
Do zoos work at raising awareness?

Quantifying the impact of informal education on adults visiting Japanese zoos

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"A thesis submitted in partial fulfilment of the requirement for the degree of Master of Science and the Diploma of Imperial College London."

September 2010

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Abstract

Although educating the public about conservation has been declared as a main aim of zoos, there has been much discussion on how efficient zoos are at doing this (Balmford et al 2004; Broad 1996; Broad and Smith 2004; Falk et al 2007; Ross and Kristen 2005; Smith et al 2008; Weiler and Smith 2009).

Balmford et al (2004) examined the impact of UK zoo education on the visiting public rather than focusing on particular exhibits. This study applies their questionnaire and methods to Japanese zoo's, and examines the effectiveness of Japanese zoos at changing visitor's conservation awareness. In addition to the visitor survey, this study also assesses Japanese zoo administration to understand current zoo education trends across the zoo community. The survey uses the zoo visitor questionnaire to enable comparisons between zoos and zoo visitor perception. Finally, we compare our results with that of the UK.

This study found that zoo's do have a certain degree of positive impact on visitors through experience rather than academic signage. Based on the preference of visitors for experience-orientated information over more academic signage, any action-orientated engagement is best linked to the exhibit through knowledge enrichment.

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List of acronyms

JAZA - Japanese Association of Zoos and Aquariums

MEDCSST - Japanese Ministry of Education, Culture, Sports, Science and Technology

MOE - Ministry of Environment

WAZA - World Association of Zoos and Aquariums

WZACS World Zoo and Aquarium Conservation Strategy

WZCS - World Zoo Conservation Strategy

1 Introduction

If a person is aware of the consequences of an action, he/she is more likely to take this into account before acting. Hansla et al (2008) carried out a review of the psychological background of pro-environmental behaviour, finding that this behaviour is founded on concern about the adverse consequences of environmental issues for themselves, others or the biosphere. This is also relevant in people's concerns about wildlife and biodiversity conservation. The concern for wildlife and the appropriate behaviour in humans will not be developed without understanding what the consequences of human activities are having on wildlife. Low awareness will by definition result in actions that do not take the biodiversity loss into account, and in many ways promote an unhealthy attitude to life on Earth.

We are in the midst of a massive biodiversity loss period; a sixth mass extinction episode. Extinction rate in present time is up to one thousand times higher than the fossil record (Millennium Ecosystem Assessment 2005). Although extinction rates of species vary by countries and ecoregions, Japan has also suffered a substantial number of species losses. Since early Meiji era (1868-1912), man-induced extinctions have been confirmed for over 47 animal species (Hayama 2001; Ministry of Environment 2007). The number of endangered species is also increasing. Japan, like many other countries worldwide, has not just had impacts within the country itself, but Japan has also contributed to a wide range of global environmental impacts on wildlife and their habitats. Excessive wildlife consumption (e.g. wildlife products and pet trade) (Japan Wildlife Conservation Society hear in after JWCS 2010) and tropical forest deforestation especially between 1960 and the 1980s has been the major global impacts (Kellert 1991).

In the past, the perception of wildlife by the Japanese has been reported as lower than in western countries (Kellert 1991). The observation is that Japanese people may be concerned with, or are aware of environmental issues; they do not tend to communicate their concerns effectively and urgently enough for the government to change its policies (Danaher 1997). Thus, ways of creating more active concern for biodiversity conservation inside and outside Japan, and raising public awareness is vital.

There are several vehicles in place that can provide further conservation information to the public. These include the media, NGOs and schools. However, zoos can also be very important in educating the general public about biodiversity conservation.

In 1993, the World Zoo Conservation Strategy (WZCS) called for zoos to be centres of conservation (International Union of Directors of Zoological Gardens/The Conservation

Breeding Specialist Group 1993 here in after IUDZG/CBSG). Since then, zoos have shifted their form from living museum to conservation centre. Recently, World Association of Zoos and Aquariums (WAZA) published its new Conservation Strategy (WAZACS) to reinforce the role of zoos in conservation (WAZA 2005).

Although educating the public about conservation has been declared as the main concern in zoos, there has been much discussion on how efficient zoos are at doing this (Balmford et al 2004; Broad 1996; Broad and Smith 2004; Falk et al 2007; Ross and Kristen 2005; Smith et al 2008; Weiler and Smith 2009). Balmford et al (2004) examined the impact of zoo education on the visiting public rather than focus on particular exhibits. Their study showed that there was no significant change in outlook towards conservation before and after zoo visits in the UK, despite significant funding of the conservation education component in many UK zoos. Despite this result, there is still much to be done to increase awareness of the visiting public and generate new ways of engaging visitors in conservation. Moreover, how visitors in different countries perceive conservation is fundamental to understand in order to improve effective education by zoos worldwide.

Zoo visitor surveys have been used extensively to understand people's general attitudes towards wildlife and can be employed to enable behavioural change. Visitor effectiveness studies have been widely undertaken in a number of Western zoos but to date there has been few investigations into how Japanese visitors perceive education in zoos and how the zoo may impact visitors. I undertook a study of visitor perception in three Japanese zoos to better understand how conservation education in these zoos affected visitor perception. I also compared the results of my study in Japan with the outcomes for UK zoos reported by Balmford et al's (2004) approach. To do this, I applied the same questionnaire as used in the UK to visitors at the Japanese zoos. In addition to the visitor survey, I applied another questionnaire, which targeted Japanese zoo administration to understand current zoo education trends in the country's zoo community. The survey used a part of the original questionnaire that asks perception about zoo roles and zoo education to compare between zoos and zoo visitor perception.

1.1 Aims and objectives

The main aims of the project are:

- To measure baseline Japanese conservation knowledge.
- To measure Japanese visitor concern about conservation.
- To identify present zoo education in Japanese zoos and investigate their limitations.
- To measure the impact of Japanese zoos on the conservation knowledge and attitudes of visitors.

The main outputs will be:

- Whether zoos are having a positive impact on the visitors' conservation awareness.
- Current Japanese perception of conservation.
- Present Japanese zoo stance on conservation.

1.2 Overview of thesis structure

The thesis has five chapters. Chapter 2 gives a background of the literature around zoos and their role in conservation. It explores how zoos changed through history from being menageries to more conservation-oriented centre. I also explore information available on the trend in Japanese zoos. This section briefly describes past studies of Japanese awareness and Japan's reaction to the global conservation movement. Finally, I present the focus of this study. Chapter 3 describes the methods in this study both questionnaires targeting zoo and zoo visitors, questionnaire contents and analyses. Chapter 4 present the results section with supporting figures. In the last chapter, Chapter 5, I discuss my results in the broader context of the literature, emphasizing the broader implications of the study. I suggest recommendations for future research and conclusion.

2 Background

2.1 A brief history of zoos, their roles and missions

When zoos were first opened to the public, zoos were menagerie and primary leisure places where visitors could see overseas exotic animals (Fa et al., in press). By the 20th century, zoos had changed from menageries to living museum and included educational (Fa et al., in press). Against a background of increasing environmental destruction throughout the world, zoos have realised that they have a role in protecting species from extinction. As a response to this, the World Zoo Conservation Strategy (WZCS) called for zoos to become more important in delivering conservation (IUDZG/CBSG 1993), and pushing them to move away from living museum to Conservation Centre (Fig. 1).

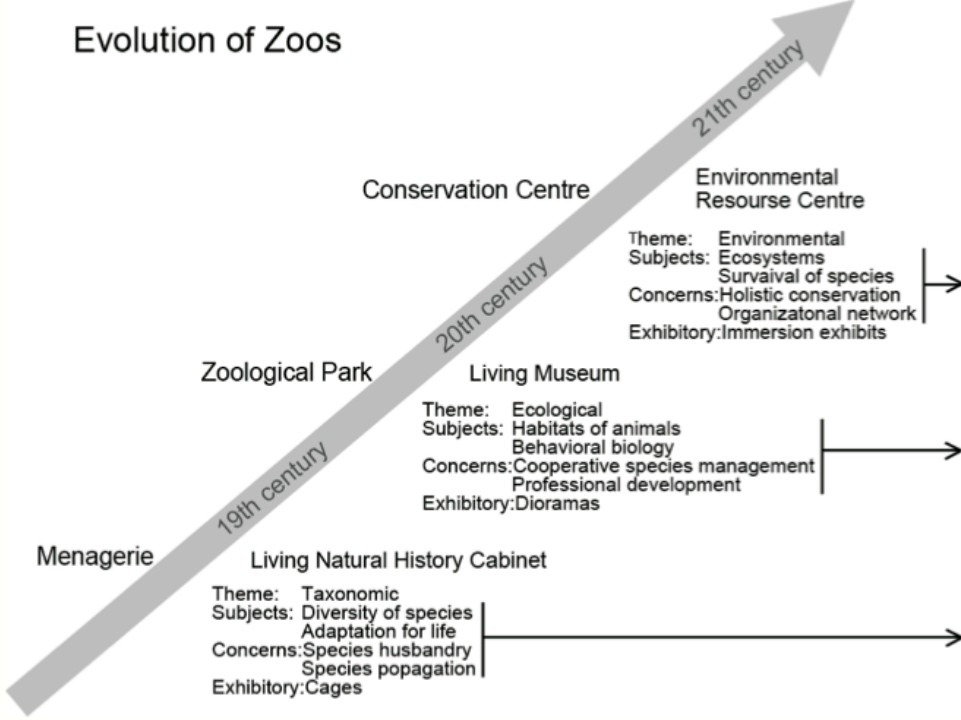


Figure 1 Evolution of Zoos (IUDZG/CBSG 1993)

Currently, the WAZA have declared that their major goal is protection and to secure threatened species and ecosystems (WAZA 2006). Although the more traditional zoo roles of providing recreational facilities for visitors is still considered important by zoos, the conservation of wildlife, and zoos as places of education and research have become more prominent. The final goal is for all members of the zoo community to contribute to nature conservation both through funds and

staff (WAZA 2006). Among these four main roles, education has been recommended as a central focus for all zoos and for cooperation between organisations (WAZA 2006).

Although after WZCS 1993 was declared, Japanese zoo tendency of their roles, historically, tends to focus on recreation and education (Saito 1999).

However, following WZACS (WAZA 2005), JAZA has also declared new resolutions supporting conservation. According to the JAZA general assembly report, held in 2008, JAZA will support activities of ex and in-situ conservation, preservation of endemic species, local conservation activities and inform visitors of the resolution (JAZA 2008).

2.2 Zoos in Japan

In Japan, zoos are not defined in the legislation as separate entities but categorised as a form of museum under the Japanese Museum Act (Saito 1999).

2.2.1 Management and legislation

Zoos are managed by the board of education if they are municipal zoos (Saito 1999). In addition to municipal zoos, other private incorporated foundations can register as museums or museum correspondence facilities once they have passed the board of education's museum standards, as stipulated in the museum act (Saito 1999; Ohori 2005). Facilities that do not meet the museum standards are placed outside the museum act and considered to be “resembling” organizations (Ohori 2005). Recently, some municipal zoos have become private operations as a result of the introduction of the local autonomy act was introduced in 2003, where private entities are allowed to operate municipal facilities (Research institute co-operation study the designated administrator system 2008). Examples of this are all zoos in Tokyo and Yokohama (Tokyo zoological park society 2010 and Yokohama greenery foundation 2010).

To help bring clarity and better standards in Japanese zoos, the Japanese Association of Zoos and Aquariums (JAZA), was formed in 1939. According to the JAZA's latest report, the total number of JAZA members was 89 (JAZA 2009) distributed in 38 out of the total 47 prefectures in Japan (Fig. 2). In most Japanese zoos, admission is relatively cheap (about 500 yen £4), or free in municipal zoos, especially for old age pensioners and disabled people. Thus, zoos are generally considered cheap, convenient and enjoyable places for the public to visit. Because of this, the Japanese Ministry of Education, Culture, Sports, Science and Technology (MEDCSST) consider zoos education facilities, which endorse the aim of affording “Lifelong learning” (pursuit of knowledge in lifetime), to Japanese people (Saito 1999).

Japanese zoos differ widely in their management and jurisdiction. There are also many zoos that operate outside the municipal system and JAZA, which can be said to be self-defined zoos (Saito 1999). The number of Japanese zoos is probably much larger than reported.

