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Research article

Do social media users' interactions with the elderly Tsushima leopard cat at Kyoto City Zoo translate into changes in conservation behaviour?

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Abstract
The exhibition of elderly animals in Japan has the potential to promote the formation of personal connections between visitors and animals and behavioural change such as increased conservation behaviour. This study focused on social media and investigated whether the connection between elderly animals (Tsushima leopard cat *Prionailurus bengalensis euptilurus*; an endangered species in Japan, individual died in September 2020) and visitors is related to self-reported conservation behaviour of visitors and social media users at Kyoto City Zoo. Information about the care of elderly animals was disseminated on several social media sites at least once a month for about six months before the death of the leopard cat. The information also included messages about conservation, especially after the death of the target animal. Surveys were conducted 1–3 months after the individual's death. The questionnaire contained both closed-response items (e.g., gender, age, frequency of zoo visits, experience with animal keeping and frequency of browsing zoo's social media) and open-ended questions (e.g., 'types of conservation behaviour', 'lifestyle changes' and 'impressions of the target animal'). Responses (n=180) indicate respondents' interest in conservation activities and formation of personal connections with the target animal. Involvement in conservation activities is related to animal keeping status and social media use. Specifically, social media dissemination of information contributed to forming a connection between viewers and the animal. These results suggest that elderly animal exhibits with conservation messages are effective in encouraging pet owners and social media users to form personal connections with target animals and to participate in conservation activities.

Introduction

The World Zoo and Aquarium Conservation Strategy (Barongi et al. 2015) and Conservation Education Strategy (Thomas 2020), both published by the World Association of Zoos and Aquariums, call for zoos to facilitate behavioural change among their visitors. In previous studies, building empathy and personal connection of visitors towards animals has been considered key in encouraging visitors to change their behaviour (Grajal et al. 2017; Howell et al. 2019). Sato (2016) noted that in Japan, there is a respect for natural death and consequently resistance to euthanasia, which may help

Japanese people develop empathy for animals and concern for their end-of-life care. In the context of this unique sense of respect toward animals, the exhibition of elderly animals has drawn huge attention, mainly from zoo enthusiasts (Okabe and Matsunaga 2021). Okabe and Matsunaga (2021) conducted a study on visitors attending a memorial lecture for an elderly lion that died at Kyoto City Zoo. The elderly lion exhibit had focused on end-of-life care, presenting no specific conservation messages to encourage visitors to change their behaviour. This exhibition of an elderly animal and its subsequent death caused zoo enthusiasts to self-reflect, although only a few visitors self-reported behavioural changes. The authors highlight the

importance of using the strength of connection to the animals from this exhibit to actively promote behavioural change in visitors by sending messages about animal conservation.

Many zoos have created their own social media accounts to disseminate a variety of materials about zoos and wildlife conservation that have diverse impacts on their audience (Llewellyn and Rose 2021; Rose et al. 2018). This study focuses on information dissemination through social media. Social media influence differs from country to country; in Japan, information on cute-looking animals is widely distributed, sometimes to the extent of negatively affecting conservation (Harrington et al. 2019). Instagram users construct their own narratives by reclassifying or reconstructing their natural history museum visits (Weilenmann et al. 2013). This can be considered a component of 'personal connection to animals' (e.g., appreciation, attribution, inspires emotions, interaction and proximity) in zoo conservation education (Howell et al. 2019). The unique view that social media has created might be an effective educational target if applied appropriately. In the death scene of an elderly animal, is there a possibility that social media viewers develop an interest in animal conservation? This study focuses on the case of an active call for conservation in an exhibition of an elderly animal of a Japanese native species (Tsushima leopard cat *Prionailurus bengalensis euptilurus*) and compares it with that in a previous study (Okabe and Matsunaga 2021) to examine whether personal connections lead to the implementation of conservation behaviour.

