

An evaluation study of zoo visitors' perception, learning, and knowledge of nature conservation at Korkeasaari Zoo, Finland

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Zoos aim to enhance zoo visitors' knowledge of biodiversity, conservation and sustainability and responsible consumer consumption, encouraging visitors to form positive connections to wildlife. To analyse how this is achieved in Korkeasaari Zoo after changes to their conservation education, we conducted a follow-up study in 2023 by interviewing zoo visitors (in Korkeasaari Zoo). The previously published research from 2018 reported that visitors were unaware of the zoo's conservation activities and that the zoo's conservation education messages did not impact individuals' everyday conservation practices. Since then, Korkeasaari Zoo has diversified and improved the zoo conservation education materials, offering better practical examples of zoo conservation work and how visitors can become involved in zoo conservation activities. Our results show that in 2023, the interviewees were better informed and more aware of the zoo conservation because Korkeasaari Zoo communication materials at zoo exhibits and the signboards had been renewed. Many interviewees deemed the zoo's conservation role significant. In our 2023 study, perceptions of animal welfare were also included at the Zoo's request.

When we asked how visitors perceived animal welfare at the zoo, they viewed it as good and appreciated the zoo's requests not to disturb the animals while watching them. We believe that the zoo's sustainable conservation education with interactive learning opportunities and communication intervention may positively impact visitors' everyday conservation practices and promote a radical political change at the societal level.

KEYWORDS: biodiversity; conservation education; conservation knowledge; nature conservation; zoos; animal welfare; visitor studies

Introduction

In the era of a biodiversity crisis, it is important to evaluate how modern zoos perform in their conservation education task. How can a zoo affect and increase visitors' knowledge of biodiversity conservation and encourage visitors to engage with conservation and make their everyday practices to more sustainable? Globally, the major contribution of zoos to biodiversity conservation has been in protecting exotic animal species through ex-situ conservation (Moss et al. 2023). Zoos worldwide engage in various conservation actions such as breeding and reintroduction programmes for endangered species (Rees 2023).

In our article we aim to embrace a zoo-friendly research tradition, where zoos are seen as places, which currently consider demands to manage animals in more naturalistic settings, emphasising the well-being of zoo animals, while continuing to maintain long-term positive effects on people's attitudes towards zoo animals (on critique of this research tradition, see Malamud et al. 2010). In this way, modern zoos also explicitly consider their roles as centres for conservation and conservation education, aiming to promote and strengthen pro-environmental behaviour among visitors.

Modern zoos still present their zoo animals as representatives of animal species inspiring visitors to act in animal wildlife and nature protection. Today, globally, both Article 9 of the Convention on Biological Diversity (CBD) and the post-2020 Global Biodiversity Framework (GBF) have required zoos to implement better measures to their conservation work to mitigate biodiversity loss globally by 2030 (Ainsworth 2023; Rees 2023; UNEP 2023a). As a result, zoo communication has become the cornerstone of zoo conservation efforts. Today, the conservation role of zoos has evolved from simply providing biological information about animal species to conservation education and zoo advocacy. Advocacy includes public engagement, raising awareness and organising

fundraising events and campaigns. Due to the demands of climate change, zoos have moved from providing facts about animal species to more impactful conservation education aimed at educating people about biodiversity and changing everyday lifestyles and consumption patterns (Spooner et al. 2023).

Related to the issues mentioned earlier, Ojalampi and Nygren's (2018) earlier Korkeasaari Zoo study of visitor perceptions of nature conservation at Korkeasaari Zoo investigated how nature conservation themes (biodiversity, species conservation, and endangered species) and conservation education emerged from zoo visitors' survey responses. The results showed that the visitors were unaware of conservation activities in the zoo and that the zoo conservation education messages were not effectively inducing a change in individual everyday conservation actions (Ojalampi and Nygren 2018, 242).

Due to this, Korkeasaari Zoo had to seek to change its conservation education methods and strengthen them to enhance the future zoo visitor experience with better knowledge and understanding of biodiversity conservation. After our first visits to Korkeasaari Zoo in 2023, we researchers realised that during the COVID-19 pandemic of 2020–2022, the zoo had significantly renewed its communication and environmental education on nature and species conservation compared to 2018, partly in response to the results of the research mentioned above (Ojalampi and Nygren 2018). The altered educational materials aim to inform visitors about biodiversity and encourage them to improve their pro-environmental practices.

Therefore, in 2023, Korkeasaari Zoo commissioned us to conduct a follow-up study to assess how zoo visitors perceived biodiversity, conservation education and animal welfare during their zoo visit. In this way, we had an opportunity to study, together with my research assistant (Joel Wamai), the impact of changes to conservation education and communication on visitors' environmental knowledge and actions and animal welfare at the zoo between 2016, when the first research data was collected, and 2023. Following a request from the zoo, the pilot study was expanded to include animal welfare to gather updated information on visitors' views of animal care.

