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A Human-Animal Dialogue: Positive Reinforcement Training in Zoos and Aquariums

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Abstract

This paper addresses the benefits of positive reinforcement training in zoos and aquariums across America, and why this form of training is best for both the animals and people. There is a long standing public debate about the appropriateness of keeping wild animals in zoos and aquariums and their treatment within these facilities. The way in which some animal care facilities have historically managed animal behavior using dominance-based training which uses methods such as punishment and deprivation, has rightly come under criticism and proven to provide poor animal welfare. This poor mis-management has fueled an anti-zoo and aquarium agenda for many people and organizations. Today, the method of positive reinforcement training has become the primary method of training in zoos and aquariums across the United States because of its benefits to animal welfare and to the general public. Positive reinforcement training refers to a style of training that uses desirable stimuli to increase wanted behavior. Positive reinforcement training is behind many of the presentations or shows you can see at zoos or aquariums across the country. Further, it provides a much deeper contribution to animals beyond the view of the public eye, including animal health care, mental stimulation, and the conservation of species. Chapter one uses quantitative data on the public perceptions of zoos and aquariums, and the methods of dominance based training and positive reinforcement training to provide a deeper understanding of how zoos and aquariums provide supporting and provisioning services to nonhuman animals. Chapter two delves into the contributions to animal welfare that training provides through an animal welfare perspective, using background such as animal-welfare laws in the US and animal welfare theory. Looking through the lens of conservation biology, Chapter three analyzes how husbandry training can increase the health and life expectancy of certain

species. With an environmental education perspective, Chapter four explores the way in which positive reinforcement training helps to educate guests and visitors of these institutions about the importance of wildlife conservation. Ultimately, Chapter five addresses the current policies surrounding animal care, and my suggestions to increase positive reinforcement training in zoos and aquariums to benefit animal welfare and public education.

Keywords: conservation, training, positive reinforcement, husbandry, wildlife, animal welfare, zoos, aquariums, environmental education.

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Introduction: Five Years Old and the Feeling of Flippers

The smell of fish and ocean breeze has been thoroughly ingrained in my brain since I was about five years old. My first encounter with a sea lion was at the New York Aquarium in Coney Island, Brooklyn, and I can still remember it as if it were yesterday. If I close my eyes hard enough, I can still hear the screeching of the penguins, the barks of the sea lions, and, of course, the smell of fish. But what remains the most prominent sense memory for me was the feeling. Specifically, the feeling of the flippers. During this trip, I met a sea lion named Fonzi. The feeling of his flipper in my small hand was so mind blowing to me that I never forgot it: rubbery, firm, and cold. After the encounter, we got to watch the sea lion show at the aquarium's Aquatheater. I remember being so amazed at how the animals could perform such amazing behaviors– a backflip! I had never seen such a thing.

Kathryn and Fonzi, New York Aquarium, 2006.

If you would have told me 15 years later that I would be working at the New York Aquarium, performing on the same Aquatheater stage I once watched in awe, I wouldn't believe it. That one moment as a five year old girl solidified my love and passion for wildlife. That one moment 15 years ago worked as a

Kathryn and Osborn, New York Aquarium, 2021.

catalyst for my career. While some things stay the same (such as the feeling of a sea lion's flipper in my now-much-larger hand), a lot has changed. I've finally found an answer to the question I wondered as a little girl: *how* do these animals perform those amazing behaviors? The answer: positive reinforcement training.

I've also come to learn that animal training is so much more than a backflip in a show. Positive reinforcement training has immense benefits to the animals under human care as well as the guests at these zoos or aquariums. The use of positive reinforcement training improves animal welfare by providing mental and physical stimulation, aids in the conservation of species through breeding programs and increasing their lifespan with any necessary medical treatment, and educates visitors on human impacts on wildlife. Just like Fonzi and his trainers inspired me all those years ago, the use of positive reinforcement training continues to inspire guests and foster a deep compassion for these animals, which can help protect wild animal species in years to come.

While today positive reinforcement training is the main form of animal management in zoos and aquariums across America, it wasn't always this way. The historic use of dominance based training and aversive methods have been labeled as "animal abuse" and "inhumane". Although a lot has changed over the decades, this image is a battle that zoos and aquariums still fight today. It is vital to note that from this moment forth, all zoos and aquariums referenced in this paper are accredited and legitimate facilities, and exclude illegal or roadside "zoos" that may still utilize force and aversive methods for animal management. Accreditation for zoos and aquariums is given by a few different associations, although the main one referenced in this paper is accreditation by the Association of Zoos and Aquariums.

Chapter one provides a brief history on the development of positive reinforcement training, and uses quantitative data on public perceptions of zoos and aquariums to display the benefits of positive reinforcement training for visitors. Chapters 2-4 explore positive reinforcement training through the lens of animal ethics, conservation biology, and environmental education. In the final Chapter 5, I propose policy recommendations which would ensure positive reinforcement training programs in zoos and aquariums, instill a greater understanding of positive reinforcement to the public, and help to foster support for zoos and aquariums while simultaneously combatting the anti-zoo and aquarium agenda.

Chapter 1: Out With the Old and in With the New

Types of Zoos and Aquariums. Before diving into how positive reinforcement training has developed and transformed animal care facilities, it is important to lay out the different types of zoos and aquariums, and which ones will be referenced in this paper. A zoo is defined by the USDA as "any park, building, cage, enclosure, or other structure or premise in which a live animal or animals are kept for public exhibition or viewing, regardless of compensation" (USDA 2005, 39). With this definition, there are 5 types of zoos: Safari parks, Aquaria, Animal Theme Parks, Petting zoos, and Roadside zoos.

Safari parks typically house animals in large outdoor enclosures. Their environments are enclosed by motes, rivers, and flora and fauna as opposed to cages. Often, visitors are allowed to drive through these environments and even feed the animals. Many large zoos fall into this category, combining indoor exhibits and outdoor exhibits which cater to the species they house.

These kinds of zoos are mainly accredited by the Association for Zoos and Aquariums (AZA) and are regulated by the USDA.

Aquaria include public aquariums that house aquatic animal and plant species for guests to come see. The emergence of positive reinforcement training coincides with the introduction of marine mammal training in aquaria. Because of this, many of the advancements in animal training have been within aquariums across the country. Aquaria are regulated by USDA and accredited by AZA. The International Marine Animal Trainer's Association (IMATA) also accredits facilities to recognize exceptional positive reinforcement training programs in marine mammal facilities. Positive reinforcement training is still the main method of animal management amongst aquariums. Today, aquariums advocate for ocean conservation and work to educate their guests.

Animal theme parks combine amusement parks and zoos for entertainment and commercial purposes. These kinds of facilities include marine mammal parks such as SeaWorld, and wild animal parks such as Disney's Animal Kingdom and Six Flags Discovery Kingdom. Historically, these types of zoos have come under criticism from animal welfare activists who argue the focus on entertainment compromises the animals' welfare. In response to these criticisms, these facilities have greatly improved their animal care by adopting practices such as positive reinforcement training. Due to the revenue these entertainment facilities can generate, today places like SeaWorld and Disney World invest millions of dollars into rescue and rehabilitation programs that help wild animals across the world. These facilities are also regulated by the USDA and accredited by AZA.

Petting zoos are a small zoo or farm that house domestic animals. Petting zoos offer visitors the chance to touch and feed the animals with food provided by the facility. The AWA states that farm animals are exempt from USDA inspection, however petting zoos must be licensed (USDA 2005, 7). Roadside zoos are often small zoos in remote locations that allow visitors to interact with animals in often unregulated settings. Roadside zoos are often criticized for their lack of proper care for their animals. They are less regulated than larger animal care facilities because they are not accredited by any organization. These roadside zoos pose a threat to the animals under their care, and to the people who interact with them. Roadside zoos must comply with the AWA, however they often fail to do so. Because of this, roadside zoos are unaccredited and often recognized as illegitimate animal care facilities.

In this paper, the terms 'zoos and aquariums' and 'zoological facilities' will only refer to accredited facilities that fall into the categories of Safari Parks, Aquaria, and Animal Theme Parks. These three types of facilities are regulated and inspected by USDA and the Occupational Safety and Health Administration (OSHA). Additionally, accredited facilities are recognized by associations such as AZA, the national standard for animal welfare, which "examines the zoo or aquarium's entire operation, including animal welfare, veterinary care, conservation, education, guest services, physical facilities, safety, staffing, finance, and governing body" (Association of Zoos and Aquariums 2023). Roadside zoos and petting zoos, which are unaccredited facilities and generally less regulated, are not included in this paper, as they may not meet national standards of animal care and generally do not utilize positive reinforcement training.

The Old Methods. Prior to the 1950s, zoos and aquariums across America turned to dominance-based training methods as the primary form of animal management. Many flaws with

this kind of animal care have come to light, including lack of animal choice, failure to provide proper animal welfare, and lack of human-animal relationship or connection. Dominance-based training refers to any type of training that utilizes power to pressure a subject into acting a certain way. It is founded on the idea that humans are "dominant" and therefore can control the actions of an animal (The Association of Professional Dog Trainers 2022). The primary method within dominance-based training is called aversive punishment. Aversive punishment uses "an unpleasant event that is intended to decrease the probability of a behavior when it is presented as a consequence (i.e., punishment)... An aversive stimulus may also increase the probability of a behavior when it is removed as a consequence" (Pritchard 2011, 190). This method is founded on the idea that humans have complete control over the animals, and can utilize negative stimuli to force or coerce the animal to complete a desired behavior, or to eliminate undesired behaviors. An example of this can be an image many people have of circus animals; a ring master uses a whip to move a tiger from one place to another. While this image pulls upon stereotypical images of animal abuse, aversive stimuli may also include hoses, loud noises, and other stimuli that act as a deterrent. Although not all aversive stimuli were physically harmful to the animals, they have presented negative effects on animals' well being. While most of the studies on the psychological effects of aversive punishment have been done on dogs, the evidence presented is relevant to all animals under human care. A study done on dogs trained with aversive punishment versus positive reinforcement found that aversive training methods compromise animal welfare. The results "revealed that punishment-based training methods were related to a larger number of reported behavior problems compared to reward-based training" (Ziv 2017, 51). Loud noises, such as yelling the word "no", and physical aversive stimuli were linked to an increase in fear

and aggression. In comparison, there was almost no fear or aggression linked to the dogs that were trained using reward-based training (positive reinforcement).

