

DO WE VALUE WILD ANIMALS MORE THAN TAME ONES? THE EXAMPLE OF THE SMOOTH-COATED OTTER IN SINGAPORE

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Abstract

Although a variety of urban wildlife exists worldwide, opportunities to observe it are rare, except for some species such as birds. Generally, the frequency with which aquatic animals are encountered is incredibly low. We selected the smooth-coated otter in Marina Bay, Singapore, as the object of an empirical investigation into people's preferences related to wildlife encounters in urban tourism spots. A premium for wild animals over tame ones will provide a more solid academic foundation for the argument that a policy for the conservation of wild species is important to people. We conducted questionnaires to gather data on September 22, 2017, and June 20, 2018. We applied conjoint analyses using observations provided by the respondents and found the following results. First, we compared the perceived value of wild and tame otters and discovered a 35 to 49% premium for wild ones. Second, we investigated the relationship between sighting frequency and respondents' perceived value of the otters. Our results implied that respondents bestowed high value to wild otters, as long as the sighting frequency was high enough. Third, we examined whether respondents would indeed be willing to pay to watch otters after providing cues about the existence of alternative activities, such as sightseeing, and confirming the rareness of seeing otters in an urban bay. We observed a reduced willingness to pay after giving these cues, especially for tame otters; this result may also imply that respondents prefer wild animals.

Keywords: *Lutrogale perspicillata Marina Bay, Singapore, smooth-coated otter, wild sea animals*

1. INTRODUCTION

You may agree with the statement that, generally, wild animals have more value than tame ones, such as those in zoos. For many people, this judgment may sound intuitive. However, to the best of our knowledge, there is little academic evidence that this intuition is scientifically correct. Only a few studies have examined people's preferences for wild versus tame animals, or related issues. Dutton, Hepburn, and Macdonald (2011) compared wild and farmed bear bile and found that people's willingness to pay (WTP) for wild bear bile was substantially higher than that for farmed ones. Shahwahid, Yong, and Sius (2008) compared people's experiences with wild honey harvesting to their experiences at a honey apiculture museum and revealed that museum visitors had a higher WTP for the former activity. Other studies have evaluated people's WTP for species conservation, including for otters (e.g., White et al., 1997; Loomis, 2006). Thus, scientific knowledge is still limited.

Therefore, the purpose of this study is to empirically examine this unverified judgement using economic methods called choice experiments (CEs), a type of conjoint analysis. The CEs enable us to ascertain the premium for wild animals over tame ones through eliciting respondents' WTP for encountering urban wild versus tame animals. Through these investigations, we can clearly show that some policies, such as artificial reintroduction and restocking, are less desirable than other policies, such as protecting wild animals as they are (although restocking and protection are not necessarily alternatives in real life). By doing this, we may insist on protecting wild animals from a more solid academic foundation.

There are a variety of wild species worldwide, but we selected aquatic animals for our investigation for the following reasons: When considering the frequency with which humans encounter wildlife, wild aquatic animals, such as whales and seals, have the lowest rate of visibility because their habitats generally do not overlap with those of humans. We expect the difference in the values between wild

and tame marine animals to be greater than those animals found more often around us, such as birds. Because marine animals are rarer than terrestrial animals, people may value them more, which would produce clearer results.

We also investigated the attributes that influenced people's preferences. Specifically, we selected otters as an example and examined the following: the relationship between WTP and the distance that respondents had to walk to the site where they could watch otters; the relationship between WTP and the frequency of encountering otters at the site; and the relationship between WTP and the number of otters they could see at the site. In addition, because we applied hypothetical examinations, to improve the accuracy of the results, we divided our experiment into two parts and provided cues before the second part. These cues may have allowed respondents to imagine more realistic situations and thus improve the accuracy of their answers.

