

Engaging Urban Residents in Primate Conservation: Impact of a Conservation Education Intervention in Hong Kong

Michael Ka Yiu Hui¹ and Kim-Pong Tam²

¹*Kadoorie Conservation China, Kadoorie Farm and Botanic Garden, Tai Po, New Territories, Hong Kong*

²*Division of Social Science, The Hong Kong University of Science and Technology, Clear Water Bay, Kowloon, Hong Kong*

Abstract: The global market for forest-risk commodities has become the major driver of deforestation across the tropics, threatening the survival of many forest-dependent primates. To combat deforestation and extinction, conservation interventions should include both supply- and demand-side measures, targeting the commodity producers and consumers respectively. We evaluated the impact of an open-air exhibition, 'The Gibbon's Life in the Treetops', which was held on a prime shopping street in Hong Kong. The aim of the exhibition was to raise public awareness of the plight of gibbons and encourage consumers to switch to palm-oil-free and forest-friendly certified products. Visitors who were about to enter the exhibition (pre-visit group) and visitors who had just left the exhibition (post-visit group) were intercepted and invited to complete a questionnaire regarding their knowledge of gibbons, knowledge of forest-friendly purchasing, awareness of the impacts of human behavior on forests, efficacy belief (an individual's confidence in his/her ability to contribute to forest conservation), moral obligation (an individual's sense of moral responsibility to protect forests) and their behavioral intention to purchase forest-friendly products (N = 105). The results revealed that their knowledge of gibbons and of forest-friendly purchasing were significantly higher ($p < 0.05$) in the post-visit group than in the pre-visit group, while the remaining variables did not show any significant difference. Specifically, we did not observe a distinctly higher intention to buy palm-oil-free and forest-friendly certified products in the coming months among participants in the post-visit group. Our findings further contribute to the literature suggesting knowledge enhancement alone does not necessarily prompt behavior change. Conservation scientists and educators should also consider psychological and contextual factors when designing behavior-change interventions. We suggest that the exhibition interpreters should deliver information tailored to the visitors' needs and provide post-visit action resources to extend the visitors' experience and repeat their exposure to the campaign.

Keywords: Behavior change, green purchasing, impact evaluation, outreach, pro-environmental behavior, sustainable consumption

Introduction

Global demand for forest-risk commodities, such as beef, palm oil, soy and wood fiber, continues to soar, and has become the major driver of deforestation across Southeast Asia and Latin America (Curtis *et al.* 2018). Such extensive conversion of forests to agricultural land has led to significant declines in biodiversity, affecting many forest-dependent primates such as orangutans and gibbons (Zhang *et al.* 2010; Rainer *et al.* 2015; Meijaard *et al.* 2020). Estrada *et al.* (2019) found that 95% of the forest-risk commodity exports from primate-rich countries were purchased by a few major importers, suggesting disproportional, unsustainable over-consumption in some countries. In a business-as-usual scenario, significantly more primate species in these

habitat countries will be threatened with extinction (Estrada *et al.* 2019). To combat deforestation and the consequent extinction crisis, conservation interventions should include both supply and demand-side measures, targeting the commodity producers and consumers respectively (Lenzen *et al.* 2012; Estrada *et al.* 2019). Unfortunately, many primate-conservation-education interventions nowadays target primarily local communities in the habitat countries (Lanjouw 2021; Bezanson *et al.* 2023).

Changing consumer behavior

Ensuring sustainable consumption and production patterns is one of the 17 Sustainable Development Goals (Goal 12) of the 2030 Agenda for Sustainable Development set by the United Nations (Convention on Biological Diversity

2016). The idea of shifting human behavior towards sustainability is certainly not new to conservation scientists and educators, but in recent years there has been growing interest among zoological and botanical institutions in promoting sustainable consumer behaviors (e.g., Kemmerly and Macfarlane 2009; Dunstan 2014; Wright *et al.* 2015; Mann *et al.* 2018; Zelenika *et al.* 2018; Kelly and Skibins 2020; Miller *et al.* 2020; Major and Smith 2022). Zoos Victoria, for example, has launched the “Don’t Palm Us Off” campaign, which calls for public support for the mandatory labeling of palm oil and reduction of the use of unsustainably sourced palm oil in order to save habitat for wild orangutans (Pearson *et al.* 2014). Ramkisson and Smith (2014) reported on the “Wipe for Wildlife” campaign which encourages visitors to switch to 100% recycled toilet paper. Most such campaigns, however, have been on-site interventions targeting visitors who are arguably more concerned about environmental issues compared to the general public (Adelman *et al.* 2000; Dierking *et al.* 2004; Kelly *et al.* 2014), are intrinsically motivated to learn during their visit (Roe and McConney 2015; Ballantyne and Packer 2016), and expect and enjoy being informed about what they can do to help conservation (Smith *et al.* 2012; Meyer *et al.* 2015). It is understandable that zoological and botanical institutions may give little priority to engaging people that do not visit their botanic gardens or zoos but these excluded audiences should also be targeted for enhancing conservation success.