Criticism of zoos currently claims that many zoos do not sufficiently promote social change in visitors' pro-environmental practices, even though their conservation education includes instilling a sense of respect for and responsibility towards nature¹ and decreasing consumption of natural resources (Krause and Robinson 2021). Due to

1 In this article, nature is defined as “not one nature, but a diversity of contested natures constituted through sociocultural processes... where nature serves to define what it means to be human” (Uggla 2010).

this, zoos' educational values and functions generally appear ambiguous (Rees 2023). In this research, we aim to enhance and deepen research on visitors' perceptions of zoo conservation and show how conservation education influences zoo visitors' conservation knowledge and learning experiences in zoos.

Korkeasaari Zoo has altered its conservation education and zoo biodiversity conservation communication methods. In this study, we examine the impact of the changes. We also report visitors' perceptions of conservation and conservation education, which can influence and improve their awareness of biodiversity conservation, motivate them to participate in conservation efforts, foster pro-environmental change in their daily practices, and encourage more sustainable behaviours among them.

Our research questions are:

1. Are zoos perceived as places of conservation?
2. What kind of conservation activities does the zoo encourage?
3. How do visitors perceive the welfare of the animals at Korkeasaari Zoo?

Zoo visitor research and conservation education in Korkeasaari Zoo

In this section, we discuss the zoo's educational goals and teaching strategies, along with the motives why their conservation education initiatives have become a component in zoo function.

Despite the growing recognition among modern zoo organisations of the importance of conservation education in promoting behavioural and social change towards environmental action, there persists a lack of a global strategic approach to this area (Thomas 2020). In addition, zoos' educational targets and pedagogical content have remained relatively conservative (Lloro-Bidart & Russell 2017). In the current climate crisis and biodiversity loss, we believe a more radical and structural transformation in zoo practices is needed, and it should achieve a more holistic approach to environmental education. Therefore, today's zoos should seek to change visitors' everyday lifestyles and consumption patterns radically. This explains the growth in research on zoo conservation education in recent years (Counsell et al. 2020). Earlier global survey studies by Moss et al. (2015) and Moss et al. (2014) showed increased biodiversity knowledge through biodiversity education campaigns, but individually achieved self-reported pro-conservation actions were reported by only half of the visitors. The next study on visitor biodiversity knowledge and self-reported pro-conservation behaviour by Moss et al. (2017) found a slight association between biodiversity-related knowledge and self-reported pro-conservation behaviour.

Subsequent studies have also analysed the impact of zoo learning experiences through changes in visitor behaviour (Godinez and Fernandez 2019; Learmonth et al. 2021) and perceptions of zoo conservation (Ojalammi and Nygren 2018). The educational value of zoo visits and the learning experience have also been studied by researchers such as Ballantyne and Packer (2016) and Ballantyne et al. (2018). These studies examined the effectiveness of specific conservation and zoo education campaigns or programmes on visitors' perceptions, attitudes and behaviour. The results reported a need to foster engaging visitors' biodiversity learning with post-visit actions (like the zoo's takeaway educational materials and website-based action resources), which may encourage visitors' conservation behaviour.

For decades, studies have acknowledged that the zoo's conservation education messages have not caused change in individuals' pro-conservation behaviour. Spooner et al. (2021) studied visitors' experiences through the educational effect of animal shows at Flamingo Land Resort Ltd. in the UK. Their results demonstrated that the animal shows may potentially increase visitors' knowledge of animals, but the impact of animal shows indicated only a slight change in conservation action awareness. Similarly, Counsell et al. (2020) assessed the effectiveness of in-school repeat engagement in the zoo education programme and its learning outcomes for pupils, and their study showed a minor positive change in attitudes towards conservation self-efficacy. Pavit and Moss's (2019) study focused on the impact of zoo exhibit design on visitor engagement and conservation attitudes in the UK in Chester Zoo's walk-through exhibits. Their results revealed minimal evidence of walk-through exhibits increasing knowledge about zoos' conservation but a potential impact for influencing visitor attitudes towards pro-conservation behaviours.

Development of biodiversity policies and environmental education

In this section we describe the impact of the current biodiversity policy evolution on zoos and why zoos' conservation education is considered a part of environmental education.

Before 2020 the World Zoos and Aquarium Conservation Education Strategy (WZACES) had four goals for zoo education, all related to the current conservation education themes at Korkeasaari Zoo: building knowledge and understanding; fostering positive relationships; motivating pro-environmental behaviour; developing scientific, technical and personal skills (Thomas 2020). We define conservation education as influencing people's attitudes, emotions, knowledge and behaviours towards wildlife and wild animals and places, emphasising local people's knowledge, experiences, values

and practices (Ardoin et al. 2020).