Materials and methods

Tsushima leopard cat
The Tsushima leopard cat, a small wild cat, lives only on the remote island of Tsushima in Japan. This cat is considered to be a regional population of the Amur leopard cat (Patel 2017). The population hovers around 100 and conservation efforts are underway by the Ministry of the Environment, Tsushima City, and several conservation groups (Izawa 2009). Therefore, the Tsushima leopard cat has been awarded National Nature Monument status and classified as a Critically Endangered species on the Japanese Red List. In 1995, the Japanese Ministry of the Environment started a protection and breeding programme for this wild cat with the Japanese Association of Zoos and Aquariums (Ito and Inoue-Murayama 2019). Hanamatsu et al. (2021) summarise the natural history and conservation of this species as follows. It conventionally raises its young in rice paddies, feeding on rats and aquatic insects that live on cultivated land. However, as cultivated lands disappear, food for the Tsushima leopard cat is decreasing. By transforming abandoned land into highly biodiverse ecosystems, creating a habitat and feeding area for the Tsushima leopard cat, it is possible to contribute to the Tsushima leopard cat's preservation. The crops produced on such high biodiversity farmland have added value and are regarded as "crops to preserve the Tsushima leopard cat".

Exhibition history and context
This study focuses on an exhibition of an elderly Tsushima leopard cat that was in its end-of-life period at the Kyoto City Zoo. This animal, named Miyako, died of chronic kidney failure in 2020. Miyako was born in 2003 and in 2013 moved to Kyoto City Zoo, where she was kept for 10 years. Since the launch of the Tsushima leopard cat exhibit, Kyoto City Zoo has held an annual Tsushima leopard cat education and outreach event. Miyako died at an advanced age of 18 years; the average lifespan is considered to be approximately 16 years in captivity (Weigl 2005). Kyoto City Zoo had been sending out information about Miyako's care via social media (Instagram™, Facebook™ and Youtube™) and notices for about six months before her death. Miyako died on 5 September 2020 and Kyoto City Zoo received numerous comments (n=96) on its social media. During the first month after Miyako's death, a flower-offering table was set up in front of her exhibit. At the time of the animal's death, messages about cooperation in conservation activities were sent through social media and message postings in the zoo.

Questionnaire development and distribution
To evaluate perceptions of the exhibition and its influence on zoo visitor attitude and behaviour, a questionnaire was developed and distributed to visitors. Table 1 shows an outline of the English translation of questionnaire items. The questionnaire was developed by Okabe and Matsunaga (2021) and contains items that were selected based on factors found to influence attitudes toward animals, death or conservation (gender: Johnson et al. 1992; age: McCutcheon and Fleming 2002; frequency of zoo visits: Godinez and Fernandez 2019; and current animal ownership: Okabe and Matsunaga 2021). In addition to these items, questions were added related to Miyako's social media presence and the duration of conservation activities for the Tsushima leopard cat. Questions related to the frequency of zoo visits were specific to Kyoto City Zoo. Three open-ended questions were asked:
1. What are the concrete details of your conservation activities for the Tsushima leopard cat?
2. What lifestyle changes other than conservation activities for the Tsushima leopard cat have occurred for you since the Miyako exhibit?
3. What impressions have you gained from the Miyako exhibit?

These questions were designed to investigate the psychological impact of Miyako's exhibition on visitors and their behavioural changes.

The questionnaire was written in Japanese and targeted the Japanese people who visited Kyoto City Zoo or who browsed the zoo's social media. Visitors were classified as those who responded to the questionnaire (QR code) posted in the zoo's Tsushima leopard cat exhibit, or attended lectures or the Tsushima leopard cat annual education and outreach programme held at the zoo (16–17 October 2020). Social media viewers were those who voluntarily responded to the zoo's social media questionnaire. This survey was conducted 1–3 months after Miyako's death to allow sufficient time for visitors and social media viewers to respond to the messages sent by the zoo after her death.

The questionnaire accompanied a clear statement that it was being administered for research purposes and no personally identifiable information was collected. The questionnaire was administered with the prior approval of the ethics committee of Kyoto City Zoo (Registry number: G32-01-B).