Negative Perceptions of Zoos and Aquariums. Dominance-based training methods have fueled negative perceptions of zoos and aquariums, yet critics of zoos and aquariums did not only stem from these methods. People have been challenging the morality of wild animal-human interactions for centuries. The Royal Society for the Prevention of Cruelty to Animals (RSPCA) was formed in 1824 in the UK as the first animal-welfare organization in the world. At the time, the RSPCA was born out of criticism of "pit-ponies", which were horses that worked in coal-mines, and other animals used for labor (RSPCA 2023). The mission of the RSPCA is to protect and reduce the suffering of all animals. At the core of their mission, the RSPCA recognizes "animals as sentient beings - and not just commodities for food, transport or sport" (RSPCA 2023). At the turn of the 20th century, many other organizations against animal cruelty developed across the world. After this, animal activists split into two general categories: animal rights and animal welfare activists. Animal rights activists believe "that animals, like humans, have interests that cannot be sacrificed or traded away", and should not be used "for food, clothing, entertainment, or experimentation" (PETA 2023). On the other hand, animal welfare activists believe in supporting animals' overall wellbeing in the environment they are in, ensuring that animals are "healthy, comfortable, well-nourished, safe, able to express innate behavior, and … not suffering from unpleasant states such as pain, fear, and distress" (AVMA 2023). Animal welfare analyzes "how an animal is coping with the conditions in which it lives", and is measured by "health, productivity, behavior, and physiological responses" (AVMA 2023). This

distinction between animal rights and animal welfare is important, as it leads to the criticisms of zoos and aquariums today.

People who believe in animal rights inherently disagree with zoos and aquariums. If someone believes that animals have the same rights as humans, then without a doubt that same person would believe it is morally unjust to house animals in zoos and aquariums, as it is equated to housing humans in enclosures. This is where the claim that zoos are “prisons” or “jails” for animals stems from. With this belief, it seems nearly impossible to convince an animal rights activist that accredited zoos and aquariums can actually benefit both animals under its care and humans that visit. Additionally, animal rights activists aim to “protect animals' rights to enjoy lives free from human interference”, meaning that animals should not be used for food, experimentation, entertainment, and even pets (The Humane League 2023). At its core, the animal rights movement completely disagrees with human interference in animals’ lives. This neglects all the ecosystem services that humans can provide to animals and that animals can provide to humans, which will be further discussed in the “Ecosystem services” section later in this chapter.

Animal welfare activists, on the other hand, criticize the poor treatment of animals rather than the institution of zoos and aquariums as a whole. Similar to the animal rights belief, animal welfare seeks to reduce the suffering of animals, however animal welfare activists also recognize the ways in which humans can benefit animal’s lives. With the belief that “ensuring animal welfare is a human responsibility” (AVMA 2023), animal welfare activists do not inherently disagree with animal care institutions. Rather, they tend to see them as a way in which humans can protect animals’ mental and physical welfare. Therefore, the main criticism that animal

welfare activists have of zoos and aquariums is that these institutions have poor animal welfare. Historically, this has come in the form of dominance based training, which can cause physical and psychological harm to the animals. Additionally, the lack of psychological care for the animals can cause conditions like “zoochosis”, which will be further explained in Chapter 2.

The future of positive reinforcement training holds great potential for tackling issues that zoos and aquariums face, such as the anti-zoo and aquarium agenda. The emergence of documentaries such as Blackfish and animal rights organizations have pushed an anti-zoo and aquarium agenda, claiming that wild animals should not be kept under human care regardless of the circumstances. Many of these assertions are baseless arguments that display a clear lack of understanding regarding how these legitimate institutions work, how the animals are treated, and their important contributions to research and conservation. One of the organizations at the forefront of the anti-zoo and aquarium agenda is People for the Ethical Treatment of Animals (PETA). PETA asserts that animals in zoos and aquariums are “forced to perform silly, difficult tricks under the threat of physical punishment” (People for the Ethical Treatment of Animals 2020). Additionally, PETA claims that zoos and aquariums merely claim to contribute to environmental education, naming Sea World as one who hides animal abuse behind a conservation-education front.

PETA’s claims blatantly ignore the prominent use of positive reinforcement in accredited zoos and aquariums, and does not distinguish between accredited, legitimate facilities and roadside illegal zoos. This creates a harmful narrative that labels all animal-care facilities as having poor animal welfare and “forcing” animals throughout their lives. Additionally, it ignores the good that zoos and aquariums do in providing rescue animals homes, providing voluntary

medical care to the animals, and allowing guests the opportunity to see and connect with animals they may not be able to see anywhere else. Most importantly, the anti-zoo and aquarium agenda ignores the use of positive reinforcement training and all its benefits to animal welfare, the conservation of species, and environmental education.

Positive reinforcement training has and can continue to remedy many of the criticisms of zoos and aquariums. It is important to note that the animal rights argument that humans should not interfere in the lives of animals inherently disagrees with the institutions of zoos and aquariums, and therefore no amount of positive reinforcement training or benefits from zoos and aquariums can remedy this criticism. However the criticism of the treatment of animals within zoos and aquariums can be solved with the use of positive reinforcement training. Positive reinforcement training provides mental stimulation that contributes to animals' psychological welfare, as will be described in Chapter 2. Additionally, the use of positive reinforcement for husbandry behaviors can care for animal's physical welfare and in many cases extend their lifespan in comparison to their wild counterparts, as explained in Chapter 3. As the previous section "The Old Methods" outlines, the historic use of force and dominance-based training methods can cause psychological and physical damage to animals under human care. Yet positive reinforcement training provides animals with choice and control over their behavior, and the criticism of zoos and aquariums' poor welfare is resolved through the implementation of positive reinforcement training.

The Rise of Positive Reinforcement Training. In light of the clear downfalls of aversive punishment, trainers in zoos and aquariums sought out a new form of training. Positive reinforcement training became the solution for good animal welfare and proper animal

management. Before delving into the psychology behind positive reinforcement training, it is important to look at the development of these training methods and the shift away from aversive punishment. In the 1940s, positive reinforcement training entered the zoological field with Keller Breland. Keller Breland and his wife Marian were the first people to bring applied animal psychology to animal training in zoos and aquariums. In 1944 they opened up a business called ABE which trained a variety of animals for entertained-purposed zoos, and later went on to create a training program at Marine Studios (now Marineland located in Florida) in 1955. This training program worked to train dolphins using the psychology-based methods for shows and other displays. The program included "developing and training new behaviors [and] providing written training manuals"(Gillaspy 2014, 238) and teaching Marine Studios Staff on these new training techniques. This type of training that the Brelands instilled with this training program is called operant conditioning. After the success of the training program at Marine Studios, it quickly spread to other institutions such as Sea Life Park in Hawaii. Inspired by the training programs and psychology set forth by Keller Breland, founder of Sea Life Park Karen Pryor explored the application of operant conditioning on pinnipeds (seals and sea lions) as well as dolphins at her facility. She aided in the expansion of training in zoological facilities across the country with the publications of her books *Lads Before the Wind: Diary of a dolphin Trainer* (1975) and *Don't Shoot the Dog: The Art of Teaching and Training* (1980). She was one of the first people to demonstrate the importance of eliminating "the use of coercion and punishment" in order "to gain the animal's cooperation and create a trusting relationship between the keeper or trainer and the animal" (Ramirez 2012, 414). By the 1980s, the success of operant

conditioning had been clearly documented and these methods were widely adopted by zoos and aquariums across the country, and even heavily influenced the dog training community as well.

At this time, training was mainly used to condition animals for show demonstrations (mostly dolphin shows). Positive reinforcement training began to be applied to other areas of animal care as well, such as medical training and control behaviors (such as shifting from one area to another). In the early 1970's, the International Marine Animal Trainer Association (IMATA) was formed. This was crucial in expanding positive reinforcement training to facilities outside of the US, as well as expanding training from marine animal facilities to zoos and domestic animals (Ramirez 2012, 415). Much more research was done across the world on the psychological effects of positive reinforcement on animals, as well as the training successes across facilities. In 1989, IMATA invited the Association of Zoos and Aquariums (AZA) to "provide a special presentation about medical training at their annual conference" (Ramirez 2012, 419). Arguably the most important outcome from this presentation was that trainers in zoos and aquariums across the world came together under the understanding that "training was a key role in animal care and that skilled trainers need to be part of a good animal care team" (Ramirez 2012, 419). With this understanding of the importance of training for the animals, the purpose of training was shifted away from solely entertainment purposes and there began to be a greater focus on the benefits to animal care in many facilities. Today, zoos and aquariums have developed rich training programs that have improved animal welfare in a variety of ways, and have transformed the animal entertainment industry.