Western zoos have always undergone changes and reinventions. Beer et al. (2023) and Miranda et al. (2023) have aptly described the institutional evolution of their roles as conservation institutions. Today, zoos stress their contribution to biodiversity conservation on educational grounds (Rees 2023, 44) and endeavour to support visitors' pro-environmental practices with pro-conservation learning outcomes (Taylor and Duram 2021; Counsell et al. 2020). The first biodiversity-related conservation regulation affecting zoo strategies was the Convention on Biological Diversity (CBD) of 1992 (UNEP 2023b) endorsed by the EU in 1992, where Article 9 on ex-situ conservation required zoos and aquariums to complement their in-situ methods with "measures for the ex-situ conservation of components of biological diversity" (EU 2023).

Global biodiversity conservation highlights the maintenance of balance in biodiversity and ecosystems. The loss of biodiversity, the climate crisis and global demands for sustainable development have resulted in mounting pressure on zoos to accomplish their roles in ensuring conservation goals and biodiversity agreements (Zoo Director Sanna Hellström, Korkeasaari Zoo 2023).

The historical model of zoos as pillars of conservation, education, research and recreation is also outdated and unrepresentative of the role of zoos. This explains why zoos globally are challenged to redefine their conservation goals and frameworks (Spooner et al. 2023). In addition, while the zoo's wildlife management has historically been based on the idea that captive animals in zoos are representative of their wild counterparts (cf. Braverman 2015; Spanning 2017), today, modern conservation activities address the global challenges of species loss, biodiversity crisis and climate change.

Zoos have realised their unique position, offering a global perspective through common conservation goals that align with the UN's Sustainability Development Goals (SDGs) (Spooner et al. 2023). As a result, many visitors today expect zoos to incorporate SDGs into their strategies. In addition, for zoos to survive and maintain their image, their strategies need to demonstrate a radical transformative change that includes a new ethic for the relationship between humans and biodiversity of nature, radically innovative conservation practices, policies, marketing, communication and education, and a greater commitment to motivating zoo visitors to take more pro-environmental actions in their daily lives (Xu et al. 2020). Therefore, in 2005, the World Association of Zoos and Aquariums (WAZA) and the European Association for Zoos and Aquariums (EAZA) demanded a uniting commitment to conservation by establishing a network of certified zoos (WAZA 2005). A decade later, in 2015, WAZA published its conservation guidelines, clearly outlining the role of zoos in implementing both in-situ and ex-situ

conservation actions (Barongi 2015). That same year, EAZA renewed its position, stressing the contributions of zoos to conservation and education (EAZA Council 2023). In 2020, the WAZA education strategy “Social Change for Conservation: The World Zoo and Aquarium Conservation Education Strategy” (WZACES) scrutinised educational goals and both human and social dimensions in conservation education (Thomas 2020, 16). EAZA also stressed global biodiversity goals by calling in its strategic conservation plan 2017–2020 for member zoos’ conservation impact, activities and education (EAZA 2017).

In 2022, the Conference of Parties to the CBD adopted the post-2020 Global Biodiversity Framework (GBF) and its targets to halt biodiversity loss globally by 2030 (Ainsworth 2023). The framework requires zoos to measure their progress in conservation as a function of changes in human behaviour (Moss et al. 2023). In WAZA’s Sustainability Strategy for 2020–2030, the role of zoos in sustainability actions is highlighted, and the strategy guides member zoos to implement and integrate the United Nations Sustainable Development Goals into their operations with partnerships (UN 2023; Bensted et al. 2020; Thomas 2020, 49).

Korkeasaari Zoo is a WAZA and EAZA member and is recognised by the International Union for Conservation (IUCN). Along with policy developments, Korkeasaari Zoo’s strategies have evolved with the goals and strategy targets of international conservation, like the conservation targets of the CBD (interview with Zoo Director Hellström 2023) and the conservation educational goals of both EAZA and WAZA. Current conservation values in the zoo’s operations aim at ethical animal welfare and promote active and positive experiences in animal care to encourage visitors to engage in pro-conservation actions (Korkeasaari Zoo, a 2023). WAZA’s new Animal Welfare Goal also encourages zoos to improve animals’ social well-being and increase the evaluation of animal welfare processes in zoos (Mellor et al. 2015).

The study site, the Korkeasaari Zoo

Korkeasaari Zoo is one of the oldest zoos in the world. It was established in 1889 on Mustikkamaa Island close to the centre of Helsinki, the capital city of Finland. The zoo received its first wild animals, bears, as donations before the zoo was established, when the Korkeasaari area was a public recreational area for Helsinki residents. After the zoo was established, wild animals were bought and caught in the wild. Monkeys and parrots were sent by ship and were given to the zoo as donations, as was the custom in the 19th century in Finland and elsewhere in Europe (Korkeasaari Zoo 2025 a).

Like many other zoos today, Korkeasaari Zoo, in its strategy and values, emphasises the protection of endangered animal species in wildlife projects (in-situ and ex-situ conservation) (Korkeasaari Zoo, 2023a), aims to ensure good animal welfare, and presents general information about environmental topics that are important for a particular species (Zoo Director Hellström, 2023.) Korkeasaari Zoo defines good animal management as complying with animal care and welfare appropriate welfare management for each species according to WAZA animal welfare standards (Mellor et al. 2015) and providing conservation education through its schooling days for primary school pupils (Korkeasaari Zoo 2025 b).