“The Gibbon’s Life in the Treetops” Exhibition

Gibbons, among our closest relatives, are endemic to South and Southeast Asia. All 20 species are threatened (IUCN 2023), with habitat loss being the major driver (Geissmann 2007; Fan and Bartlett 2017). To promote public awareness of the plight of gibbons and encourage wiser consumer choices in order to save their habitats, Kadoorie Farm and Botanic Garden (KFBG) curated the open-air exhibition “The Gibbon’s Life in the Treetops” on a prime shopping street in Wan Chai, Hong Kong from 16 to 24 October 2021. The exhibition was divided into three zones: the first focused on the ecology of gibbons; the second presented two case studies of endangered gibbons in China—the Gaoligong hoolock gibbon *Hoolock tianxing* and Hainan gibbon *Nomascus hainanus*—to explain the threats faced by the gibbons; and the third zone showed how consumer behavior leads to forest destruction, and invited visitors to pledge support for forest-friendly products that are palm-oil free or certified by the Forest Stewardship Council (FSC) or Rainforest Alliance (RA).

The venue was surrounded by commercial and residential buildings; for this reason, exhibition visitors were mostly white-collar workers on the weekdays and families during the weekends. Previous surveys have shown that although local consumers are willing to purchase sustainable products, lacking related information creates a major barrier to actual purchases (Consumer Council 2016, 2021;



Figure 1. Setting of the “The Gibbon’s Life in the Treetops” exhibition. Photograph by Tsz Kin Au, Kadoorie Farm and Botanic Garden.

Council for Sustainable Development 2017). In view of this, we explicitly suggested a few categories of products (tissue paper, toilet rolls, tea, coffee, and chocolate) that may bear the FSC and RA logos when inviting visitors to pledge to purchase forest-friendly products in the future. Since certified sustainable palm oil products are uncommon in Hong Kong based on our observations, we instead encouraged visitors to switch to palm-oil free biscuits, shampoo, lipsticks and detergent. Gibbon postcards made of FSC-certified paper were offered to visitors as gifts when they made a pledge; this would demonstrate how such logos are presented on the product and remind them of their commitment. There were four to seven interpreters during the entire opening hours of the exhibition (12:00–19:00) to engage with visitors; all had received a short training from the staff of KFBG and FSC Asia Pacific Regional Office in guiding visitors through the exhibition and explaining the certification schemes. A variety of elements were also incorporated into the exhibition to cater to visitors of different learning types and age groups, including text, graphic, sound, video, augmented reality selfie filter for social media, interactive installation, hands-on workshops and traditional artwork.

In this study, we explore the impact of this exhibition by comparing the visitors' knowledge, attitudes and behavioral intention between the pre-visit group and the post-visit group.

Methods

Visitors were intercepted and invited to complete a questionnaire via a tablet. There were two interception points: one at the starting point of the exhibition and the other at the exit point, representing the pre-visit group and post-visit group, respectively. Every fifth person encountered was approached but only those above 18 years old were invited to participate in the study. Informed consent was obtained from all participants. The protocol of the study was reviewed and approved by the Human and Artefacts Research Ethics Committee of the Hong Kong University of Science and Technology (Protocol no.: HREP-2021-0215).

The questionnaire contained 16 questions in the following sections: three sets of questions regarding knowledge (about gibbons, forest-friendly purchasing, and awareness of the problem); two sets of questions regarding attitude (efficacy belief and moral obligation); one set of questions regarding behavioral intention (see Appendix). Background and demographic information of participants were collected at the end. The questionnaire comprised 23 questions in all and took around 10 minutes to complete.

Knowledge of gibbons (Questions 1–5)

We assessed the interviewees' knowledge of gibbons with five questions. Participants were asked to identify the



Figure 2. A participant printing the slogan on the tote bag in a hands-on workshop. The bag can act as a prompt to remind them of their pledge when purchasing. Photograph by Tsz Kin Au, Kadoorie Farm and Botanic Garden.



Figure 3. The gibbon postcards made of FSC-certified paper.

appearance, conservation status, distribution, behavior and habitat of the gibbons. A 5-point knowledge score was created, with one point awarded for each correct response. The score ranged from 0 to 5.

Awareness of the Problem (Questions 6–7)

Two questions were used to test the visitors’ awareness of the impacts of human behavior on forests. The first focused on the participants’ awareness of palm-oil production as the major threat to the rainforest, and the second one asked whether participants knew that paper is locally the second largest constituent of municipal solid waste. Responses were coded as either No (0) or Yes (1).