The Psychology of Training. So what exactly is a positive reinforcement based training program and the psychology behind it? Operant conditioning is a method of learning that stems

from the work of psychologist BF Skinner, which states that behaviors can be modified by reinforcement and punishment. Skinner outlines the four components of operant conditioning: positive reinforcement, negative reinforcement, positive punishment, and negative punishment. In order to define all four of these, first the difference between a reinforcer and a punisher is described. A reinforcer is any consequence that is paired with a behavior to increase the probability of the behavior occurring again. A punisher, on the other hand, is any consequence that is paired with a behavior to decrease the likelihood it will happen again. Skinner states that "[p]unishing contingencies are just the reverse of reinforcing"(Skinner 1988, 68). The addition of "positive" or "negative" in front of reinforcement or punishment just imply the addition (positive), or removal (negative) of a stimulus (Pryor 2002). Skinner describes a positive reinforcer as a tconsequence that "strengthens any behavior that produces it: a glass of water is positively reinforcing when we are thirsty, and if we draw and drink a glass of water, we are more likely to do so again on similar occasions" (Skinner 1988, 51). On the other hand, a negative reinforcer is a consequence that "strengthens any behavior that reduces or terminates it: when we take off a shoe that is pinching, the reduction in pressure is negatively reinforcing, and we are more likely to do so again when a shoe pinches"(Skinner 1988, 51). What positive and negative reinforcers have in common is that they both tend to increase the probability of a behavior occurring again. This only occurs when a reinforcer is paired as a consequence of a certain behavior. Trainer and behaviorist Karen Pryor puts reinforcement in its most basic terms: "Scientifically speaking, reinforcement is an event that (a) occurs during or upon completion of a behavior; and (b) increases the likelihood of that behavior occurring in the future" (Pryor 2002, 2). Aversive stimuli, which are used in negative reinforcement, "function as reinforcers when

they are reduced or terminated" (Skinner 1988, 68). In the example that Skinner used, the aversive stimulus was the pinching of the shoe, which when that feeling was relieved, innately reinforced the behavior of removing the shoe. Karen Pryor advocates that the "overuse of negative reinforcers and other aversives can lead to "fallout," which is the complete loss of a behavior all together because of passiveness or uninterest in an animal (Pryor 2002, 8). In sum, positive reinforcement training draws from the behavioral psychology founded by BF Skinner, and uses something that the animal in training wants or needs (food, petting, praise, etc) to reward and thus increase the frequency of the given behavior. This science of positive reinforcement training remains the same for all species of animals.

With this understanding of the behavioral technology behind positive reinforcement, the question arises: how is this actually used to train behaviors? After all, positive reinforcement acts in conjunction with a given behavior, but how does one get a behavior to occur in the first place? There are a few methods that modern animal trainers use to train behaviors using positive reinforcement. The two main methods are shaping and scanning. Shaping is the process of "taking a very small tendency in the right direction and shifting it, one small step at a time, towards an ultimate goal" (Pryor 2002, 19). In other words, shaping uses successive approximations, or "baby steps", to build up to a completed behavior. At each approximation, the subject is positively reinforced. Pryor highlights some "shortcuts" that induce the first step in shaping. The first is targeting. "Target" means "to touch", so the animals learn to touch a control point (often an object or even a trainer's hand). Then, "by moving the target around and getting the animal merely to go and touch it, you can elicit all kinds of other behaviors" (Pryor 2002, 29). Scanning, on the other hand, takes an already occurring behavior and puts it on a cue. The

best example of this is a vocalization; animals naturally vocalize. The process of scanning this behavior would be to wait for an animal to vocalize, and then continuously reinforce the behavior with something positive. This will increase the frequency of the behavior over time, and eventually a trainer can add in a cue, such as the word "talk". Regardless of the method used, a behavior is considered fully trained when: "the behavior always occurs immediately upon the presentation of the conditioned stimulus (cue), the behavior never occurs in the absence of the stimulus, the behavior never occurs in response to some other stimulus, [and] no other behavior occurs in response to this stimulus" (Pryor 2002, 35). The chain of action should be the presentation of a conditioned stimulus (the cue), the completed behavior by the animal, and finally the positive reinforcement. This is key to understanding the positive effects of positive reinforcement training: the animal has full control to respond or not to respond to the conditioned stimulus. In aversive punishment, the animal is either forced or coerced into responding to an aversive stimulus. However, a conditioned stimulus is inherently a neutral stimulus, such as a word or a hand signal, that doesn't elicit a response from the animal until it is paired with a behavior (Pryor 2002, 35).

Ecosystem Services of Zoos and Aquariums. Positive reinforcement unveils the services that humans can provide to animals, while also improving the function of an animal-care facility which can provide services to humans as well. Ecosystem services include provisioning services, regulating services, supporting services, and cultural services to human and non-human animals. While regulating services don't necessarily apply here, zoos and aquariums definitely provide provisioning services: food and water to the animals under their care, supporting services: shelter and habitat for the animals, and cultural services: recreation and mental stimulation for the

animals and recreation and tourism for the visitors. With the understanding of positive reinforcement training and the impact on animals, it becomes clear that zoos and aquariums that utilize positive reinforcement improve the psychological and physical welfare of animals under their care. Additionally, zoos and aquariums provide provisioning and supporting services to the animals in the sense that they provide housing and the basic needs to survive. It can also be seen how positive reinforcement training also provides cultural services to the animals, in the form of mental stimulation and enrichment, which will be further explained in Chapter 2. While the services that zoos and aquariums provide to animals are almost self-evident in the sense these animals are under their care, it is also important to shed light on the ecosystem services that zoos and aquariums can provide to visitors. These institutions can provide cultural services to people who visit them, as cultural services are defined as the psychological and cultural benefits to people from contact with their surrounding ecosystems.

There are many different ways in which zoos and aquariums benefit their visitors in these non-material ways, including education and psychological well being (both of which will be further explored in Chapter 4). Quantitative data on the public perception of zoos and aquariums further show how animal care institutions can positively impact its visitors. In a study done by the Association of Zoos and Aquariums (AZA) to measure the impact of visitors at zoos and aquariums across a three year period, the study found that approximately 61% of visitors across 12 AZA accredited zoos and aquariums "found that their zoo and aquarium experience supported and reinforced their values and attitudes towards conservation" (Reinhard 2007, 9-10). About half of the visitors (42%) "believed that zoos and aquariums play an important role in conservation education and animal care," and 57% "said that their visit experience strengthened

their connection to nature" (Reinhard 2007, 10). The conservation efforts of zoos and aquariums help to influence prior perceptions of visitors, as well as induce emotional responses. These institutions "can encourage empathy in visitors for the care of zoo animals and, in turn, their wild counterparts and the ecosystems where these animals live. The catalyst for this empathy is positive experiences with animals in zoo environments" (Godniez 2019, 3). This intersectionality between conservation action and positive emotional experiences exemplifies how zoos and aquariums can positively impact visitors through these non-material benefits.

Chapter 2: Are They Happy? A Look Into Animal Welfare

Animal Welfare Legislation. Before diving into how positive reinforcement training promotes animals' psychological welfare, it's important to take a look at the existing legislature that affects animal welfare in zoos and aquariums. There are two existing acts that provide important regulations for zoos and aquariums: the Animal Welfare Act (AWA) and the Health Research Extension Act (HREA). The Animal Welfare Act regulates the interstate movement of various animal species and commercial activities involving them (United States Department of Agriculture 2022). The AWA is enforced by the USDA, and the act gives USDA the authority to enforce, implement, and make regulations to ensure good animal welfare. Zoos and aquariums undergo inspections by the USDA at least every 6 months to ensure that the standard of animal care is upheld in accordance with the AWA (USDA 2022), and USDA can schedule follow-up inspections until any violations are resolved. While requirements may change depending on the species, under the AWA USDA ensures that zoological facilities provide proper "handling, housing, feeding, watering, sanitation, ventilation, shelter from extremes of weather and

temperature, adequate veterinary care, and separation of species [with] human handling, care, and treatment of animals" (USDA 2022, 10). The HREA also monitors the care of wild animals, specifically ensuring proper medical and veterinary care. HREA covers animals involved in research, including laboratory animals and animals involved in behavioral research in zoos and aquariums. This act lays out requirements for veterinary staff and protocols to ensure good animal health care, such as the "the appropriate use of tranquilizers, analgesics, anesthetics, paralytics, and euthanasia for animals in such research" and "appropriate pre-surgical and post-surgical veterinary medical and nursing care for animals in such research" (Health Research Extension Act of 1985). While there are many other acts that pertain to zoos and aquariums, these two are the main pieces of legislation that ensure the overall welfare of animals, and regulate the health care and daily care of wild animals within zoos and aquariums.

With the great understanding of positive reinforcement training provided by previous chapters, it becomes apparent that these standards of animal care proposed by AWA and HREA can be best upheld through the use of positive reinforcement training. While there are many regulations that involve facility design, employee requirements, and other things that are unrelated to positive reinforcement training, the quality of animal care that AWA and HREA seek to uphold is materialized through the use of positive reinforcement training programs through the mental stimulation and physical care it can provide.