Korkeasaari Zoo is open all year round. It receives more than 500,000 visitors annually and is a popular summer holiday destination for families. It is managed by a private foundation (the Korkeasaari Foundation) and owned by the City of Helsinki. Zoo Director Sanna Hellström informed me that half of the Zoo's budget comes from ticket sales, and the other half is allocated from the city budget.² In 2024, the Zoo kept 180 animal species and 2,390 individual animals (Korkeasaari Zoo 2024). The Zoo also runs a nature school and a wildlife hospital, which treats about 1,400 wild animals annually; most are released after recovery (Korkeasaari Zoo 2025c). Since 2020 the zoo has also embraced new digital technologies, such as downloadable audio guides, and increased the number of guided tours. The zoo is active in both social and traditional media, such as Facebook (Korkeasaari Zoo 2023b), Instagram and Twitter (Korkeasaari Zoo 2025d and 2025e), Finnish TV's reality show (Ruutu+ 2023) (Haapala and Niisku 2023) and Finnish radio. The Zoo also holds specific events, like the Night of the Cats.³

In the past, the Zoo's conservation information on individual species mainly contained biological facts. Currently, the Zoo takes a more humanized perspective towards zoo animals, representing animals as individuals with unique names and stories, which aims to foster a better understanding of zoo animals that extends beyond mere biological facts (Zoo Director Hellström 2023). The zoo has also an increased number of exhibits with well-highlighted signs addressing the zoo's essential role in saving endangered animal species from the threat of extinction. There is also more new information about Finnish flora and fauna.

2 Sanna Hellstrom, e-mail message to author, February 11, 2017.

3 During the Night of the Cats event, the zoo offers many activities, and visitors can visit the Cat Valley and see for instance, the Amur tiger, Amur leopard and Snow leopard during their feeding times. Other activities include Light the Art Route, when Korkeasaari Island is illuminated by Sun Effects with the lantern installation Fires of Amur, representing the number of critically endangered Amur leopards in the wild. (Korkeasaari Zoo 2025 f.)

Method and analysis

We asked about visitors' experiences during a zoo visit to scrutinise their views, perceptions and observations of zoo conservation and zoo animals' well-being and care to better comprehend the interconnections between captive wild animals and visitors, exhibit designs, and the impact of individual animal characteristics on visitors. We investigated how nature conservation and animal well-being themes emerged from visitors' responses, with their thoughts and opinions on conservation, animal welfare and their needs, and future aspirations for the conservation activities of zoos.

We collected data from two different types of interviews:

1. 75 structured situational interviews (altogether 104 participants: individual visitors, families with children and couples) collected at Korkeasaari Zoo in the summer of 2023.
2. The director of the zoo was interviewed in July 2023.

We used situational interviews (Nieminen 2015) as in our previous study (Ojalampi and Nygren 2018). On average, our visitor interviews lasted about two to seven minutes; they were recorded and transcribed verbatim (see Table 1).

Ojalampi, with her research assistant, Joel Wamai, conducted the interviews in Finnish and English. Interview dates and locations were decided together with zoo representatives. We conducted interviews in the peak season, June and July 2023 (see Table 1.) and conducted seven group interviews with families or couples where all participants, mothers and fathers, and a girl and a boyfriend, responded to the questions. We aimed to include visitors of different ages, genders and groups (with children, couples, and individual visitors). Only adults were interviewed, as interviewing children would have required differently phrased questions with a different analytical lens and permission from their guardians. We did not collect any personal data for background information, but we did ask about the visitors' reasons for visiting the zoo. Most respondents were between 30 and 50 years old and came with their children. Ojalampi's and Wamai's observations of zoo communication were used to support the analysis, validate new conservation information from the interview data, and contextualise the study findings.

The main interview questions related to zoo conservation began with "warm-up questions" (e.g., Why did you come to the zoo today? Have you enjoyed your day in the zoo today? What do you think is the purpose of the zoo?). The study had three direct questions at the end of the interview, where the conservation issue was elicited directly.

