From Exhibit to Classroom: Transitioning Aquariums and Zoos for the Twenty-First Century

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INTRODUCTION

People young and old are captivated by Calypso, the Green Sea Turtle who lives at the National Aquarium. Whether swimming in the crystal-blue waters of the Blacktip Reef exhibit, nibbling on romaine lettuce and the occasional squid, or peeking her head out just above the glistening surface, the five-hundred-pound, three-flippered Calypso is a sight to behold. The giant turtle was rescued by the Riverhead Foundation for Marine Research and Preservation in 2000, after becoming cold-stunned and stranded in the Long Island Sound. At the time of her rescue, Calypso weighed only six pounds and had a badly infected front flipper that was later amputated. Due to federal regulations governing the rescue, rehabilitation, and release of endangered marine life, the Riverhead Foundation could not return Calypso to her habitat. Instead, she came to live at the National Aquarium, where she has been delighting visitors ever since as one of the Aquarium's most popular attractions.

By providing Calypso with a clean habitat, ample food, and medical care, the National Aquarium has likely spared her from the fate of many sea turtles in the wild who face mounting challenges including poaching, bycatch, disease, and habitat loss.[1] In partnering with organizations like the Riverhead Foundation and the North Carolina Aquarium, the National Aquarium is also helping to rescue, rehabilitate, and release a variety of species of sea turtles who can be returned to their habitats. And through various media and educational programs, the Aquarium is working to communicate the crucial message that it is we humans and our harmful activities that pose the greatest threat to these animals.

But while the experience of seeing Calypso in the Blacktip Reef exhibit at the National Aquarium is designed to motivate visitors to take personal and political action toward conservation, studies show that it doesn't.[2] According to the report "Do Zoos and Aquariums Promote Attitude Change in Visitors? A Critical Evaluation of the American Zoo and Aquarium Study," by Lisa Marino, et al., "there remains no compelling evidence for the claim that zoos and aquariums promote attitude change, education, or interest in conservation in visitors."[3] How can these well-meaning organizations who do so much for animal rehabilitation, like saving Calypso, make progress on conservation action? Is it possible these institutions have a business model that is preventing them from succeeding in their missions—and, if it is, how can they bring about change and stay financially viable?

TRANSITIONING MODELS: FROM ENTERTAINMENT TOWARD EDUCATION

Today's aquariums and zoos have come a long way from their early days as aristocratic menageries, those captive collections of "exotic" animals that were held by rulers as a show of power and for personal entertainment,[4] developing into organizations with science-based missions by the turn of the nineteenth century. Having adopting conservation-based missions

toward the end of the twentieth century, today's aquariums and zoos—and the people who lead and work for them—have a far more humane attitude toward animals than any of their predecessors. This evolving ethic reflects larger social and cultural changes informed by emerging science, policy, and technology. For instance, scientists' developing understanding of the sentience, intelligence, and consciousness of a range of species (humans included) has led to significant changes in the practice and regulation of aquariums and zoos.[5] These include instituting higher standards of care and display, adopting conservation-oriented missions, discontinuing breeding programs and performances, and, most recently, initiating efforts to retire large mammals to sanctuaries.[6]

The National Aquarium, for example, has recently announced that it will no longer hold dolphins in captivity, and that it plans to establish a sanctuary for the eight dolphins currently in its care by 2020.[7] The Monterrey Bay Aquarium has long enjoyed popularity, prosperity, and support for what others have termed its "captive-free model," as well as efforts to educate the public about ocean health, sustainable aquaculture, and research and conservation activities within its community. Even the Georgia Aquarium, an organization that until recently contracted with Russia to capture beluga whales that they intended to exhibit, has announced that it will "no longer take dolphins or whales caught in the wild, a dramatic policy reversal."[8] Yet, while we see these organizations continuing to evolve, today's aquariums and zoos have nevertheless maintained a model in which their viability is dependent upon the entertainment value of displaying animals to visitors.

> "Today's aquariums and zoos have outgrown the entertainment model.

Many aquariums were in fact established specifically for this purpose—conceived as economic anchors that could help attract investment in their cities' ailing downtowns.[9] Building aquariums was about reinventing these former waterfronts of industrial production into playgrounds of shopping, leisure, and entertainment. Zoos were built or significantly renovated for the same reason; to produce an entertainment destination that could be an economic driver. And while many of these same organizations may have explicit conservation missions, partner with scientific institutions, and consider themselves educational institutions, most, if not all, of them continue to brand themselves as entertainment venues.[10]