2. SURVEY DESIGN AND DATA

2.1. Survey design

2.1.1. Sites and animals

We selected the smooth-coated otter *Lutrogale perspicillata* in Marina Bay, Singapore, as the object of our study. There are two species of the otter native to Singapore; in addition to smooth-coated otters, small-clawed otters *Aonyx cinereus* inhabit Pulau Ubin Island. According to Theng and Sivasothi (2016), smooth-coated otters (hereafter referred to as otters) have been observed throughout the seashores and inland areas of mainland Singapore and other nearby islands, although records from some restricted areas near the coasts are not available. There are also reported records of otter sightings in Marina Bay since 2014 and that Marina Bay is currently one of the otters' residential areas.

Around 10 otters were found in Bishan Park in 2014, and Singaporeans started to refer to them as the Bishan 10 (China Internet Information Center, 2016), which may have increased citizens' attention. Bishan Park is located near the Bishan MRT Station, practically in the heart of mainland Singapore. The otters moved to and from the inland area and the outskirts of Singapore via rivers and canals, including Marina Bay. The community group "OtterWatch," headed by N. Sivasothi, launched a Facebook group that provides a continuously updated status of the otters in Singapore, which has also enhanced citizens' interest in otters.

2.1.2. Questionnaire

Before preparing the questionnaire, one of the authors visited Marina Bay in March 2017 to check the status of the site and to take pictures of the scenery and the otters there. The scenario, and some attributes of the choice sets in the CE, was based on these observations. In the experiment, the questionnaire was accompanied by PowerPoint slides to make it easier for the respondents to answer. We will explain the questionnaire and PowerPoint slides in the following sections.

We prepared two types of questionnaires: in one, we assumed there were wild otters in Marina Bay, and in the other, tame ones. The questionnaire consisted of three main parts: (1) the scenario, (2) the points of attention, and (3) the choice sets (questions 1 to 4; Figure 1). The scenario described a situation that respondents were supposed to imagine. The points of attention reinforced the attributes that respondents should keep in mind when selecting their choice in the choice sets.

There were four profiles in each choice set. The first three profiles consisted of four attributes: distance, fare, frequency, and number of otters (hereafter referred to as heads). The last profile was a "status quo" choice. Here, we provided numbers for one way distance and round trip train fare, because we believed those figures were the most intuitive for respondents. We varied the levels of distance, fare, frequency, and heads, as shown in Table 1. There were three levels for each attribute in the wild case, when the otters were said to be wild. Because it was reasonable to assume that people could watch tame otters at almost any time, we included just one level of frequency in the tame case, when the otters were said to be tame.

Based on the above attributes and their levels, there were 81 ($3 \times 3 \times 3 \times 3$) and 27 ($3 \times 3 \times 1 \times 3$) profiles for the wild and tame cases, respectively. We constructed choice sets so that none of the three profiles dominated the others; to do so, we removed three extreme profiles from both the wild and tame cases. Because we prepared 78 ($81 - 3$) and 24 ($27 - 3$) profiles for the two questionnaires, both before and after providing the cues, and each choice set consisted of three profiles (the fourth one was “do not select any”), we used 13 ($78 \div 2 \div 3$) and 4 ($24 \div 2 \div 3$) types of questionnaires for the wild and tame cases, respectively.

Before answering the questionnaire, respondents were explained about the site and animals using PowerPoint slides. Of 31 slides, 23 were pictures or maps of the site with and without otters (see Picture 1). We carefully selected pictures that appeared to be dwellings for both wild and tame otters. This picture and maps enabled the respondents to have a common idea of the site and the animals. The other eight slides mainly provided instructions and demonstrations of the questionnaire. All slides were shown, regardless of which questionnaire the respondent received. We asked respondents not to change their choices once they had proceeded to the next question.

Between the first two and the last two questions, we provided cues using PowerPoint slides that said the following:

Once again, consider the following points.

- 1) Watching otters reduces sightseeing and shopping time.
- 2) It is quite a rare opportunity to watch otters in the city center.
- 3) Are the choices you selected in the two questions above the ones you will do when you visit the site in real life?

After providing these cues, we continued the questionnaire. Note: In the scenario section, the instructions for the tame otter case are underlined and in parentheses.