	June 20, 2023 (Tuesday)	July 5, 2023 (Wednesday)	July 15, 2023 (Saturday)	July 21, 2023 (Friday) Interview with Sanna Hellström
No. of visitors	14	20	26	15
Weather	25 °C, sunny	19 °C, sunny	25 °C, sunny	22 °C, partly rainy and sunny
Interview location	<ul style="list-style-type: none"> • Harbor • Binocular viewing platform • Picnic area at Pukki restaurant • Peacock house • Indoor and out-side picnic area in the Bear Castle area • Picnic area near Otters 	<ul style="list-style-type: none"> • Harbor • Binocular viewing platform • Picnic area at Pukki restaurant • Indoor and outside picnic area in the Bear Castle area • Picnic area near the Milu • Picnic area near Otters 	<ul style="list-style-type: none"> • Harbor • Binocular viewing platform • Picnic area at Pukki restaurant • The path along the Przewalski's horses • Indoor and outside picnic area in the Bear Castle area • Picnic area near Otters 	<ul style="list-style-type: none"> • Harbor • Binocular viewing platform • Picnic area at Pukki restaurant • Cat valley • Indoor and outside picnic area at the Bear Castle • Benches along the path near the Milu and the Redneck kangaroo/Emu
Daily Visitor Count	2510	4399	7873	3955

Table 1: Summary of interviews

The questions were: How is nature conservation visible here? Do you remember any messages or experiences related to nature conservation? To study visitor perceptions of zoo animal welfare, we asked the informants: How do you perceive animal welfare in the Korkeasaari Zoo?

To cover places where the new communications were more visible, we chose different locations from those used in our earlier study. Among these locations were the zoo's harbour, frequently used walking routes around the zoo grounds, and a popular destination for visitors (e.g., Cat Valley and Bear Castle) where feline species, like Amur tigers and leopards, and brown bears, are kept on exhibit, and various recreational

indoor/outdoor locations for zoo visitors, like barbecue spots near Bear Castle and the Pukki Restaurant and a nearby place to rest and relax with the benches by the binocular viewing platform near the harbour (see Table 1). We approached visitors while they were viewing zoo animals, spending leisure time at the barbecue areas, or waiting for the ferry back to Helsinki city market square. Most visitors were keen to participate and had spent a few hours in the zoo.

We conducted a content analysis (Sarajärvi and Tuomi 2018) of empirical evidence from visitor statements and perceptions of conservation and animal welfare, and self-reported voluntary conservation actions. The research categories would help us to understand the meaning of the changed conservation impact before the visit vs. after the visit in 2023 from visitor statements and perceptions, such as the impact of the newly reformed zoo conservation from the zoo's exhibits and signs. Before analysing the data, we hoped that visitors' responses to our interview questions would show a growth in their conservation knowledge, with new types of pro-conservation actions and an emotionally positive human-animal connection, ultimately leading to a general interest in wildlife and nature.

We categorised mentions of conservation themes into three groups: biodiversity, species conservation (protecting and managing species) and endangered species (animals at risk of extinction). The animal welfare theme was categorised into six groups: general welfare, stimulation, conditions and enclosures, people's behaviour and concerns revealing visitors' observations on animal welfare during their visit. Responses limited to species biology, ecology or zoo maintenance were excluded from this analysis.

Results

Biodiversity conservation by the zoo

Compared to the earlier research at the site, new conservation themes drew attention to the globally critical loss of biodiversity and increased visitors' knowledge of species conservation and survival. In 2023, the results showed a better perception of conservation themes, like species protection, endangered species and their survival and animal welfare.

Especially among respondents who had been at the zoo for a long time, a large number, 68% of them (52) when asked the direct conservation questions answered affirmatively and described diverse conservation themes and/or reported what they had observed and learned at the zoo at specific interviewee locations or seen on the Korkeasaari Zoo TV show or read on the zoo's internet pages.

Many visitors also commented on the well-designed information displays:

There is a lot of information here on the animal displays, and they inform visitors about the endangered status of animals, what causes endangerment, I mean the information that can be read here, and due to that... it is important.

(Male, outside picnic area in the Bear Castle area, 21 June 2023.)

I feel that it (conservation) can be perceived easily. It is stated everywhere how the zoo tries to save them (animals) and what they do for animals and raise money. So, you can see it in every way.

(Female, harbour, 21 July 2023).

There are animals here, and they (the zoo) give information about those animals so that people become aware of them, and then perhaps people will protect nature more when animals are seen up close.

(Female with family, picnic area by the Pukki Restaurant, 15 July 2023.)

Thus, our research shows a marked change in conservation awareness due to the effectiveness of exhibition messaging compared to the situation in 2016, when a third of respondents were not sufficiently aware of conservation and could not easily or specifically comment on conservation topics (Ojalampi and Nygren 2018).

Biodiversity conservation by the zoo

Zoos are involved in in-situ, ex-situ and captive breeding programmes and ex-situ conservation's reintroduction projects are undertaken in partnership with other organisations (Rees 2023). Respondents' comments indicate that zoo conservation is evidently visible and easily observed in multiple ways at Korkeasaari Zoo. Furthermore, respondents understood how to get involved in the Zoo's conservation efforts. The zoo's conservation projects are prominently displayed on signs, for instance at the harbour, where visitors can learn about why Berber macaques (*Macaca Sylvanus*) were acquired for the zoo, or how the Bearded Vulture (*Gypaetus barbatus*) was reintroduced in Spain.

In my opinion, conservation is visible in everything. Here it becomes clear that the money that we bring to this facility will be used for research, the protection of animals, and care for existing animals... No, I do not think that it should be a mystery to a visitor here.