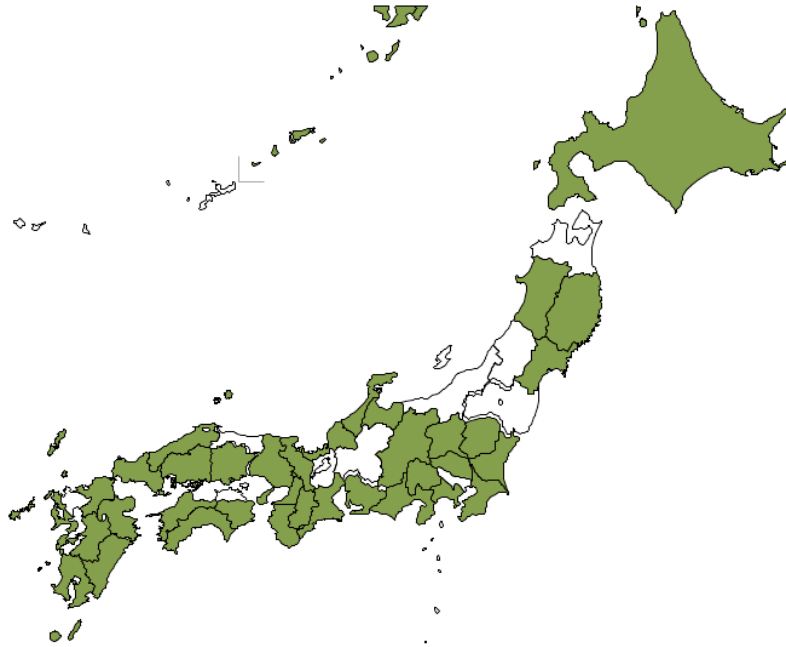


Figure 2 Distribution of JAZA registered zoos in Japan.

2.3 Conservation education in Japanese zoos

Takahashi (1998) has indicated that there are differences on how Japanese zoos focus on education of visitors compared to western zoos. Whilst western zoos are likely to put importance on conservation education, Japanese focus more on cultivating aesthetic sensitivity through means such as summer school (summer camp) or children's zoos. However, Japanese zoos are often criticized because they do not provide enough conservation education to the public e.g. information on the current situation of wildlife in Japan or worldwide, the linkage between Japan and wildlife loss and how ordinary livelihoods lead to biodiversity loss (Ishida 2002, Togawa 2006, Nishihara 2006, Hayama 2001, Shintaku 2009). Some zoo workers in Japan nonetheless suggest that the first step in conservation education is to make people interested in animals (Namiki pers. comm., 2010).

There are examples of Japanese zoos where provide conservation education. This is the case of Inokashira zoo that offer short courses on the Tsushima leopard cat, a critically endangered species in Japan. This program provides first a series of mini-lectures on topics in biology and conservation, followed by trips to the Tsushima leopard cat conservation area to participate in

conservation activities (Amano 2009). From the profits from vending machines donations are made to build a wildlife rescue centre in Borneo (Bando pers.com 2010). There are clear explanations on the vending machines, and talks about the project are occasionally held at the zoo. Some zoos also engage in cooperative conservation education with conservation NGOs.

2.4 The need for raising public awareness

Japanese awareness and policy towards wildlife preservation are often criticised from outside and inside Japan. There are known limitations, for example, on how effective Japanese legislations that govern wildlife trade (Takahashi 2009). The Ministry of Environment (MOE) controls laws and policies in Japan, but personnel and budgets are minimal (Takahashi 2009). Because of this, management of wildlife is very often not optimal. Wildlife management is often entrusted to local authorities, but is conducted without expert scientific input, and the norm of pest control, for example, is still culling (Takahashi 2009). Illegal wildlife trade is also very prevalent due to the demand for live endangered species as well as a wide range of derived products. During the period 1999-2006, the highest number of illegally imported Slow Lorises (363) was recorded, as a result of the popularity of the species as pets (JWCS 2007). Moreover, illegal wildlife products such as tiger parts for Chinese traditional medicine, ivory and tortoise are still in demand (JWCS 2010). The Japanese media is also criticised because they do not do enough to dissuade people from acquiring wild animals and products, and do not encourage conservation action in the early stages of an emerging problem (Ando 2008; Yamamoto 2009). To communicate effectively to government and change these circumstances, strong conservation support from the general public is vital.

2.5 Measuring zoo impact

Since WZCS was declared in 1993, there has been an increase in studies attempting to understand the impact of zoos on visitors. These studies explore visitors' knowledge, attitude, and behaviour, often comparing differences between knowledge at arrival and departure. For example, Broad (1996) demonstrated that awareness of endangered species was heightened in departures at Jersey zoo, especially for less charismatic and lower profile species. Anderson et al (2003) found positive effects of performing animal-training sessions while zoo visitors watched.

In Japan, visitor response to zoos has not all been positive with studies like Nishihara (2006) analysing visitors' conversations at a Japanese Zoo, who found that a very low proportion of conservation topics were discussed when visitors were actively viewing animals. However, this is not unusual for zoos in other parts of the world since the results of studies measuring zoo

impacts vary widely. Long-term positive effects (Falk et al 2007), positive effects (Lehnhardt et al 2004), have been recorded but also no impacts (Balmford et al 2004, Nishihara 2006), immediate short term positive impacts and less so when measured in a follow up investigation (Broad 1996, Adelman et al 2000, Manubay et al 2002, Dieking et al 2004). Studies measuring zoo impacts are rarely quantitative and most of them are focused on general natural history knowledge or measuring specific exhibit influences.

2.6 Study sites

Balmford et al (2004) pointed the need to measure overall conservation knowledge and attitude in a more quantitative way to find out ways in which zoos' contribution to conservation can be improved. For this study, I decided to apply the same techniques as used by Balmford et al. (2004) to measure conservation impact in Japanese zoos. Balmford et al (2004) investigated six zoos and one nature reserve; Bristol, Chester, Colchester, London and Paignton zoos and Thrigby Hall Wildlife Gardens and Wildfowl & Wetlands trust; a total sample size of 1340 visitors (Table.1). Their sites had the following characteristics:

- The most visited zoos: London and Chester zoos are the third and fourth most visited zoos in the UK respectively (IZYB 2010)
- There is an official institution in zoos
- They conduct ex and in-situ conservation work (differs between zoos)
- They have many species

To match these characteristics, I choose two zoos which included a research institute and a breeding or conservation centre, one of the most visited zoos and a zoo with the high numbers of species (Table.2). I was also recommended candidate zoos by a professor at Kyoto University. In total, I applied to four zoos and received the permissions from three of them. The names have been withheld by request of one of these three zoos. In Balmford et al's study, the questionnaire was also conducted in one nature reserve. This has not been possible within the scope of this study.

Table 1 Study sites in Japan. Based on International Zoo Year Book (2010) and animal inventory of each zoo (2010).

Name	Zoo Area ha	Attendance	Mammals Species	Birds Species	Reptiles Species	Amphibians Species	Fishes Species	Invertebrates Species	Total Species
ZOO A	33	2138723	123	86	74	56	236	7	582
ZOO B	56.6	1055474	61	105	8	2	10	166	352
ZOO C	34.2	707778	66	72	6	1	1	N/A	145

Table 2 Study sites of Balmford et al (2004). Data is based on International Zoo Year Book (2010)

Name	Zoo Area ha	Attendance	Mammals Species	Birds Species	Reptiles Species	Amphibians Species	Fishes Species	Invertebrates Species	Total Species
CHESTER ZOO	44.5	1233000	79	155	52	24	80	32	422
LONDON ZOO	15	1108541	68	116	73	26	214	250	747
BRISTOL ZOO GARDENS	5	548257	56	70	46	16	148	176	512
PAIGNTON ZOO	34.4	507727	66	146	47	13	1	8	281
COLCHESTER ZOO	24	500000	95	55	27	5	68	21	271
THRIGBY HALL WILDLIFE GARDENS	4	74692	24	33	17	1	4		79
WILDFOWL & WETLANDS TRUST	28	78041	N/A	N/A	N/A	N/A	N/A	N/A	N/A

2.6.1 Zoo A

Zoo A, was established more than 100 years ago, is located in Nagoya, one of Japan's major cities. Nagoya's population is more than 2million (Ministry of Internal Affairs and Communications 2009) and zoo attendance is over 2 million/annum, making it one of the most visited zoos in Japan (see table 1). In addition, the total number of species the zoo curates is the top in Japan (582) (HZBG 2010). The total park area including the zoo and one of the few large parks in Nagoya is 410 ha (Public work department 2010). During the survey period, there was a special exhibition of endangered species related to the Conference of the Parties 10 (here in after COP 10) of the Convention on Biological diversity (here in after CBD). Nagoya is the host site of the CBD COP10 in 2010.

2.6.2 Zoo B

This zoo is located in a suburb of Tokyo, Hino city. The population of Hino is nearly 200,000 (Ministry of Internal Affairs and Communications 2009). Currently this zoo is the largest zoo in Japan and this zoo is the only one out of the surveyed zoos to have a Wildlife Conservation Centre. One of Zoo B's key attractions is their Orang-utan enclosure. Both environmental enrichment and conservation information around the Orang-utan's enclosure are substantial. A former zookeeper of Zoo B's Orang-utan's is one of the proposers of the Borneo Conservation Trust Japan (BCTJ), which is involved in a variety of ongoing conservation projects with Zoo B and other zoos (Wildlife Conservation Centre annual report 2007). In addition, the centre works with other research institutions, non-profit organizations, administrative institutions and local supporters to do conservation both in Japan and overseas (Wildlife Conservation Centre annual

report 2009). A special exhibition of the Amur tiger, covering broad topics about the Amur tiger from their ecology and situation in the wild to their threats and conservation activities, was held during the study period.

2.6.3 Zoo C

This zoo is a relatively young institution in Japan, opened in 1985. Compared to other two zoos, the signs about endangered species and its threats are fewer due to the small number of endangered species. The special feature of this zoo is a children's zoo. There is mixture of domestic and wild animals. Its contents are petting area, large domestic animals area such as horses, experience area with goats and ducks and wild species area such as Humboldt penguin and giant tortoise. The Children zoo informs that familiar wild animals of zoos are also endangered species to visitors.

This zoo became an exhibition site of JWCS conservation exhibition a couple of times in the past (JWCS 2006). During survey period, there is no exhibition about endangered species at this zoo

3 Methodology

The design and conduct of the survey of the Japanese public was methodologically similar to the study of Balmford et al (2004). In addition to their survey, my survey consisted of two questionnaires, targeting zoo visitors and the zoo to itself understand the actual condition of conservation education at Japanese zoos and for comparison between visitors' and zoo's perception of zoo education.

3.1 Data collection

The questionnaire was distributed to zoo visitors in each zoo and completed by visitors. Respondents were divided as "arriving" and "departing". In Balmford et al's study, most of "arriving" responses were taken in the entrance queue and 91.8% were within one hour of entry. Conversely, visitors completing the survey > 3 and 2 hours after entry were classified as "Departing" (Balmford et al 2004). In my study, the classification of "arriving" is slightly different due to a limitation to conduct the questionnaire in the entrance queue areas of the zoos. 84.5% of "arrival" responses were just arrived visitors or less than 1-2 hours after entry. "Departing" respondents were classified based on them staying more than 2 hours and most of them are > 3 hours. All respondents complete the questionnaire only once, and under 18 years old participants were excluded.

3.2 Survey format

For comparison with Balmford et al's survey, my study is based on an updated and edited version of their original questionnaire. The survey consisted of a combination of close-ended and open-ended questions. This questionnaire is constructed of the following five parts:

3.2.1 Demographics and background

This survey asked participants their age, sex, whether or not they had received higher education, their occupation, whether they are member of any conservation related charity groups and whether they had visited a zoo in the past. These domestic questions are based on Balmford et al's original questionnaire except the occupation. A further question was added to the background information that asks whether they had contributed to a conservation activity. The aim of this question was to collect more data on real conservation activity as it is often assumed active conservation members are low in Japan. For the majority of Environmental Non Governmental Organisations, of which conservation groups are included, members in Japan are less than 1000 (Minatani 2000). Moreover, comparison of the number of WWF members

between the UK and Japan also indicates fewer people are members of conservation charities in Japan compared to the UK (UK, 168,417, Japan, about 42,000) (WWF UK, Japan 2010). For those reasons, the question was added in this survey.

