Public attitude toward tiger farming and tiger conservation in Beijing, China

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Abstract

There are arguments in support of and against use of tiger farming as a tool for the conservation of wild tigers *Panthera tigris*. Public attitude toward tiger farming can be a useful reference for tiger conservation. To fill this knowledge gap, we surveyed 677 citizens and 381 college students in Beijing to understand their knowledge of tiger conservation and attitude toward tiger farming. The results of ranking questions showed that with regard to the value of tigers, ecological, cultural and aesthetic, and scientific and educational value were ranked as the top three; legislation on wildlife protection and establishment of nature reserves were ranked as the top conservation methods; and poaching and illegal trade, human disturbance and loss of habitat were ranked as the top threatening factors. Apparently, medicinal and healthcare use as well as value as status symbols can be considered the main consumption motivations that trigger poaching and illegal trade. With regard to farming of tigers and the aspects of whether tigers should be farmed, the number of farmed tigers, how to dispose of farmed tigers and so on, we found that most of respondents considered farming of tigers to be a social undertaking and found it difficult to relate to commercial purposes. The results showed that people hold clear positions on arguments for and against the ban on tiger trade and were inclined to support the ban on trading tiger products, especially college students. We also found that the respondents were more balanced toward arguments in support of the use of farmed tigers than arguments against it.

Introduction

Currently, the wild tiger *Panthera tigris* faces unprecedented threats, including habitat loss and fragmentation, depletion of prey and continued illegal poaching (Dinerstein *et al.*, 2007). There are only 3000 wild tigers in the world, and tiger populations are now decreasing (IUCN, 2013). Recent reports have found that tiger habitats have shrunk by as much as 41% in 10 years (Dinerstein *et al.*, 2007). The primary direct threat to wild tigers is poaching for illegal trade of tiger bones for traditional medicine and skins for ornamentation and collection (Xu, 2008; Nowell & Xu, 2007; Mills & Jackson, 1994; IUCN, 2013). The ongoing decline in tiger populations has led to their classification as endangered (IUCN, 2013). In 1993, China banned all trade of tiger bone in response to international concern about ongoing trade of tiger products. Tigers should not be bred for the trade of their parts and derivatives (CITES, 2007b).

Before 1993, there were over 200 factories producing traditional Chinese medicine (TCM) products with leopard bone or claiming tiger bone as an ingredient (Li & Zhang, 1997; Mills, 1997). Between 1990 and 1992, China recorded the export of 27 million units of products (Mills & Jackson, 1994). China's 1993 ban closed down a significant legal industry in tiger bone and medicines made from tiger bones (Gratwicke *et al.*, 2008b). In China, approximately 5000 captive tigers were held in tiger farms, with an additional 800 tigers bred annually (Government of China, 2007). A survey of over 600 pharmacies and shops in China found that the supply of tiger products had sharply declined; only 3% claimed that they supply tiger bones (Nowell & Xu, 2007). There was not a single TCM producer producing medicine that contained tiger bones as an ingredient (Du, 2003). In 2009, there were over 900 Siberian tigers *P. tigris* ssp. *altaica* in the Siberian Tiger Artificial Propagation Center in Harbin and over 1300 tigers in the Xiongsen Bear and Tiger Mountain Village in Guilin (CITES, 2007c;

Nowell & Xu, 2007; Feng, 2007; Bian, 2010). Over 300 stockpiled tiger carcasses were frozen in facilities in China's two largest breeding centers, which faced the difficulty of dealing with the dead tigers in 2006 (Nowell & Xu, 2007).

Wildlife trade survey in key regions in China showed that the proportion of Chinese urban residents who had consumed wildlife dropped slightly from 31.3% in 2004 to 29.6% in 2012; in the same year, 52.7% agreed that wildlife should not be consumed which significantly increased in comparison with the survey result of 42.7% in 2004 (Zhang, Hua & Sun, 2008; Zhang & Yin, 2014). The consumer attitude survey indicated that tiger and leopard skin clothing possession is uncommon in three regions in Tibet; only 3% of the people interviewed claimed to have tiger skins that were primarily valued as an indicator of prosperity; 80% of people were aware of endangered status of tigers and understood that the trade was illegal (Nowell & Xu, 2007). A heated debate has emerged about the potential consequences of lifting the ban on trade in farmed tiger products in 2007 (Dinerstein *et al.*, 2007; Jiang *et al.*, 2007; Lapointe *et al.*, 2007; Gratwicke *et al.*, 2008*a*). A targeted consumer attitude survey found that 43% of respondents had consumed some product alleged to contain tiger parts, 71% said that they preferred wild products over farmed ones, 88% of respondents knew that it was illegal to buy or sell tiger products and 93% agreed that a ban in trade of tiger parts was necessary to conserve wild tigers (Gratwicke *et al.*, 2008*b*).