To be sure, aquariums and zoos do share educational information with their visitors. They do this by accommodating large contingencies of visiting school groups, providing informational placards and signage accompanying exhibits, training staff members and volunteers to engage visitors, telling stories on their websites, and offering on- and off-site programs for people of all ages. But while these good intentions to educate have built brand awareness about a particular aquarium or zoo, they are not measurably changing conservation behavior in visitors.[11] Perhaps even more significantly, because entertainment remains a primary concern, crucial public education issues like climate change and habitat loss as the result of human practices—and even the foundational theory of evolution—are either diluted or not communicated at all.[12] The terms climate change and global warming are still noticeably absent from many of today's aquariums and zoos, especially in conservative areas of the country, while logos for some of the least environmentally friendly corporations are conspicuously present,[13] despite scientific consensus that the world is getting warmer due to human activities. This kind of information—that we humans are not outside of or dominant over nature, but rather interconnected and inseparable from all life, and that our actions resonate globally—could be communicated to visitors in a way that encourages action. It becomes far more difficult, however, when visitors are primed to expect entertainment and spectacle in exchange for an often steep monetary investment and then encouraged to consume. "You don't want [visitors] walking away saying, 'I paid to get in, I bought my kid a hot dog, I just want to show my kid a fish—and you are making me feel bad about climate change,'" said a former AZA official, speaking to this idea in 2012.[14] Instead, many aquariums and zoos seek merely to "inspire" visitors—and to maintain their financial solvency through the price of admission, otherwise known as gate revenue.

It is true that these organizations do foster interactions between people and animals, often exposing children, especially in urban areas, to animals and habitats—to "nature"—they might never see otherwise. These experiences can make people feel good or in awe or inspired, and sometimes they may even motivate a child to become more interested in science or to recycle plastic, although unfortunately this remains unverified outside of anecdote. But when a child sees an animal that might not have the same backstory as

the rescued three-flippered Calypso, even if she comes away from the experience exuberant and in awe, is she not also being taught to normalize the idea that animals live in swimming pools and exist to entertain us and that they are separate and subservient to humans? We should be talking about the potential disconnect between implicit and explicit messages and how these might be undermining the genuine efforts on the part of these organizations to educate and motivate their visitors

With their stated conservation missions, today's aquariums and zoos have outgrown the entertainment model, and their reliance on gate admissions is holding them back from becoming premier conservation and education organizations. The proliferation of concessions and gift shops that this entertainment model encourages, for example, often promotes the very materials threatening the health and well-being of animals and the environment. The plastics that create carbon pollution, choke poverty-stricken areas, and blight our ocean, often end up inside the intestines of animals like Green Sea Turtles.

But what if aquariums and zoos could re-establish their relationship to visitors not as entertainers or vendors but as true educators?

BECOMING TRUE EDUCATORS: THE FUTURE IS SCHOOL

Luckily, zoos and aquariums already have the resources and opportunities at their disposal to take this next step in their evolution. If they truly want to be conservation organizations—and become organizations that make crucial contributions to the world by educating people about the challenges facing animals and their habitats and motivating them to take action—they have to enhance their current educational focus and have more direct positive impact on their communities. Because these organizations are already recognized as civic institutions within their cities, they are uniquely positioned to become a new kind of civic asset. They could become schools that offer specialized, experiential science career training and technical education programs. By co-locating and co-operating schools on site at aquariums and zoos, these organizations can use their facilities, resources, and strategic urban locations to educate and train generations of students to become scientists, biologists, climatologists, and environmental stewards. Fully embracing their educational potential will not only allow aquariums and zoos to thrive as organizations and diversify their funding base, but also give them agency to create better communities and a better world.

With an estimated 97,000 elementary and secondary schools across the United States serving nearly 50 million students, schools have an outsized influence on the education, health, and welfare of youth, their families, and their neighborhoods. And many city schools are currently grappling with a number of major challenges, including population shifts that affect enrollment; declining budgets; increasing debt and pension obligations; and the need to provide social services beyond their core educational mission.[15] Meanwhile, they continue to prepare students to participate in society and a global economy that requires fundamental skills and rewards exceptional ones. The latter is especially true for the fields of math and science, in which U.S. students are catching up but still lag behind their international counterparts.[16]

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Schools at aquariums and zoos would be specially equipped to address these challenges and empower American students with the types of knowledge and skills that will become increasingly critical for the future of our planet. To devise such schools would require curriculum development, entrepreneurial thinking, and financial support, as well as strong collaboration across institutional boundaries—things that aquariums and zoos already excel at—but it would also bring multiple benefits. These organizations are home to unique animals, expert knowledge, and advanced technical facilities—all of which could undergird a new kind of school with the essential mission to instill in people, beginning at a very young age, a holistic understanding of the relationship between humans and the health of the planet. Hands-on learning becomes applicable and possible in all subjects of the curriculum, providing students with much-needed skills and knowledge in the STEM fields. Innovative school programs could lead to certification in marine science technology, comparative biology, or sustainable agriculture—with jobs to follow. Specifically, students would gain expertise in fields that would benefit the future health of our planet—for instance, sustainable practices of farming and fishing.

