler, "Measuring the Cultural Impact of Zoos and Aquariums," *International Zoo Yearbook* 43 (2009) : 103-112. DOI: 10.1111/j.1748-1090.2008.00064.x
- 78 J. Fraser and J. Sickler, "Measuring the Cultural Impact of Zoos and Aquariums," *International Zoo Yearbook* 43 (2009) : 103-112. DOI: 10.1111/j.1748-1090.2008.00064.x
- 79 Corazon Catibog-Sinha, "Zoo Tourism: Biodiversity Conservation Through Tourism," *Journal of Ecotourism* 7 (2008) : 160-178. DOI: 10.1080/14724040802140527
- 80 Corazon Catibog-Sinha, "Zoo Tourism and the Conservation of Threatened Species: A Collaborative Program in the Philippines," *Zoos and Tourism: Conservation, Education, Entertainment?*, ed. Warwirck Frost (Bristol: Channel View Publications, 2010)
- 81 Jeremy Hance, "Zoos could become 'conservation powerhouses'," 8 December 2015, The Guardian, Accessed 4 Apr 2016 <<http://www.theguardian.com/environment/radical-conservation/2015/dec/08/zoos-aquariums-conservation-animals-wildlife-funding>>.
- 82 International Union for Conservation of Nature, "Summary Statistics," Accessed 3 Apr 2016 <<http://www.iucnredlist.org/about/summary-statistics>>.
- 83 Christopher Peterson, "Results of a New National Survey," Apr/May 2011, Food Safety Magazine, Accessed 3 Apr 2016 <<http://www.foodsafetymagazine.com/magazine-archive1/aprilmay-2011/results-of-a-new-national-survey>>.
- 84 Edelman, "Trustbarometer: 2016 Executive Summary," Accessed 4 Apr 2016 <<https://www.scribd.com/doc/295815519/2016-Edelman-Trust-Barometer-Executive-Summary>>.
- 85 Gallup, "Confidence in Institutions," 7 June 2015, Accessed 4 Apr 2016 <<http://www.gallup.com/poll/1597/confidence-institutions.aspx>>.

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