But, is farming of tigers able to prevent the continued reduction in the number of wild tigers? It is still a controversial question (Huang, 2003; Mitra, 2005; Dinerstein *et al.*, 2007; Jiang *et al.*, 2007; Lapointe *et al.*, 2007; Gratwicke *et al.*, 2008*a*; Kirkpatrick & Emerton, 2009). Supplying farmed tigers is generally considered a new approach to further reduce poaching pressure on wild tigers (e.g. Mitra, 2005; Lapointe *et al.*, 2007). However, there are some arguments both for and against the use of tiger farming as a tool for conservation of wild tigers, and supporters and opponents of tiger farming each have their own opinions (Gratwicke *et al.*, 2008*a*; Kirkpatrick & Emerton, 2009). The public are the primary consumers of TCM products made with wildlife components. What is their opinion of these arguments? We conducted a social investigation of both citizens and college students about the trade of tiger farming. In 2012, the gross enrollment rate of China's higher education institutions reached 30%, among which 6.8883 million are college students (Ministry of Education of the People's Public of China, 2012) who have a fairly higher level of wildlife protection awareness and represent the mainstream opinion among young people (Zhang, Li & Wang, 2011). What are the public's and college students' views and attitudes toward tiger farming and trade? In this study, a questionnaire survey was conducted to find out the answer.

Materials and methods

This study was conducted in Beijing among citizens and college students from December 2011 to January 2012. A stratified random sampling method was used to select neighborhoods and universities in Beijing (Kish, 1987). The researchers obtained household information from neighborhood committees. Then, households and family members were randomly sampled for questionnaire surveys in their house (Gratwicke *et al.*, 2008*b*; Dutton, Hepburn & Macdonald, 2011). Using the same method, the researchers obtained the students' accommodation information from the dormitory management committees, randomly selected the dormitories and students and then carried out the questionnaire survey.

A set of questionnaires was designed for the study (De Vaus, 2002). The questionnaire consisted of three parts: the importance ranking of value, protection methods for tigers and threats to tigers; questions about farmed tigers; and attitudes toward arguments on tiger trade. We designed six opposing views on banning or lifting the ban on trading tiger products (Table 3) and named the two opposite groups of views blue side (against lifting the ban on trading tiger products, anti for short) and red side (support lifting the ban on trading tiger products, pro for short). There are three types of questions: multiple-choice questions (including one-answer questions and multiple-answer questions), ranking questions and attitude questions. A 7-point Likert scale was employed as a data collection instrument for attitude questions. Seven points from 1 to 7 represent completely disagree (1), disagree (2), somewhat disagree (3), neutral (4), somewhat agree (5), agree (6) and completely agree (7). Rank-order scale was employed to capture the data for rank questions. We dictated the following to the interviewees: place 1 alongside the item you feel is the most important, 2 as next to most important and so on until you have ranked all items (Schiffman & Kanuk, 2004).

Face-to-face interviews were conducted with the selected respondents, who had lived in Beijing for at least 1 year and were over 18 years old (Gratwicke *et al.*, 2008*b*). The survey usually lasted between 20 and 30 min; afterward, the researchers checked the questionnaires to avoid any errors, omissions or logical contradictions. Lastly, respondents were given a small gift to thank them for their participation. To eliminate fraudulent interviews, supervisors checked the returns and randomly chose 30% for telephone return interviews to verify their authenticity. The disqualified questionnaires were treated as waste. When the data entry was finished, all data were checked to avoid any errors and omissions before data processing (Dutton *et al.*, 2011).

Kendall's *W*-test was used to test the ranking questions in the questionnaire, and Cochran's *Q*-test was used to test the multiple-choice questions. Pearson's chi-square test was used to test cross-table data. The Wilcoxon test for two related samples and the Mann–Whitney *U*-test for two independent samples were used to test if the data were ranked. Kolmogorov–Smirnov test was used to test whether the data are from a normal distribution. The paired-sample *t*-test, independent sample *t*-test and one-way analysis of variance (ANOVA) were used if the data were normally distributed (Quinn & Keough, 2002). The SPSS17.0 (IBM Corporation, Armonk, NY, USA) was used for statistical analysis and to make statistical graphs.