New legislation continues to be pushed forward today, some of which can actually hinder animal welfare in zoos and aquariums. For example, the "Strengthening Welfare In Marine Settings Act" (SWIMS Act) of 2022 prohibits the "capturing, importing, exporting, or breeding of orcas, beluga whales, false killer whales, or pilot whales for the purpose of public display"

(SWIMS Act, 2022). It also prohibits the breeding of these listed animals within zoos and aquariums. Capturing animals and taking them out of the wild is illegal in almost every case: the Endangered Species Act allows certain zoos or aquariums to house endangered animals in the effort of their species conservation (Endangered Species Act, 1983). The prohibition of capturing these animals from the wild is no doubt a good thing, however the rest of the act can actually harm these animal's welfare for the following reasons: breeding is a part of an animals' natural behavior, and is also considered a primary reinforcer for them. (Kuczaj 2002, 192). Taking away this ability for them to breed and successfully reproduce can be harmful to their welfare, as it is taking away a natural primary reinforcer. Additionally, whales and dolphins are extremely social animals, and prohibiting the export/import of these animals takes away the ability for zoological facilities to manage different social groupings. Often times, animals are transferred from different facilities if it is in their best interest to join a different social grouping of their species. The goal of this act is to eventually end the presence of orcas, beluga whales, false killer whales, or pilot whales in zoos and aquariums over time. While this may be well-intentioned, it actually may harm the welfare of these animals already in zoological facilities. This will be further discussed in Chapter 5 on policy recommendations.

Training is good welfare. As briefly mentioned in Chapter one, positive reinforcement training provides ecosystem services in the form of mental and physical stimulation, which also promotes good animal welfare. Mental and physical stimulation promote overall psychological welfare because it encourages species-appropriate behaviors; a concept which will be further explained in the "Enrichment" section of this chapter. Critics of zoos and aquariums use "poor" psychological welfare as an attack against these institutions, and as a result the psychological

welfare of animals has been extensively studied. Conclusions show that positive reinforcement training provides significant benefits to psychological welfare of animals. Many people disagree on one singular definition of psychological well being for animals, because of the simple fact that the "mental states of animals cannot be determined absolutely because one cannot ask animals directly" (Hetts 2008, 371). Thus, animal care specialists must look towards indicators of psychological welfare with a good understanding of animal behavior to determine the mental well being of an animal. Animals with good psychological well being are expected to be able "to engage in species-typical behavior if given the opportunity to do so, to be capable of coping with minor disruptions in routine, and to display a balanced affect (as opposed to behavior that is indicative of chronic distress)"(National Research Council 1998). With this working definition, we can further examine how positive reinforcement training contributes to the psychological well being of animals. The main ways in which training benefits animals' psychological well being is through general enrichment and greater choice and control.

Enrichment. One way that training contributes to good psychological well being of animals is through daily enrichment. Enrichment can be defined as "a creative outlet for physical activity and mental exercise, as well as choice and control over how they spend their time" (Smithsonian's National Zoo 2022). This is essential for animal welfare because it encourages natural species-appropriate behaviors such as foraging, exploration, problem solving, and more. Species-appropriate behaviors are defined as "behavior that is common to nearly all members of a particular species and expressed in essentially the same way" (American Psychological Association 2023). This is important because you wouldn't expect different species to display the same behavior in their environment. For example, it is important that a meerkat has space to

burrow, as this is one of their species-appropriate behaviors. However if someone observed a tiger digging a hole in its environment to burrow, that could be cause for concern and indicative of insufficient stimulation, as this is not a species-appropriate behavior. Animals that interact and engage with their environment appropriately are indicative of good mental health and help to avoid boredom or a lack of stimulation in captive animals (Wild Welfare 2022). There are two main types of enrichment: environmental enrichment and behavioral enrichment, both of which can be used with positive reinforcement training. First, environmental enrichment is considered adding something to a species' environment that "provides species-appropriate challenges, opportunities and stimulation"(Wild Welfare 2022). There are many different types of environmental enrichment, such as physical, sensory, social, toys, and food (Smithsonian's National Zoo 2022). Some examples of these enrichment strategies include: a physical or structural change in an animal's environment, adding new smells such as animal-safe perfumes or oils into their environment, allowing a certain group of animals access to one area for socialization or play time, adding toys to their environment, and introducing new foods. These types of environmental enrichment are often combined. For example, putting food into toys encourages animals to use problem solving and natural foraging skills to get the food out. In sum, environmental enrichment contributes to animal welfare because it is mental stimulating for animals and enhances an animals environment (Wild Welfare 2022).

While environmental enrichment and training can be considered separate, it is important to note how environmental enrichment can be utilized in positive reinforcement. For the animals, "training provides a dynamic change in the animals' day" (Fernandez 2021, 8). This benefit of training is the same as that of enrichment. Similarly, the function of some environmental

enrichment devices are similar to that of positive reinforcement training: “Early enrichment practices incorporated food delivered mechanically as a reinforcer for engaging in desired responses, such as primates swinging from parts of their exhibit or felids chasing and catching artificial prey” (Fernandez and Martin 2021, 532). The visual or sensory stimuli in enrichment that elicit natural behaviors that are then reinforced by food is similar to the process of positive reinforcement training where a cue elicits a desired behavior, and then is reinforced by a trainer. In the example that Fernandez gives with the primates, the stimuli would be artificial prey and the behavior would be swinging across the exhibit. Thus, environmental enrichment can be viewed as a “tool to increase naturalistic behaviors” (Fernandez and Martin 2021, 532) using reward-focused procedures, in the same way that positive reinforcement training is a tool to increase desired behaviors using a reward-based system of reinforcement.

Positive reinforcement training is also considered enrichment in itself. Training is enriching for animals for a variety of reasons: providing a learning opportunity for animals, expanding behavioral repertoire, engaging in human-animal relationships, and introducing novel stimuli. To put it simply, “training affords learning, and learning is considered enriching” (Fernandez 2021, 8). Learning new behaviors is mentally stimulating for animals, as “training sessions focus on the problem solving process, presenting animals with mental and physical challenges” (Fernandez 2021, 8). Additionally, expanding the behavioral repertoire of an animal is a form of enrichment. Karen Pryor states that “behavioral variability is an important welfare/ enrichment measure” (Fernandez 2021, 8). With rich behavioral repertoires, animals have a wide range of behaviors they can exhibit both in and out of session. Many trainers have even noted animals using previously trained behaviors in novel ways outside of training sessions. For

example: “bottle-nosed dolphins trained to slide out on a platform as a show and husbandry behavior were observed using the behavior during free time, adding their own variations -twisting around and returning into the water head first, laying with head or tail in the water, spinning around on the deck, or sliding all the way across the platform and back into the water” (Laule and Desmond 2017). Increased behavioral repertoires can increase creativity in animals and give them greater control over their behavioral responses (Laule and Desmond 2017).

Another way that positive reinforcement training provides enrichment is in the actual reinforcement. The definition of reinforcement is “a response to someone's behavior that is intended to make that person more likely to behave that way again” (Merriam Webster Dictionary 2023). With this definition, trainers choose reinforcement that will increase desired behavior of an individual animal. The types of reinforcement may vary depending on different animals and what these animals find enjoyable. To put it simply: positive reinforcement training provides the things that individual animals like. For some animals this can be a certain kind of food, tactile, sensory, or even a favorite toy. Reinforcement can also be different every session, providing variability to their day. Positive reinforcement training provides positive experiences and rewards to the animals every day, inherently enriching their lives.

Appropriate Challenges. Animals’ brains have developed over hundreds, thousands, and millions of years to be natural problem solvers. In the wild, animals have to constantly solve problems in order to survive. This can be finding food, finding a mate, relocating or migrating, avoiding predators, securing shelter, and possibly avoiding human-caused threats to their environment. Under human care, animals don’t need to worry about these challenges, as their needs are all provided for them. So what happens when we solve their problems for them? While

there are many benefits to the animals, there are also some downfalls. Their brains that have adapted to think cognitively and problem solve for survival are ultimately under-stimulated. Therefore, it becomes the responsibility of animal care takers to provide supplemented cognitive stimulation. As previously mentioned, this comes in the form of positive reinforcement training and enrichment. While these provide mental activity and stimulation, it is also important to provide cognitive challenges to animals as well, in order to remedy that lack of problem-solving they have to do under human care. This can be done through advanced training using positive reinforcement to train cognition-based behaviors.

Cognitive challenges have proven to benefit animal psychological welfare. A lack of "opportunities to experience challenge have been linked to underdeveloped competence, negative emotional states, reduced behavioral expression and decreased healing" (Hall 2021, 2). In order to be considered cognitive challenges, the behavior must provide opportunities to solve problems and/or control some aspect of the environment (Hall 2021, 2). Examples of this can be puzzles, memory games, cooperation games, concept behaviors, novel behaviors, and more. The work at Dolphin Discovery and their cognition-based training displays some of the observed outcomes of cognitive challenges through training, which will be further discussed in the following section "Greater choice and control".

With insufficient cognitive challenges, animals living under human care can suffer from "zoochosis". Zoochosis is term that people use to define poor psychological welfare in animals that manifest in the form of stereotypic behavior (Yasmeen 2022, 1). Many people that are anti-zoo and aquarium define zoochosis as a "disease", "mental disorder, or "psychosis" (In Defense of Animals 2023). Behaviorists know that this is not accurate, as zoochosis can be defined as

observable behavioral patterns, rather than a sickness. Zoochosis is a term people have adopted to describe stereotypic behavior. Stereotypic behavior is defined as “repetitive, habitual behavior patterns with no obvious function” (Coleman 2010, 1). In zoological facilities, this can present itself as pacing, head bobbing, excess grooming, and other abnormal and repetitive behaviors. There is no definitive answer as to why individual animals adopt stereotypic behaviors, but they are often associated with a lack of stimulation, lack of control over their environment, boredom, or stress (Yasmeen 2023, 2). The use of positive reinforcement training—more specifically cognition based behaviors— have been proved to reduce or completely eliminate stereotypical behaviors. One study done on African wild dogs at the Franklin Park Zoo in Boston found that stereotypic pacing was reduced following training sessions. The study found that with no training, it was observed that around 45% of the time the dogs were displaying stereotypic pacing. On the other hand, with positive reinforcement training sessions the percentage of time pacing plummeted to 7% in all three dogs (Shyne and Block 2010, 61). In these training sessions, the wild dogs were trained new behaviors, which introduced novel stimuli and engaged them in new cognitive challenges. It was concluded that “training has the potential to improve the animals’ general psychological health” (Shyne and Block 2010, 63). Therefore, not only can positive reinforcement training prevent the presence of stereotypic behaviors, but the application of this training can also help to eliminate them and ultimately improve animal psychological welfare.