Statistical analysis
The open-ended questions were analysed by text data mining using the free software KH Coder (version 3.0; Higuchi, Ritsumeikan University, Kyoto, Japan). This software uses multivariate analysis to automatically identify and classify groups of words that frequently appear in the same document, or groups of documents that contain many common words, thereby removing the potential for any selection bias introduced by a human coder. KH Coder employs 'ChaSen' for extracting words from Japanese text data, R for statistical analysis and MySQL for data organisation and retrieval (Higuchi 2016). Two analysis methods were used: word frequency lists and co-occurrence networks. In the word frequency list, words were displayed in order of their frequency of appearance in the target text. A co-occurrence network is a visualisation of the patterns of association between words on a two-dimensional plane, which allows the viewer to intuitively grasp how often words appear together. Words that form a co-occurrence network display a higher percentage of use in the

Table 1. Structure of questionnaire items. Modified from Okabe and Matsunaga (2021) and translated into English

Item	Response Options
Visitor age	<19 years, 20–29, 30–39, 40–49, 50–59, >60 years, N/A
Visitor gender	Male, female, N/A
Frequency of Kyoto City Zoo visits	Once every few years (<0.5 time/year)
	Once a year (1 time/year),
	Several times a year (>1 time/year),
	At least once a month (≥1 time/month)
Frequency of Miyako's social media browsing	Not browsed,
	Current animal ownership
	All browsed
Current animal ownership	Currently have animals,
	Do not have any animals currently
Duration of conservation activities for the Tsushima leopard cat	No experience
	Have experienced after Miyako's death,
	Have experienced before Miyako's death
What are the concrete details of your conservation activities for the Tsushima leopard cat?	Open-ended response
What lifestyle changes, other than conservation activities, have you made as a result of Miyako's exhibition?	
How did Miyako's exhibition make you feel?	

same sentence than other words in the entire sentence, implying similar patterns of occurrence. Groups of words formed by co-occurrence networks were used more frequently at the same time (considered to be well-described sentences). Another feature of the software is the ability to go back to the original text from the detection results to explore factors that formed the connection between words, making it possible to understand the overall flow of the text without any subjectivity from the analyst or the possibility of the analyst misinterpreting the results. However, the analyst must compensate to some extent in advance for shaky notation, fluctuating words and character errors caused by the respondents' writing. Elaborate information about the above methods is available in the KH Coder 3 Reference Manual (Higuchi 2016).

The association between the respondents' choice of the period of Tsushima leopard cat conservation behaviour and answers to other questions was investigated by χ^2 test (age, gender, current animal ownership and social media browsing related to Miyako) with Haberman's definition of adjusted standardised residuals (Haberman 1973) or Spearman's correlation coefficient (for frequency of zoo visits). Notably, participants were only included in the statistical analysis if they mentioned specific conservation activities. For bias comparison with the respondent population of the previous study (Okabe and Matsunaga 2021), the χ^2 test was again employed. To investigate social media viewers' characteristics, the χ^2 test (age, gender and current animal ownership) with Haberman's definition of adjusted standardised residuals or Spearman's correlation coefficient (for frequency of zoo visits) was used to analyse comparisons with responses to other questions. There were several items that violated Cochran's rule (Cochran 1954) when performing the χ^2 test. Therefore, conservation behaviour and social media experience were grouped into presence and absence at the time of statistical analysis. The statistical processing software used in this study was Statcel4 (OMS Publishing, Saitama, Japan). All data are presented as means with 95% confidence intervals.

Results

The total number of questionnaire responses was 188 (36 Tsushima leopard cat education programmes, 68 other animal lectures, 62 social media and 22 zoo posts). Table 2 summarises the questionnaire results. Respondents in their teens and younger (9; 5.5%), twenties (15; 8.3%) and thirties (27; 14.4%) gave slightly fewer responses than other age groups. In terms of frequency of visits, about half of the respondents visited the park several times a year. About 40% of respondents browsed all of Miyako's social media and about 30% of respondents had never browsed any of this content. About 40% of the respondents currently kept animals. About 30% had participated in Tsushima leopard cat conservation activities (note that all of these conservation activity participants described specific Tsushima leopard cat conservation activities in Free Response Item 1). Compared to the previous study (Okabe and Matsunaga 2021), no significant change was observed in the percentage of respondents in terms of age (df=5, χ^2=4.30, P=0.50), gender (df=1, χ^2=0.08, P=0.87) or animal keeping status (df=1, χ^2=0.09, P=0.85). On the other hand, there was a significant bias in the frequency of zoo visits (df=3, χ^2=9.59, P<0.05), with a significantly larger group of 'once every few years' visitors in this study (P<0.01).