Table 1 Importance ranking value of tigers, threatening factors and protection methods

Items	Mean rank[a]	Mean rank[a]	Items	Mean rank[a]	Mean rank[a]
Protection method	Citizen	Student	Threatening factor	Citizen	Student
Establish nature reserves	2.31	1.85	Low adaptability	4.33	4.45
Publicity and education	2.92	3.39	Habitat loss	2.36	2.36
Scientific research	3.75	3.73	Poaching and illegal trade	2.21	1.96
Legislation on tiger protection	1.95	1.88	Human disturbance	2.34	2.04
Captive breeding	4.24	4.15	Natural disaster	3.67	4.41
Kendall's W[b]	0.395	0.457	Kendall's W[b]	0.396	0.594
χ^2 and *P*-value	1068.46, $P < 0.01$	696.28, $P < 0.01$	χ^2 and *P*-value	1072.39, $P < 0.01$	905.60, $P < 0.01$
Consumption motivation	Citizen	Student	Value of tiger	Citizen	Student
Edible use	5.02	5.38	Scientific and educational value	2.95	2.82
Medicinal use	2.80	3.20	Entertainment and ornamental value	3.73	4.09
Health care	3.41	3.50	Medicinal value	3.81	4.24
Decoration	4.62	4.31	Edible value	5.41	5.71
Collection	4.06	3.84	Ecological value	1.80	1.31
Used as apparel	4.44	4.27		3.30	2.82
Symbol of social status	3.65	3.51			
Kendall's W[b]	0.126	0.115	Kendall's W[b]	0.403	0.656
χ^2 and *P*-value	510.84, $P < 0.01$	263.13, $P < 0.01$	χ^2 and *P*-value	1362.86, $P < 0.01$	1249.85, $P < 0.01$

[a]Mean rank, lower values indicate higher ranks.
[b]Kendall's *W*-test was used to test the difference among choices of ranking questions.

Results

Ranking of protection method and threats

The results of Kendall's *W*-test showed that there was a significant difference among the ranks of various factors ($P < 0.01$). Legislation on wildlife protection and establishment of nature reserves were ranked first and second as effective methods to protect the tigers by both the citizens and the students; captive breeding was sequenced last by both citizens and students. Poaching and illegal trade was sequenced first on the list of threatening factors. For consumption motivations, use as traditional medicine was sequenced first, followed by health care and symbol of social status. Regarding the value of tigers, ecological value was ranked first, followed by scientific and educational value, whereas the medicinal value and edible value were sequenced as the last two ranks (Table 1).

Attitude toward tiger farming

The results of Cochran's *Q*-test showed that both the citizens and students expressed choice preference in all multiple-choice questions ($P < 0.01$) (Table 2). Of citizens and students, 63.22 and 62.73%, respectively, thought that tigers should be farmed, mainly for 'continuation of the populations and reintroduction to the wild' and those who disagreed tiger farming believed that 'tigers belonged to nature'. As for the number of farmed tigers, the option '10 000' was chosen the most. The 'no-profit research base of tiger breeding' was selected the most as suitable tiger farmers, followed by 'conservation organizations' and 'business enterprises'. 'Government finance', 'fundraising of

conservation organizations' and 'general public's donations' were selected the most for funding sources for farming. Regarding the criteria for determining the number of farmed tigers, 'sufficient for continuation of the species and reintroduction to the wild' was selected the most and 'sufficient for commercial utilization and entertainment' was selected the least. After the population of farmed tigers reaches a certain scale, 'reintroduction to the wild' was selected the most, followed by 'utilization for scientific research and development of tourism'. As for the disposal of farmed tigers that died of natural causes, 'temporary storage for further consideration' was selected the most, followed by 'trade in tiger products' and 'destruction'. Pearson's chi-squared test showed that there were significant differences between the citizens' and students' views on questions ($P < 0.01$) (Table 2).