Greater choice and control. Greater choice and control for animals is arguably the most important benefit to animals' psychological well being. Positive reinforcement training “is based on voluntary cooperation by the animals” (Laule and Desmond 2017), meaning that animals have

free will whether to participate in a training session or not. This is important because in "replacing traditional animal management strategies that rely on escape/avoidance techniques, positive reinforcement training provides animals greater choices and greater control over their lives" (Laule and Desmond 2017). In other words, under positive reinforcement animals gain a sense of control within training sessions, but more importantly a general sense of control within their day to day lives. A sense of control over an animal's environment is incredibly important for their welfare, as the conditions and restrictions of animal care facilities can offer animals little control over their lives. Therefore positive reinforcement "provides one of the best opportunities for animals to gain greater, albeit not total, control over events through their actions" (Laule and Desmond 2017).

While with positive reinforcement training animals always have the option to not participate, the reason that positive reinforcement training is such a successful phenomenon is because it's been proven that animals actually *want* to participate in sessions. The term contra-freeloading describes "the phenomenon where animals will choose to work for food … over freely available food" (Fernandez 2021, 8). This is because animals find it much more stimulating and enriching to earn rewards rather than get free food all the time. Positive reinforcement training "offers animals a chance to work for their food, i.e., perform certain tasks/ behaviors for a food reward", and given this choice "animals will most often voluntarily work for their food" (Laule and Desmond 2017).

Giving animals the choice to work for their food also promotes other benefits for well being, such as decreased fear and better coping mechanisms with stress. For example: "Mineka, Gunnar, and Champoux (1986) found that rhesus monkey infants (Macaca mulatta) that were

given the opportunity to work for their food showed less fearfulness when exposed to threatening stimuli and demonstrated better coping responses when separated from cage mates than did monkeys that received food for free"(Laule and Desmond 2017). These added benefits were directly linked to a sense of control over their environment, as "the authors discussed their results in terms of the importance of animals' control over their environment" (Laule and Desmond 2017).

Positive reinforcement training can also offer animals choice in the kinds of behaviors they offer. Training sessions can create an environment where "animals are free to experiment with a broader range of behavioral responses because there are no negative consequences to that experimentation" (Laule and Desmond 2017). Not all of the behaviors trained with positive reinforcement training have one response: advanced training can produce more complex behaviors such as problem solving behaviors or cognition based behaviors, which often allow the animals to pick from a wide range of correct responses or "creative solutions" and thus give them more control. For example, Dolphin Discovery in Puerto Vallarta, Mexico began a cognition training program for their dolphins in 2009. The behaviors trained included concepts such as "repeat, combine, sequence, copy, and you choose" (Rust 2017). Instead of a conditioned stimulus (cue) eliciting one behavioral response, the cue communicated a general concept to the dolphins. The goal was to "ensure that the animals do not associate any of the concept [cues] with specific behaviors or predictable chained responses. The final product focuses on the animal's ability to generalize concepts well enough to produce the corresponding response to the given behavior syntax" (Rust 2017). These behaviors were utilized in some guest interaction programs, and helped to "provide increased mental stimulation during long, repetitive guest

interactions and demonstrate the animals' cognitive abilities in inspiring ways" (Rust 2017). Behaviors that allowed the dolphins to display some form of creativity and control over their behavioral responses resulted in "better attention and response" in comparison to training sessions that did not involve these cognition-based behaviors. Overall, it becomes clear that increased choice and control over an animal's behavioral responses and environment has many benefits for their psychological well-being.

Giving an animal the choice to decide whether or not to participate in session also has benefits for an animal's willingness to engage. During his time at Shedd Aquarium in Chicago, Ken Ramirez utilized an innovative way for animals to choose not to participate in session using positive reinforcement. A beluga whale named Kayavak began to develop behavioral issues during training sessions, meaning that she would refuse to participate in behaviors and often leave her trainers mid-session. As a solution, Ramirez proposed that trainers teach Kayavak a way to opt-out of behaviors but still get reinforced for it. In other words, they were reinforcing her choice for saying "no". Trainers taught Kayavak to touch a small buoy in her environment, and she would always receive fish for this. Therefore, if a trainer asked Kayavak a behavior, she would have the option to touch the buoy instead of completing the behavior and still get reinforcement. The other trainers were very skeptical about this, as they assumed that the whale would always choose to touch the buoy instead of participating in other behaviors that require more effort. Ramirez notes that once Kayavak understood that her choice to participate or not was reinforced either way, she actually began touching the buoy less. Over time, her refusal rate for general behaviors in sessions dropped to around 2% (Ramirez 2018). She became much more motivated in session, rarely left trainers during sessions, and touched the buoy minimally.

Ramirez uses this as an example of how giving an animal choice over their behavioral responses motivates them during training sessions and increases their success.

Chapter 3: Caring for Future Generations: The Conservation of Species

What is Husbandry? In the animal training field, husbandry is often referred to as a fancy word for "healthcare". Ken Ramirez offers a more official definition for husbandry training: "training animals to assist in their own care and management" (Ramirez 2013, 424). Obviously, there are many factors that contribute to an animal's overall "care and management", so what exactly constitutes husbandry behaviors? Husbandry behaviors provide provisioning services to animals in human care, as these behaviors help to improve their physical health. The training of husbandry behaviors is incredibly important in zoos and aquariums, as it contributes to an animal's well being. As previously discussed in Chapter 2, psychological wellbeing is an important component of an animal's wellbeing. While this is not to be ignored as part of an animal's overall welfare, husbandry behaviors tend to focus more on medical behaviors that support physical well being.

With husbandry programs, trainers work to train "the animals to collaborate voluntarily in their health care" (Brando 2010, 784). As previously mentioned in Chapter 2, an animal's choice to participate in positive reinforcement training is incredibly important to animal welfare and often increases the success of training sessions. This plays an important role in husbandry sessions as well; voluntary cooperation from the animal can lead to safe and effective exams or procedures for animals, trainers, and veterinary staff involved by avoiding the use of restraints or sedatives, which will be discussed more in depth in this chapter. Animals can learn to stay still or

remain in certain positions for trainers and veterinary staff to perform voluntary medical care and procedures such as blood draws, x-rays, ultra sounds, and more. This is done by using both classical and operant conditioning with positive reinforcement. Some experiences and sensations that come with medical procedures can be inherently aversive and elicit negative responses from animals at first. For example the feeling of a needle may pinch at first, or the sound of a machine used for a medical procedure can be loud and scary. Therefore, trainers need to desensitize the animals to these novel sensations, and condition them to not be scary. Often, this is done by pairing food and other types of reinforcement with these stimuli. This means that trainers can condition neutral or positive responses to these novel stimuli, which is an example of classical conditioning. Over time, these sensations that were once aversive, can become positive experiences.

Additionally, positive reinforcement training can be used to get animals comfortable with new locations, extended durations, and certain positions for these husbandry behaviors. For example, at the New York Aquarium 22 year old California sea lion Osborn participates in his own health care in many ways, one of which being voluntary blood draws. Trainers ask Osborn to present his rear flippers where the trainer and veterinary staff can draw blood. Osborn is trained to lay still for the duration of the blood draw, and if at any point Osborn moves from this position or pulls his rear flippers away, trainers understand that this means Osborn isn't comfortable with the blood draw at that time and simply move onto something else. While Osborn always has the option to say "no" to having his blood taken, his trainers have paired this experience with all his favorite kinds of reinforcement such as fish, Jell-O and whisker rubs so that Osborn has learned to even enjoy having his blood taken. The use of positive reinforcement

training with husbandry behaviors motivates animals the participate in these sometimes scary procedures. Osborn has participated in hundred of blood draws, which has helped monitor his health over his lifetime. With animals' voluntary cooperation such as this, "veterinarians and trainers have the possibility to practice preventive medical care as well as reactive care" (Brando 2010, 784). Positive reinforcement is vital to the training of these behaviors because "focusing on positive reinforcement training allows the caregiver to build trust and a bond with the animals, while at the same time promoting the desired behaviors and creating a stimulating, interesting and safe learning environment" (Brando 2010, 779). It allows these animals to be comfortable with the above kinds of medical experiences and even enjoy them.

In order to provide proper husbandry care and effectively train husbandry behaviors, trainers and veterinary staff must be knowledgeable about the species as well as the individual animal. Understanding the individual animal is important because the trainer gains a good understanding of how to best reinforce the animal for these behaviors. For example, reinforcers most often used with marine mammals can be "primary (i.e., fish and social contact), or secondary (i.e., toys and environmental change)" (Brando 2010, 779). However each animal has their own preferences, and understanding what is most reinforcing to an individual animal can lead to more successful husbandry training. Additionally, when a trainer is familiar with an animal's normal behavior patterns, they are better equipped to recognize abnormal behaviors, which could be a sign that there is something medically wrong. For successful husbandry training and care, all animals "must be observed daily" and all keepers must "be trained to recognize abnormal behavior and clinical signs of illness" (Backues 2011, 178). Trainers must also be "knowledgeable concerning the diets, husbandry, and restraint procedures for the animals

under their care" (Backues 2011, 178). Successful husbandry training programs also include an experienced veterinary staff that can assist in administering injections, medication, and other procedures as needed. Husbandry training has enormous benefits, as voluntary cooperation "reduces stress for the animals and makes the procedures far safer for all involved," (Ramirez 2013, 424) and can prevent possible illness with the daily check ups and close monitoring of the animals.