(Male, outside picnic area in the Bear Castle area, 5 July 2023.)

In my opinion, it is clear when it (conservation) is said everywhere that how the Zoo tries to save them (animals), and what is done for them (animals) and collecting money. That is seen in every way.

(Male and female [couple], harbour, 21 July 2023.)

Concerning ex situ conservation, it was evident that respondents demonstrated a robust understanding of the Korkeasaari Zoo biodiversity conservation, survival of threatened animal species efforts, animal welfare, and possible capability to contribute to conservation initiatives or projects.

While observing the communication materials, particularly for new information on biodiversity, animal species conservation, and practical advice on conservation, we found that compared to 2018, information on species conservation had improved alongside the quality of the educational materials. To promote and enhance self-directed learning, the Zoo has created new routes, such as the Conservation Heroes Route. The route prompts visitors to answer a series of questions to help them identify how they can become involved in conservation and provides tips on how to do so.

Species conservation

In species conservation, the themes of protection of endangered species (animals at risk of extinction), reproduction (breeding), and reintroduction (taking species back into the wild) were often viewed positively as respondents raised it as a valued example of the Zoo's important role in species preservation.

Fifty per cent of respondents mentioned something about species conservation, endangered species and reproduction. They understood the zoo's animal care to be effective and appreciated the Zoo's participation in conservation ex-situ projects by saving rare animal species from the threat of extinction and conducting good animal care in the Zoo's animal clinic.

The respondents reported how they had perceived the ex-situ conservation in the zoo:

It can be seen by securing the reproduction of species so that they (animals) can be released into the wild, and Finnish wild animals are protected here at the zoo animal clinic.

(Female, benches near the Milu antelope exhibition, 5 July 2023.)

Many respondents mentioned that they had learned about species reintroduction back into the wild and the breeding of animal species. Here, the interview location often affected these answers. For instance, when interviews took place along the routes to

the zoo exhibits, visitors mentioned reintroduced animal species, like the bearded vulture (*Gypaeus pappatus*), European bison (*Bison bonasus*), and Przewalski's wild horse (*Equus przewalskii*).

Some respondents also raised the conservation of the Amur tiger (*Panthera tigris altaica*) or Amur leopard (*Panthera pardus orientalis*) connected to the well-known in-situ Amur conservation project, in which Korkeasaari zoo has been actively involved since 1989 with the Wildcats Conservation Alliance (Korkeasaari Zoo, 2025g).

These respondents mentioned examples of reintroduced species of captive-born or zoo-bred animals (Snow leopard, *Panthera uncia*):

Maybe it was in the snow leopard areas that the zoo conservation showed up well. There was a signboard that said now there are about 140 snow leopards born in Korkeasaari Zoo. Perhaps that's the zoo's biggest merit, that it would be able to breed animals that are endangered.

(Male, binocular viewing platform, 21 June 2023.)

There was at least some animal... some antelope (Milu, *Elaphurus davidianus*) that is left nowhere else in the world except in a zoo. That's where conservation has been successful.

(Male, picnic area by the Pukki Restaurant, 5 July 2023.)

Many respondents mentioned the numerous displays in the zoo area and appreciated the zoo's role in species preservation and reintroduction. This signals that the zoo's biodiversity conservation communication has been effective and achieved positive perceptions and emotional outcomes toward the zoo's animal care and wildlife.

Some respondents mentioned having visited the zoo several times, even since childhood. When frequent respondents referred to a substantial quantity of conservation information on signboards, they said that they had no point in rereading and/or were not interested in how the zoo communicates local/global conservation initiatives.

It's mentioned a lot in these signs, but otherwise I don't notice it much. Perhaps you would somehow need more information to tell people how it (conservation) is done and implemented here.

(Female with children, binocular viewing platform, 15 July 2023.)

Generally, quite many visitors realise that the zoo is a place for conservation information. Of the respondents, 24% mentioned some details of conservation information, conservation action, newly designed self-directed learning options with conservation

info, and new exhibitions (animal and plant species seized by customs) or an animal clinic. Often when respondents referred to conservation info, they mentioned reading/seeing information about endangered species, their status, and successful acts of species reintroduction.

There is a lot of information here on the animal signs, and they indicate the endangered status of species, and what causes threats to them. Yes, it is certainly important in this regard.

(Male with family, picnic area by the Pukki Restaurant, 5 July 2023.)

Well, wherever you read noticeboards, they talk about nature conservation and the clinic that's here, I've read about it.

(Male, cat Valley, 15 July 2023).

There are many signs here advertising conservation, and I have been reading them. Especially this (noticeboard about the bearded vulture), where the zoo reintroduces a bird species into nature in Spain (Andalucia).

(Male, picnic area near Otters, 15 July 2023.)

It was the group game that had been launched here this summer, and you can go there as a group and complete those tasks.