3.2.2 Conservation knowledge

There are four types of questions to measure conservation knowledge. Participants were asked:

- 1) Name a single word associated with "conservation"
- 2) Name of globally and nationally threatened species and for each species to give one reason why the species is threatened
- 3) Rank threats (habitat loss, pollution, over-hunting, introduced species, invasive species and climate change) in terms of seriousness for endangered species both globally and nationally
- 4) Rank three major habitat types (tropical forest, ice caps/polar regions and fresh water lakes) in terms of their global threat status

Answers 2) to 4) are scored using information based on the IUCN Redlist (IUCN 2009) and Living planet index (WWF 2008). Original study used IUCN Redlist and UK biodiversity action plan, and 2) to 4) were equally calculated out of 20 points. However, their methodology was not clearly explained in their article. Therefore, this study used the search system of IUCN Redlist website to rank the serious threats by calculated the number of endangered species excluding NT and DD under each threats globally and in Japan (Table. 3). The latest version of Ministry of Environment Threatened Wildlife of Japan Red Data Book listed 3155 species (MOEJ 2007) but these data were not available on online. Although only 1748 species are listed on IUCN Redlist, using this list was the most appropriate way to make the ranking. For the two ranking based questions, the most serious threats and threatened habitats, the respondents were asked to rank a set of potential candidate in order to perceived importance. Score was determined by distance of perceived rank from the assumed correct rank. Distance was calculated using a form of Levenshtein distance methodology.

e.g. Given a ranking of 1,2,3,4 and a correct ranking of 4,3,2,1, the distances are 3,1,1,3 and the total distance of this score is 8.

Likewise Balmford et al's study (2004), "species" name was marked loosely. For example, "sea turtle" was scored as correct answers of Japanese threatened species, because all listed sea turtles except Flatback Turtle (DD) are endangered species in Threatened Wildlife of Japan Red Data Book (2006).

The answer of the most threatened habitat was ranked the seriousness in change of each habitat in 35 years, based on the WWF Living Planet Index.

The original point system was also not well defined, thus this survey follows their description as much as possible, with a total of 20 points divided amongst 6 questions, each question scoring 3.33 points.

Table 3 *Ranking the serious threats for endangered species based on IUCN Redlist data.*

Japan	Number of species	Rank	Global	Number of species	Rank
Pollution	164	3	Pollution	1542	4
Over hunting and harvesting	227	1	Over hunting and harvesting	5781	2
Invasive species	145	4	Invasive species	2431	3
Habitat loss	209	2	Habitat loss	7110	1
Climate change	139	5	Climate change	1333	5

3.2.3 Ability to name useful activities

Respondents were asked to name useful activities through which they can contribute to conservation. Balmford et al (2004) introduced simple scoring for this question; very vague and passive ideas (ex: Learn more, eco and be green) were counted as 0, and active and detailed ideas such as "donation" and "recycling" were scored as 1. This survey has followed their scoring system.

3.2.4 WTP questions ‘Concern about Conservation’

These questions are based on the Balmford et al “willingness-to-pay”(WTP) survey. These WTP questions allow this survey to measure the values of good causes for individual visitors. First of all, respondents were asked to divide locally raised ¥ 100,000 (Approx £730) among competing charities such as animal welfare, social and charities work for international issues. Secondly, the respondents were asked if all the money were to go to conservation, how much would they allocate to local, national, and international conservation work. Finally, the respondents were asked to assign ¥ 100,000 to habitat conservation and species conservation.

3.2.5 Visitor perceptions about zoos

An extension to the original Balmford study, there are wide ranges of questions that ask visitor perceptions about zoos in this part. The aim of these broad questions was to provide sufficient variety for a detailed comparative analysis of Zoo visitor vs. operator perception;

- The primary purpose of zoos for visitor's views among four roles (entertainment, conservation, education and research).
- A series of questions about visitor attitudes to zoos, such as whether they read signs, attend keeper's talks and shall we concern about endangered species globally and nationally?
- What did visitors learn through visiting the zoo and visitor's view of zoo's contributions to conservation?
- An open-ended question to know that the view of a good zoo for visitors
- Whether they feel visiting the zoo gives them conservation ideas in personal level.

These questions attempt to grasp the perceptual differences between Japanese zoo visitors and Japanese zoos as education providers. These questions are also therefore used in the second questionnaire targeting zoos themselves.

3.3 Pilot study

A pilot study was carried out with 2 volunteers and 5 visitors at Zoo A, covering all age groups and both genders. Beforehand, an informal discussion about the draft was taken with zoo staff in Zoos A and B. Considerable negative incentives to lead participant's non-committal answers were 1) too many questions (30 questions with options) and 2) some of the questions are unfamiliar for visitors and special knowledge is need to answer. Therefore interview was introduced to reduce the amount of time to complete the questionnaire.

After the pilot study was undertaken, another informal discussion was held with two volunteers and zoo staffs of Zoos A and B to improve the questionnaire. Predictably, most participants of the pilot survey suggested that the questionnaire was "difficult". Moreover, interview style took more time than completed by participants themselves. The amount of time taken to complete the draft questionnaire was recorded. On average, participation in the survey took 15 - 20 minutes. So for avoiding non-committal answers, self-administered style was introduced instead of the interview with the translated sentences simplified. Finally as a positive incentive, high quality wildlife picture postcards were given to visitors who participated in the questionnaire. This

postcard novelty was very useful to motivate participants to complete this long questionnaire and also it received attention from visitors.

3.4 Japanese zoo questionnaire

3.4.1 Survey format

The content of this questionnaire overlaps the section of visitor perception about zoos of the questionnaire targeting zoo visitors. This questionnaire asked a combination of close-ended and open-ended exploratory questions. To compare the perception of visitors and zoos, participant zoos were asked:

- What can visitors learn through visiting your zoo?
- Rank 4 zoo roles (entertainment, conservation, education and research)
- Whether participant zoos feel they are providing conservation ideas to visitors in personal level. If they agree with the question, its details
- What does your zoo do to help conserve species and habitats currently and in the future
- If they have any limitations to provide conservation education to visitors, what are the limitations for them

3.4.2 Target zoos

Target zoos were chosen from the International Zoo Yearbook (2010) and registered zoos of JAZA (JAZA 2010). Many zoos do not publish their email address on their website in order to avoid spam, therefore only zoos where their emails were available on International Zoo Yearbook and searchable were sent this questionnaire. Moreover, zoos that do not have endangered species such as children's zoos, and aquariums and safari parks were excluded. Total target number was then 62 zoos.

3.5 Analysis

The survey data was analysed using general and statistical analyses, in order to distinguish differences between the responses of "arrivals" and "departures", and across the three zoos. First, to understand tendency of arrivals/departures and difference between three study sites, general analyses were conducted. Second, Kruskal-Wallis test allows seeing if the five response variables differ between three sites. To test the difference between "before" and "after" at each zoos and each of the response variables, Mann-Whitney's U-test (Wilcox test) were used.

4 Zoo visitor results

4.1 Sample sizes

The survey period was one month during the end of May to the end of June 2010, a week each in Zoo A and C, 2 weeks in Zoo B, however the achieved sample number of Zoo C is smaller than other two zoos due to the rainy season and that the questionnaire was not easily conducted because the visitors fragmented into three entrances. The responses sizes of each zoo are 107 in Zoo A, 128 in B and 69 in C making a total of 304 visitor responses (Table 4). The arrival and departure sample sizes were approximately equal with 155 and 149 respectively.

Table 4 Total "arrivals" and "departures" numbers and for each zoos.

	Zoo A	Zoo B	Zoo C	Total
Arrivals	58	64	33	155
Departures	49	64	36	149
Total	107	128	69	304

4.2 Demographics of zoo visitors

The visitor trends of the three study sites are similar in their demographics data. Firstly, more females answered the questionnaire than male (59% female, 38% male, 3% did not answered their gender). Secondly majority of the respondents' age are in between 20 -59 years old (~60% are 20 - 39, ~25% were 40-59). Of the total respondents surveyed, 65% had received higher education. Lastly, the percentage of Company employee and housewife are most prominent in the occupation data; 35% and 26% respectively with all other occupations <10% (See Appendix). The proportion of conservation members was ~2% (n=6). However, 17.8% (n=54) joined some volunteer activities and had donated to conservation charity groups.

More than half of the participants had visited the zoos this year and last year (54.27%). Among them, 61.21% also visited other zoos within past 2 years. Altogether, more than one third of participants visited zoos at least 3 times within 2 years. The same trend was observed across all three zoos.

4.3 A word associated with conservation

This question, which asked respondents to name a word associated with conservation, was not analysed in the original survey. Asking this question allowed understanding of which object is the most familiar object for respondents, because the usage of the word "conservation" is always used with an object in Japanese.

The most common associated words were Environment-related words (e.g. environment, nature, wilderness) and accounted for 34.21% (n=104) of results. "Animals" and "Wild animals" 3.95% (n=12), while other species, biodiversity, and wildlife related answers 3.95% (n=12). The remaining results widely differed and were grouped into four categories; the meaning of conservation, synonymous (e.g. preservation and protection), image and opinion (e.g. strict, peace and good thing), and other. All of these groups accounted for less than 20% . The occurrence of the answer "wildlife" was low (1.3%), indicating no bias through the naming of the questionnaire ("Wildlife conservation survey").

4.4 Good zoo

On average 50% (n=152) of participants answered that in their view a good zoo is an animal centred zoo. All other answers were accounted for less than 10%. Answers related to petting and experience accounted for 7.56% of answers (n=23).

A similar questionnaire was conducted at Zoo A in 2006. Rather than asking for opinions on "a good zoo" the questionnaire asked for opinions on "the most wanted zoo". Contrasting my results, the most common answers were "petting zoo" (44.91% n=305 out of 679) indicating that Japanese perceptions when asked directly what they want are orientated towards a more rich experience led zoo visit (Public work department 2006).

4.5 Conservation knowledge

The zoo visitors showed high variance in their scores for conservation knowledge with an average score of 9.70/20. The average scores appear to differ slightly between the sites with the highest average recorded at Zoo B (10.14) and the lowest at Zoo C (8.98).

4.5.1 The most common answers

On average 67.1% of respondents could correctly answer globally threatened species. More visitors were able to name a nationally threatened species (80.26%). This is in contrast to the UK results (85.4% vs 51.4%) (Balmford et al 2004) possibly due to their being more species in Japan than the UK. Not surprisingly plants and insects were not named in their answers.

4.5.2 Globally threatened species

The 10 most common answers of globally threatened species were large flagship mammals (except Blue Fin Tuna) (Table 5). This is very similar to the UK result, where cod was exceptional and other species were all large mammals (Balmford et al 2004). Three species out of top five ranked common answers were same as the UK data, Giant Panda, Gorilla and Tiger (Balmford et al 2004). Half of the participants who named Tiger as a globally threatened species showed specific knowledge by including the Tiger subspecies such as Bengal, Sumatra and Siberian. Species related to Japanese culture such as Whales and Blue Fin Tuna were rated comparatively low, 2.63% and 1.32% respectively.

Table 5 *The top 10 most common answers when participants were asked to answer globally threatened. (n=304 Japan, n=1340 The UK) The UK data is based on Balmford et al (2004).*

Globally threatened species (JP)	%	Globally threatened species (UK)	%
Giant Panda	12.17	Tiger	28.17
Tiger	11.84	Giant Panda	20.68
Gorilla	9.87	Rhino	13.39
Polar Bear	8.22	Gorilla	8.09
Orangutan	4.28	Lion	4.90
Elephant	4.28	Elephant	4.70
Whale	2.63	Whale	4.00
Leopard	1.97	Cod	2.00
Cheetah	1.64	Orangutan	1.70
Rhinoceros	1.32	Chimpanzee	0.80
Koala	1.32		
Bluefin Tuna	1.32		

4.5.3 Nationally threatened species

Compared to the answers of globally threatened species, birds are often named as nationally threatened species by Japanese visitors (Table 6). The top named species was Japanese crested ibis 48.68%. Japanese crested ibis is already extinct species in wild in Japan. The MOE has been working on reintroduction of this species into the wild in cooperation with China and the programme is one of the most tackled conservation programs in Japan (Ministry of the Environment Japan 2010). The trends of other answers were similar to the UK, although more varied, with mammals, amphibians and fish.

In both globally and nationally threatened species questions, responses were focused on the top four answered species, especially nationally threatened species Japanese Crested Ibis 48.68% in Japan, Red Squirrel 25.79%.