Routine Checks and Baseline Data. Husbandry behaviors can range from as basic as an animal opening its open mouth to as complex as allowing veterinarians to draw blood. The husbandry behaviors that are typically used on a day-to-day basis are also referred to as "body check" behaviors. These behaviors help trainers look over an animal's body every single day to monitor their body condition. Daily monitoring of an animals body condition can help to note any sudden changes which may be an onsight of illness, or address any superficial wounds an animals may have such as cuts and scrapes. Daily body check behaviors can include an open mouth behavior, dorsal and ventral layouts, open eye presents, limb presents, allowing a trainer to touch an animal's body, and other behaviors that allow a trainer to closely examine an animal's body. Other routine husbandry behaviors "may include shifting…from one area to another", allowing staff to separate animals from each other, and "working with the animals so that they tolerate close visual inspection by keepers and treatment by veterinarians" (Chicago Zoological Society). Some species are prone to dental issues, which is especially common in marine mammals. In this case, daily husbandry behaviors may require "daily or regular attention such as brushing, flushing, and cleaning with a dental pick and or water jet" (Brando 2010, 783).

Before husbandry behaviors were frequently trained in zoos and aquariums, the main method of collecting baseline data from animals was putting them under anesthesia. The introduction of positive reinforcement training to medical behaviors allowed veterinarians to collect baseline data for species such as vitals, blood samples, and urine samples without the use of anesthesia. This is especially important as there can be many complications with anesthesia, especially in marine mammals which are voluntary breathers. Sea lions have a dive reflex that allows them to hold their breath for extended periods of time, and when they are unconscious this reflex can cause them to have apnea (temporary cessation of breathing) or hypoxemia (low levels of oxygen in the bloodstream) (Spelman 2004, 65).

It is also common in all animals "that anesthetics tend to depress an animal's normal heart rate" (Brown 2007, 345). A study done on Western Lowland gorillas displayed the benefits of positive reinforcement training for collecting baseline vitals without the use of anesthesia. Two male gorillas were trained to "press their chests to the enclosure mesh" and participate in a voluntary heart rate sample using a stethoscope (Brown 2007, 345). From the two gorillas, a total of 176 heart rate samples were acquired. Researchers were surprised to find that although animals under anesthesia typically have a lower heart rate, in this study the average of the 176 heart rate samples was actually lower than that recorded in anesthetized gorillas. It was later concluded that these lower heart rates could be explained by the use of positive reinforcement, because "operant conditioning techniques in zoo animals are thought to reduce stress and lower anxiety." (Brown 2007, 346). This means that the gorillas that were voluntarily participating in a heart rate sample were more relaxed and calm, producing a lower heart rate than the "heart rates in which animals are presumably stressed during induction and anesthetic procedures" (Brown

2007, 346). Therefore, it can be concluded that positive reinforcement training of husbandry behaviors can be a safe and more positive experience for the animals, and also can provide more accurate baseline data than anesthetics can provide.

Reproduction of Species and Longevity. Husbandry behaviors can also help with the management of breeding and reproductive success of endangered species. Positive reinforcement training can help to enhance "the management of species for reproduction" (Desmond and Laule 1994). This can be done in many ways: behaviors that assist in the data collection of pregnancies and fetal growth, preventative husbandry behaviors that can ensure a higher survival rate, and treatment for existing medical conditions.

One example of how husbandry behaviors help with the management of reproductive species is with bonobos. In the Milwaukee County Zoo, the pregnancy of a 27 year old bonobo was monitored using positive reinforcement. This was incredibly important, as there were only a little over 100 bonobos in human care in 1994 and therefore monitoring pregnancies and possible births was vital (Teare 1996, 477). The female bonobo was trained to participate in voluntary sonograms and ultrasounds, which allowed veterinarians to track fetal growth and ensure a healthy pregnancy and birth, as well as collect data on a healthy bonobo pregnancy. Using positive reinforcement, the bonobo was reinforced every time she pressed her lower abdomen against a cage mesh for inspection. As her "pregnancy progressed, it became more difficult for [her] to hold this position and press the lower abdomen close enough for examination" (Teare 1996, 478). Trainers had to then train her to lay in sternal recumbency (laying down with the animal's chest on the ground) in an overhead shoot, so veterinary staff could examine the fetus from underneath (Teare 1996, 478). While the steps for how this training was achieved is not

publicly available, trainers note that everything was made possible with operant conditioning and positive reinforcement, meaning that the bonobo was consistently reinforced for correct positioning and extended durations to allow examination (Teare 1996, 477).

Breeding for bonobos is critical for their species survival and therefore data on bonobo pregnancies is highly valuable. Bonobos are part of a Species survival plan (SSP), which is a management program that helps ensure the survival of bonobos in zoos and aquariums. One of the main things that SSPs do is regulate the breeding of a certain species to ensure genetic diversity, favorable genes, and overall long-term survival. With this in mind, the information presented in this case study presents valuable data on healthy bonobo pregnancies that can be useful "in future pregnancies to assess fetal growth and fetal health and to predict parturition in this species" (Teare 1996, 480). Positive reinforcement training can allow close monitoring of pregnancies and births, such as in this case study, that is relevant to future species reproduction as well.

Husbandry behaviors also allow preventative treatment for animals that can ensure longer lifespans and greater survival rates for the species. Studies have shown than over 80% of the mammal species studied live longer in zoos and aquariums than their wild counterparts (Tidière et al 2016). It was concluded that this longevity may be "because zoos evidently offer protection against a number of relevant conditions like predation, intraspecific competition, and diseases" (Tidière et al 2016). Protection from predation and intraspecific competition are not products of training, rather they are benefits that come with animals living under human care. Diseases, on the other hand, can be prevented or treated in zoos and aquariums with the implementation of husbandry programs. Voluntary injections are an important part of all husbandry programs,

where animals can learn to allow veterinary staff to administer vaccinations. Some common vaccinations across zoos and aquariums include West Nile Virus, rabies, tetanus, and many viral pathogens (Clancy 2023).

In addition to preventative care, husbandry behaviors can also facilitate the treatment of existing conditions. The Georgia Aquarium in Atlanta used positive reinforcement training to treat a fungal infection in one of their male bottlenose dolphins (Bodechon 2022). After a positive fungal culture revealed that one of the bottlenose dolphins, named Makana, had a fungal infection *Cunninghamella bertholletiae,* trainers formulated a treatment plan using positive reinforcement training. The first step was to train Makana to open his blowhole on a cue. Once this was complete, trainers desensitized Makana to several novel objects and sensations: a catheter, a 0.9 saline solution, and a betadine solution. After learning correct positioning for treatment and extended durations, Makana voluntarily received "sinus flushes and oral anti-fungal therapy" (Bodechon 2022) from May 2012 to January 2017. By April 2016, "results from Makana's blowhole sample came back negative for *cunninghamella"* (Bodechon 2022). Trainers and veterinary staff concluded that "through excellent collaboration between animal training teams and veterinary service teams, Makana remained clear of *cunninghamella bertholletiae".* It was with Makana's voluntary cooperation and participation in husbandry behaviors that his team was able to treat this fungal infection.

Conservation of species outside of zoos. In addition to focusing on the benefits of positive reinforcement training within a zoological setting, it is also important to note that positive reinforcement training can and has been applied to wild populations of animals to further aid in their conservation efforts. One of the people at the forefront of this is Ken Ramirez. While

Ramirez has made countless contributions and breakthroughs within zoos and aquariums across the world, he has also contributed to numerous conservation-training projects. Conservation-training is "the use of behavior science to benefit wildlife conservation, either directly or indirectly" (Ramirez 2019). One of the most notable projects he has been a part of is the use of positive reinforcement training to change the migration pattern of a group of wild elephants. Ramirez details in his 2017 Clicker Expo that "the current [migration] route takes [the elephants] through poacher territory and has resulted in the slaughter of dozens of elephants every year" (Ramirez 2017). They planned to use remote training "to re-route the elephants and direct them to a safer path" (Ramirez 2017). Remote training is when "the trainer does not interact with the learner directly. Reinforcers are delivered in creative ways that appear to come from the natural environment. This type of training is increasingly being employed in wildlife-conservation projects to prevent habituation or any contact whatsoever with humans" (Ramirez 2017).

Ramirez and his team (comprised of more than 150 people) are working to protect wild elephant populations in Zambia. The goal is to successfully reroute the elephant group to bypass the Democratic Republic of Congo— a small section of their route— to avoid poacher territory. To do this, the team used large tree trunks and branches as naturally constructed barriers within the Zambian boarder to prevent the elephants continuing on their normal route. For reinforcement they implemented nearly 300 man-made water holes around the new route to reinforce the elephants for moving along the barrier and changing their route. With these modifications to the elephant's environment, the data looks promising. In the years leading up to the project, the number of elephant deaths per year in this area was ranging from 60-70 with the majority of these deaths due to poaching. After the project began in 2017, the following year

only saw 4 elephant deaths (Ramirez 2021). The following years continued the trend: only 6 deaths in 2019 and 5 in 2020, with these being due to natural causes (Ramirez 2021). In addition to reducing the deaths due to poaching, Ramirez's work has also helped the population grow. In 2019 the team saw the elephant population grow from 374 in 2018 to 407 that year. Ramirez notes that this was the first time this population increased in over 20 years, as their reproduction was able to flourish as well (Ramirez 2021). This is a great example of the amazing work that positive reinforcement training can do for wild populations of animals.