Figure 1. Questionnaire Sample

[Scenario]

Suppose you are in a vacation spot abroad. You hear you can watch otters near the city center. They are **wild** ones (**tame** ones). It is a rare opportunity to see otters in the middle of a city. Suppose you have enough time to see them.

Because they are **wild** otters, you may not see them even if you visit the site at the time they are most often found [**the site will be shown using pictures**].

(Because they are **tame** otters, you will probably find them at **the site, which will be shown using pictures**. However, on some occasions, you may miss them because they may hide under some cover.)

[Points of attention]

Pay attention to the following four points when answering the questions:

1) Suppose that you walk to the otter site on foot from the nearest station in the center of the city.

.... Check [**Distance**] in the questions below.

2) Suppose that you are now in your hotel. You have to pay for the train fare between the hotel and the nearest station.

.... Check [**Fare**] in the questions below.

3) The frequency that you may watch otters is provided.

.... Check [**Frequency**] in the questions below.

4) The number of otters you may watch is provided.

.... Check [**Heads**] in the questions below.

[Questions]

Q1: Select any one of Choices 1 to 4.

	Choice 1	Choice 2	Choice 3	Choice 4
Distance [one way]	1 km	2 km	500 m	
Fare [round trip]	500 JPY	1,000 JPY	1,000 JPY	Do not select any
Frequency	1 in 3	1 in 3	1 in 6	
Heads	5	15	10	

Q2: Select any one of Choices 1 to 4.

[Omit the table that is the same style in Q1 with different values]

Wait for instructions if you finish the above questions.

Q3: Select any one of Choices 1 to 4.

[Omit the table that is the same style in Q 1 with different values]

Q4: Select any one of Choices 1 to 4.

[Omit the table that is the same style in Q 1 with different values]

Table 1. Levels of the attributes in the choice set

Attribute	Level	
	Wild	Tame
Distance [one way]	500 m, 1 km, 2 km	500 m, 1 km, 2 km
Fare [round trip]	500 JPY, 1,000 JPY, 2,000 JPY	500 JPY, 1,000 JPY, 2,000 JPY
Frequency	1 in 1, 1 in 3, 1 in 6	1 in 1
Heads	5 heads, 10 heads, 15 heads	5 heads, 10 heads, 15 heads

Picture 1. Otters in Marina Bay



Note: Taken by Kawata in March 2017.

2.2. Data

We conducted the surveys at two different times, at different Japanese universities, with undergraduate students (juniors or seniors) as respondents. We did not select Singaporeans because local residents have previous knowledge of the otters in Marina Bay, and therefore they may value them less, causing unclear results. In fact, McIntosh and Wright (2017) suggested that the “element of surprise” and “novelty” were important factors that enhanced the satisfaction of the wildlife viewing experience. Considering these points, among others, we selected settings that involved foreigners traveling to Singapore and visiting the bay of otters, as described in the questionnaire scenarios (Figure 1).

The first and second surveys were conducted on September 22, 2017, and June 20, 2018, at University A and B, respectively. Since the first survey was done appropriately, we used the same questionnaire for the second survey, without modifying any questions. As explained above, there were two types of questionnaires, in which the otters were assumed to be either wild or tame. We assigned the choice sets four times for each respondent; the first two choice sets were answered without providing any cues and the second two were answered after providing the cues. When distributing questionnaires, we mixed the wild and tame questionnaires and randomly assigned them to respondents. We did not explain that there were two types of questionnaires. Because there were some inappropriate replies, the number of valid responses (sample sizes) was slightly different in each of the four cases (“wild before,” “wild after,” “tame before,” and “tame after”). Sample sizes are shown in Table 2.

The sample sizes for the 13 types of wild and four types of tame questionnaires were on average 10 to 10.4 ($133 \div 13$ for “wild after” and $135 \div 13$ for “wild before;” see Table 2) and 26.8 to 27.3 ($107 \div 4$ for “tame after” and $109 \div 4$ for “tame before”), respectively. As shown in Table 2, we tried to equalize the sample size among the four cases, resulting in sample sizes between 89 and 95, as shown

in Table 2, for the first survey at university A. This is because, to make feasible estimations, we needed a minimum number of observations for each of the four cases. However, when conducting the second survey at university B, because the sample sizes for the wild and tame case questionnaires were substantially different (ca. 10 and ca. 27), we distributed nearly double the number of wild otter questionnaires.

