

Wildlife conservation assignment: The role of zoos in Conservation

Introduction:	1
The current state of biodiversity and extinction	1
A brief history of practices in zoos	2
Conservation and recovery of species in zoos	2
Case studies	3
Animal welfare in zoos	4
Education	5
What does the future look like	5
Conclusion	6

Introduction:

This report seeks to examine the debate over the role of zoos in conservation by exploring the current state of biodiversity and conservation and critically assessing how zoos have benefited conservation whilst also having negative influences. Finally, this report examines the current activities taking place in zoos and how these actions might be improved to better enhance zoo conservation efforts in the future. The debate around zoos is highly complex and lots of factors need to be thought about to conclude what is best. Zoos help to conserve biodiversity by offering secure, regulated conditions where threatened species can successfully reproduce. They also contribute significantly to raising awareness of conservation efforts through increased education and research, as well as helping with reintroduction programmes that release animals back into the wild. The California Condor (*Gymnogyps californianus*), Golden Lion Tamarin (*Leontopithecus rosalia*), and black-footed ferrets (*Mustela nigripes*) are only a few of the zoos' accomplishments (Che-Castaldo et al, 2018.) But, there are still criticisms of zoos in the sense that they are unethical and can negatively impact the health and welfare of the animals. According to national geographic, a zoo is a place where animals live in captivity and are put on display for people to view.

The current state of biodiversity and extinction

Zoos have a role in conserving biodiversity and preventing extinction. The UN convention on biological diversity, (1992, page 7), defines biodiversity as “*The variability among living organisms on the earth, including the variability within and between species and within and between ecosystems*”. There are 1.75 million different species that have been discovered with many more yet to be discovered (McDaniel et al., 2022). This emphasises the importance of conserving biodiversity so that more species can be discovered which may have the potential for all sorts of ecosystem services such as the use in the pharmaceutical industry. If efforts aren't put into conserving species some species may become extinct before we even discover

them. The leading cause of biodiversity loss is habitat destruction, with pollution, overfishing and climate change contributing to it. Additionally, it is well known that ecosystems with high biodiversity are generally a lot stronger and more resilient to change as high genetic variation increases a species' ability to adapt to changing environmental conditions, disease, and climatic changes. (Centre for Biological Diversity, 2019) Estimations suggest that in recent years, extinction rates have been running 100 or more times faster than pre-human times, accelerating the rate of extinction. (Rounsevell et al, 2020.) Currently, 6,811 species are critically endangered, defined by the IUCN as having 250 adults or fewer and extinction is likely within decades (IUCN, 2022). The magnitude and complexity of the global extinction crisis require huge amounts of collaboration between those involved. This highlights the current state of biodiversity and extinction and how important it is to understand so that you can protect, enhance and restore global biodiversity.

The Convention of Biological Diversity (2011) set out 20 Aichi biodiversity targets which set out to improve several things. They aim to address the underlying causes of biodiversity loss and the direct pressures on biodiversity. Also to improve the status of biodiversity and enhance the benefits of biodiversity. This is something zoos should consider and apply to their work.

A brief history of practices in zoos

Zoos have undergone many changes in the past. Zoos didn't start with conservation as the main purpose. Historically they were used to execute power and status by showing the human control of nature. They were exotic attractions that didn't consider the welfare of animals. In the 18th century, more modern zoos were established but they were more like museums of living animals kept in small cages. In the past animal welfare has been very poor due to a lack of understanding and putting profit as the main focus. However, as they have evolved, the focus has shifted towards four fundamental roles; conservation, research, education and welfare. However, it is important to understand that not all zoos have the same missions and goals and some may prioritise the experience over animal welfare.

Conservation and recovery of species in zoos

The conservation work of zoos is split into two categories: in-situ and ex-situ. In situ is the conservation of populations in their natural surroundings e.g. national parks. Ex situ is the conservation of populations outside their natural environment e.g. zoos. (Maxted, 2001) Zoos engage in captive breeding for reintroduction as a method of conservation which is explored further in this section.

It is important to understand that many species we have now wouldn't be here if it wasn't for the conservation efforts of zoos. Zoos create safe environments for endangered species away from threats such as poaching, habitat loss and predators. It is expected that these pressures will be exacerbated by climate change as there will be significant changes to habitat conditions and the distribution of wildlife. This emphasises the significance of zoos in the future. Zoos increase

declining populations and often set up insurance populations so they can assist in reintroduction into the wild if the wild populations did go extinct.