Knowledge of forest-friendly purchasing (Questions 8–9)

Two questions were used to assess the visitors’ knowledge of purchasing products that are forest-friendly. The first asked visitors to choose among an array of 10 labels the ones that certify forest-friendly products. Four of the 10 labels were correct answers, namely FSC, RA, Programme for the Endorsement of Forest Certification (PEFC) and Roundtable on Sustainable Palm Oil (RSPO). One point was awarded for each correct answer; the total score for each participant ranged from 0 to 4. Incorrect answers were also counted; the score ranged from 0 to 6.

The second question asked participants to indicate which products may contain palm oil. Six products were

listed: shampoo, lipstick, detergent, chocolate, nail polish, and bread—all of them may contain palm oil. One point was awarded for each product selected, the full score ranged from 0 to 6. There was also an option of “None of the above,” which no participant selected.

Efficacy belief (Questions 10–11)

Efficacy belief, in this case, refers to an individual’s confidence in his/her ability to contribute to forest conservation. Two items were used to measure it: “I can save the forests on Earth” and “I think I can protect the forest by means of my personal forest-friendly purchasing behavior”. Participants responded on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree).

Moral obligation (Questions 12–13)

Moral obligation, in this case, refers to an individual’s own sense of moral responsibility to protect forests. Again, participants indicated their agreement with two statements on a 5-point Likert scale: “I feel morally obliged to buy certified forest-friendly products” and “I would feel guilty if I bought products containing palm oil.”

Behavioral Intention (Questions 14–16)

Three items were used to assess participants’ intention to purchase forest-friendly products (palm-oil-free products, forest-friendly tissue paper/toilet rolls, and sustainably sourced agricultural products) in the coming months. Participants gave their answers on a 5-point Likert scale.

Data analysis

We analyzed the data collected using IBM SPSS Statistics 24. A series of independent sample t-tests were conducted to compare the pre-visit and post-visit groups on the various outcome variables. A chi-square test was performed to determine the significant differences of categorical data. Cronbach’s α was used to assess the internal reliability of the attitude and behavioral intention questions.

Results

One hundred and forty exhibition visitors participated in the survey, of which 105 were retained for analysis after data cleaning—52 in the pre-visit group and 53 in the post-visit group. Most of the participants were aged between 18 and 39 (58.8%), followed by 40–49 (20.6%), 50–59 (10.8%) and over 60 (9.8%). Seventy-three percent of the participants identified themselves as female, and 27% as male.

Knowledge

As shown in Table 1, the mean score for knowledge of gibbons was significantly higher for the post-visit group ($M = 4.40$, $SD = 0.82$), than for the pre-visit group ($M = 3.29$, $SD = 1.21$), $t = -5.488$, $p < 0.001$, $d = -1.075$.

The post-visit group also showed greater knowledge of the forest-friendly certification labels. The mean score

Table 1. Knowledge of gibbons and forest-friendly purchasing in the pre-visit and post-visit groups.

		Mean (SD)	t	p	Cohen’s d
Knowledge of gibbons (Range 0–5)	Pre-visit	3.29 (1.21)	-5.488	<0.001	-1.075
	Post-visit	4.40 (0.82)			
Knowledge of forest-friendly purchasing - 1 (Range 0–4)	Pre-visit	1.46 (1.11)	-2.528	0.013	-0.501
	Post-visit	1.96 (0.86)			
Knowledge of forest-friendly purchasing - 2 (Range 0–6)	Pre-visit	3.21 (1.61)	-3.202	0.002	-0.625
	Post-visit	4.17 (1.45)			

of correct answers for the post-visit group was 1.96 ($SD = 0.86$), significantly higher than the pre-visit group ($M = 1.46$, $SD = 1.11$), $t = -2.528$, $p = 0.013$, $d = -0.501$; the mean score of incorrect answers for the post-visit group was 0.13 ($SD = 0.44$), significantly lower than the pre-visit group ($M = 0.86$, $SD = 1.16$), $t = 4.137$, $p = <0.001$, $d = 0.832$.

The second question regarding the knowledge of forest-friendly purchasing asked participants to indicate which products may contain palm oil. The mean scores were 3.21 ($SD = 1.61$) for the pre-visit group and 4.17 ($SD = 1.45$) for the post-visit group. The difference between the two groups was statistically significant ($t = -3.202$, $p = 0.002$, $d = -0.625$).

As for awareness of the problem, there were no significant differences between the pre-visit and post-visit groups for both questions ($p = 0.129$ and 0.081), although the correct answer rate was always higher among the post-visit group (Table 2). Interestingly, the participants’ understanding of the threat of palm oil was fairly high, with 82.6% answering correctly even before their visit to the exhibition and reached 92.4% in the post-visit group.