Chapter 4: Connecting with Another Species: Environmental Education

Modern zoos and aquariums aim to promote conservation efforts, and in the past few decades have increased the quality and quantity of environmental education programs, further enhancing the cultural services that these institutions provide to guests. Zoos and aquariums offer many different forms of environmental education. Interactive or immersive exhibits can include push-button audio that can give visitors information about a species and its habitat. Signs surrounding an exhibit can also encourage visitors to learn about the animals they are observing. Exhibits can also be "enhanced by soundscapes, lighting, weather effects, and sensory stimulation" (Roe 2014, 168) to immerse visitors in the environment. While these forms of education provide valuable information and create an interactive environment for guests, research "showed that many visitors did not make the connection between the landscape environment and the animals" (Roe 2014, 168). This displays the need for a more immersive experience and the ability to connect guests directly to the animals and the threats to their environment. Thus, positive reinforcement training provides a solution to this.

Zoos and aquariums can educate their guests using positive reinforcement in various ways: public training sessions, animal presentations such as shows, and animal encounters. These forms of education programs educate people on individual animals and species, discuss animals' natural environment and possible threats in the wild, highlight the scope of environmental destruction that are relevant to these animals, and provide a connection between guests and the animals. All of these can further environmental education by getting guests emotionally and personally involved in environmental issues. These forms of educational programs that connect guests with animals utilize "live interpretation, including keeper talks… guided tours" and narrated animal encounters that "facilitate a personal connection with the animals on display" (Roe 2014, 169). Programs where visitors can "touch, observe, and ask questions about the animals" increase "their receptivity to learning" (Roe 2014, 169). This is because interactions with animals and observing high levels of animal activity "effectively capture attention and engage the zoo visitor" (Anderson 2003, 828). These kinds of programs where guests can experience animals up close and personal are made possible with positive reinforcement training. The use of training for these programs increases environmental education, which fosters emotive connections between guests and the animals, and can ultimately promote environmental advocacy for guests long after their visit to a zoo or aquarium.

Environmental Education. Animal encounter programs, shows, and other live demonstrations can provide forms of environmental education to their guests. This includes educating guests on the individuals species they encounter, and revealing various threats to these animals out in the wild and the reality of environmental issues. The animals that participate in animal encounters are typically referred to as animal ambassadors. AZA asserts that "the

presentation of ambassador animals can provide the compelling experience needed for visitors to gain and maintain personal connections with their own relationships with nature" (Association of Zoos and Aquariums 2023). With lots of positive reinforcement training, animal ambassadors can participate in live demonstrations or encounters that allow guests to get close to animals that they may not have the opportunity to see in the wild.

The way that zoos and aquariums convey their education messages in conjunction with these animal programs is by having a narrator or trainer talk during the encounters. With this, narrators can educate guests about what they are seeing in the moment, creating a more personal and meaningful educational experience. For example, Epcot's The Seas at Disney World in Orlando, Florida is home to several rescued manatees. One of their manatees, Lou, lost the majority of his tail in a boat collision. After unsuccessful attempts to rehabilitate him, he now resides at The Seas. Guests can observe Lou's feedings and training sessions with a narrator giving live interpretations. With Lou's training, his trainers can closely monitor his condition and provide any medical treatment if needed. This gives The Seas an opportunity to explain the deformity in Lou's tail, which inherently causes guests to feel sympathy for the injured animal. Ultimately, the narrator can connect what the guests are experiencing to the bigger picture: manatees in the wild are being threatened by commercial activity such as boating, and there are things that humans can do to help mitigate those environmental threats to wild manatees. Guests can walk away from The Seas with knowledge about manatees and their threats out in the wild, and maybe even deeper empathy towards these animals (Magic of Disney's Animal Kingdom 2020).

A study done at Zoo Atlanta looked at the educational effects of public animal training with narrations on visitors. Visitors were able to observe live training sessions with Asian small-clawed otters, accompanied by a live interpreter who was narrating the training sessions. The otters completed “behaviors facilitating aerobic activity, safe husbandry, and veterinary procedures” (Anderson 2003, 830). The narrator was able to talk about training methods, the species and the individual animals, and possible threats they are exposed to in the wild. After, visitors were handed a questionnaire to assess their experience and educational impacts. The study found that visitors who experienced public training sessions in conjunction with live interpretation had positive zoo experiences, increased time spent at exhibits viewing the animals, and overall increased wildlife education (Anderson 2003, 837). This study shows how the use of live training sessions and narration can provide education and recreational benefits through entertaining programs that allow guests to learn about animals, their threats out in the wild, and what they can do to help them.

Connecting with Other species. As discussed in Chapter 1, positive reinforcement training in zoos and aquariums can provide numerous benefits to humans psychological well-being through connecting us with the animals and their surrounding environments. Zoos and aquariums inherently connect us to nature with their environments: overall, visitors “benefit from the green space provided by zoos” (Bisgrove 2022, 1737). Studies have shown that this is especially impactful on young children “in terms of educational and moral outcomes”(Bisgrove 2022, 1737). This stems from children building a connection with nature, as many modern zoos have incorporated natural landscapes into the “zoo experience”. This combats “nature deficit disorder”, which refers to the “theoretical ailment in many children today that results from a

substantial disconnection from nature due to American' increasingly urban and technological lifestyles" (Bisgrove 2022, 1737). While this connection to the environment is important, the connection guests can make to animals even furthers these psychological benefits.

Today, we see human-animal companionships enriching humans lives and improving psychological well-being in many ways. Interactions with animals have even been proved to have healing benefits and promote good mental-health. For many, "the presence of an animal prompts the body to release serotonin, prolactin and oxytocin. These hormones generate a relaxation and stress-reducing response" (Husson University 2022). Therapy animals are often used in many different settings because of these benefits. Evidence of the health benefits of interspecies interactions is even evident on a much smaller scale: pets! One study found that out of US medical enrollees who were "divided into pet owners and those who did not own pets, pet owners had fewer physician visits overall and fewer visits related to stressful life events. This suggests that owning a pet helps mediate stress" (Simaika 2010, 904). Companionships, friendships, and bonds "between humans and individuals of other species" have historically "enriched human lives so significantly as to warrant worry about human psychological well-being if suddenly we find ourselves alone through the destruction of others" (Bexell 2019, 218). This means that humans' psychological well-being may suffer in the absence of animals, as many species are threatened by the man-made destruction of the environment. Arguably, this idea is at the crux of why visitors to zoos and aquariums may feel obligated to protect the kinds of animals they see that are being affected directly by environmental problems such as climate change.

Connecting guests with animals can tap into human's biophilia. Biophilia is the "innate human affinity for the natural world" (Bexell 2019, 221). Biophilia plays a crucial role in our

psychological well-being and physical health. Biophilia is also beneficial in the sense that "it resists cultural and economic reductionism (i.e., how much land or individual species are worth to us)" (Simaika 2010, 905). In other words, biophilia fosters an appreciation of nature and its beauty, instead of viewing it in terms of economic "value" and how much nature is "worth". Biophilia "calls for a common ethic of conservation of nature, beyond our immediate needs" (Simaika 2010, 905). Essentially, biophilia helps us look at nature selflessly and goes hand-in hand with conservation biology, as our appreciation for nature calls us to preserve what we love.

Biophilia can be furthered within zoos and aquariums through the use of positive reinforcement training. This is because positive reinforcement training helps connect people to nature, and allows guests to understand these animals in a new light. For example, guests watching animal training sessions are often able to see first-hand an animal's cognitive and physical capabilities. If trainers are working on new behaviors with the animals, guests get to watch an animal learning in action. Studies have shown that the use of "public animal training and public animal training with interpretation produce[s] more positive zoo experiences" for zoo and aquarium visitors (Anderson 2003, 827). As a result, this increased both "educational and recreational benefits" for guests and furthered the message of climate change education while providing positive emotional experiences for visitors (Anderson 2003, 839).

Although the programs that allow guests to get up close and personal with zoo or aquarium animals often rely on the use of positive reinforcement training and pre-planned behaviors, sometimes animals can surprise both guests and trainers to create a truly unique experience. As previously mentioned in Chapter 2, bottlenose dolphins at Dolphin Discovery were trained in cognition-based behaviors that allowed them to explore creativity and offered

them more choice in their behavioral responses. Some of these cognitive behaviors were utilized in guest-interaction programs, as it provided increased enrichment for the animals during these programs as well as gave trainers an opportunity to talk to guests about the innovative training they were doing at Dolphin Discovery. Trainers began to incorporate the "mark" behavior (where trainers "mark" or identify a behavior that the dolphins already know, and the dolphin must remember what behavior was marked until asked to repeat the marked behavior) into guest interaction programs. Trainers saw that "oftentimes, the animals are better able to recall the mark behavior during an interaction program than the guests. These humbling moments often spark a connection to an animal that didn't exist before" (Rust 2017). This displays how the interactions between guests and amazing animals can produce incredible connections, which are enhanced by the use of positive reinforcement training.

The effects of human-animal interactions have proven to be especially prominent for children. These kinds of interactions also help to combat nature-deficient disorder from an early age, as it connects animals to another species. As children are developing, their understanding of the world is also developing. In children's "observations of and interactions with other beings, there is a developing sense of 'we are in this together' and camaraderie…in terms of relationships with other animals" (Bexell 2019, 218). This is because children are naturally more attuned to empathy, and "naturally and willingly empathize with other humans as well as other animals, and feel compelled to help animals in distress" (Bexell 2019, 222). Therefore interactions with animals can make children want to "preserve the natural environment for the animals they have grown to love and admire" (Bexell 2019, 222). With the progression of climate destruction and decline of wild species, "today's children are raised in environments

where the presence of wildlife is increasingly rare" (Bexell 2019, 220). Thus, the opportunity that zoos and aquariums provide through animal encounters to connect children with wildlife is important for children. It is vital to acknowledge "the need for other animals in healthy child and human development" and can provide "another imperative to protect and preserve those with whom we share Earth" (Bexell 2019, 220).

