

Wildlife conservation assignment: The role of zoos in wildlife Conservation

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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 while 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 considered to conclude what is best. A zoo is a place where animals live in captivity and are put on display for people to view (Stanley, 2022). They help to conserve biodiversity by offering secure, regulated conditions where threatened species can successfully reproduce. They also contribute to raising conservation awareness through increased education and research, as well as helping with reintroduction programmes that release animals back into the wild (Che-Castaldo et al, 2018). 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.

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 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 many ecosystem services such as the use in the pharmaceutical industry. If efforts aren't put into conserving species some may become extinct before we discover them. The primary drivers of biodiversity loss are habitat destruction, with pollution, overfishing, and climate change contributing to it (The Royal Society, 2022). Additionally, ecosystems with high biodiversity are generally 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 times or more 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 facing extinction 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 the need to understand it to protect, enhance, and restore global biodiversity.

A brief history of practices in zoos

Zoos have undergone many changes in the past. Zoos didn't start with conservation as their main purpose. Historically, they were used to demonstrate human control over nature to demonstrate power and prestige. These were exotic attractions that didn't consider the welfare of animals (EAZA, 2013). 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 a focus on profit (EAZA, 2013). However, as they have evolved, the focus has shifted towards four fundamental roles: conservation, research, education, and welfare (Hancocks, 1980). 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 (Keulartz, 2015). 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 going forward into 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 do go extinct (Che-Castaldo et al, 2018).

Case studies

The Northern White Rhino (*Ceratotherium simum cottoni*) (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 have stores of frozen tissue from previous NWRs (Callender, 2021). The last remaining hope for this species is advanced reproduction and genetic technology. There are three different pathways: 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 (*Ceratotherium simum*) (SWR) acting as a surrogate. In 2019, the San Diego Zoo used artificial insemination using a SWR surrogate and produced two offspring, which is a great success. Selective breeding is 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 powerful tools in conservation and have proven to increase numbers. Clearly, the contribution zoos make to research has proven essential in conservation work.

However, there are still arguments against this kind of conservation. While re-establishing the population's self-sufficiency is the ultimate goal, the core issues remain unresolved. Poaching rates remain alarmingly high, and they argue that it's 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? (Gilchrist, 2018). On the other hand, there are strong arguments that there is an ethical and moral obligation of humans to protect species and repair the damage done. The value of biodiversity and ecosystem services is another significant argument for conservation work (The Conservation Handbook, 2017).

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 (Smithsonian's National Zoo, 2018). They predominantly inhabit tropical rainforests in South-Eastern Brazil, where they live and graze for fruit, insects, and tiny invertebrates among tree canopies (National Geographic, 2011). Tropical rainforests suffer significant threats from deforestation caused by logging, agriculture, industry, and roads, resulting in significant habitat loss and forest fragmentation (Save the Golden Lion Tamarin, n.d). 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 conservation efforts (Royal Society of Biology, 2020). As a result, the population declined to 200 in the wild in the 1970s prompting a huge conservation effort that included them in the AZA species survival plan and 143 zoos engaged in captive breeding and 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, and suitable spaces and secure habitats are limited. Moreover, genetic modifications can occur during captivity, including loss of genetic diversity, accumulation of mutations, inbreeding depression, and genetic adaptation to captivity (Frankham, 2008). Captive environments differ from those found in the wild, so over generations, animals may express genes that favour captive environments

which are then passed through generations. The characteristics selected under captive conditions are disadvantageous in the wild. 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 to 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 enrich the animals' environment to provide challenges and choices for the animals to provide a stimulating environment. A study of orang-utans at several rehabilitation centres in Indonesia discovered that offering complex, stimulating settings helped to enhance the psychological and physiological characteristics (EAZA, 2013b). Figure 1 shows an example of enrichment activities designed for Lions.

JANUARY 200X						
MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
	1	2	3	4	5	6
	PREPARATION: HANG ROPES IN THE EXHIBIT OF THE MONKEYS	MAKE SMELL TRACKS WITH DEODORANT SPRAY ON ROCKS & GROUND IN LION EXHIBIT	HIDE RABBIT SKIN IN THE EXHIBIT	FEED A WHOLE CARCASS OF COW (OR OTHER)	MAKE HOLES IN SUBSTRATE AND HIDE FOOD IN IT	COLLECT THE ROPES FROM MONKEY EXHIBIT AND SPREAD THEM THROUGH LION EXHIBIT
7	8	9	10	11	12	13
PREPARATION: MAKE ICE BALLS WITH WATER, BLOOD & MEAT	FEED ICE BALLS TO THE LIONS	PREPARATION: MAKE 2 BAGS WITH STRAW AND PUT THEM IN THE ZEBRA ENCLOSURE. FEED LIONS WITH MEAT THAT IS ATTACHED TO BONE	FEED LIONS WITH MEAT THAT IS ATTACHED TO BONE	COLLECT DUNG FROM ZEBRAS/GIRAFFES AND SPREAD THIS THROUGH LION EXHIBIT	COLLECT BAGS FROM ZEBRA ENCLOSURE AND PUT THEM IN THE LION EXHIBIT	FEED LIONS WITH MEAT THAT IS ATTACHED TO BONE