(Male with family, outside picnic area in the Bear Castle area, 15 July 2023.)

Let's think about these good information signs and these activities, where you can, for example, just go through the different options with kids and think about what kind of thing is right or wrong, or important.

(Female and her children, barbecue area by the Pukki restaurant, 15 July 2023).

These interactive learning opportunities may have affected respondents' biodiversity learning for gaining new knowledge where zoo-based learning is often self-directed free-choice, where respondents personal experiences, knowledge, and agendas affect their learning processes (Smart et al. 2021), i.e., stand-and-stare exhibits. As Schilbert and Scheerso (2023) emphasise, during a visitor's zoo visit, informal and interactive learning environments and/or inspiring technological innovations with educational learning outcomes are based on the visitor's discretion and motivation.

The zoo's biodiversity conservation education and communication currently focus on individual conservation actions, and behaviour change has been less effective, as only donating money was mentioned in interviews. This shows that the zoo *still* lacks a strategic focus on conservation education goals and in its communication on sustainable

consumer and citizen practices that can affect the root causes of species loss, such as climate change and habitat loss.



Figure 1: In the Korkeasaari Zoo, the Zoo's wildlife conservation projects are prominently displayed on signboards. In this photo from the Harbour taken in July 2023 by Ojalampi, visitors are informed about how the zoo contributes to the conservation.

Conservation Fundraising/Donations

A small number of respondents, 12% (9), mentioned fundraising/donations. The respondents usually referred to the bigger picture of the meaning of fundraising more generally or how they can donate money through a fundraising box at animal species projects (e.g., Snow leopard, *Panthera uncia*). As Kelly and Skibins (2020) report, trying to enhance environmental learning outcomes through monetary offerings, such as donations, is less common in zoos. Among our respondents, only one interviewee mentioned having donated money.

Conservation... well, here at the collection boxes and those collection points, info point...at least you can see it very clearly.

(Male and Female, outside picnic area in the Bear Castle area, 15 July 2023.)

Today zoo visitors can make one-off or monthly donations to the zoo. Despite the efforts of the zoo fundraising aims to enhance monetary contributions, such as donations infrequently, very few visitors donate money to the zoo's conservation projects.

Figure 2: Korkeasaari Zoo's Amur-leopard and Amur-tiger projects fundraising box. Picture by Ojalammii.



Animal welfare

Generally, respondents seemed to us to be able to judge whether the animals were well looked after and if their enclosures resembled natural habitats. Some respondents criticised the enclosures by saying they were too small. Respondents generally felt that the animals at the Korkeasaari Zoo were well cared for and had space and enclosures that

met their natural needs. Today, the zoo has multi-species exhibits to co-habit animals that would occur together in natural conditions.

Only a few respondents (6) mentioned animal welfare in their answers to the direct conservation questions. When visitors were asked directly how they perceived animal welfare at the zoo, they perceived it as good. Few respondents mentioned animal welfare and animal conditions within enclosures. 26% (20) of respondents perceived that the animals looked good and were well cared for. Regarding the living conditions of the animals, 29% (22) of the respondents said that the facilities and enclosures were sufficiently spacious and clean or well-adapted to the natural conditions of wild animals. In animal welfare aspects, 6% (5) appreciated signs and information boards that warn and/or prohibit visitors from being noisy, approaching the animals or disturbing them (e.g. tapping on glasses).

As Learmonth et al. 2023 stress, peaceful interactions between zoo animals and visitors also enhance visitors' on-site conservation learning and pro-conservation actions.

When one visits the zoo, you can then understand animals yourself, and try to do your best not to make anyone's conditions worse yourself.

(Male with family, harbour, 20 June 2023.)

It (the zoo) also teaches children the right to self-determination that animals are not just for us, we are all there for each other.

(Female, harbour, 15 July 2023.)

Some of the younger and couple interviewees were concerned for the animals' well-being. Among them animals' stressed behaviour was mentioned in some (4) comments when respondents described the Amur leopard (*Panthera pardus orientalis*) pacing up and down, or the Barbary macaque's (*Macaca sylvanus*) stressed behaviour with obsessive symptoms of which the visitors were informed (by an info sign). Also, birds in aviaries, like eagles, evoked empathy and concern among younger visitors (20–30 years old). They viewed the birds' captivity critically due to the lack of space in the enclosures. One young woman commented:

Well, some birds, like those big eagles, I don't know if they can fly at all. That I was worried that some of them might look a bit stressed.

(Female with family, harbor, 20 June 2023.)

Regarding conservation learning, Jensen et al. 2017 stress that repeated zoo visits may aggregate learning among zoo visitors. This was confirmed among respondents because the zoo conservation message seems to have a strong effect on those respondents who have had an interactive experience with family members and/or revisited the zoo often (yearly). Despite this, providing information did not affect behaviour change to conservation action as there was little fundraising action. Regarding animal welfare, animals' well-being was perceived to be good, and the enclosures were deemed big enough to meet animals' natural needs at the zoo. Some respondents criticised the keeping of specific animals in the zoo. One visitor phrased it:

I mean, I understand the animal protection side of species protection, that they've been able to reintroduce wild horses into the wild... But then the fact that there are camels makes you doubt if we really need to drag some camels from somewhere to Finland.