Table 6 *The top 10 most common answers when participants were asked to answer nationally threatened species both in Japan and the UK. (n=304 Japan, n=1340 The UK) Note that Wolf is an extinct species in Japan and badgers are not endangered species in the UK. The UK data was based on Balmford et al (2004).*

Threatened species (JP)	%	Threatened species (UK)	%
Japanese Crested Ibis	48.68	Red Squirrel	25.79
Iriomote Wild Cat	7.57	Otter	8.5
Japanese Medaka	6.25	Badger	6.58
Wolf (EX)	2.63	Bat	5.08
Japanese Giant Salamander	2.3	Water vane	4.12
Japanese Serow	1.97	Sparrow	4.12
Oriental Stork	1.97	Eagle	3.43
Okinawa Rail	1.64	Cod	3.02
Crane	1.32	Newt	3.16
Ptarmigan	0.99	Barn owl	2.88

The common answers when visitors were asked to rank the most serious threats in Japan were:

1. Habitat loss
2. Pollution
3. Over-hunting/harvesting
4. Invasive species
5. Climate Change

Rank 4 and 5 match the assumed correct answers (See Table 7). Habitat loss and pollution were recognised as serious, and visitors do not tend to think that invasive species and climate change were comparatively urgent problems. Interesting findings were even though human exploitation of natural resources is serious in Japan, Japanese visitors do not recognise this inside the country. On the other hand, Japanese think it is the most serious problem overseas.

The assumed correct answer and participant's responses agree that most threatened habitat is rainforest (Table 7). However, the second and third ranked answers differ.

Table 7 *Assumed correct answers and visitor answers*

Japan	Answer	Response	Global	Answer	Response
Pollution	3	2	Pollution	4	2
Over hunting and harvesting	1	3	Over hunting and harvesting	2	1
Invasive species	4	4	Invasive species	3	5
Habitat loss	2	1	Habitat loss	1	3
Climate change	5	5	Climate change	5	4

Habitat	Answer	Response
Rainforest	1	1
Fresh lake	2	3
Ice caps/Polar regions	3	2

Although there are some variance in mean, statistical analyses of total score across the sites and between arrival and departures showed no significant difference (both Kruskal-Wallis test and Mann-Witney's U test $P > 0.3$, See Fig. 3) except for one question. The only influence of a single visit that this survey detected was the result when visitors were asked to name globally threatened species. Individually, the visual pattern of change indicates increasing knowledge of global threatened species after a Zoo visit, however the result is not statistically significant, perhaps due to small sample size ($p < 0.4$). Pooling the results across all locations offers a more robust dataset to perform a test, and results in a p value close to the 95% confidence level (MWU, $p=0.087$).

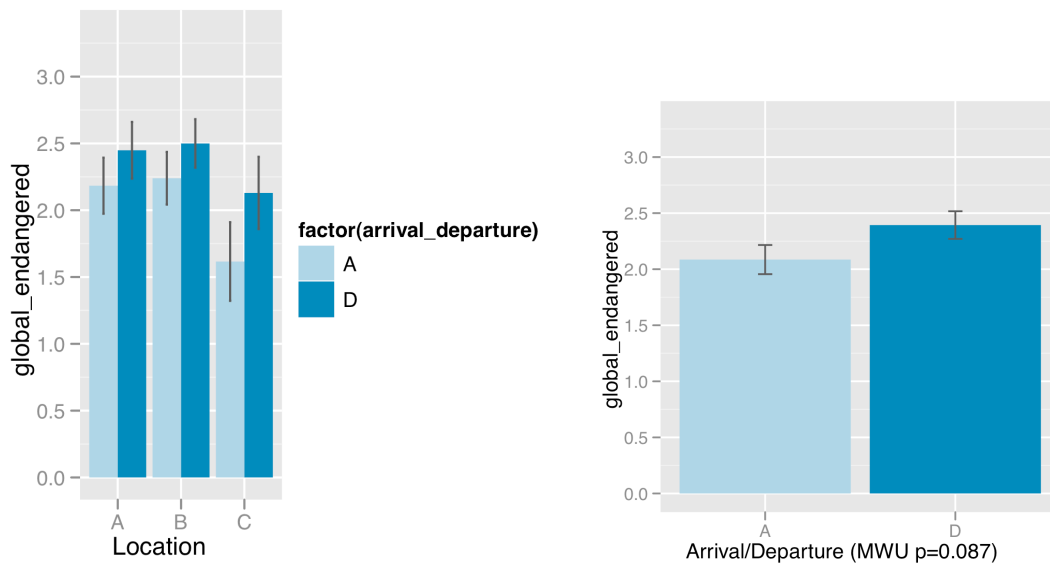


Figure 3 Differences in arrivals and departures across three sites. (Mann-Witney's U test p-value for in total $P = 0.087$, Zoo A $P = 0.3792$, Zoo B $P = 0.3330$, Zoo C $P = 0.2030$)

4.6 Ability to name useful activities

217 out of 304 (71.38%) wrote some ideas they could do for conservation. Among the answers, the most common idea was Donation (14.43% n=44), and then following answers were "Learn more" (9.51% n=29), "Eco" (7.54% n=23) and "Do not waste resources" (5.54% n=17). However, only 40.79% of zoo visitors could name active answers, which followed Balmford et al's scoring system. Common active answers were "reduce carbon emission" (2.96%) and "sensitive shopping" (2.3%). Although Japan is one of the top countries for illegal pets trade and invasive species and released unwanted pets are a serious problem, answers such as "Do not buy rare species as pets" and "Do not throw away unwanted introduced species into wild" accounted for less than 2%. 30.59% of answers were slogan words such as "protect environment", "think" and "consider" and were not judged as actively connected to conservation.

4.7 WTP questions: Concern about conservation

4.7.1 Good causes

The Japanese participant's hypothetical distribution of ¥ 100,000 to five good causes show similar average allocations. The most interested cause for Japanese zoo visitors was "Health" (¥23,129), second was "Social"(¥21,904) and following causes order was "Conservation"(¥20,564), "Animal welfare"(¥17,557) and "International aid"(¥16,843).

Comparing across three sites, this order appeared in the answers of Zoo B and C visitors (Social, Conservation, Health, Animal welfare and International aid). Zoo A data showed slight difference in each good cause. For these Japanese visitors, the most important areas to allocate funds to were human-related. Non-human related Japanese causes such as Japanese wildlife and domestic animals in Japan were more important than overseas causes.

Comparison of mean results for arrivals and departures indicate spend on "Health" decreased and "Social" and "Conservation" increased by 9.76% and 6.44% respectively (Fig. 4). The highest increase in "Conservation" was 17% in Zoo A and 7.03% in Zoo C.

Kruskal-Wallis tests for difference across sites and Mann-Whitney U tests for differences between arrival and departures show no significant difference at $p < 0.05$.

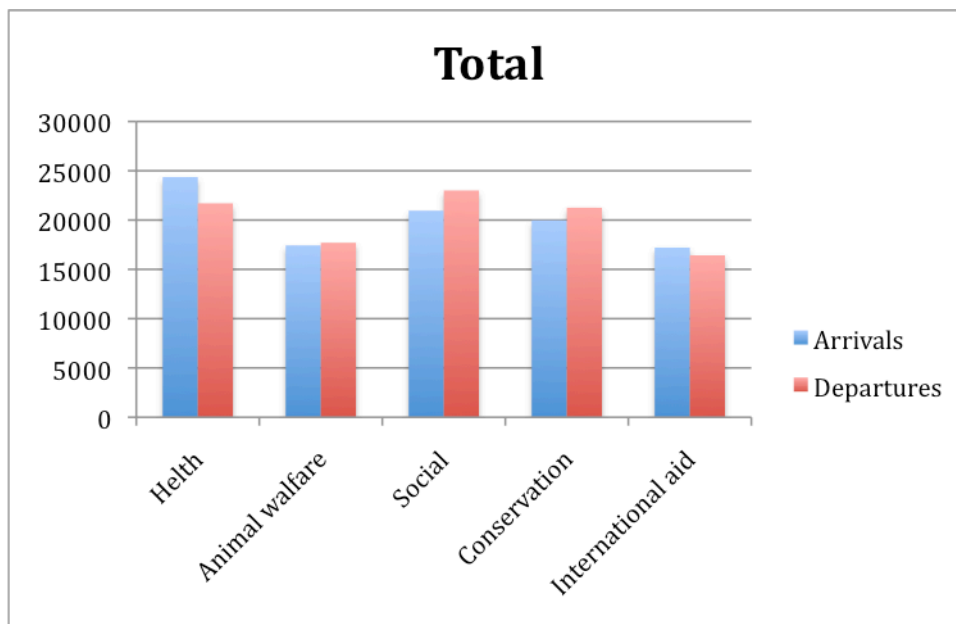


Figure 4 Allocation to five good causes when visitor asked to allocate ¥100,000.

4.7.2 International, National or Local?

The hypothetical allocation to conservation by location show a lower mean distribution to overseas of approximately ¥10,000 compared to Local and National causes (Local: ¥37,857, National: ¥35,097, International: ¥26,815).

In comparing allocation changes for arrival and departures we can observe the following differences:

Zoo A: Local decrease, increase in National and Overseas.

Zoo B: Decrease in Local and Overseas, increase in National

Zoo C: Local decrease, increase in National and Overseas.

Kruskal-Wallis tests for difference across sites and Mann-Whitney U tests for differences between arrival and departures show no significant difference at $p < 0.05$.

4.7.3 Species? Or Habitat?

In total, an average ¥51,597 went to habitat conservation when participants asked to allocate ¥100,000 to species or habitat conservation activity, while the mean allocation to species based conservation ¥48,402. The importance of habitat conservation is marginally higher than species conservation across three sites. Similarly, when comparing arrivals and departures, departure participants tend to distribute more money to habitat conservation than species activities in both T zoo and C zoo. Only departures of H zoo allocate equally to habitat and species conservation. Kruskal-Wallis tests for difference across sites and Mann-Whitney U tests for differences between arrival and departures show no significant difference at $p < 0.05$.

4.8 Comparison of results between the UK and Japan

Firstly, despite using a slightly different method in the scoring system, the mean score of "Conservation knowledge" between Japan and the UK show a similar score of 9.70/9.26 respectively. Secondly, the allocated spends on conservation also show little difference between countries: On average 18% of money was distributed to conservation in the UK, compared with 21% in Japan. Zoo visitor's mean allocations to international aid were 24% in the UK and 26% in Japan, while average distribution to habitat-based conservation 54% in the UK and 52% in Japan. Surprisingly, zoo visitor answers both in Japan and the UK showed striking similarities in our surveys (See discussions).

5 Zoo results

5.1 Survey response rate

The survey was available for 2 months during end of May to end of July. 32 zoos returned the survey out of 62 zoos, which gives a response rate of 51.62%.

5.2 Japanese zoo circumstances

When asked to choose the extent of six zoo conservation activities (breeding, reintroduction, education, fundraising, training conservation professionals and work with conservation organizations), in general, most zoos are engaged in breeding and education. For the other remaining activities, the majority of zoos have little or no engagement (See Table 7). All surveyed zoos answered that they are doing a form of conservation education of visitors (substantial n=11, some n=17, little n=4). The information which giving idea for visitors can do for conservation was not likely to available at many zoos, less than half (n=14). Further investigation was taken for understanding the detail of the conservation ideas which given at zoos. Some zoos, **in their reply, believe that informing "life of animals"** may make visitors to think about conservation by themselves rather than providing actual ideas link to conservation. Therefore, inside these 14 zoos, how many zoos are providing practical ideas to visitors was unknown. The limitations of these circumstances see discussion.

Table 7 Zoo contribution (n=32) to conservation activities.

	Breeding	Reintroduction	Education	Fundraising	Train conservation professionals	Work with conservation organizations
Substantial	13	2	11	5	2	2
Some	13	9	17	2	8	10
Little	4	9	4	10	6	5
None	2	12	0	14	15	13
N/A	0	0	0	1	1	2

5.3 Ranking zoo roles

Nine zoos did not rank zoo roles (Leisure/Recreation, Conservation, Education and research). The main reason cited for this was that all 4 roles are important and they are connected with each other, therefore ranking is not appropriate. A total of 23 zoos ranked this question.

There were five roles (including "other"). In scoring, Rank 1 was scored the maximum of five points and Rank 5 the minimum of one.