Attitude

Two items were used to measure the visitor’s confidence in his/her ability to contribute to forest conservation (efficacy belief) and another two items for the sense of moral obligation to do so. Both measures had satisfactory scale-reliability (Cronbach’s $\alpha = 0.808$ and 0.627 , respectively). Thus, the mean score between the items was calculated for each measure. The mean efficacy belief score for the post-visit group was 4.11 ($SD = 0.75$) and did not differ from that of the pre-visit group, 4.06 ($SD = 0.69$), $t = -0.327$, p

Table 2. Awareness of the impacts of human behavior on forests in the pre-visit and post-visit groups.

		Yes	No	p
Awareness of the problem - 1	Pre-visit	82.6% (43)	17.3% (9)	0.129
	Post-visit	92.4% (49)	7.54% (4)	
Awareness of the problem - 2	Pre-visit	28.3% (15)	71.1% (37)	0.081
	Post-visit	45.2% (24)	55.7% (29)	

= 0.744, $d = -0.064$. The mean moral obligation scores for pre- and post-visit groups were 3.79 (SD = 0.59) and 3.88 (SD = 0.78), also not significantly different ($t = -0.659$, $d = -0.129$, $p = 0.511$).

Behavioral Intention

The mean of the three items in the final three questions—intention to buy palm-oil free products, forest-friendly tissue paper and toilet rolls, and sustainably sourced agricultural products—was used for subsequent analysis (Cronbach's $\alpha = 0.846$). As Table 3 shows, the mean behavioral intention score for the pre-visit group was 3.95 (SD = 0.56) and 3.97 (SD = 0.72) for the post-visit group. There was no significant difference between the two groups ($t = -0.207$, $d = -0.040$, $p = 0.837$).

Table 3. Efficacy belief, moral obligation and behavioral intention in the pre-visit and post-visit groups.

		Mean (SD)	t	p	Cohen's d
Efficacy Belief (Range 1–5)	Pre-visit	4.06 (0.69)	-0.327	0.744	-0.064
	Post-visit	4.11 (0.75)			
Moral Obligation (Range 1–5)	Pre-visit	3.78 (0.59)	-0.659	0.511	-0.129
	Post-visit	3.87 (0.78)			
Behavioral Intention (Range 1–5)	Pre-visit	3.95 (0.56)	-0.207	0.837	-0.040
	Post-visit	3.97 (0.72)			

Discussion

The findings suggested that our exhibition increased the visitor's knowledge of gibbons and forest-friendly purchasing, but it had a limited effect on changing attitudes and their behavior.

Basic knowledge of the species is one of the factors influencing people to protect it (Wilson and Tisdell 2005; Jaunky *et al.* 2021), and action-related knowledge is needed for the appropriate conservation behavior to take place (Tanner and Kast 2003; Frick *et al.* 2004). The present study further contributes to the literature by suggesting that knowledge enhancement alone does not necessarily prompt behavior change. Environmental and conservation psychology research has demonstrated that many other psychological and contextual factors such as values (e.g., Chan 2020), beliefs (e.g., Chan and Tam 2021), moral engagement (e.g., Leviston and Walker 2021), relationship with nature (e.g., Tam 2013, 2022), markets and costs (e.g., Steg and Vlek 2009), and culture (e.g., Tam and Chan 2017; Tam and Milfont 2020; Tam *et al.* 2021) also matter when it comes to changing environmental attitudes and behavior. More information about how and where to find forest-friendly products, for example, may be necessary for the messaging in this exhibition (see Kemmerly and Macfarlane 2009; Williams *et al.* 2021; Sundaraja *et al.* 2021, 2023).

Prior studies provided examples of campaigns that have successfully motivated zoo visitors to adopt forest-friendly purchasing behavior (e.g., Dunstan 2014; Pearson *et al.* 2014; Ramkissoon and Smith 2014; Kelly and Skibins 2020; Major and Smith 2022). In contrast, our findings are less encouraging than those from zoo-based campaigns. We argue that our findings highlight the difficulty and complexity of changing the behaviors of the general public. To design impactful conservation education interventions, conservation scientists and educators may draw on the principles and research of psychology (Clayton and Myers 2009). For example, based on the Stage Model of Self-Regulated Behavioral Change proposed by Bamberg (2013b), behavior change occurs in four stages, namely pre-decision, pre-action, action and post-action. Stage progression is marked by crossing the threshold of different intentions which is determined by various stage-specific factors. Research indicated that interventions providing stage-tailored information are more successful in leading to stage progression for the targeted behavior (Bamberg 2013a; Klöckner and Ofstad 2017). Yet this model has not been applied in an exhibition setting. In our case, interpreters can be trained to quickly assess which stage the visitors belong to using a pre-designed script and then deliver tailored information or guide the visitors to suitable parts of the exhibition that match their needs. Since their visit is one-off and fleeting, post-visit action resources can be provided to extend the visitors' experience and repeat their exposure to the campaign (Ballantyne and Packer 2011; Hughes *et al.* 2011; Wheaton *et al.* 2016; Fernández-Llamazares *et al.* 2020). They include such as a kit with fact sheets providing additional information and a list of forest-friendly products that can be easily found locally, a monthly e-mail to remind participants of their pledge to purchase forest-friendly products with updates about gibbon conservation and follow-up activities, and/or access to virtual communities with conservation-minded people who also made the pledge.