(Female, inside picnic area in the Bear Castle area, 15 July 2023.)

Zoo animal welfare was viewed positively overall, though younger respondents and couples had concerns. Criticism was also made over animals' stress levels and the size of some animal enclosures, like those for birds.

Discussion

We believe that when studying the effectiveness of the zoo's communication to achieve education and behavioural changes, it is good to employ research methods with a longer temporal scope when aiming to identify changes such as better knowledge of conservation and environmental awareness. Korkeasaari Zoo has effectively addressed institutional and educational challenges while successfully delivering conservation information but prompting visitors to engage in conservation action is still lacking. Our follow-up study shows that in 2023, there was a noticeable increase in visitors' observations of biodiversity information around the zoo and awareness of the zoo's conservation action compared to 2016. Thus, we can say that new educational materials (in different media) and self-directed and shared learning opportunities have worked better than before to enhance visitors' educational learning and have improved the outcomes of conservation education.

For the zoo's education goals, visitor engagement with new educational elements, such as interactive on-site or digital learning opportunities, has improved visitor activation and enhanced visitor learning. Similarly, in animal welfare, the studies by

Clayton and Le Nguyen (2018) and Howell et al. (2019) have shown that in animal exhibits, well-executed animal welfare management with effective conservation information may raise visitors' environmental awareness and affect the growing appreciation of conservation care and the connection to wildlife.

There was no progress in intentional sustainable practices among visitors. For the zoo's conservation engagement, it is important to recognise effective ways to promote this. One way is to develop "extrinsic motivators and reduce barriers" to the learning circumstances that inspire individuals to perform conservation actions (Routman et al. 2022, 9). Zoos should give concrete advice on how ordinary people can make conscious sustainable choices as consumers and active citizens (Ojalampi and Nygren 2018). The zoos should also develop new strategies and better support mechanisms to establish sustainable wildlife management and fair conservation goals in protected areas and wild populations (Beer et al. 2023). During our interview days in the Korkeasaari Zoo, we observed how the Zoo's Global South conservation projects and their socio-ecological impacts (social inequality, human-animal conflict, or political circumstances) were not sufficiently visible. Therefore, Korkeasaari Zoo ought to enhance new methods for biodiversity conservation with people-nature relationships in global wildlife conservation projects. This would endeavour the zoo to shape visitors' urbanised attitudes towards wildlife in the broader socio-ecological context, i.e. with community needs (Gippoliti and Battisti 2023; Shyamsundar et al. 2023).

The present article shows how modern zoos play a critical role in conservation efforts. We explored the evolving public perception of Korkeasaari Zoo's wildlife conservation and communication efforts. In addition, we emphasised how conservation and visitor awareness at zoos are linked to animal welfare, like the competence/incompetence of the zoo's enclosures.

Moreover, in contemporary society, we argue that the zoo's current humanized perspective highlights animal welfare, conservation, and education in conservation education and communication by aiming to foster a deeper and more empathetic connection and understanding of zoo animals and wildlife. For example, in the context of animal welfare, the zoo prioritizes the overall well-being of its animals. It provides detailed information about the history of each animal, assigns them names, and strives to raise awareness regarding animal welfare issues. It also ensures that visitors view animals respectfully and do not disturb them. In conservation education, the zoo's wildlife projects teach visitors to understand wildlife biodiversity and species loss. This way, the humanized perspective aims to foster better human-animal connection and inspire visitors to engage in conservation efforts with better conservation education.

Our research shows that significant changes in the Zoo's conservation and communication efforts with accessible learning materials (media and audio) and interactive learning opportunities with humanized perspectives towards zoo animals have increased visitors' conservation knowledge and positive human-animal connections. Therefore, we encourage other researchers to conduct follow-up studies on the efficacy of zoo education and communication changes, especially in zoos that lack commitment to zoo conservation targets and have no evidence of learning results with advanced educational methods.

Conclusions

We hope our research demonstrates to zoos worldwide, how changes made in conservation education and communication can enhance visitors' understanding of conservation. However, the causes of driving changes in visitor's pro-environmental behaviour remain complex (Greenwell et al. 2023).

We believe that the change may occur if zoos can substantially contribute to the radical sustainable transformation of societies through their biodiversity conservation and translate impactful conservation action into practical, long-term solutions.

Better results can be directly reported to global framework targets, like the post-2020 Global Biodiversity Framework (GBF) (UNEP 2023a) and/or biodiversity strategies (Moss et al. 2023). To contribute to the sustainable transition, zoos should promote more planet-friendly and stronger pro-environmental behaviour change among zoo visitors and foster a deeper engagement with zoo animals and wildlife conservation.

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