Social media viewers were significantly more likely to be female (P<0.01). Significantly more viewers were aged 50–59 (P<0.01) and considerably fewer were under the age of 19 (P<0.01; Figure 1). No noteworthy relationships were found for experience in animal keeping (P=0.76) or zoo visit frequency (P=0.15).

In terms of specific conservation actions, 47 (25.0%) of the descriptions were associated with actual conservation (duplicates: rice purchase for conservation contribution 32, goods purchase for conservation organisations 13, donations 8 and membership of conservation organisations 8). In terms of the relationship between the duration of conservation activities for the Tsushima leopard cat and other responses, a significant relationship was detected between frequency of browsing Miyako's social media (χ^2=7.51, P <0.01; Figure 2) and current animal ownership (χ^2=5.02, P <0.05; Figure 3). Zoo visit frequency and duration of conservation activities for the Tsushima leopard cat were not correlated (rs=0.15, P=0.05). Other items were not found to be statistically significant (gender: P=0.41, age: P=0.43).

To investigate the effect of perspectives and attitudes instilled by the exhibition on the questionnaire responses, a text mining analysis examined responses to the open-ended item "How did Miyako's exhibition make you feel?" The number of targeted responses was 107. Prior to the analysis, ChaSen was used to detect compound words, and words that co-occurred more than five times were considered compound terms and were treated as single words for the remainder of the analyses (e.g., Kyoto-City-Zoo, visiting-the-zoo, conservation-activity). After preprocessing, 147 paragraphs and 248 sentences were identified using KH Coder. The total number of extracted words (i.e., the total number of words included in the files to be analysed) was 5,191 and the

Table 2. Summary of the questionnaire results

Items	Frequency						
Visitor age	Under 19	20–29	30–39	40–49	50–59	Over 60	N/A
	9 5.5%)	15 (8.3%)	27 (14.4%)	43 (22.9%)	52 (27.7%)	40 (21.3%)	1(0.5%)
Visitor gender	Female	Male	N/A				
	137(72.9 %)	50(26.6%)	1(0.5%)				
Frequency of Kyoto City Zoo visits	<0.5 time/year	1 time/year	≥1 time/year	≥1 time/month			
	32(17.0%)	12(6.3%)	86(45.7%)	51(27.1%)			
Frequency of Miyako's social media browsing	Not browsed	Sometimes browsed	All browsed				
	52 (27.7%)	52 (27.7%)	81(43.1%)				
Current animal ownership	Do not have any animals currently	Currently have animals					
	109 (58.6%)	77 (41.4%)					
Duration of conservation activities for the Tsushima leopard cat	No experience	Have experienced after Miyako's death	Have experienced before Miyako's death				
	139 (73.9%)	13 (6.9%)	36 (19.1%)				

number of unique words was 877. After excluding common words that appear in most sentences (known as stop words), such as particles and auxiliary verbs, 2,002 words (675 unique words) were extracted for analysis. The 10 most frequently occurring words in the free-text responses were "Miyako" (69 times), "think" (51), "know" (42), "Tsushima leopard cat" (39), "exhibition" (34), "animal" (33), "keep" (31), "feel" (25), "watch" (22) and "zoo" (20).