Balance on arguments for and against lifting the ban on tiger trade

We list the arguments for and against the use of tiger farming in Table 3. The results of the Wilcoxon test showed that both the citizens' and the students' agreement with each of the blue side's (anti) views was higher than that of the red side's (pro) ($P < 0.01$) (Table 4), and that the average attitude scale about the blue (anti) and red side's (pro) views was mostly between 5 and 6 and between 3 and 4, respectively, indicating that they were somewhat in agreement with the blue side's (anti) views and somewhat in disagreement with the red side's (pro) views. The Mann–Whitney *U*-test results showed that, except argument 1, the citizens' agreement with the blue side's (anti) views was significantly lower than that of the students ($P < 0.01$), and that their

Table 2 Attitudes and knowledge toward tiger farming

Question	Response	Citizen%	Student%
Do you think whether tiger should be farmed or not? Why?	Should be farmed	63.22	62.73
	Continuation of the populations and reintroduction to the wild	55.69	60.38
	Commercial trade in tiger products from farmed tigers	10.19	7.87
	Entertainment and ornamental	9.31	4.99
	Scientific research and education	10.93	8.14
	Others	1.77	0.26
	Cochran's Q^a	916.30	693.39
	P	< 0.01	< 0.01
	χ^2 and P^b	13.82, $P < 0.01$	
	Should not be farmed	36.78	37.27
	Tigers belonged to the nature	33.38	33.86
	Captive breeding is usually farm for commercial purposes	5.76	10.24
	Cannot afford to farm tiger	1.92	1.05
	It is too dangerous	5.76	3.67
	Others	0.59	0.26
	Cochran's Q^a	617.12	356.78
	P	< 0.01	< 0.01
	χ^2 and P^b	10.23, $P < 0.05$	
Who is suitable as tiger farmers?	No profit research base of tiger breeding	70.46	63.52
	Personal	5.76	2.62
	Conservation organizations	42.84	54.07
	Business enterprises	13.88	7.87
	Others	1.18	1.05
	Cochran's Q^a	1035.97	629.15
	P	< 0.01	< 0.01
	χ^2 and P^b	20.79, $P < 0.05$	
Where should the farming funding come from?	Government finance	74.88	75.59
	Personal investment	11.08	8.66
	Fundraising of conservation organizations	36.63	45.14
	Enterprise investment	20.53	20.73
	General public's donations	22.45	27.30
	Others	1.33	1.31
	Cochran's Q^a	1101.68	662.34
	P	< 0.01	< 0.01
	χ^2 and P^b	6.13, $P > 0.05$	
How many tigers do you think should be farmed in China?	Less than 100	13.44	11.02
	1 000	29.25	33.60
	10 000	33.09	34.65
	100 000	17.58	14.96
	1 000 000	6.65	5.77
	Cochran's Q^a	163.82	134.81
	P	< 0.01	< 0.01
	χ^2 and P^b	4.10, $P > 0.05$	
What is the criterion of the number of farmed tigers?	Sufficient for continuation and reintroduction to the wild	69.72	83.73
	Depend on how much the fund for farming	16.99	11.55
	Not causing threat to human's survival	35.16	21.26
	Sufficient for commercial utilization	6.79	4.99
	Sufficient for entertainment and ornamental	6.65	4.20
	Sufficient for scientific research and education	12.85	10.50
	Others	1.03	0.52
	Cochran's Q^a	1336.68	1138.88
	P	< 0.01	< 0.01
	χ^2 and P^b	30.69, $P < 0.01$	
What do you think should be done to farmed tigers when the population reaches a certain size?	Reintroduction to the wild	75.18	85.56
	Utilization for tourism industry	25.41	15.49
	Commercial trade in tiger products from farmed tigers	9.16	7.87
	Specimens made for exhibition	3.10	1.57
	Transfer or lease them to zoo or circus	17.13	7.87
	Utilization for scientific research	24.96	28.61
	Keep up feeding and do not dispose	4.87	5.51
	Others	2.07	1.31
	Cochran's Q^a	1647.94	1299.22
	P	< 0.001	< 0.001
	χ^2 and P^b	30.86, $P < 0.01$	
What do you think should be done to farmed tigers that died of natural causes, except for scientific and educational purposes and exhibition purposes?	Permanent storage	16.40	17.06
	Destruction	23.34	12.60
	Commercial trade in tiger products made of dead tigers	26.74	32.28
	Temporary storage for further consideration	32.64	36.75
	Others	4.58	4.20
	Cochran's Q^a	154.37	140.20
	P	< 0.01	< 0.01
	χ^2 and P^b	18.43, $P < 0.01$	

[a]Cochran's Q-test was used to test the difference among choices of multiple-choice questions.
[b]Chi-square test was used to test the selection difference between citizens and students.