Figure 1, Enrichment Calendar for Lions (EAZA, 2013a, p61)

Animal welfare in zoos

Animal welfare has become of much greater importance to zoos than it was in the past and more is now done to enhance the welfare of animals. Animal welfare refers to the animal's overall physical, mental and emotional well-being over a period of time (Bacon, n.d). Accredited zoos such as those licenced under the AZA, have a moral obligation to protect the welfare of animals under their care and to enhance their understanding of animal welfare by increasing scientific research on animals (AZA, n.d). According to the Zoo Licencing Act (1981), which covers the United Kingdom, animals in zoos must be accommodated to their 'biological and conservational requirements'. This includes adapting the environment to 'satisfy the physical, psychological, and social needs' and providing 'high standards of animal husbandry, veterinary care and nutrition'. This ensures that all UK zoos have the same minimum standard of animal welfare. Zoo populations must be suitable for breeding and reintroduction, thus elements like

cage design, diet, interactions between keepers and visitors, enrichment, and enclosure furnishings must be considered (Hancocks, 1980).

However, animal welfare varies from zoo to zoo and isn't always prioritised. Poor welfare can lead to abnormal behaviours such as repetitive actions, overgrooming and stress, which increase cortisol levels in the brain. This can have further implications like the suppression of the immune system and a decrease in reproduction (Bacon, n.d). Additionally, studies have shown how some animals may be better suited to zoo life than others which will inevitably affect their welfare regardless of what zoos do to improve the setting. A study on 2685 female Asian elephants explored the long-term effects that capture from the wild has 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). In cases like this zoos should be the last resort and alternative provisions should be used as much as possible such as in-situ conservation.

Education

Zoos are good at increasing education. Each year, worldwide, Zoos attract over 700 million visits providing potential for public education. One of the main goals of zoos is to increase public understanding and awareness of biodiversity, the effects humans have, and the steps taken to protect it (Gusset & Dick, 2011). This is done through public engagement, promoting awareness, and fundraising events. Zoos and aquariums frequently highlight their role as education providers as a key contribution to biodiversity conservation, and 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. This shows the emphasis put on education. However, this is a relatively small sample so doesn't fully represent the real scale of global zoos and some zoos may fail to deliver on their promises.

Making education accessible globally is essential to increasing awareness and knowledge about protecting the wildlife around people. The animal welfare charity 'Wild Welfare' is dedicated to promoting animal welfare education and making information 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 the correct education to learn how to properly care for and conserve animals, which will improve animal populations and care in zoos.

Furthermore, 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 that goes towards improving habitats, research, monitoring, and saving species from endangerment (Noah's Ark Zoo Farm, n.d).

What does the future look like

Education must be prioritised since it plays a vital part in understanding why animals become endangered and may help people learn how to care for the environment properly.

Conservation faces many challenges in the future, including threats from climate change, which will change the climate conditions of habitats, and accelerated population growth, which causes an increase in land use, resulting in more wild-land destruction (Callender, 2021). This suggests that zoos will become increasingly important refuges as more populations require support in adapting to changes. Leaving nature is no longer an option to restore biodiversity when climate change and land use change are occurring rapidly.

Recommendations

- When research shows certain animals don't suit captive environments, alternative provisions should be used, so zoos are the last resort.
- All zoos should focus less on attractive, charismatic animals that are fine in the wild and more on animals in urgent need of conservation.
- Education needs to be made more accessible in regions with less knowledge of proper care and practice.
- Stricter laws on zoos that are monitored more thoroughly.
- 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 (e.g. palm oil).

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 generally, zoos have had enormous achievements in prior conservation programmes such as the golden lion tamarin and northern white rhinos and will continue to do so in the future. Practises have improved over time, with greater attention on animal welfare and enclosure designs. Education has played a significant role in zoos, increasing global awareness of conservation concerns and 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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