The co-occurrence network based on the 60 most frequently used words that occurred at least 5 times is shown in Figure 4(a). Based on co-occurrence, these words were automatically classified by the software into eight groups (underlined words indicate words represented in the co-occurrence network). Group A consisted of a group of words about how respondents came to know about the Tsushima leopard cat, including words such as "keeping exhibit of Miyako at the zoo" (n=10) gave them an opportunity to "know about the Tsushima leopard cat" (n=12). Group B consisted of a group of words about the care and exhibition of elderly animals and included words such as "care for elderly individuals" (n=6), "happy to know them through social media until the end of their lives" (n=9), "care her with love" (n=6) and "difficulty in living
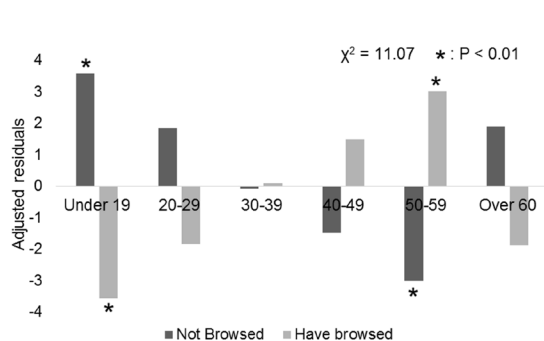
Figure 1. Relationship between experience browsing Miyako's social media and respondents' ages
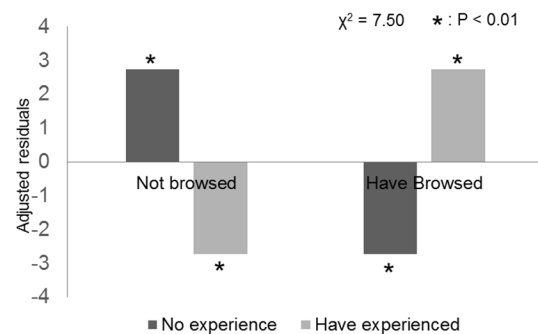
Figure 2. Relationship between the frequency of browsing Miyako's social media and self-reported experience of conservation activities for the Tsushima leopard cat as a result of viewing the elderly Tsushima leopard cat exhibition

(n=4)". In Group C, the word group pertained to information dissemination and included words such as "I knew that (Miyako) had <u>died</u> from <u>information dissemination</u> by the <u>Kyoto City Zoo</u>" (n=4) and "<u>Information dissemination</u> about animals that I cannot <u>see</u>" (n=3). Group D consisted of words related to the conservation activities of visitors, including word groups such as "<u>visited zoos</u>" (n=2) and "became interested in the <u>conservation activities</u>" (n=3). Group E included the words "<u>go</u> to <u>Tsushima</u>" (n=3). Group F included the words "<u>importance</u> of <u>nature protection</u>" (n=2). Group G included the words "I <u>considered</u> about what I could do <u>myself</u>" (n=5). Group H included the words "I felt <u>familiar</u> by what I <u>witnessed</u>" (n=5).

To investigate the types of behavioural changes in addition to the conservation activities among respondents, text mining analysis was conducted on the responses to the open-ended item "What lifestyle changes, other than conservation activities, have you made as a result of Miyako's exhibition?" Out of 188 respondents, 60 (50.7%) responded to the open-ended question. Prior to the analysis, compound words were detected via morphological analysis using ChaSen, and words that co-occurred >5 times were forcibly extracted as single compound terms. After preprocessing using KH Coder, 78 paragraphs and 114 sentences were identified. In total, 2,031 words were extracted, including 432 unique words. After excluding stop words, 848 (including 318 unique) words were extracted for analysis. The 10 most frequently occurring words in free-text responses were "Miyako" (29 times), "Tsushima leopard cat" (26), "animal" (18), "know" (17), "zoo" (14), "watch" (13), "feel" (10), "have" (10), "extinction" (10) and "interest" (9).

Figure 4(b) shows the co-occurrence network based on the 60 most frequently used words that appeared at least 4 times. These words were automatically categorised into seven groups by the software based on their co-occurrence. Group 1 comprised words related to zoos and animal involvement and included statements such as "I started going to the <u>Kyoto City Zoo</u>" (n=9) and "I started <u>look</u>ing at <u>information</u> about <u>zoos</u> (and the <u>Tsushima leopard cat</u>)" (n=4). Group 2 was a group of words related to zoo visits, which included the statement "I increased the frequency of <u>visiting the zoo</u>" (n=4). Group 3 contained words related to environmentally friendly behaviour, which included the statement "I have become

more <u>friendly</u> to the <u>natural environment</u>" (n=4). Group 4 included the word group "<u>actually went</u> to <u>Tsushima</u>" (n=3). Group 5 was the word group "I started to think and <u>behave</u> about what I could do on my <u>own</u>" (n=6). Group 6 was a group of words related to interest in and behaviour change from the Tsushima leopard cat exhibit, which included the word groups "I <u>bought</u> something related to <u>animals</u>" (n=4) and "I became interested in <u>danger</u> of <u>extinction</u> (endangered) <u>animals</u>" (n=10). Group 7 comprised a group of words about interest in conservation activities related to the Tsushima leopard cat, which included words such as "I took an <u>interest</u> and <u>concern</u> in <u>conservation activities</u> (of the Tsushima leopard cat)" (n=15). Although no specific groups were formed, co-occurrences describing comparisons and relationships with domestic cats are also shown (* in Figure 4(b), n=6).