For zoos, the highest points role was "Education" with 97 points, followed by "Leisure/Recreation", "Conservation", "Research" and "Other" (90, 76, 55 & 9 respectively). The responses when zoo visitors were asked the primary purpose of zoos differed from zoo responses. For visitors "Leisure/Recreation" was the most selected answer (120 people), followed by "Education" (101), "Conservation" (45), "Research" (8) and "Other" (3). The top three roles are matched across zoo and visitor; Leisure/Recreation was No.1, Education No.2, Conservation No.3 (Figure 5). Hence, perceptions about zoo role between zoos and zoo visitors approximately equal in this case.

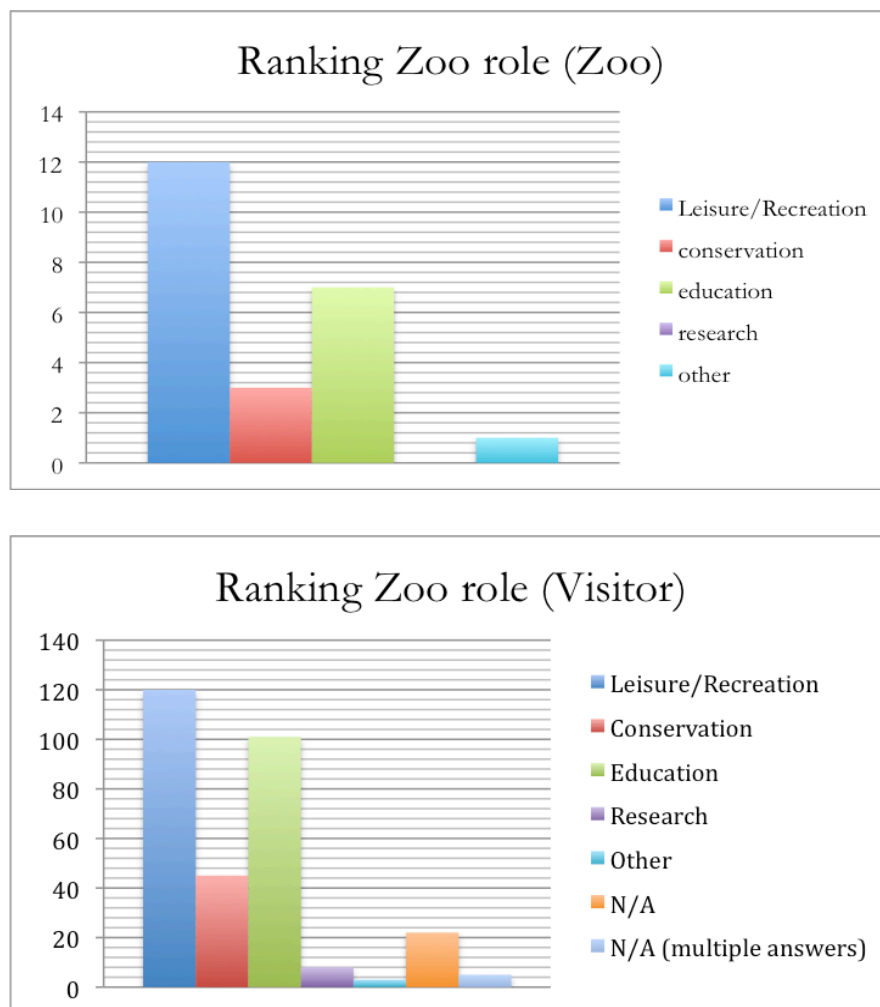


Figure 5 Comparison of visitor and zoo attitudes to zoo roles

5.4 Comparison between zoo and zoo visitor's perceptions

5.4.1 What visitors feel that they could learn through zoo visits

Targeting only "Departures" and those visitors who read signs, the answers of each three zoos and its zoo visitors were analysed to measure differences in perception of educational material between zoo and zoo visitors.

5.4.2 Zoo A and visitors

According to the questionnaire targeting zoos, Zoo A had the perception that all information (endangered species and habitat information, what visitors can do for conservation and zoo role in conservation) is available at Zoo A. For visitors, 91.83% (n=45) answered they read signs always or sometimes, and the majority of them 71.11% (n=32 out of the 45) perceived they could learn the information about endangered species and its habitat. Less than half of them 33.33% (n=15) answered they learned "what you can do for conservation". However, despite the perception of 33.33% learning appropriate conservation activities through their zoo visit, only 4.44% (n=2) were actually able to write active answers in "Ability to name useful activity" section.

5.4.3 Zoo B and visitors

Although B zoo responded that they do not believe they are providing substantial information about endangered species and habitat, the majority of their informal signs provided species assessment and threats when researched informally. Most visitors to B zoo read signs (95.31% n=61), half (50.81% n=31) of respondents were able to name endangered species and habitat. About one third (n=18) of visitors perceived they could learn useful personal level activity for conservation and 25.5% (n=15) of them successfully completed the "Ability to name useful activity" section. 14.75% (n=9) of them answered active answers.

5.4.4 Zoo C and visitors

The tendency of C zoo and visitors perceptions are similar to other two zoos, 94 % (n=34) read signs and 38% (n=13) said they think that threatened species and habitat information are available in C zoo. Zoo C does not provide the information of "what you can do for conservation", however 23.53% (n=8) of visitors perceived they can learn this from their visit and 8.82% (n=3) showed active answers for "Ability to name useful activity".

6 Discussion

This study has focussed on exploring visitor attitudes and effectiveness of zoo education in Japan. This is the first study of its kind. Understanding and determining the effectiveness of zoo education on visitor's conservation awareness is vital to improve people's participation in conservation of biodiversity in their country and in the world. My results have shown that despite strong cultural differences the Japanese visitors' perception of conservation, and current attitude towards conservation of zoos in Japan was not dissimilar to findings of this in the UK. Here, I will discuss my main outputs.. Finally, I will propose recommendation for zoo exhibition that may have some effect on visitor's awareness through the findings of my study.

6.1 Overview of Japanese awareness towards conservation

Although it is always hard to make generalisations of Japanese visitor perceptions because of sample size limitations (See details in "Potential factors of no impacts" below), my study has highlighted a number of key points. Firstly, Japanese visitors show a high interest in zoos and zoo animals. A high proportion of zoo visitors have visited zoos at least three times in two years. Amongst them, the importance of conservation appears recognised. Almost all interviewees (90.13%) believed that we should be concerned about species and habitat loss, both in the world and in Japan. This result is significantly higher than the 26% obtained in a past survey, which asked the same question not of zoo visitors but of the Japanese public (Japanese prime Minister's 1986 office cited by Kellert 1991).

A recent study by Sadotomo et al (2005) also showed a higher interest of modern Japanese in conservation. Nevertheless, this interest did not tend to stimulate people to take action. This was confirmed in my study. Although 40.79% of total visitors are aware of conservation activities, only 17.8 % actually engage in active conservation activities.

6.2 Current situation of Japanese zoos

The zoo questionnaire, which 32 zoos answered, revealed that most zoos engage in breeding and education for conservation, but less in other activities. A total of 15 out of 32 zoos explained the limitation for these circumstances. Generally, the management of the majority of zoos are municipal. In these cases, there are several factors that influence how such zoos can operate. For example, local legislation prevents zoos that are in nationally designated parks from directly fundraising. This places limitations on the amount of non-visitor related conservation work that the zoo can participate in. In addition to this, some local authorities do not acknowledge

conservation as a goal for zoos. This prevents municipal zoos from directly engaging in conservation. Furthermore, for some zoos, conservation activities are not achievable because their management has a lack of resources, personnel and trained conservation professionals. Engagement with other organizations is also limited at the legislature level.

6.3 Do Japanese zoos educate?

Simple analytic comparison between zoo and zoo visitor perceptions reveal differences. Although zoos believe that they are providing conservation information to visitors, few departing visitors confirmed this. Accordingly, Japanese zoos may not yet be engaging effectively with the public with regards to conservation education.

In further statistical analyses, I found almost no significant difference across the three sites and between arrivals and departures in conservation knowledge, ability to name useful activity and WTP questions. However, I did find a significant difference between arrival and departure for naming endangered globally threatened species (Mann-Whitney U $p=0.087$). This difference was also across sites (Kruskal Wallis $p=0.099$).

6.4 Significant differences in "globally threatened species"

Moving on to explaining why the results in naming of globally endangered species showed a significant difference between arrivals and departures in three sites. Considerable factors to this are the effect of animal identification labels in comparison to the visual effect of zoo animals. Both may apply to Zoo A and B as they have strong signage and good complement of endangered species. In comparing answers with actual Zoo inventories, it is interesting that the majority of answers of Zoo C were more concentrated in animals that were not exhibited or signed.

It can be said that an obvious difference between entering and leaving is whether they had a visual experience or not. The majority of zoo visitors come to zoos to see animals. Thereby visually experiencing zoo animals might reasonably give influence to answers when visitors were questioned to name endangered species. If so, we may ask why there was no substantial difference in the results for endangered endemic species? One answer may lie in the proportion of endemic species to overseas species in the zoo exhibits. At all study sites, exhibit animals were typified by foreign species. In addition to this, people are especially attracted by young animals and large or dangerous animals (Tunncliffe and Scheerso 2009). It appears that Japanese are no exception to this trend (Ikeo 1996). What does this result mean for effective conservation

education at zoos? Perhaps experience-orientated education is key to lasting impacts on visitors. In contrast to the Balmford study, numerous other studies also support the effects of experience-based education for raising public awareness (Smith et al 2008, Weiler and Liam Smith 2009, Broad 1996, Lehnhardt et al 2004, Miller et al 2004).

6.5 Potential factors of no impacts

This study is based on a past UK study's questionnaire (Balmford et al 2004), specifically to enable comparisons with the UK. The results of the UK survey also did not prove any impacts of informal conservation education on visitors. The study, however, would have been enhanced if the following potential factors could have been modified in the questionnaire.

Firstly, the length of the original questionnaire might be too long for zoo visitors to achieve valid answers. According to an established theory of how to make effective questionnaires, many questions and questionnaires that take a long time are inappropriate for questionnaires targeting visitors (Sakai 2003, Ando 2009). There were 30 questions if we split these questions into their constituents. In reality, 4 questions possess detailed questions, and one of the questions contains 12 sub-questions. With these, the total number becomes 47 questions. I encountered significant resistance to the completion of all sections of the questionnaire, mainly due to time. Therefore it may improve answer quality if the total number were reduced. In the Japanese surveys, I also combated this "questionnaire fatigue" by moving the easy to answer demographic questions to the end of the questionnaire, and by rewarding completion of the questionnaire with high quality animal postcards.

It is, moreover, arguable that there were potential problems in the questions which measured conservation knowledge and ranked the most serious threats and threatened habitats. It can be said that there is no "correct" answer to these questions. In my survey, in order to enable quantitative analysis I constructed a ranking by summing species numbers under each threat using IUCN Redlist data. Clearly, the scores or participants are highly dependent on the methodology used to construct the "correct" rank. If this rank were to be calculated another way, the score for the respondents may differ. Especially this can be said for the threatened habitat answers where ranking data from the Living Planet Index was hard to locate and changes the number of threatened species or inhabitant species in each habitat over time with annual releases. Thus, it may be hard to measure visitor's conservation knowledge by using these questions alone in both in the original survey, and the subsequent Japanese survey I conducted.

In addition to the above, another potential factor which may have influenced participants' answers was the structure of WTP questions. Given that all options are good and the money can be divided equally, then we might well expect an equal deviation of WTP choices. In the original questionnaire they asked to allocate £1000 to 5 good causes. £1000 is divisible by 5. As a consequence, most results in both the UK and Japan was close to near £200 (£180.32 ± £16.82) and ¥ 20,000 (¥20,564). Results for the spend on habitat or species based conservation question follows the same pattern: £500 (£538 ± £14.53) and ¥5000 (¥51,597) due to £1000 and ¥100,000 being divisible by 2. Looking at these Japanese answers, both have the same median (Figure 6).

Finally, the question "locally raised money allocation to local, national and international" includes the words "locally raised". This may have influenced responses in favour of money being used locally. How much average money allocated to local was not mentioned in the original paper, but the highest allocation in three options was local in the Japanese result (¥37,857), while mean spend on international conservation resulted in less than the amount divided by three, ¥26816. This is similar in ratio to the UK international spend result £246.23±18.35.