We support the notion that zoological and botanical institutions should reach out to a broader range of audiences and engage non-visitors (see Vergou and Willison 2016; Thomas 2020). Recent examples include: the Zoological Society of London launched the 'Project Ocean' sustainable seafood campaign together with Selfridges, a chain of high-end department stores in the UK (Wright *et al.* 2015); and the Monterey Bay Aquarium created a 'Seafood Watch' guide, and has also been working with retailers, distributors and food service companies to help shape the sustainable seafood movement at regional, national and international levels (Kemmerly and Macfarlane 2009; Spring 2018).

Finally, our participants were generally on the positive side of the scales of all pre-visit psychological measures, with the mean scores around 4 on a 5-point scale, indicating a potential ceiling effect. Considering the small sample size in the present study and the above limitation, further research is needed to investigate the impact of similar behavior change campaigns, and it is important to report the

experiences of both successes and failures (Catalano *et al.* 2019; Webber *et al.* 2022). Follow-up assessment should also be considered to examine the lasting impact of intervention and the longer-term reflections of the visitors as some impacts may take time to manifest (Ardoin *et al.* 2015).

Acknowledgments

We gratefully acknowledge the comments of Michelle H. G. Wong and the assistance in data preprocessing and analysis by Hiu Laam Lau. We thank all volunteers and supporting organizations for their contributions to the exhibition. Two anonymous reviewers provided helpful comments that greatly improved the manuscript.

Literature Cited

- Adelman, L. M., J. H. Falk and S. James. 2000. Impact of National Aquarium in Baltimore on visitors' conservation attitudes, behavior, and knowledge. *Curator* 43(1): 33–61.
- Ardoin, N. M., K. Biedenweg and K. O'Connor. 2015. Evaluation in residential environmental education: an applied literature review of intermediary outcomes. *Appl. Environ. Educ. Commun.* 14(1): 43–56.
- Ballantyne, R. and J. Packer. 2011. Using tourism free-choice learning experiences to promote environmentally sustainable behaviour: the role of post-visit 'action resources.' *Environ. Educ. Res.* 17(2): 201–215.
- Ballantyne, R. and J. Packer. 2016. Visitors' perceptions of the conservation education role of zoos and aquariums: implications for the provision of learning experiences. *Visit. Stud.* 19(2): 193–210.
- Bamberg, S. 2013a. Applying the stage model of self-regulated behavioral change in a car use reduction intervention. *J. Environ. Psychol.* 33: 68–75.
- Bamberg, S. 2013b. Changing environmentally harmful behaviors: a stage model of self-regulated behavioral change. *J. Environ. Psychol.* 34: 151–159.
- Bezanson, M., M. Franquesa-Soler, M. Kowalewski, A. McNamara, R. Oktaviani and M. A. Rodrigues. 2023. Best practices are never best: evaluating primate conservation education programs (PCEPs) with a decolonial perspective. *Am. J. Primatol.* 85(5): e23424.
- Catalano, A. S., J. Lyons-White, M. M. Mills and A. T. Knight. 2019. Learning from published project failures in conservation. *Biol. Conserv.* 238: 108223.