Discussion

There were no significant differences between the breakdown of respondents (age, gender, animal keeping status) in the current study and those in Okabe and Matsunaga (2021), except for frequency of zoo visits. The group that visited the park once every few years in this study was significantly larger than that in the previous study (Okabe and Matsunaga 2021). This may indicate overrepresentation of frequent zoo visitors' behaviour.

The most common Tsushima leopard cat conservation behaviour indicated in the survey was 'rice purchase for conservation contribution'. This can be seen as the result of long-term educational activities that have provided visitors with accurate knowledge about Tsushima leopard cat conservation. Moreover, the rice could be purchased at the zoo's gift shop. This initiative to sell such conservation products in the zoo's gift shop is one effort to encourage conservation behaviour (Godinez and Fernandez 2019; Sigsgaard 2009) and may have influenced the conservation behaviour of visitors to the zoo. Conservation behaviours other than these have been previously experienced by the respondents, but this survey cannot determine whether the respondents' experiences occurred before (prior to 2013) or after the zoo exhibit began. Therefore, it is possible that some respondents may have already engaged in conservation actions before the exhibit; however, there is at least a possibility that there was an affinity between such conservation-minded respondents and the zoo's Tsushima leopard cat exhibit.

A total of 47 people described specific actions related to Tsushima leopard cat conservation. Three-quarters (36/47) of the conservation practitioners were involved in conservation activities before Miyako's death, while the remaining quarter (11/47) became involved after Miyako's death. Although the percentage was minimal, the event of death and the zoo's call for conservation may have encouraged conservation actions, but it is unclear whether the respondents who were involved in conservation activities before Miyako's death were active before the Tsushima leopard cat was bred in the target zoo. It is possible that there is a high affinity between people involved in conservation activities and information dissemination at the zoo.