Case studies

The Northern White Rhino (NWR) is an example of the intervention of zoos. The species has vanished from the wild, leaving just two females, mother and daughter, living in the Pejeta conservancy in Kenya. However, neither of these females are viable mothers. The last male died in 2018 but they do have frozen tissue from the last remaining NWR. The last remaining hope for this species is from advanced reproduction and genetic technology. There are three different pathways to creating NWRs; In Vitro Fertilisation (IVF), selective breeding and stem cells. IVF is achieved by using the frozen sperm from the male store and fusing it with an egg from the remaining female. They can then implant the embryo into a Southern White Rhino (SWR) acting as a surrogate. In 2019 the San Diego zoo used artificial insemination using a SWR surrogate and produced two offspring. Selective breeding could be another option as there are limited female gamete options. Hybrids from a NWR sperm and a SWR egg can be created and selectively bred to match the genetic profile of a NWR. Finally, stem cells can be an option using highly specialised technology to construct gametes from NWR tissue (Callender, 2021). This demonstrates how advances in biotechnology are a powerful tool in conservation and how the contribution zoos make to research has proven essential in conservation work. However, while re-establishing the population's self-sufficiency is the ultimate goal, the core issues remain unresolved. Poaching rates remain alarmingly high, and it would be naive to believe that the problem will simply go away so this raises the question of why restore a species if its environment hasn't changed? And, if humans are unable to preserve the species while it is still living, what does the future hold for them?

Another example is the Golden Lion Tamarin (*Leontopithecus Rosalia*) which was a critically endangered species in the past whose populations have been brought back up by conservation efforts by zoos. The current population is around 2,500 so it's endangered on the IUCN red list. They predominantly inhabit tropical rainforests in South-Eastern Brazil, where they live and graze for fruit, insects, and tiny invertebrates among tree canopies. Tropical rainforests suffer significant threats from deforestation caused by logging, agriculture, industry, and roads, resulting in significant habitat loss and forest fragmentation. This reduces the Golden Lion Tamarin's habitat and limits its food supply. They also face threats due to their use in the pet trade and diseases such as yellow fever. A yellow fever epidemic in 2018 reduced the population from 3600 to 2500, causing a significant setback in the conservation effort (Royal Society of Biology, 2020). As a result of these threats, the population declined to 200 in the wild in the 1970s prompting a huge conservation effort that included them as part of the AZA species survival plan and 143 zoos engaged in captive breeding and long-term research into reproduction, social behaviour and husbandry. Between 1983 and 2000, 146 zoo-born Golden Lion Tamarins were reintroduced into the Poco das Antas natural reserve and woods on private land as part of a conservation effort. Additionally, more than 50% of their wild population has descended from reintroduced captive-bred stock. This demonstrates the value of zoos in captive breeding and increasing wild populations (Smithsonian's National Zoo, 2018). However captive

breeding does have a few constraints; the cost is high, suitable spaces are limited and secure habitats are limited. Moreover, genetic modifications can occur during captivity which include loss of genetic diversity, inbreeding depression, accumulation of mutations, and genetic adaptation to captivity (Frankham et al. 2002). Captive environments differ from wild ones so over generations, animals may express genes that can favour captive environments which are then passed through generations. The characteristics selected under captive conditions are disadvantageous in the natural environment. For example, lions that have less aggressive traits will be favoured in captive environments as they are easier to handle. But, in the wild environment where hunting and establishing a position in the tribe hierarchy demand aggressive tendencies, they are unlikely to thrive. (Frankham, 2008)

However, research has been done to find ways to overcome these issues. Naturalistic enclosures should be used that best mimic the wild environment. For example, Plantasia has mimicked a tropical rainforest environment so they can house animals in their native environments such as the Edwards Pheasant (*Lophura Edwardsi*). They should also create challenges and choices for the animals so that it provides a stimulating environment.