- Chan, H. W. 2020. When do values promote pro-environmental behaviors? multilevel evidence on the self-expression hypothesis. *J. Environ. Psychol.* 71: 101361.
- Chan, H. W. and K. P. Tam. 2021. Do people's assumptions about the social world matter? The effects of social axioms on environmental attitude and efficacy beliefs. *J. Environ. Psychol.* 75: 101598.
- Clayton, S. and G. Myers. 2009. *Conservation Psychology: Understanding and Promoting Human Care for Nature*. Wiley-Blackwell, Oxford, UK.
- Consumer Council. 2016. Sustainable Consumption for a Better Future—A Study on Consumer Behaviour and Business Reporting. Consumer Council, Hong Kong.
- Consumer Council. 2021. Embracing Sustainable Consumption for a Happy Life. Consumer Council, Hong Kong.
- Convention on Biological Diversity. 2016. Biodiversity and the 2030 Agenda for Sustainable Development: Technical Note. Secretariat of the Convention on Biological Diversity, Montreal.
- Council for Sustainable Development. 2017. Report on the Public Engagement on Promotion of Sustainable Consumption of Biological Resources. Council for Sustainable Development, Hong Kong.
- Curtis, P. G., C. M. Slay and N. L. Harris, A. Tyukavina and M. C. Hansen. 2018. Classifying drivers of global forest loss. *Science* 361(6407): 1108–1111.
- Dierking, L. D., L. M. Adelman, J. Ogden, K. Lehnhardt, L. Miller and J. D. Mellen. 2004. Impact of visits to Disney's Animal Kingdom: a study investigating intended conservation action. *Curator* 47(3): 322–343.
- Dunstan, E. 2014. How can a secret forest save possums? *Int. Zoo Educ. Assoc. J.* 50: 31–34.
- Estrada, A., P. A. Garber and A. Chaudhary. 2019. Expanding global commodities trade and consumption place the world's primates at risk of extinction. *PeerJ* 7: e7068.
- Fan, P. and T. Q. Bartlett. 2017. Overlooked small apes need more attention! *Am. J. Primatol.* 79(6): e22658.
- Fernández-Llamazares, Á., S. Fraixedas, A. Brias-Guinart, A. and J. Terraube. 2020. Principles for including conservation messaging in wildlife-based tourism. *People Nat.* 2(3): 596–607.
- Frick, J., F. G. Kaiser and M. Wilson. 2004. Environmental knowledge and conservation behavior: exploring prevalence and structure in a representative sample. *Pers. Individ. Differ.* 37(9): 1597–1613.
- Geissmann, T. 2007. Status reassessment of the gibbons: results of the Asian Primate Red List Workshop 2006. *Gibbon J.* 3: 5–15.
- Hughes, K., J. Packer and R. Ballantyne. 2011. Using post-visit action resources to support family conservation learning following a wildlife tourism experience. *Environ. Educ. Res.* 17(3): 307–328.
- IUCN. 2023. The IUCN Red List of Threatened Species. Version 2022-2. Website: <<https://www.iucnredlist.org>>. Accessed 10 June 2023.
- Jaunky, V. C., J. Jeetoo and J. M. Thomas. 2021. Willingness to pay for the conservation of the Mauritian flying fox. *Glob. Ecol. Conserv.* 26: e01504.
- Kelly, A. and J. C. Skibins. 2020. Inspiring wildlife conservation behaviors through innovations in zoo exhibit design. *Visit. Stud.* 24(1): 79–99.
- Kelly, L. A. D., J. F. Luebke, S. Clayton, C. D. Saunders, J. Matiassek and A. Grajal. 2014. Climate change attitudes