Environmental Advocacy. Animal interaction programs can foster greater environmental advocacy in guests by getting them emotionally invested in the deterioration of our planet. Research shows that "zoo and aquarium visitors are more concerned about climate change than is the general US public" (Armstrong 2018, 81). This is due to the fact that connecting guests to the animals can bring about positive experiences and motivate them to care more about larger issues that threaten the kinds of animals they meet. Empathy works as a catalyst for action, and therefore, guests feel that climate change is a more pressing issue once it's connected to the experiences they have with the animals. Interactions and presentations "can harness visitors' emotional connection with the zoo or aquarium animals to make climate change a personally relevant issue" (Armstrong 2018, 81). This is because programs that "share the stories of [the] animals" help to "raise awareness and inspire people to take action" (Armstrong 2018, 81). In other words, if someone goes to a zoo or aquarium and feels some type of connection or positive emotional experience, and this is paired with what steps they can do to help protect the kinds of animals they are connecting with, it creates a more powerful form of environmental education than simply talking to someone. This is one way in which, with the help of animal ambassadors and positive reinforcement training, zoos and aquariums can help inspire the next generation of environmental advocates.

Chapter 5: The Future of Training

As I have argued in the above chapters, positive reinforcement training can provide numerous benefits to both animals and humans. This comes in the form of provisioning and cultural services to animals, and cultural services to humans. In order to continue to support the work that zoos and aquariums across the country are able to do, and to combat the anti-zoo and aquarium agenda, there are a few steps that must be taken regarding animal welfare-policy and the further implementation of positive reinforcement training.

Combatting Harmful Policies. As previously mentioned at the beginning of Chapter 2, new regulations, laws, and petitions are consistently being pushed forward to regulate zoos and aquariums and their resident animal species. Regulations for zoological facilities can help to move these facilities forward in terms of a higher standard for animal care. Regulations can also limit the ability to provide a standard of animal welfare that takes into consideration the needs of individual animals. For example, as previously mentioned, the SWIMS act may arguably diminish the current welfare of the listed cetacean species, as it limits their breeding and social groupings, both of which are primary reinforcers for these animals. This act is just one example of ways in which new legislation may unintentionally harm animal welfare rather than improving it. Therefore, my solution would be to have scientists, veterinarians, and most importantly animal care professionals be a part of these conversations about new legislature. Currently, many decisions about legislation exclude trainers, keepers, and all those that actually work with these animal species on a daily basis. Consequently, this often excludes behavioral needs of individual animals and species overall, and focuses rather on political agendas stemming from activists groups. Therefore, I think that new legislation concerning animal welfare and animals in

zoological facilities should be created out of a dialogue between politicians, researchers, scientists, veterinarians, and animal care professionals in order to ensure the best for animal species living in zoos and aquariums.

Publicly Available Positive Reinforcement Training Policies. The required use of positive reinforcement training programs for all accredited zoos and aquariums under the AWA and HREA would be most beneficial. Currently, zoos and aquariums are not required to make their training protocols and plans public available. While almost all zoos and aquariums utilize some form of training, some facilities utilize detailed and world-renowned training programs that set examples for zoos and aquariums across the world. Additionally, these training programs are made public for other trainers to learn from, and to share with the general public the good that training can do for the animals. These publicized training programs also work against the anti-zoo and aquarium agenda that organizations such as PETA utilize, because the general public are able to see in depth how training works, and more importantly how the animals respond to it. I propose that policies that require detailed training programs for accredited facilities would inherently help to uphold existing regulations for animal welfare, while also helping to educate the public about the benefits of positive reinforcement training.

The training at Monterey Bay Aquarium is a great example of a detailed positive reinforcement training program that can be implemented in facilities across the country. Monterey Bay Aquarium uses positive reinforcement training on all of their animals, from sea otters to fish. That's right–fish! Senior Aquarist Kelsey Barker says, "Some people are surprised that you can train fish, but you can train them just as easily as mammals. The trick is to find what motivates them and use that as a reward-based system in positive reinforcement training"

(Monterey Bay Aquarium). In many ways, Monterey Bay Aquarium has revolutionized positive reinforcement training programs. The concept of a "target" as previously discussed in Chapter one, is commonly used with marine mammals such as sea lions, seals, and dolphins. Yet Monterey Bay uses target training with all their animals, including sea birds, sea turtles, sea otters, and fish. They state that "Target training is the heart of our repertoire" (Monterey Bay Aquarium). In utilizing target training plans with animals of all species, Monterey Bay Aquarium extends the benefits of positive reinforcement training to all the animals under their care.

While the training at Monterey Bay Aquarium mirrors the training programs of zoos and aquariums across the country, the fact that it is explained in detail and made available to the public is something that I believe zoos and aquariums across the country can adopt and expand upon. Websites that highlight the positive reinforcement training a facility does can offer guests a "behind the scenes look" on training while also emphasizing the benefits to animal welfare that this training provides. Moreover, it increases transparency about the work trainers do with animals on a daily basis, and works as a form of education to the general public. In addition to educational websites that highlight training, I think that zoos and aquariums should be required to have documented training plans for all species within a facility. In an amendment to the AWA, all zoos and aquariums should be required to have some sort of species-specific training program that utilizes positive reinforcement and is subject to inspection by the USDA. This can ensure that all species are a part of the numerous benefits of positive reinforcement training.

Public Education. The availability of information regarding positive reinforcement training programs to the general public can foster great environmental education. Information can be provided through official statements released by a facility, an official social media page,

published works by a facility, shows or presentations, and more. As mentioned in Chapter 4, the public display of positive reinforcement training gives zoo and aquarium visitors an opportunity to see how the animals are cared for and learn more about the individual species. This was exemplified in the study on public perception and environmental education after watching otter training sessions at Zoo Atlanta. Similarly, a greater understanding of how positive reinforcement training works can help to address anti-zoo sentiments and gain support for zoos and aquariums across the country. In addition to their training program, Monterey Bay Aquarium provides excellent public education about training. On their website, they include exactly what positive reinforcement training is, its benefits, and all the ways in which they utilize this training with their animals. The website uses digestible language, and puts training goals in simple terms: “It’s better to train a sea otter or penguin to willingly go onto a scale than to pick them up, put them on the scale, and expect them to remain there” (Monterey Bay Aquarium). Arguably the most impressive feature is the detailed list of behaviors that are trained with a variety of species. Some examples include training giant sea bass to enter a stretcher for a voluntary parasite-removal procedure, training octopus to “pour themselves into a basket” for voluntary weights, and training African penguins to go on walks with trainers for enrichment (Monterey Bay Aquarium). The website also includes videos so the general public can visually see the process of these behaviors being trained, and the final product.

I believe that the implementation of educational websites such as Monterey Bay Aquarium's website will help to publicize information about positive reinforcement training. The incorporation of videos of training sessions, simple explanations of training, and explanations of training’s benefits will help to educate website-viewers on information they might not have

access to before. Additionally, the transparency that these kinds of websites provide work to close the gap between the public and the institution. Similar to a "behind the scenes" look, videos of training give the public a chance to see positive reinforcement in action, and can provide a deeper understanding to how zoos and aquariums truly work.

Enforcement by AZA and Government Agencies. Additionally, zoos and aquariums should keep records of training plans, as to be reviewed by the Association for Zoos and Aquariums (AZA) to ensure that training programs are using positive reinforcement methods instead of aversive or force-based training. The ability to keep track of and see the use of training programs within facilities would work in conjunction with existing acts such as AWA and HREA, and would increase all around animal welfare through the use of monitored, structured, and detailed positive reinforcement training programs. Additionally, the possibility to get cited by USDA for the lack of training programs can encourage facilities to adopt or expand existing programs. This would be possible if training plans and programs were required by AZA, and would continue to push zoological facilities towards increasing their animal welfare. Citations as a result of USDA inspections of zoos and aquariums can help to continuously improve zoological facilities. Even accredited zoos and aquariums get cited! Citations can actually work as an incentive for facilities to provide better care for the resident animals. After all, it's never a bad thing to have more requirements and push for better animal welfare!

The future. The future of zoos and aquariums is a hopeful. Zoos and aquariums are essential to the future of conservation preservation and fighting extinction. While they face many criticisms from animal rights activists and the general public, I think that a true understanding of the work these facilities do using positive reinforcement training can open people's eyes to the

vital importance of zoos and aquariums. The anti-zoo and aquarium agenda ignores all of the ecosystem services that positive reinforcement provides to the resident animal species and the general public. To summarize, positive reinforcement training helps to provide exceptional psychological welfare to the animals, extends many animals lifespans and aids in conservation biology, provides visitors with positive animal-human interactions, and helps educate zoo and aquarium visitors about environmental degradation.

Training in zoos and aquariums has come an incredibly long way across the decades. Of course, there is always further to go. I think that my recommendations for better online public education and required training programs would help to highlight the numerous benefits of positive reinforcement training as laid out in this paper. We must always be raising the bar and always increasing our standards for animal welfare. With this, animal care professionals can utilize positive reinforcement training to ensure the best animal care and apply the numerous ecosystem services this kind of training provides. Ultimately, positive reinforcement training is a dialogue between trainers and animals. When available to the public, visitors can be included in this dialogue, as training can bridge the gap between incredible animals and the general public.

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