The presence or absence of conservation behaviour among the respondents was significantly related to two items. The first item is the frequency of social media browsing. Viewers who browsed extensively on Miyako's information dissemination were more involved in conservation activities. On the other hand, there was no significant relationship with the frequency of zoo visits, in contrast to that revealed in Okabe and Matsunaga (2021). One possible reason for this may be the difference in the target respondents of the surveys. The survey target in the previous study (Okabe and Matsunaga 2021) was a group of zoo visitors who were interested in the target animals and participated in the memorial lecture. The current study included participants from other programmes. Pro-
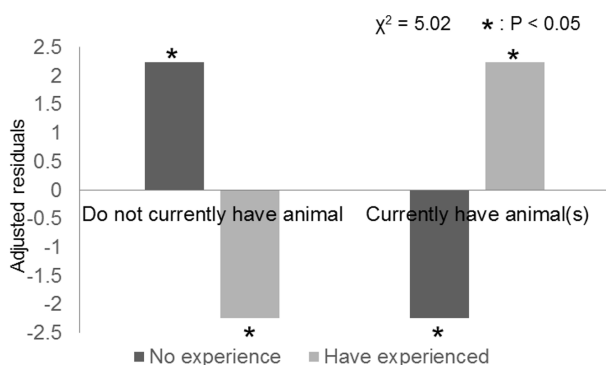
Figure 3. Relationship between current animal ownership and self-reported experience of conservation activities for the Tsushima leopard cat as a result of the elderly Tsushima leopard cat exhibition
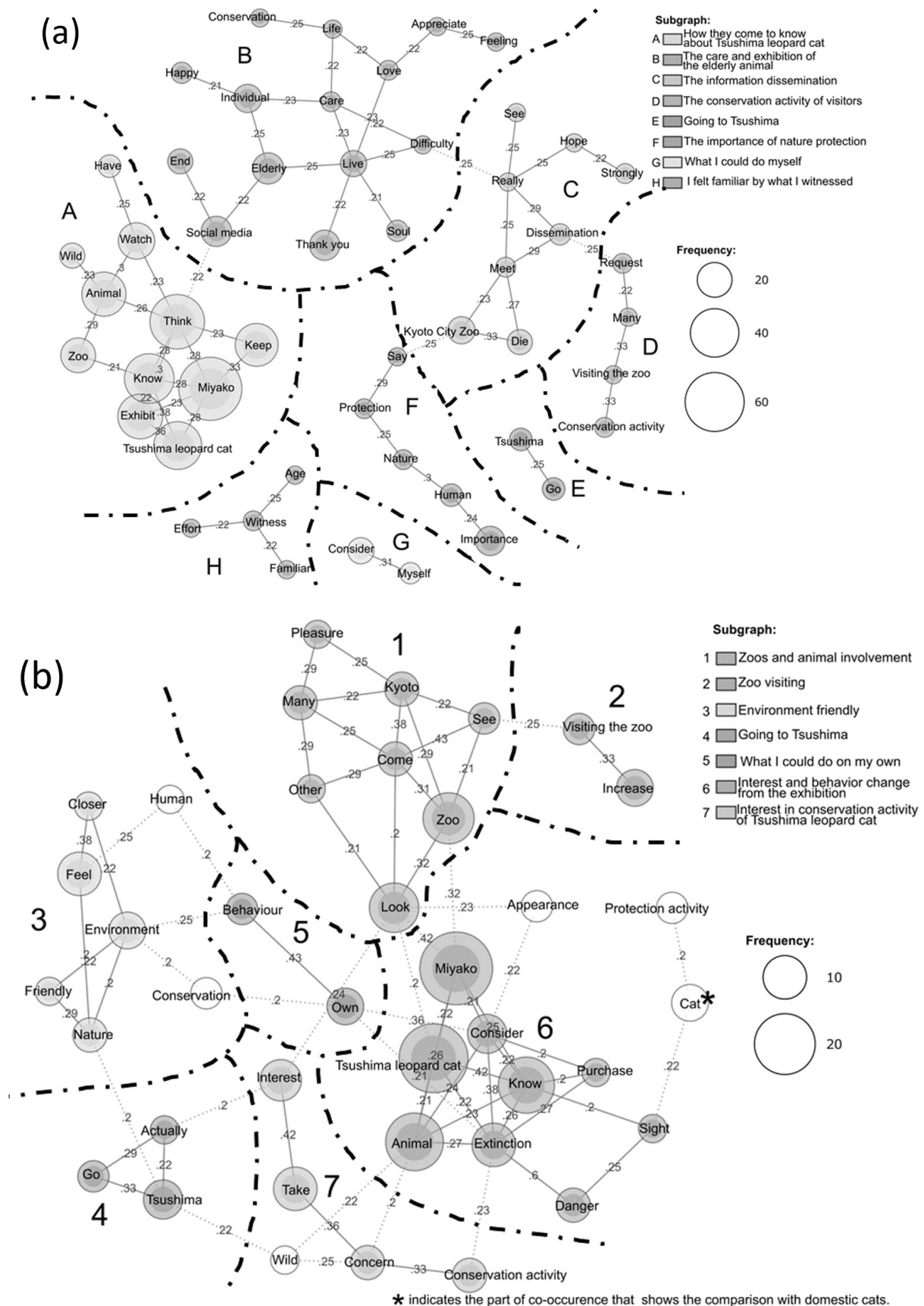
Figure 4. Co-occurrence network based on responses to the open-ended questions (a) "How did Miyako's exhibition make you feel?" and (b) "What lifestyle changes, other than conservation activities, have you made as a result of Miyako's exhibition?"
Words with a high percentage of occurrences in the same sentence at the same time are connected by a line, and words with a relatively high percentage of occurrences are grouped together. The strength of co-occurrence (the percentage of words that simultaneously appear in the same sentence) is indicated by Jaccard's coefficient, which is indicated as a number on the line. Words in the same group are connected by solid lines, and words not in the same group but showing co-occurrence are connected by dashed lines. The thick dashed black lines indicate divisions between groups of words that frequently co-occur and were drawn by the authors to ease interpretation. All of these groups were mechanically classified by KH Coder software.