- of zoo and aquarium visitors: implications for climate literacy education. *J. Geosci. Educ.* 62(3): 502–510.
- Kemmerly, J. D. and V. Macfarlane. 2009. The elements of a consumer-based initiative in contributing to positive environmental change: Monterey Bay Aquarium's Seafood Watch Program. *Zoo Biol.* 28(5): 398–411.
- Klöckner, C. A. and S. P. Ofstad. 2017. Tailored information helps people progress towards reducing their beef consumption. *J. Environ. Psychol.* 50: 24–36.
- Lanjouw, A. 2021. De-colonizing conservation in a global world. *Am. J. Primatol.* 83(4): e23258.
- Lenzen, M., D. Moran, K. Kanemoto, B. Foran, L. Lobe-faro and A. Geschke. 2012. International trade drives biodiversity threats in developing nations. *Nature* 486: 109–112.
- Leviston, Z. and I. Walker. 2021. The influence of moral disengagement on responses to climate change. *Asian J. Soc. Psychol.* 24(2): 144–155.
- Major, K. and D. Smith. 2022. Measuring the effectiveness of using rangers to deliver a behavior change campaign on sustainable palm oil in a UK zoo. *Zoo Biol.* 42(1): 55–66.
- Mann, J. B., R. Ballantyne and J. Packer. 2018. Penguin Promises: encouraging aquarium visitors to take conservation action. *Environ. Educ. Res.* 24(6): 859–874.
- Meijaard, E. et al. 2020. The environmental impacts of palm oil in context. *Nat. Plants* 6: 1418–1426.
- Meyer, D., A. Isakower and B. Mott. 2015. An Ocean of Opportunities: Inspiring Visitors and Advancing Conservation. The Ocean Project, Providence, RI.
- Miller, H., C. Bailey and P. Smith. 2020. BGCI Technical Review: The Role of Botanical Gardens in Practicing and Promoting Environmental Sustainability. Botanic Gardens Conservation International, Surrey, UK.
- Pearson, E. L., R. Lowry, J. Dorrian and C. A. Litchfield. 2014. Evaluating the conservation impact of an innovative zoo-based educational campaign: “Don't Palm Us Off” for orang-utan conservation. *Zoo Biol.* 33(3): 184–196.
- Rainer, H., A. White, and A. Lanjouw. 2015. *State of the Apes: Industrial Agriculture and Ape Conservation*. Cambridge University Press, Cambridge, UK.
- Ramkisson, H. R. and L. Smith. 2014. Evaluating the Effectiveness of Wipe for Wildlife and Its Campaign Elements. BehaviourWorks, Melbourne.
- Roe, K. and A. McConney. 2015. Do zoo visitors come to learn? An internationally comparative, mixed-methods study. *Environ. Educ. Res.* 21(6): 865–884.
- Smith, L. D. G., J. Curtis, J. Mair and P. A. van Dijk. 2012. Requests for zoo visitors to undertake pro-wildlife behaviour: how many is too many? *Tour. Manag.* 33(6): 1502–1510.
- Spring, M. 2018. Lessons from thirty-one years at the Monterey Bay Aquarium and reflections on aquariums' expanding role in conservation action. In: *The Ark and Beyond: The Evolution of Zoo and Aquarium Conservation*, B. A. Minter, J. Maienschein and J. P. Collins (eds.), pp.156–168. University of Chicago Press, Chicago, IL.
- Steg, L. and C. Vlek. 2009. Encouraging pro-environmental behaviour: an integrative review and research agenda. *J. Environ. Psychol.* 29: 309–317.
- Sundaraja, C. S., D. W. Hine and A. D. Lykins. 2021. Palm oil: understanding barriers to sustainable consumption. *PLoS One* 16(8): e0254897.
- Sundaraja, C. S., D. W. Hine, E. B. Thorsteinsson and A. D. Lykins. 2023. Purchasing products with sustainable palm oil: designing and evaluating an online intervention for Australian consumers. *Aust. J. Environ. Educ.* 39(2): 213–230.
- Tam, K. P. 2013. Concepts and measures related to connection to nature: similarities and differences. *J. Environ. Psychol.* 34: 64–78.
- Tam, K. P. 2022. Gratitude to nature: presenting a theory of its conceptualization, measurement, and effects on pro-environmental behavior. *J. Environ. Psychol.* 79: 101754.
- Tam, K. P., A. K. Y., Leung and S. Clayton. 2021. Research on climate change in social psychology publications: a systematic review. *Asian J. Soc. Psychol.* 24(2): 117–143.
- Tam, K. P. and H. W. Chan. 2017. Environmental concern has a weaker association with pro-environmental behavior in some societies than others: a cross-cultural psychology perspective. *J. Environ. Psychol.* 53: 213–223.
- Tam, K. P. and T. L. Milfont. 2020. Towards cross-cultural environmental psychology: a state-of-the-art review and recommendations. *J. Environ. Psychol.* 71: 101474.
- Tanner, C. and S. W. Kast. 2003. Promoting sustainable consumption: determinants of green purchases by Swiss consumers. *Psychol. Mark.* 20(10): 883–902.
- Thomas, S. 2020. Social Change for Conservation: The World Zoo and Aquarium Conservation Education Strategy. WAZA Executive Office, Barcelona.
- Vergou, A. and J. Willison. 2016. Relating social inclusion and environmental issues in botanic gardens. *Environ. Educ. Res.* 22(1): 21–42.
- Webber, A. D., S. Cotton and G. M. McCabe. 2022. Failure is the greatest teacher: embracing the positives of failure in primate conservation. *Int. J. Primatol.* 43: 1095–1109.
- Wheaton, M., N. M. Ardoin, C. Hunt, J. S. Schuh, M. Kresse, C. Menke and W. Durham. 2016. Using web and mobile technology to motivate pro-environmental action after a nature-based tourism experience. *J. Sustain. Tour.* 24(4): 594–615.
- Williams, A., A. A. Dayer, J. N. Hernandez-Aguilera, T. B. Phillips, H. Faulkner-Grant, M. I. Gómez, and A. D. Rodewald. 2021. Tapping birdwatchers to promote bird-friendly coffee consumption and conserve birds. *People Nat.* 3(2): 312–324.