The most appropriate questions to measure conservation knowledge are reduced to opinions of national and global endangered species, and their threats.

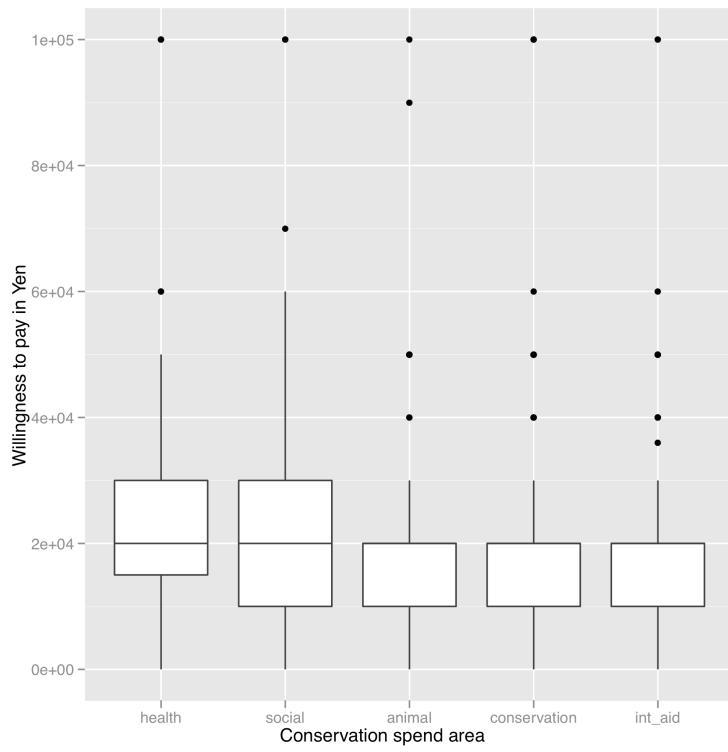
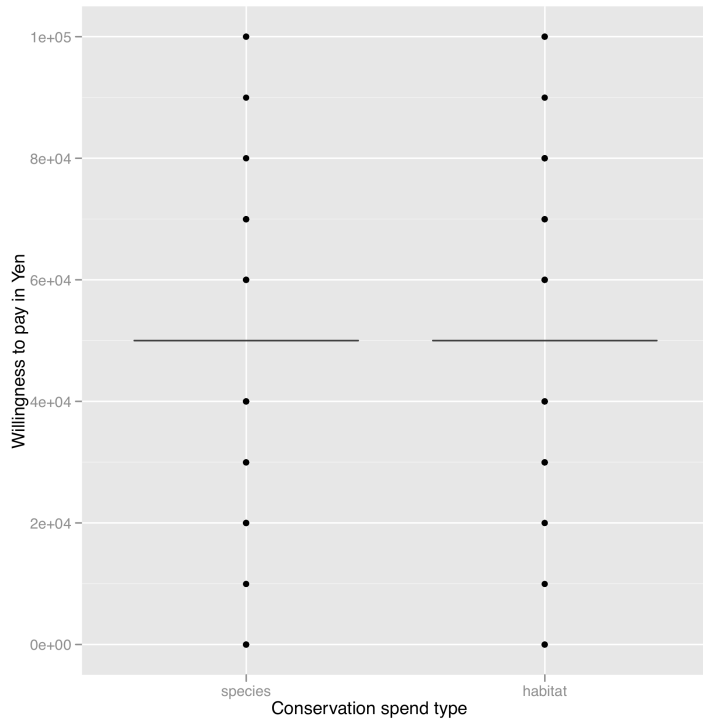


Figure 6 Medians of conservation spend type in WTP answers.



6.6 Differences between the UK and Japan's results

Despite no significant changes between entering and leaving in the original study, according to Balmford et al (2004), there was considerable variation in all answers across their study sites. It seems clear that this result is significant only due to the inclusion of a nature reserve in their sites. Looking at the original survey results, respondents of the nature reserve showed high scores in both conservation knowledge, the ability to name useful activities, and had higher spending on conservation than other causes. This may be due to characteristic differences between zoos and the nature reserve visitors. One of the main role of zoos is recreation with mostly parents and children visiting. By contrast, recreation is not a nature reserve's role. Therefore, visitor social stratification might be different even though their overall activities (such as conservation and conservation education) are common. If the the nature reserve is excluded from the Balmford study differences zoo sites are not significant, except for WTP on International (Figure 7).

In addition to this there may be errors in the graph depicting spend on habitat as the data presented in the prose and the graphic do not match. While they showed the variance in spend on habitat-base conservation on their graph around £200, the prose indicated a mean spend of £538 ± £14.53 on habitat conservation. (Figure 8).

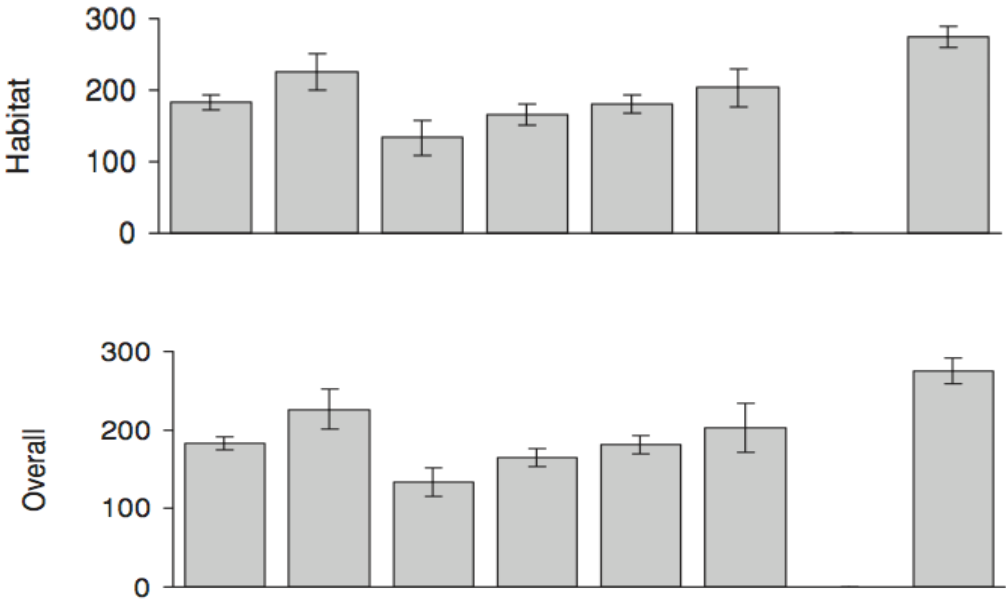


Figure 8: Possible error in habitat spend Balmford et al. 2004

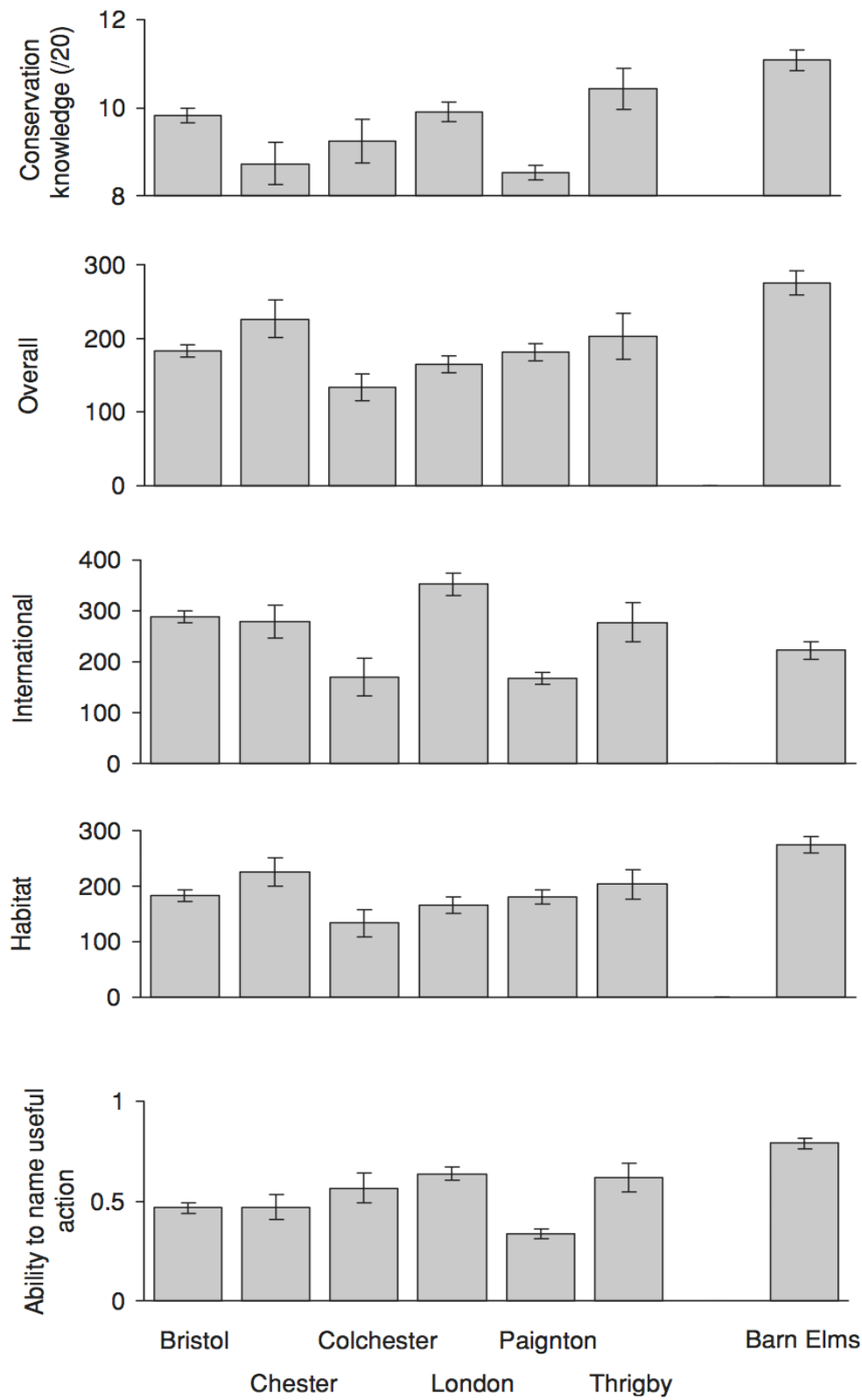


Figure 7 Variation in results across study sites of Balmford et al (2007). Bars are represent means \pm SEs. (Kruskal-Wallis tests $P < 0.001$) Note that Balm Elms is a nature reserve.

6.7 Recommendations

There is evidence of the difficulty in attracting visitors to learn academic information in free-choice learning facilities (Falk and Dierking 1992, Sandifer 1997, Adelman and Falk 2000). Moreover, some visitors are not necessarily motivated by a desire to learn (Ferguson and Griffin 2001). Despite these circumstances, I found evidence that zoo experience have some influence to the visitors in my study. Visitors certainly see zoo animals in their enclosure and appear to be affected by this experience. Therefore, incorporating this message into the enclosure may have an improved impact on visitors. Whole stories of wild animals can be relayed to the public by using animal enclosure without high-level signage. For example, the depiction of a bulldozer to represent deforestation or a oil palm in part of an Orang-utan's enclosure and a pet shop showcase in the exotic species enclosure. In a similar vein to the introduction of the movement towards "environmental enrichment" for zoo animals, one could imagine a change in the animal enclosures towards "knowledge enrichment" for zoo visitors. In addition, improving the variety of experience-orientated exhibits may provide people with a better understanding of their connection with and impact on biodiversity in the world using zoo utilities. Adelaide zoo, for example, not only ensures their new exhibit are linked to things people can do in their own life to make a difference, but also emphasises this throughout their facility, such as raising awareness about saving water in their toilets (Litchfield and Foster 2009). To change visitor behaviours effectively and in long term, reinforcing familiar activities linked to indirect conservation (e.g. recycle and water conservation) in conjunction with other information sources were recommended by Broad and Smith (2004) and Adelman et al (2000). As response to this, Smith et al (2008) confirmed this in long-term impacts in their study. Thus, it would be beneficial for zoos to reinforce the conservation message in cooperation with other agencies, taking care to especially emphasise experience-orientated techniques.