If aquariums and zoos transformed into spaces of learning with active classrooms, learning labs, maker spaces, and hands-on studies of animals and environ-

ments, they could foster new sustainable industries, helping to create jobs and drive economies in ways that prioritize the natural environment. Public investment in aquariums and zoos would become an investment in our youth, helping to create the next generation of capable environmental advocates, and in the capacity and equity of our educational system, in which it is estimated that we are "underinvesting by a staggering $46 billion annually"[17] while "needs are mounting as school conditions decline over time and funding to adequately maintain and renew school facilities is inequitably distributed across communities with vastly differing wealth and resources."[18]

PRECEDENTS FOR IMPLEMENTATION: THE FUTURE IS NOW

Successful collaborations between schools and aquariums already exist today and can serve as precedents for pushing this education model further. The Urban Assembly New York City Harbor School, for example, is a public high school serving 432 young adults in grades 9 through 12. The Harbor School was founded in 2003 as a collaboration between the non-profit organizations Urban Assembly and Waterkeeper Alliance and the privately owned South Street Seaport Museum. Prioritizing student-centered learning and family engagement, the School is open to all students in New York City, with no screening process other than expressed interest on the part of the student. Their graduation rate is an impressive ninety-seven percent, soaring over the city's average rate of seventy-seven percent and well above the national average of eighty-two percent.[19]

The Harbor School divides its curriculum between traditional coursework (English, social studies, mathematics, science, foreign language, art, physical education, and health) and career and technical education coursework. As freshmen, students learn about the New York Harbor and gain or strengthen skills like swimming (nearly half of incoming freshman learn to swim at Harbor School), rowing, and sailing. As sophomores, students select one of six programs of study, having identified and solidified that interest during their freshman year, and participate in work-based learning experiences that prepare them for careers in aquaculture, marine biology research, marine service technology, ocean engineering, scientific diving, and vessel operations, ultimately achieving industry certification. Many of these students, despite living in New York City surrounded by water, arrive at the Harbor School with little or no exposure to boats or water.

While the school's diving program takes place in the open harbor waters when feasible, generally between May and October, during the colder months it partners with the New York Aquarium, allowing students to practice their skills inside the Aquarium's tanks. During their dives, students join adult volunteers and Aquarium staff in maintaining the tanks and, in addition to keeping their skills fresh, they also earn wages and gain valuable work experience.

Perhaps most significantly, the Harbor School's Billion Oyster Project offers a precedent for the kind of curriculum that has the potential to reshape our educational and environmental landscapes. Students have been growing oysters in the New York Harbor for the last six years, learning to "SCUBA dive safely, raise oyster larvae, operate and maintain vessels, build and operate commercial-scaled oyster nurseries, design underwater monitoring equipment and conduct long-term authentic research projects all in the murky, contaminated, fast-moving waters of one of the busiest ports in the country."[20] The Harbor School students' efforts have expanded to include thirty-six other public schools, and altogether the effort has restored over 11 million oysters to their native waters. The project incorporates education, job training, and research into a harbor-wide oyster restoration project.

"Our long-term goal," says Harbor School aquaculture teacher Peter Malinowski, "is, over the next 50 years, to put a billion live oysters back in the water. A billion oysters would filter the standing volume of New York Harbor, which is about 74 billion gallons, once every three days. It's our hope that putting oysters back in the water will clean the water and provide the necessary foraging and nursery habitat for the different fish species that spawn here and return the Hudson River back to what it used to be like. And in the process educate the next generation of activists and scientists who will go on to become stewards of their waterways."[21]

Another precedent for this kind of successful partnership is the Dr. Theodore T. Alexander, Jr., Science Center School in South Los Angeles. The Science Center School is a dual-language K-5 public elementary school with an enriched math- and science-focused curriculum. It is located on site at the California Science Center, a museum of science and technology and home to the Space Shuttle Endeavour. Currently serving around 650 students primarily from the predominantly Latino Exposition Park neighborhood that surrounds it, the School was founded as part of

the Science Center's twenty-five-year master plan to alleviate overcrowding at other local schools and increase learning opportunities for students, especially those who are identified as academically low achieving. The Science Center School's curriculum is developed by both teachers and students. Twenty percent of instructional time is spent teaching, while 80 percent is reserved for child collaboration and lab time. In addition to having direct access to the cutting-edge facilities and habitat exhibits at the California Science Center, the School's partnerships with organizations like the Resource Conservation District of the Santa Monica Mountains allow students to participate in conservation work. This year, the School's third graders spent two days working to improve their native ecosystem, helping the organization remove non-native red swamp crayfish from Topanga Creek, where they have caused a severe shift in ecosystem dynamics. The School also partners with the nearby University of Southern California, bringing USC undergraduate and graduate degree students to the classroom to test curricula like the SunSmart program, which engages students in hands-on activities that teach them about ultraviolet rays and sun safety. With a grant from the National Institutes of Health, the SunSmart curriculum has become a full-fledged science experiment for the young students, who hypothesize about different levels of sun exposure around their playground, measure UV rays using wearable devices, and then graph their results.[22]