Table 3 The arguments for and against the legalization of domestic trade of captive-bred tiger products

Argument no.[a]	Two sides	Arguments
1	Blue side (anti)	The tiger trade ban has been even more effective to deter poaching; the plan to lift the tiger ban will accelerate the extinction of endangered tigers.
	Red side (pro)	The tiger trade ban has failed to protect wild tigers, so the tiger ban should be lifted to allow domestic trade in tiger products from farm-raised tigers.
2	Blue side (anti)	Reopening of the trade in farm-sourced tiger products will stimulate consumer demand for wild-sourced tiger parts and encourage poaching.
	Red side (pro)	Captive-bred tigers have the capacity to meet the tiger part demand and can undercut the demand for wild-sourced tiger products.
3	Blue side (anti)	Poaching tigers has a lower cost than farming tigers; poachers have more economic incentive to harvest from the wild.
	Red side (pro)	Prices decrease as farmed tigers flood the markets; illegal poaching will decrease when the profits of poachers began to decline.
4	Blue side (anti)	It is difficult to distinguish the infiltration of 'laundered' wild supply from farmed products, so it is difficult for law enforcement to crack down on the trafficking.
	Red side (pro)	Strict regulations under the existing labeling system can prevent illegal trade while allowing legal trade in products from farmed tigers.
5	Blue side (anti)	The tiger is a highly endangered species, so lifting the tiger ban will heighten the possibility that the tiger will become extinct in the wild.
	Red side (pro)	Tigers can be farmed as well as other animals of economic value, considering both conservation and commercial exploitation simultaneously.
6	Blue side (anti)	There are many substitutes existing for tiger products, so it is not necessary to use tiger products.
	Red side (pro)	Tiger products are necessary for traditional Chinese medicine and the inheritance of Chinese traditional culture.

[a]We designed six opposing views on banning or lifting the ban on trading tiger products and named the two opposite groups of views blue side (against lifting the ban on trading tiger products, anti for short) and red side (support lifting the ban on trading tiger products, pro for short).

agreement with the red side's (pro) views was significantly higher than the students' ($P < 0.01$) (Table 4). The test also showed that regarding lifting the ban on the trade of tiger products and allowing businesses to trade parts and products from dead farmed tigers, the degree agreement of the citizens (3.20 ± 0.07) was significantly higher than that of the students (2.88 ± 1.69) ($Z = -3.050$, $P < 0.01$).

Kolmogorov–Smirnov test showed that citizens' and students' selection frequencies of different attitude scales were all from normal distributions ($P > 0.05$). The results of the one-way ANOVA analysis indicated that there was a significant difference among the citizens' and students' selection frequencies of different attitude scales about the blue (anti) or red side's (pro) views (blue side's views of citizens: $F_{brown\text{-}Forsythe} = 177.484$, degrees of freedom (d.f.)$_1$ = 6, d.f.$_2$ = 17.886, $P < 0.01$; red side's view of citizens: $F = 141.262$, d.f.$_1$ = 6, d.f.$_2$ = 35, $P < 0.01$; blue side's views of students: $F = 334.816$, d.f.$_1$ = 6, d.f.$_2$ = 14.729, $P < 0.01$; red side's views of students: $F_{brown\text{-}Forsythe} = 34.982$, d.f.$_1$ = 6, d.f.$_2$ = 35, $P < 0.01$. The independent samples t-test showed that citizens mostly selected Attitude Scale 6 toward the blue side's (anti) views ($P < 0.01$) and Attitude Scale 2 toward the red side's (pro) views ($P < 0.01$). A majority of students selected Attitude Scale 7 toward the blue side's (anti) views ($P < 0.01$) and Attitude Scale 2 toward the red side's (pro) views ($P < 0.01$) (Fig. 1). Kolmogorov–Smirnov test showed that the range of value of the respondents' selection frequency of different attitude scales toward the blue side's or red side's views was all from normal distributions ($P > 0.05$).

The paired-samples t-test showed that the range of value of the respondents' selection frequency of different attitude scales toward the blue side's (anti) views was significantly higher than that of the red side's (pro) views (citizens: $t = -10.010$, $P < 0.0$; students: $t = -7.714$, $P < 0.01$), which showed that the magnitude of change in selection frequency of the blue side's (anti) views was greater than that of the red side's (pro) (Fig. 1).