6.8 Future research

It was not possible to comprehensively measure the positive impacts of zoo positive impacts on visitors in my survey. However, a certain degree of quantitative analyses was possible. While methods to understand zoo influence have been developed (e.g. Smith et al 2008), statistical analyses are often not conducted. To explore effective and long-term success of zoo education in the future, use of the techniques here, in addition to GLM/GLMM statistical tests would lead to more reliable and relevant outputs.

6.9 Limitations

This study has highlighted some interesting results, however, the results would have been enhanced if each gender had been interviewed equally and a larger sample was achieved. Attitudes towards animals have been shown to be sex dependent (Fujita and Uchida 2003).

Another possible limitation may be a characteristic of Japanese. The concept of "endangered species" is widely known to public. However, the word "endangered species" may not be familiar to some people. Some definitions of threatened species use a more simple explanation than "endangered species". Therefore, some people know which species are under threat but they were not able to specifically answer questions on endangered species.

6.10 Zoo questionnaire respondent limitation

Some Zoo questionnaire responses are the results of official meetings while others are completed by a single member of staff and therefore the subjective opinion of the respondent (pers comm.). We may expect the results to differ between these two groups, however information on how the questionnaires were filled in is unavailable. Future questionnaires should include a section on understanding how the questionnaire itself was answered.

6.11 Conclusion

This study does not mean Japanese zoos are not engaging with the public to change attitudes. Despite the limitations of the questionnaire design, this study found some positive impacts on visitors. Based on the preference of visitors for experience orientated information over more academic signage, any action-orientated engagement is best linked to the exhibit through knowledge enrichment. Notably, other studies have shown that emphasis on non-quantitative information results in more positive learning impacts. More quantitative studies that measure zoo impacts are needed.

7 References

- Adelman, L. M., & Falk, J. H. (2000). Impact of National Aquarium in Baltimore on visitors' conservation attitudes, behavior, and knowledge. *Curator*, 43, 33–61.
- ADELMAN, L. M., FALK, J. H. and JAMES, S. (2000), Impact of National Aquarium in Baltimore on Visitors' Conservation Attitudes, Behavior, and Knowledge. *Curator: The Museum Journal*, 43: 33–61. doi: 10.1111/j.2151-6952.2000.tb01158.x.
- and Media Conference*. Tourism Research Unit, Melbourne, 15–23.
- Anderson US, Kelling AS, Pressley-Keough R, Bloomsmith M, Maple T. (2003) Zoo visitor's experience by public animal training and oral interpretation at an otter exhibit. *Environ Behavior* 35:826–841.
- Ando, A. (2009) Social study, questionnaire survey and data analyses. Nihon hyoronsya, Tokyo. (in Japanese).
- as a key to biological education. *Journal of the international zoo educators association*, 45, US.
- Asahiyama zoo.(2010) [Online]. Available from:
<http://www5.city.asahikawa.hokkaido.jp/asahiyamazoo/zoo/boruneo/boruneo-o.html> [Accessed 7th August 2010]
- Broad, G. (1996) Visitor profile and evaluation of informal education at Jersey Zoo. *DODO*.
- Broad, S. & L, Smith. (2004) Who educates the public about conservation issues?
- Convention on Biological Diversity. (2010) [Online]. Available from:
<http://www.cbd.int/cop10/> [Accessed 22nd July 2010].
- Danaher, M., (1997) Public Awareness of Environmental Issues in Japan. In: S. Totony de Zepetnek and J. Jay (Eds.), *East Asian Cultural and Historical Perspectives, Research Institute for Comparative Literature and Cross-Cultural Studies*, University of Alberta, Edmonton, pp. 17-34.
- Davis, N. (1995) Paperpower: The Japanese Paper Industry and the Environment in Australia and Japan. In: *Japanese Studies Bulletin*. Vol. 15, No. 1, Japanese Studies Association of Australia, Adelaide, pp. 13-18.
- Education, 81, 689–701.
- Examining the role of zoos and the media, *Proceedings from the International Tourism*
- Fa, E, J., S, Funk., & D, O'connell (n.d.) *Zoo Conservation, in press.*
- Falk, J. H., & Dierking, L. D. (1992). *The museum experience*. Washington, D.C.: Whalesback Books.
- Falk, J. H., & L,D, Dierking. (1992) *The museum experience*. Washington, D.C.: Whalesback Books.

- Falk, J.H., E, M, Reinhard., C,L,Vernon., K, Bronnenkant., N,L, Deans., & J,E, Heimlich. (2007) Why Zoos & Aquariums Matter: Assessing the Impact of a Visit. *Association of Zoos & Aquariums*. Silver Spring, MD.
- family/nonfamily visitors. *Science*
- Ferguson, S., & Griffin, D. R. (2001) Evaluating exhibit impacts on visitors. In: *Proceedings of the American Association of Zoological Parks and Aquariums*. pp. 385– 388. Silver Spring: MD.
- Ferguson, S., & Griffin, D. R. (2001). Evaluating exhibit impacts on visitors. In *Proceedings of the American Association of Zoological Parks and Aquariums* (pp. 385– 388). Silver Spring: MD.
- Fujita, T. & M, Uchida. ()The development of female students' attitude toward the uses and conservation of animals. 75-80 *Chiba daigaku kyouiku gakubu kiyou* No,51.
- Hayama, S. (2001) *Wildlife Issue*. Chijin shokan, Tokyo. (in Japanese).
- Higashiyama Zoo and Botanical Gardens. (2010) [Online]. Available from: http://www.higashiyama.city.nagoya.jp/01_annai/01_04gaiyo/01_04-01history/index.html [Accessed 24th July 2010]. (in Japanese).
- <http://www.waza.org/files/webcontent/documents/cug/docs/Marketing%20brochure.pdf>[Accessed 30th April 2010].
- Ikeo, M. (1996) How are Seen, the TV programs about animal?. *Study on concepts related to animals*. Vol, 9 No,4, Tokyo.
- Ishida, O. (2002) Education methodology at zoos and an essay. *Zoo study*,Vol6,No2,41-44 (in Japanese).
- IUCN. (2009) *IUCN Redlist* . [Online]. Available from:<http://www.iucnredlist.org/> [Accessed 15th June 2010].
- Japan wildlife conservation society (JWCS). (2010) [Online]. Available from: <http://www.jwcs.org/pr/report.html> [Accessed 30 July 2010]
- JAZA. (2008) *General assembly report 2008*. (in Japanese).
- JAZA. (2009) *General assembly report 2009*. (in Japanese).
- JAZA. (2009) *General outline 2009*. Tokyo. JAZA (in Japanese).
- JAZA. (2010). *Japanese zoo list*. [Online]. Available from:<http://www.jazga.or.jp/> [Accessed 5th May 2010]
- JWCS (2001) Can the regulations be effective without monitoring?. [Online]. Available from: <http://www.jwcs.org/data/010613e.pdf> [Accessed 30th August]. (both in Japanese and English).
- Kellert, S.(1991)Japanese perception of Wildlife. *Conservation Biology*. Vol, 5, 3.
- Lehnhardt, K., D, Hauck., S, Wilson., R, Sellin., C, Kuhar., and L, Miler. (2004) Assessment of the Bushmeat Message at Disney's Animal Kingdom. *Journal of the international zoo educators association*.US.

- Litchfield, C. & W, Foster. (2009) *Journal of the international zoo educators association*, 45, US.
- M,Saito.(1999)Shin shiiku handbook Doubutsuen hen dai 3 syu Gairon, Bunrui, Seichi, Seitai. In: *Zoo and Aquarium outline*. (in Japanese).
- Marino,L., O, Scott., R, Lilienfeld., R, Malamud., N, Nobis., R, Broglio. (2010) Do Zoos and Aquariums Promote Attitude Change in Visitors? A Critical Evaluation of the American Zoo and Aquarium Study. *Society and Animals*, 18,126-138.
- Michi Amano (2009) Environmental welfare of Tsushima Reopard CatTsushima yamaneko no kyouiku hukyuu katudou Zoo study Vol 11-1 No.18
- Millennium Ecosystem Assessment (MA). (2005) *Millennium Ecosystem Assessment (MA)*. Synthesis, Island Press, Washington DC (2005) Available on the Internet. [Online]. Available from: <http://www.MAweb.org> [Accessed 8th August 2010].
- Miller, B., Conway, W., Reading, R. P., Wemmer, C., Wildt, D., Kleiman, D., Monfort, S., Rabinowitz, A., Armstrong, B., & Hutchins, M. (2004) Evaluating the conservation mission of zoos, aquariums, botanical gardens, and natural history museums. *Conservation Biology*, 18, 86–93.
- Minatani, S. (2000) *Research about the member classification and the annual fee of environmental NGOs -an object of environmental NGO with a homepage-*. [Online]. Available from: <http://csspcat8.ses.usp.ac.jp/lab/ideken/sotsuron/f-00minatani-soturon.html> [Accessed 25th May 2010]. (in Japanese).
- Ministry of Internal Affairs and Communications. (2009)
- Miyaoka I. (2004) *Legitimacy in international society: Japan's reaction to global wildlife preservation*. Basingstoke, United Kingdom: Palgrave MacMillan.
- Nishihara,T.(2006)Raiensya no Hatsuwabunseki kara mita Doubutuen Hozen kyouiku no Arikata. In: JWSC *Wildlife Conservation Education guide*. pp.129-134. (in Japanese).
- Ohuri, S. (2005) *Introduction of museum study*. Gakubunsha Press. (in Japanese).
- Public work department. (2010) *Higashiyama Zoo and Botanical Gardens basic reform plan 2010*. [Online]. Available from: http://www.higashiyama.city.nagoya.jp/16_evolution/16_03plan/shin_kihonkeikaku_gaiyou.pdf [Accessed 23rd July]. (in Japanese).
- Research institute co-operation study the designated administrator system. (2008) *Shiteikanrisyaseido no genjo to kongo no kadai.*) [Online]. Available from: http://www1.ubc.ne.jp/~jichisoken/archive/shitei_genjo.pdf [Accessed 7th July 2010]. (in Japanese).
- Ross, S,R.& K,E,Lukas. (2005) Zoo visitor behavior at an African ape exhibit. *Visitor Studies Today* 8:4–12.
- Sakai,T. (2003) *Practical guide, understanding questionnaire surveys and data analyses*. Nihon nouritsu kyokai management centre. (in Japanese)

- Sandifer, C. (1997). Time-based behaviors at an interactive science museum: Exploring the differences between weekday/weekend and
- Shintaku, K.(2009) Species preservation and environmental education at Zoos. *Zoo study*. Vol 11-1 No.18. (in Japanese).
- Smith, L. D. G., S, Broad., & B, V, Weiler.(2008) A closer examination of the impact of zoo visits on visitor behavior. *Journal of Sustainable Tourism*, 16 (5), 544-562.
- Statistics Bureau, Director-General for Policy Planning (Statistical Standards) and Statistical Research and Training Institute*. [Online]. Available from: <http://www.stat.go.jp/data/nihon/02.htm> [Accessed 23rd July 2010]
- Takahashi, H. (2009) Current circumstance and issue of education activities at Zoos. Vol 11-1, No.18. (in Japanese).
- Takahashi, H.(1998) Environmental education study in zoos. In: Kodama,T., T, Fukui., O, Abe., Y, Asaoka. (eds.) *A study of zoo education in a lifelong learning society*. Chikuma Shobo, Tokyo. (in Japanese).
- Takahashi, M. (2006) Wildlife management and decentralization. *Kikan kankyo kenkyu* .142, 161–164. (in Japanese).
- Takahashi, M. (2009) Overview of the structure and the challenges of Japanese wildlife law and policy. *Biological Conservation*. 142, pp. 1958–1964
- The charity commission for England and Wales. (2010) [Online]. Available from: <http://www.charitycommission.gov.uk>[Accessed 19th August 2010].
- The Ministry of the Environment Japan. (2010). [Online]. Available from: <http://www.env.go.jp/>[Accessed 15th June 2010]
- The Ministry of Environment (2006) *Threatened wildlife of Japanese Red Data book*. (in Japanese)
- The Ministry of Environment. (2007)*Threatened wildlife of Japanese Red Data book* . [Online]. Available from: <http://www.env.go.jp/press/press.php?serial=8648> [Accessed 8th July 2010].(in Japanese).
- The Zoological Society of London ZSL (2010). *International Zoo Year Book*. Volume 44, Issue 1. pp.1–464.
- Togawa, K. (2006) JWSC activities at zoos. In: JWSC *Wildlife Conservation Education guide*. pp.116-128.(in Japanese).
- Tokyo zoo logical park society. (2010) [Online]. Available from: <http://www.tzps.or.jp> [Accessed 30th April 2010]. (in Japanese).
- Tokyo Zoological Park Society. (2007) *Wildlife Conservation Centre annual report 2007*. (in Japan)
- Tokyo Zoological Park Society. (2009) *Wildlife Conservation Centre annual report 2009*. (in Japan)
- Tunncliffe, S, D.& A, Scheersoi. (2009) Engaging the interest of zoo visitors
- WAZA.(2005) *Building a future for wildlife: The World Zoo and Aquarium Conservation strategy*. Bern:WAZA, Executive Office.