We analyzed the data collected in our CE using a conditional logit (CL) model (McFadden, 1974; Train, 2009).

Table 2. Sample sizes

	Wild		Tame		
	Before	After	Before	After	
Univ. A	95	93	91	89	(Sept. 22, 2017)
Univ. B	40	40	18	18	(June 20, 2018)
Total	135	133	109	107	

3. ECONOMETRIC MODEL

In this section, we briefly explain the CL model. Based on the random utility theory, if subject i selects profile j , the subject's utility function U_{ij} is provided as follows:

$$U_{ij} = V_{ij} + \epsilon_{ij}, j \in C$$

Here, C is the choice set and V_{ij} and ϵ_{ij} are deterministic and random error components, respectively. We specified V_{ij} as:

$$V_{ij} = \beta^{ASC} ASC_{ij} + \beta^{1km} D_{ij}^{1km} + \beta^{2km} D_{ij}^{2km} + \beta^P P_{ij} + \beta^{1in3} F_{ij}^{1in3} + \beta^{1in6} F_{ij}^{1in6} + \beta^{10} H_{ij}^{10} + \beta^{15} H_{ij}^{15}.$$

Here, β s are parameters; ASC_{ij} is an alternative specific constant; D_{ij}^{1km} and D_{ij}^{2km} are the one-way distance between the nearest station and the otter site in the center of the city, respectively; P_{ij} is the round-trip train fare between the hotel and the nearest station; F_{ij}^{1in3} and F_{ij}^{1in6} are the frequency of encountering otters at the site; and H_{ij}^{10} and H_{ij}^{15} are the number of otters (Table 3). Note that F_{ij}^{1in3} and F_{ij}^{1in6} are absent in the tame otter case.

The probability that subject i selects profile j is

$$\pi_{ij} = Prob\{V_{ij} + \epsilon_{ij} \geq V_{ik} + \epsilon_{ik}; \forall k \in C\}.$$

Assuming that ϵ_{ij} follows the Gumbel distribution with scale parameter 1 (Ben-Akiva and Lerman, 1985), the probability that subject i selects profile j is:

$$\pi_{ij} = \frac{\exp(V_{ij})}{\sum_{k \in C} \exp(V_{ik})}.$$

The WTP for the baseline case (500 m, 1 in 1, 5 heads) is obtained by the following calculation:

$$- \frac{\beta^{ASC}}{\beta^P}.$$

By adding associated parameter values that are divided by $-\beta^P$ (e.g., $-\beta^{1km}/\beta^P$ for the case where the distance is 1 km), we can obtain the WTP for all cases.

Table 3. Explanatory variables

Variables	Explanations
D_{ij}^{1km}	= 1 if the one-way distance between the nearest station and the otter site is 1 km and 0 otherwise
D_{ij}^{2km}	= 1 if the one-way distance between the nearest station and the otter site is 2 km and 0 otherwise
P_{ij}	= 500, 1,000, or 2,000 (JPY)
F_{ij}^{1in3}	= 1 if the frequency of encountering otters at the site is “1 in 3” and 0 otherwise
F_{ij}^{1in6}	= 1 if the frequency of encountering otters at the site is “1 in 6” and 0 otherwise
H_{ij}^{10}	= 1 if the number of otters is 10 and 0 otherwise
H_{ij}^{15}	= 1 if the number of otters is 15 and 0 otherwise

4. RESULTS

4.1. Estimation results

The estimation results of the CL model are shown in Table 4. The sign conditions of ASC_{ij} and P_{ij} were satisfied. The coefficient of these variables was significant at the 1% level in all cases (Table 4). The signs for F_{ij}^{1in3} and F_{ij}^{1in6} were also positive, and the coefficient of these variables was significant at the 1% level. These results were reasonable because they implied that respondents preferred a higher frequency of watching otters. The coefficients of D_{ij}^{1km} and D_{ij}^{2km} were significant at the 1%, 5%, or 10% levels for the “wild before,” “tame after,” and one of the “tame before” cases. The signs of all these coefficients were negative, implying that the respondents preferred the closest distance (500 m). The coefficients of H_{ij}^{10} and H_{ij}^{15} were not statistically significant, except in the case of “wild after.”