conservation behaviour among zoo visitors has been found to be linked to animals with which visitors feel a personal connection (Skibins and Powell 2013). Therefore, it was considered that there was no association between pro-conservation behaviour towards Tsushima leopard cats and the frequency of zoo visits in this study. Social media viewers were more likely to be female and more likely to be aged 50–59 (also tending to 40–49). This bias may be similar to Okabe and Matsunaga (2021). Initially, the content disseminated on social media in this study focused on the target animal's elderly care. Hence, viewers may have been a skewed group with an interest in information dissemination on the Tsushima leopard cat. Regarding this comparison of social media viewers and zoo visitors, Rose et al. (2018) discussed that posting specific themes on social media can further emphasise messages, increase audience understanding and more effectively lead zoo visitors to take positive actions for conservation. The current study may support this conjecture. There is an assumption that social media use might be effective in calling for conservation activities for specific animals after a personal connection has been formed previously between the visitor and the animal.

Presence or absence of conservation behaviour was also linked to animal husbandry status, where respondents who currently kept animals such as pets were significantly more likely to engage in conservation behaviours. This indicates pro-conservation behaviours among pet owners, which was also considered by Okabe and Matsunaga (2021). Although the animal species kept by respondents is unknown, the lifestyle description change included a description (n=6) that was associated with domestic cats *Felis silvestris catus*, suggesting that respondents who preferred felines may have been more active in conservation activities. Notably, in this study, social media viewers and animal husbandry status were not significantly related to zoo visit frequency. Therefore, it was considered unlikely that a bias in zoo visit frequency could have influenced this result.

In the co-occurrence network based on the free description of "How did you feel when you saw the Miyako exhibit?", in addition to the way of dealing with elderly animals (Group B) and the dissemination of information related to this (Group C), descriptions of what led respondents to learn about the Tsushima cat (Group A) and descriptions of nature protection and conservation activities (Groups D, E and F) were also observed. In comparison to Okabe and Matsunaga (2021), regarding attitudes toward the elderly animal, descriptions of end-of-life care and living arrangements were found, suggesting visitors had formed personal connections with the animal. In addition to the formation of personal connections with the animals, this study found that awareness of Tsushima leopard cat conservation was increasing. In particular, the recognition of endangered species, such as those found in Group A, was considered to have the same effect as in Fukano et al. (2021).

In the co-occurrence network based on the free description of "What lifestyle changes, other than conservation activities for the Tsushima leopard cat, have you made as a result of Miyako's exhibition?" descriptions of active involvement with zoos and animals (Groups 1 and 2), descriptions related to environmental conservation and other endangered species such as "starting an eco-friendly lifestyle", "going to Tsushima", "buying something related to animals" (Groups 3, 4 and 6) and descriptions of increased interest in environmental conservation and endangered species (Groups 6, 7; not included in specific actions) were included. The results for Groups 1, 2, 6 and 7 showed similarity to those of Okabe and Matsunaga (2021), but the results for Groups 3, 4 and 6 specifically described behaviours related to environmental conservation, not just the Tsushima leopard cat, and these were different to those of the previous study.

This study was conducted based on self-reporting by zoo visitors, and it remains unclear whether actual behavioural changes occurred. Therefore, it is necessary to design more experiments to show clear evidence of behavioural change. However, the attitudes of respondents were different from the results obtained by Okabe and Matsunaga (2021) and message dissemination regarding the elderly animal might have influenced visitors' views on the conservation of endangered species.

Conclusion

The elderly leopard cat exhibition conveying conservation messages may have provided an opportunity for social media viewers, who could be considered a segment of zoo enthusiasts, to form a connection with the target animals, thus encouraging interest in taking conservation actions. This study shows that pet owners significantly participated in conservation activities, which may be associated with animal similarity. These results are considered an important factor in considering effective strategies for conservation education and information dissemination related to endangered species in Japanese zoos.

Acknowledgments

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