Animal welfare in zoos

Animal welfare can vary from zoo to zoo. Accredited zoos such as those trading under the AZA will prioritise species conservation and carry out an array of in-situ and ex-situ conservation. In addition to having a moral obligation to protect the welfare of the animals under their care, AZA zoos have a scientific duty to enhance animal welfare science in order to better understand the welfare of the animals in their care (AZA, nd). Animal welfare refers to the animal's overall physical, mental and emotional well-being over a period of time. According to the Zoo Licensing Act (1981), animals in zoos must be accommodated to 'satisfy the biological and conservation requirements of the species to which they belong. This includes adapting the environment to meet the 'physical, psychological and social needs' as well as providing a 'high standard of animal husbandry with a preventative and curative veterinary care and nutrition programme'. Populations in zoos must be fit for breeding and re-introduction. To provide the optimum quality of care, variables including enclosure design, nutrition, interactions between keepers and visitors, enrichment, and enclosure furnishings should be taken into account. If animal welfare isn't followed, poor welfare can lead to abnormal behaviours such as repetitive actions or overgrooming and also stress, which increases the cortisol levels in brains. This can have further implications such as the suppression of the immune system and a decrease in reproduction. (Bacon, n.d.) A study on 2685 female Asian elephants explored the long-term effects that capture from the wild have on reproductive success, and their main key findings demonstrated that there is a consistent reduction in breeding success in captive-born females and that there are lower breeding probabilities at peak reproductive ages and a later age of first reproduction. (Lahdenperä et al., 2019). This suggests how zoo life might suit some species better than others.

Education

Each year, worldwide, Zoos attract more than 700 million visits providing great potential for public education (Gusset & Dick, 2011). One of the main goals of zoos is to increase public awareness and understanding of biodiversity, the effects humans have on it, and the steps that may be taken to protect it. This is done through public engagement, promoting awareness and fundraising events. A study by Patrick et al. (2007) found that out of 136 studied zoo mission statements, 131 specifically mentioned education and 118 mentioned the theme of conservation. However, this is a very small sample so is not fully representative of the real scale in global zoos. Zoos and aquariums frequently highlight their role as education providers on their mission statements as a key contribution to biodiversity conservation. Yet, the zoos don't always follow through on what they promise to accomplish. It could also be argued that biodiversity and conservation education could be achieved via documentaries of animals in the wild as opposed to keeping animals in captivity so education shouldn't be a reason for keeping animals in zoos.

The animal welfare charity, 'Wild Welfare' has committed to increasing education about animal welfare and insuring resources are made available in people's native language. For example in Bahasa, Indonesia, they have launched a free education programme to upskill and increase the knowledge of people working with captive wildlife (Wild Welfare, 2023). This is a more effective way of educating people about ethical behaviour and animal care since it enables those who may not otherwise have access to education to learn how to properly care for and conserve animals, which will improve animal populations and care in zoos.

Zoos raise funds for essential conservation projects and research. For example 'feed an animal' experiences and 'adopt an animal' schemes are interactive ways to donate to conservation work which goes towards improving habitats, research, monitoring and saving species from endangerment. Additionally, money from admission fees goes towards research and conservation.

What does the future look like

A continued emphasis on education as it plays an important role in understanding why animals become endangered and can help people understand how to care for the environment better. Conservation faces many challenges in the future with threats from climate change which will change the climate conditions of habitats and the accelerating population growth which will cause an increase in land use, so more wildlands will be destroyed. This means zoos will become increasingly important refuges as more populations will need support in adapting to changes in the environment. Leaving nature can no longer be expected as an option to restore biodiversity when climate change and land use change are occurring rapidly. For example, logging could be completely stopped in an area but the forest can't recover if climate change is causing changes.

Recommendations

First, zoos have many practices that are good and should continue such as the contribution to research, education and the zoo licensing act 1991 where animal welfare is protected. Greater efforts are needed to see these laws used and monitored globally so zoos can be more critically maintained and have stricter laws that better protect animal welfare. It should be compulsory that all zoos are accredited so that every zoo has to work with the same standards of animal care and practices. A big priority is protecting wild habitats such as rainforests by providing more education and campaigns to change consumer habits which can be supported via education. For example a greater understanding of palm oil plantations and encouraging sustainable sources of palm oil. A continued emphasis on education since it plays an important role in understanding why animals become endangered and can help people understand how to care for the environment better. Moreover, more education should be made more accessible in regions with less knowledge of proper care and practices. Finally, Zoos should focus less on attractive charismatic animals that are fine in the wild and focus more on animals in need of urgent conservation.

Conclusion

In conclusion, this report has supported the roles of zoos in conservation since, despite a few problems, they are effective. It has shown how certain species may be more suited to captive surroundings than others, but in general, zoos have had enormous achievements in prior conservation programmes such as the golden lion tamarin and northern white rhinos, and they will continue to do so in the future. It is clear that practices have improved over time and there is more attention on the welfare of animals and enclosure designs. Education has played a significant role in zoos, increasing worldwide awareness of conservation concerns as well as the quantity of research and understanding about animals and their environments. Ultimately, the main goal of conservation is to conserve biodiversity, which zoos have proven to do well at and will play an integral part in the future of conservation, especially with climate change becoming a significant challenge.

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