4.2. Estimated WTP

We calculated the WTP for the 54 wild cases and 18 tame cases (Table 5). We observed the highest WTP in the “wild before” case, where the attributes were 500 m, 1 in 1, and 10 heads. Because the coefficients of F_{ij}^{1in3} and F_{ij}^{1in6} were statistically significant, we calculated the average WTP for those cases (Table 6). We observed that the WTP decreased as the frequency decreased in both the wild (1,754 JPY, 987 JPY, and 467 JPY) and the tame cases (1,275 JPY, 409 JPY, and -707 JPY). We also

observed that, if the frequency was set to “1 in 1,” the WTP for the wild case was higher than that of the tame case; that is, 1,754 JPY and 1,137 JPY before the use of cues, and 1,275 JPY and 647 JPY afterwards, for wild and tame, respectively. Finally, we showed that cues had a much greater negative effect on WTP in the tame case. In the wild case, the aggregated WTP dropped by only 27.3% after cues were given; however, in the tame case, the WTP dropped by 43.1% after the cues.

Table 4. Results of CL estimation

	Wild		Tame	
	before	after	before	after
β^{ASC}	2.48 (0.384)	*** (0.359)	1.74 (0.352)	*** (0.357)
β^{1km}	-0.512 (0.212)	** (0.229)	0.089 (0.228)	-0.752 (0.256)
β^{2km}	-0.503 (0.259)	* (0.270)	-0.637 (0.350)	* (0.344)
β^P	-0.00119 (0.00018)	*** (0.000182)	-0.00151 (0.000242)	*** (0.000276)
β^{1in3}	-0.913 (0.221)	*** (0.221)	—	—
β^{1in6}	-1.53 (0.274)	*** (0.299)	—	—
β^{10}	0.166 (0.206)	-0.396 (0.222)	*** (0.246)	0.237 (0.249)
β^{15}	-0.338 (0.282)	-0.466 (0.276)	*** (0.333)	-0.156 (0.339)
McFadden's Pseudo R ²	0.126	0.135	0.184	0.170
Observations	1,080	1,064	872	856

Note: Standard error in parentheses. Significant at the *** 1%, ** 5%, and * 10% level, respectively.

Table 5. WTP for all cases

[Wild]		(Unit: JPY)					
		[Before]			[After]		
		500 m	1 km	2 km	500 m	1 km	2 km
1 in 1	5 heads	2,087	1,657	1,664	1,596	1,678	1,341
	10 heads	2,226	1,796	1,804	1,233	1,315	978
	15 heads	1,803	1,373	1,380	1,168	1,250	913
	5 heads	1,320	890	897	730	812	475

1 in 3	10 heads	1,459	1,029	1,037	367	449	112
	15 heads	1,036	605	613	302	384	47
1 in 6	5 heads	800	370	377	-385	-304	-640
	10 heads	939	509	517	-748	-667	-1,003
	15 heads	516	86	93	-813	-731	-1,068
[Tame]		(Unit: JPY)					
		[Before]			[After]		
		500 m	1 km	2 km	500 m	1 km	2 km
1 in 1	5 heads	1,235	1,311	812	984	551	444
	10 heads	1,392	1,468	970	1,087	654	547
	15 heads	1,131	1,208	709	843	410	303

Table 6. Aggregated WTP

		(Unit: JPY)					
		Before			After		
Wild	1 in 1	1,754	617 (1,754 – 1,137) is <u>35.2%</u> of 1,754		1,275	628 (1,275 – 647) is <u>49.2%</u> of 1,275	
	1 in 3	987			409		
	1 in 6	467			-707		
Tame	1 in 1	1,137			647	490 (1,137 – 647) is <u>43.1%</u> of 1,137	