Unlike the majority of aquariums and zoos that avoid mentioning climate change, these schools are explicitly talking about and taking on critical climate-related issues, empowering their students with the tools to take action and to have real impact in their communities and beyond. Aquariums and zoos throughout the world can look to these precedents as they begin to transition to a more education-focused model, building on the incredible teaching tools they already have at their disposal: their facilities, experts, and collections.

> "Zoos and aquariums are uniquely positioned to become a new kind of civic asset: schools that offer specialized, experiential science career training and technical education.

INITIATING THE CHANGE

Many aquariums and zoos already have partnerships with schools, businesses, foundations, and government entities in their communities and regions that they can develop further by including a more sustained educational focus. By working with their local educational systems to identify where schools are closing or where there is a specific educational need or inequity, aquariums and zoos can develop and make accessible science- and conservation-based programs and training, or even entire curricula, to meet the needs of students in affected communities. Working with their city, state, and federal governments and both public and private foundations, aquariums and zoos can potentially tap into resources allocated for education, green infrastructure, and public space improvements. Aquariums and zoos can begin this process by assessing the programs they already offer and increasing their public visibility and accessibility; establishing deeper partnerships with existing urban schools, colleges, and universities; and offering their facilities as sites where students and young adults can work directly with the animals, learning skills applicable to advanced studies and jobs in science and conservation.

Having developed an ecosystem of partners in the public and private sectors, aquariums and zoos could eventually adapt or rebuild their facilities to reflect this new hybrid asset for education and conservation. By becoming carbon neutral or achieving net positive energy through a creative retrofit, these facilities could simultaneously function as educational tools and tangible manifestations of a conservation ethic, modeling for their communities and other organizations around the world the actions that are necessary to conserve our environment—foremost among them, mitigating carbon pollution to reduce the major threat to the health and well-being of all life on earth.

THE NEXT STEP FORWARD

As aquariums and zoos transition toward full-fledged conservation education centers, it will become necessary to phase out the entertainment model while phasing in a new kind of business model, leveraging their organizations' resources to identify strategies for diversification. This could include developing new funding alliances, licensing new technology or curriculum developed by staff and researchers, or even establishing revenue-based contracts with employers who will benefit from better trained and certified employees. In defining a more explicit concentration on education, aquariums and zoos may even find new mission-aligned donors and revenue streams. A new

model for these organizations may at first seem challenging, but its potential is profound—not only providing a future pathway for the continued evolution of aquariums and zoos but simultaneously supporting the educational, ecological, and socio-economic health of their neighborhoods and cities.

There are also school systems that are limited ideologically and politically from addressing issues like climate change and evolution—yet another barrier to the kind of conservation education that is needed to change behaviors and develop people into environmental stewards. But the idea of attending a school that is educational, fun, and engaging while offering so much potential for future opportunity would possibly help parents overcome these barriers. Still, efforts to link aquariums and zoos with schools will need to be supported by partners in local government and by communities of citizens bound by their belief that social, educational, and attitudinal change is both needed and possible. Together, aquariums, zoos, schools, governments, and citizens can build a new culture of care and conservation permeating all aspects of society.

A CONCLUSION

It is more than apparent that the current conservation education measures taken by aquariums and zoos are earnest attempts, but they are not profound enough to match the urgency of climate change and the destruction of habitat that threatens the survival of all animals, including humans. Moreover, if aquariums and zoos fail to continue their evolution as true conservation organizations and instead remain reliant on their entertainment model, hedging their viability on spectacle and consumption, they may find themselves on the endangered species list.

Data continue to show that today's youth have different attitudes and behaviors than previous generations, including a low tolerance for seeing certain animals in captivity.[23] While attendance at aquariums and zoos is generally declining, attendance at organizations that have proven themselves dedicated to evolving the current model is holding strong. This is especially true for those organizations that are viewed as more credible with regard to their missions, i.e., aquariums and zoos that do not hold large mammals and who have innovated in areas of rescue and rehabilitation. These model institutions are doing better financially because "reputational efficiencies noticeably predict revenue efficiencies." In other words, "being good at your [conservation] mission is good business [for aquariums and zoos]."[24] Now is the time to rethink the widespread entertainment model and reinvent zoos and aquariums as conservation education centers: places where charismatic animals like Calypso, the rescued turtle, will continue to inspire us, but also places where our investments in learning, personal growth, innovation, and ideas will ensure an inspiring ecological future for us all.

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