WAZA.(2006) Understanding Animals and Protecting Them About the World Zoo and Aquarium Strategy.[Online]. Available from:

Weiler, B & L, Smith (2009) Does more interpretation lead to greater outcomes? An assessment of the impacts of multiple layers of interpretation in a zoo context. *Journal of Sustainable Tourism*, Vol. 17, No. 1. pp. 91–105

WWF Japan. (2010) [Online]. Available from: <http://www.wwf.or.jp/aboutwwf/japan/org.html> [Accessed 6th Aug 2010]. (in Japanese)

WWF UK. (2010) [Online]. Available from:

http://www.wwf.org.uk/what_we_do/about_us/faqs/ [Accessed 5th Aug 2010]

Y Sadotomo.(2005) Public Opinion for Nihondaira zoo.*Zoo study*.Vol.9, No.1.pp5-13(in Japanese).

Yamamoto, K. M,Ando, M, Ogawa., F, Akishinonomiya. (2009) Trends in otter-related newspaper articles during the extinction process of the Japanese otter, *Lutra nippon*. *Wildlife conservation society symposium 2009*. (in Japanese).

Yokohama greenery foundation. (2010) [Online]. Available from: <http://www.hama-midorinokyokai.or.jp/> [Access 30th April 2010]. (in Japanese).

8 Appendix

8.1 Zoo visitor questionnaire

Zoos and Conservation Survey

Part 1

How long have you been in the zoo today?

just arrived less than 1 hour 1-2 hours 2-3 hours more than 3 hours

Is this your first visit to this zoo?

yes no - if no, when was your last visit? this year last year longer -how long ago? _____

Have you visited any other zoos in the last two years? yes no

Are you a member or season ticket holder of this zoo? (if applicable) yes no

PART 2

What single word do you most associate with 'conservation'? _____

Could you name one species in danger of extinction? _____

Why is this species endangered? _____

Could you name one *Japanese* endangered species? _____

Why is this Japanese species endangered? _____

Which, in your opinion, are the most serious threats for endangered species?

(Please rank: 1 = most serious, 5 = least serious)

Japan-wide

___ pollution

___ over-hunting or over-harvesting

___ introduced or non-native species

___ habitat loss

___ climate change

Worldwide

___ pollution

___ over-hunting or over-harvesting

___ introduced or non-native species

___ habitat loss

___ climate change

Which habitats are the most endangered? (Please rank: 1 = most serious, 3 = least serious)

___ rainforest

___ freshwater lakes

___ ice caps/polar regions

Part 3

In your view, what is the *primary* purpose of zoos? (tick one only)

leisure/recreation conservation education research

other: _____

When you visit a zoo, do you attend talks and events?

no usually

When you visit a zoo, do you read signs about the animals?

always usually

always

Is this zoo involved in conservation projects?

no yes

Is this zoo involved in conservation projects?

no yes

don't know

The loss of species and habitats worldwide is a concern

agree neutral

disagree

The loss of species and habitats is something we need to worry about in Japan

agree neutral

disagree

As long as they are kept in zoos, endangered species are safe.

agree neutral

disagree

Do you feel you have learnt something during your visit today about:

animals – how and where they live ?

yes no

endangered species or habitats

yes no

what *you* can do for conservation?

yes no

the role of zoos in conservation ?

yes no

In your view, a good zoo is one

which: _____

To help conserve species and habitats, zoos a) currently do:

b) in the future, should do:

lots some little more same less

a) breed animals in the zoo

- b) reintroduce animals to the wild
- c) educate the public
- d) fundraise for conservation efforts in the field
- e) train conservation professionals
- f) work with conservation organisations like WWF

Visiting zoos gives me ideas about what I could do to help protect endangered species and habitats

agree neutral disagree

What can you do to help to conserve species or habitats? _____

If you had ¥100,000 of locally raised money to give to charity, how much would you give to each of the following good causes?

Health _____
 Animal Welfare _____
 Japanese Soc _____
 Conservation _____
 International aid _____

Total = ¥100,000

If you had ¥100,000 of locally raised money to spend on conservation, how much would you spend:

a)	Locally	_____	b)	on species	_____
	Nationally	_____		on habitats	_____
	Overseas	_____			
	Total	¥100,000		Total	¥100,000

Age: 11-19 If in this category, please state exact age: _____

20-39 40-59 60+

Sex: Female Male

Education (highest level):

- Junior high school high school partial college/apprenticeship
- Technical/vocational degree University degree
- Postgraduate degree Other

Occupation

Employed Officials Public service Self employed Part time Student House wife Unemployed/
Retire Other

Are you a member of any environmental charities? yes no if yes, which ?

Have you joined any conservation work before? yes no if yes, what have you done?

Thank you very much for your help

8.2 Zoo questionnaire

Zoos and Conservation Survey

Q1, Does your zoo believe visitors can learnt something during their visit about:

- animals – how and where they live ? yes no
- endangered species or habitats yes no
- what you can do for conservation? yes no
- the role of zoos in conservation ? yes no

Q2, Please rank the most important zoo roles for your zoo? (1 = most important, 5 = least important)

leisure/recreation conservation education research
other: _____

Q3, Visiting zoos gives visitors ideas about what they could do to help protect endangered species and habitats

agree neutral disagree

Q4, If yes in Q3, what type of information are you providing?

Q5, To help conserve species and habitats, your zoo a) currently do: b) in the future, should do:

	lots	some	little	none	more	same
less none						
a) breed animals in the zoo <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) reintroduce animals to the wild <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) educate the public <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) fundraise for conservation efforts in the field <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) train conservation professionals <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f) work with conservation organisations like WWF <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q6, If you choose none in Q5, could you answer the limitations?

Thank you very much for your help!

8.3 R source code for analysis

```
library(ggplot2)

#SETUP
data <- read.csv('/Users/Ayako/japanese_zoos/data_for_r.csv', header = TRUE)
response <- data[15:49]
col_count <- length(response)
sites <- c("T", "C", "H")
site_labs <- c("A", "B", "C")
arrive_depart <- c("A", "D")
stderr <- function(x) sqrt(var(x)/length(x))
std_ebars <- function(x){
  mean <- mean(x)
  min <- mean(x) - stderr(x)
}
```

```

    max <- mean(x) + stderr(x)
    out <- c(min, mean, max)
    names(out) <- c("ymin", "y", "ymax")
    return(out)
  }
quartz()

#KRUSKAL WALLIS TESTS AND CHARTS
i=1
for (response_var in response){
  a <- kruskal.test(response_var, data$location)
  print(paste("TEST ", i, ":", colnames(response[i:i])))
  print(paste("Kruskal Wallis p-value: ", a['p.value']))
  c <- ggplot(data, aes(x=location, fill=location))
  c <- c + aes_string(y=colnames(response[i:i]))
  c <- c + stat_summary(fun.y="mean", geom="bar")
  c <- c + stat_summary(fun.data=std_ebars, geom="errorbar", width=0.075, color="grey30")
  c <- c + labs(x=paste("Location ", "(Kruskal-Wallis p=", sprintf("%.3f", a['p.value']),
  ")", sep=""))
  # c <- c + opts(title=)
  # c <- c + labs(y="WTP Overall")
  c <- c + scale_fill_brewer(pal = "Set2")
  c <- c + opts(legend.position="none")
  print(c)
  ggsave(file=paste("/tmp/r-output/", colnames(response[i:i]), ".pdf", sep=""), width=4,
height=4)
  i = i+1
}

#MANN WHITNEY U TESTS AND GRAPHS
i=1
for (response_var in response){
  a <- wilcox.test(response_var[data$location == 'A' & data$arrival_departure == "A"],
response_var[data$location == 'A' & data$arrival_departure == "D"])
  b <- wilcox.test(response_var[data$location == 'B' & data$arrival_departure == "A"],
response_var[data$location == 'B' & data$arrival_departure == "D"])
  c <- wilcox.test(response_var[data$location == 'C' & data$arrival_departure == "A"],
response_var[data$location == 'C' & data$arrival_departure == "D"])

  print(paste("TEST ", i, ":", colnames(response[i:i])))
  print(paste("Mann-Whitney U p-value for Zoo A: ", a['p.value']))
  print(paste("Mann-Whitney U p-value for Zoo B: ", b['p.value']))
  print(paste("Mann-Whitney U p-value for Zoo C: ", c['p.value']))

  c <- ggplot(data, aes(x=location, fill=factor(arrival_departure)))
  c <- c + aes_string(y=colnames(response[i:i]))
  c <- c + stat_summary(fun.y="mean", geom="bar", position="dodge")
  c <- c + stat_summary(fun.data=std_ebars, geom="errorbar", width=0.075, color="grey30",
position=position_dodge(width=0.90))
  c <- c + labs(x="Location")
  # c <- c + opts(title=)
  # c <- c + labs(y="WTP Overall")
  c <- c + scale_fill_brewer(pal = "Paired")
  #c <- c + opts(legend.position="none")
  print(c)
  ggsave(file=paste("/tmp/r-output/MMU_", colnames(response[i:i]), ".pdf", sep=""),
width=4, height=4)
  i = i+1
}

#MANN WHITNEY U TESTS AND GRAPHS FOR ALL ZOOS
i=1

```

```

for (response_var in response){
  a <- wilcox.test(response_var[data$arrival_departure == "A"],
response_var[data$arrival_departure == "D"])

  print(paste("TEST ", i, ":", colnames(response[i:i])))
  print(paste("Mann-Whitney U p-value for all Zoos: ", a['p.value']))

  c <- ggplot(data, aes(x=arrival_departure, fill=factor(arrival_departure)))
  c <- c + aes_string(y=colnames(response[i:i]))
  c <- c + stat_summary(fun.y="mean", geom="bar")
  c <- c + stat_summary(fun.data=std_ebars, geom="errorbar", width=0.075, color="grey30")
  c <- c + labs(x=paste("Arrival/Departure (MWU p=", sprintf("%.3f", a['p.value']), ")",
sep=""))
#   c <- c + opts(title=)
#   c <- c + labs(y="WTP Overall")
  c <- c + scale_fill_brewer(pal = "Paired")
  c <- c + opts(legend.position="none")
  print(c)
  ggsave(file=paste("/tmp/r-output/MWU_ALL_", colnames(response[i:i]), ".pdf", sep=""),
width=4, height=4)
  i = i+1
}

#BOXPLOTS FOR ALL WTP SURVEYS.
ds <- data.frame(local = data$wtp_conservation_local, national =
data$wtp_conservation_national, international = data$wtp_conservation_international)
ggplot(melt(ds), aes(x = variable, y = value)) + geom_boxplot() +labs(y="Willingness to pay in
Yen", x="Conservation spend destination")
ggsave(file="/tmp/r-output/WTP_conservation_location.pdf", width=7, height=7)

ds <- data.frame(species = data$wtp_conservation_species, habitat =
data$wtp_conservation_habitat)
ggplot(melt(ds), aes(x = variable, y = value)) + geom_boxplot() +labs(y="Willingness to pay in
Yen", x="Conservation spend type")
ggsave(file="/tmp/r-output/WTP_conservation_type.pdf", width=7, height=7)

ds <- data.frame(health = data$wtp_charity_health, social = data$wtp_charity_social, animal =
data$wtp_charity_animal, conservation = data$wtp_charity_conservation, int_aid =
data$wtp_charity_int_aid)
c <- ggplot(melt(ds), aes(x = variable, y = value)) + geom_boxplot() +labs(y="Willingness to
pay in Yen", x="Conservation spend area")
c +

ggsave(file="/tmp/r-output/WTP_conservation_area.pdf", width=7, height=7)

```