- Wilson, C. and C. Tisdell. 2005. Knowledge of birds and willingness to support their conservation: an Australian case study. *Bird Conserv. Int.* 15: 225–235.
- Wright, A. J. *et al.* 2015. Competitive outreach in the 21st century: why we need conservation marketing. *Ocean Coast Manag.* 115: 41–48.
- Zelenika, I., T. Moreau, O. Lane and J. Zhao. 2018. Sustainability education in a botanical garden promotes environmental knowledge, attitudes and willingness to act. *Environ. Educ. Res.* 24(11): 1581–1596.
- Zhang, M., J. R. Fellowes, X. Jiang, W. Wang, B. P. L. Chan, G. Ren and J. Zhu. 2010. Degradation of tropical forest in Hainan, China, 1991–2008: conservation implications for Hainan Gibbon (*Nomascus hainanus*). *Biol. Conserv.* 143(6): 1397–1404.

Authors' addresses:

Michael Ka Yiu Hui, Kadoorie Conservation China, Kadoorie Farm and Botanic Garden, Lam Kam Road, Tai Po, New Territories, Hong Kong and **Kim-Pong Tam**, Division of Social Science, Room 2338, Academic Building, The Hong Kong University of Science and Technology, Clear Water Bay, Kowloon, Hong Kong.

Corresponding author: Michael Ka Yiu Hui
E-mail: <michaelhui@kfbg.org>

Received for publication: 10 June 2023
Revised 12 August 2023

Appendix

Questionnaire of “The Gibbon’s Life in the Treetops” Exhibition

We sincerely hope that you agree to participate in this study. Please read the following details carefully.

Purpose and Procedures

- This research project is aimed to understand the impact of “The Gibbon’s Life in the Treetops” exhibition on visitors.
- You will complete a survey online. You will answer a series of questions about the exhibition, your view of forest conservation and thoughts regarding forest-friendly actions. After that, you will also be asked to report some background information about yourself. However, please be assured that you will not be asked any question that reveals your identity.
- This study will take about 10 minutes to complete.

Potential Risks

There are no known physical or emotional risks other than those associated with usual daily activities.

Potential Benefits

There are no tangible benefits to you. Nevertheless, your participation will provide useful information about how the general public understand forest-friendly products.

Confidentiality

We will not record any information that reveals your identity. Also, your responses in this study will be kept strictly confidential and used for research purposes only.

Rights of Participants

Your participation is voluntary, implying that you can choose to withdraw any time, or to skip any question you do not want to answer. There will be no compensation if you do not complete the study.

Questions

This study is being conducted by Kadoorie Farm and Botanic Garden, in collaboration with Prof. Kim-Pong Tam, Division of Social Science, The Hong Kong University of Science and Technology. Please direct your questions to Michael Hui at michaelhui@kfbg.org or Prof. Tam at <kevintam@ust.hk>.

Declaration

By clicking “Yes” below to proceed to the next page, I indicate that 1) I fully understand the content of this form and agree to participate in this study; 2) I will not disclose the details of this study to other parties; 3) I am aged 18 or over.

Yes

1. Which of the following is a gibbon?



2. Gibbons are not endangered; there are plenty of them in the wild.

Yes No

3. Where do gibbons live?

Africa South America Asia North America
 Europe Australia

4. Gibbons love walking on the ground.
 Yes No
5. Which is the habitat of gibbons?
 Mangrove Savanah Wetland Rainforest
 Tundra
6. Which is one of the major threats to rainforest?
 Sesame oil production Olive oil production
 Palm oil production
7. In Hong Kong, 2,700 tonnes of _____ were disposed of at landfills per day, which is the second largest constituent of municipal solid waste.
 Food waste Paper Metal
8. Which label(s) certifies forest-friendly products?
-
9. Which product(s) may contain palm oil? (can select MORE THAN ONE answer).
 Shampoo Lipstick Detergent Chocolate
 Nail polish Bread None of the above
10. I can save the forests on Earth.
 strongly agree agree neutral disagree
 strongly disagree
11. I think I can protect the forest by means of my personal forest-friendly purchasing behavior.
 strongly agree agree neutral disagree
 strongly disagree
12. I feel morally obliged to buy certified forest-friendly products.
 strongly agree agree neutral disagree
 strongly disagree
13. I would feel guilty if I bought products containing palm oil.
 strongly agree agree neutral disagree
 strongly disagree
14. In the coming months, I intend to buy palm oil-free products in order to protect the forest.
 strongly agree agree neutral disagree
 strongly disagree
15. In the coming months, I intend to buy forest-friendly tissue paper and toilet rolls in order to protect the forest.
 strongly agree agree neutral disagree
 strongly disagree

16. In the coming months, I intend to buy sustainably sourced agricultural products in order to protect the forest.
 strongly agree agree neutral disagree
 strongly disagree

Background information

17. Gender:
 Male Female
18. Age:
 18–29 30–39 40–49 50–59 60+
19. Job:
 Full time job Full time student Homemaker Part-time job Unemployed
20. Monthly income:
 < 5000 5001–10000 10001–20000 20001–30000 30001–40000 40001–50000 50001+
21. Do you have any children?
 Yes No
22. Education:
 Primary or below Secondary Tertiary
23. I have environmental protection-related background (academic or career):
 Yes No

Debriefing

Thank you for participating in the survey.

- The results of the study will help us understand the impacts of the exhibition you are about to visit / you have already visited on people's views knowledge and attitude regarding gibbons and forest conservation.
- If you have any enquiries about this survey, please feel free to contact Mr. Hui (michaelhui@kfbg.org) or Prof. Tam (kevintam@ust.hk) for details.
- If you do not wish to have your information and responses used or recorded, you are free to contact the researchers above to request to have your submitted responses deleted.