5. DISCUSSION AND CONCLUSION

5.1. Comparison between wild and tame otters

The main purpose of this study was to examine if people imparted a higher value to wild animals than tame ones. To investigate this, we prepared two types of questionnaires. While presenting the same explanation using PowerPoint slides, we changed the explanations of the scenario in the questionnaire. We did not explain that we randomly distributed two types of questionnaires to the respondents. These procedures made it possible for us to use the same otters and the same pictures (e.g., Picture 1) in all the questionnaires, while assigning half of the respondents to the wild otter case and half to the tame otter case. The results showed that, generally, the WTP for wild individuals was higher than for tame individuals (Table 5). Specifically, if we set the frequency to the “1 in 1” level, the WTP for wild otters was, on average, 1,754 JPY (£11.90 based on the exchange rate as of July 10, 2018) compared to 1,137 JPY (£7.71) for tame ones (Table 6). Our results demonstrated that respondents imparted higher values to wild animals. White et al. (1997) found that people’s WTP for British otters was £11.91 (mean), which was very close to our results, indicating that our estimations were valid.

5.2. Attributes that influence WTP

We examined three attributes that might influence respondents’ preferences for watching otters. They were the walking distance between the closest train station and the otter site, the frequency of seeing otters at the site, and the number of otters the respondents could watch at the site. We fixed the

frequency for tame otters at “1 in 1” because it is possible to see tame otters at a site almost every time. Because there was some cover such as boats, as shown in Picture 1, we added the explanation that “on some occasions, you may miss them because they may hide under some cover” to the tame case questionnaire (Figure 1). Among the three attributes, frequency was statistically significant in all cases (Table 4). We also observed that distance was negatively correlated with WTP, although the coefficients in some cases were not statistically significant. The number of otters was not related to the WTP in most cases. Therefore, we provided detailed and aggregated WTP and the associated percentages concerning frequency only in Table 6. These results were summarized briefly in subsection 4.2.

Here, let us discuss some significant results. First, if we set the frequency to the “1 in 1” level, the WTP for wild otters was higher than that for tame ones. Specifically, the WTP for “wild before” was 1,754 JPY and “tame before” was 1,137 JPY; therefore, the premium for wild otters was 35.2% (Table 6). Similarly, the WTP for “wild after” was 1,275 JPY and “tame after” was 647 JPY; therefore, the premium was 49.2%. These results implied that, in the case of “tame after,” respondents reconsidered their choice and evaluated it in a more realistic manner (e.g., they realized they had the opportunity to watch tame otters in other places, such as zoos), resulting in a large decline in their WTP. On the other hand, the case of wild otters was a rare opportunity, and respondents sustained a relatively high WTP.

Second, we compared WTP before and after giving cues in Table 6. These results show that the aggregated WTP after giving cues dropped by 27.3% and 43.1% in the wild and tame cases, respectively. Again, these results imply that cues had a greater negative effect on tame otters than wild ones.

5.3. Effects of cues

We observed a negative WTP for nine cases, as shown in Table 5. These were in the “wild after” case with a frequency of “1 in 6.” These results indicated that, after receiving cues, respondents recognized that other activities, such as sightseeing and shopping, were more attractive than watching otters, especially if the chance of seeing otters was low. We had no idea if wild otters had a higher value than tame ones, when the frequency of watching them decreased, and this study is the first to shed light on this issue. As shown in Table 6, our results implied that respondents imparted a lower value to wild otters when the frequency was “1 in 3,” both before and after giving cues.

5.4. Conclusions

Overall, this study had several new findings and original contributions. We successfully demonstrated that wild otters have a higher value than tame ones, as long as the chance of watching them was high enough. We found that the successful conservation of wild animals may require frequent visual exposure for citizens. Our results also implied that group size is not necessarily an important attribute for people’s evaluations.

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