Kolmogorov–Smirnov test showed that descriptive statistics including standard deviations, skewness and kurtoses of attitude scores toward different views were all from normal distributions ($P > 0.05$). The paired-samples t-test also showed that the standard deviations of attitude scores of the red side (pro) were significantly higher than those of blue side (anti) ($P < 0.01$), which showed that the degree of dispersion of the attitude scores of red side (pro) was greater than that of blue side (anti). Regarding skewness, the attitude score of the blue side (anti) had a negatively skewed distribution, while the red side (pro) had a positively skewed distribution. Most kurtoses of the blue side (anti) were positive, whereas the kurtoses of red side (pro) were all negative, indicating a flat peak for the red side (pro) and a sharp peak for the blue side (anti) (Table 5); data distribution for the blue side (anti) was more concentrated (Fig. 1). The independent samples t-test also showed that the standard deviations of the citizens' blue side (anti) were significantly higher than those of the students' ($t = -2.58$, $P < 0.05$), which showed that the degree of dispersion of the citizens' blue side (Anti) is greater than that of students'. The kurtosis of the

Table 4 Comparison of the mean ± (SE) attitudes scales toward arguments for and against the use of farmed tiger bone

Arguments[a]	Citizens			Students			Citizens versus students	
	Blue side	Red side	Blue versus red	Blue side	Red side	Blue versus red	Blue side	Red side
1	5.89 ± 0.05	3.47 ± 0.07	$Z = -17.93, P < 0.01$	6.01 ± 0.06	3.04 ± 0.09	$Z = -14.51, P < 0.01$	$Z = -1.43, P > 0.05$	$Z = -4.13, P < 0.01$
2	5.45 ± 0.06	3.73 ± 0.07	$Z = -14.10, P < 0.01$	5.73 ± 0.07	3.40 ± 0.09	$Z = -12.55, P < 0.01$	$Z = -3.25, P < 0.01$	$Z = -2.78, P < 0.01$
3	5.36 ± 0.06	3.67 ± 0.07	$Z = -13.69, P < 0.01$	5.68 ± 0.08	3.41 ± 0.09	$Z = -12.32, P < 0.01$	$Z = -3.12, P < 0.01$	$Z = -2.17, P < 0.05$
4	5.56 ± 0.06	3.71 ± 0.07	$Z = -15.15, P < 0.01$	5.89 ± 0.06	3.27 ± 0.09	$Z = -14.26, P < 0.01$	$Z = -3.79, P < 0.01$	$Z = -3.82, P < 0.01$
5	5.57 ± 0.06	3.63 ± 0.11	$Z = -15.62, P < 0.01$	5.98 ± 0.06	3.34 ± 0.09	$Z = -13.87, P < 0.01$	$Z = -5.06, P < 0.01$	$Z = -2.56, P < 0.05$
6	5.30 ± 0.06	3.85 ± 0.07	$Z = -11.61, P < 0.01$	5.63 ± 0.07	3.56 ± 0.09	$Z = -11.91, P < 0.01$	$Z = -3.07, P < 0.01$	$Z = -2.43, P < 0.05$

[a]The arguments were showed in Table 3.

citizens' red side (pro) was significantly higher than that of the students' ($t = -2.69$, $P < 0.05$), which showed that the data distribution of the citizens' red side (pro) was flatter than that of the students' (Table 5).

Discussion

Tiger conservation and endangering factors

Laws protecting wildlife play an important role in the conservation of endangered species (CITES, 1997; Nowell & Xu, 2007; Gratwicke *et al.*, 2008*b*). The trade of tiger products has been significantly reduced through sufficient national law enforcement efforts (Nowell & Xu, 2007). In our investigation, respondents considered legislation on wildlife protection and establishment of nature reserves to be the most efficient conservation methods, whereas farming tigers as a conservation method was sequenced as the least efficient, indicating that the public tends to support *in situ* conservation, such as establish nature reserves. China could achieve similar success by emphasizing habitat and prey protection instead of captive breeding (Nowell & Xu, 2007). Improving protection of tiger habitats and enforcing laws to restrict tiger trafficking were considered the most important work for the Chinese government to conserve wild tigers (Gratwicke *et al.*, 2008*b*). *In situ* conservation as a key method for conservation of wild tigers is effective; thus, all governments throughout the range of tigers' habitats should demonstrate greater resolve and lasting commitments to conserve tiger habitats (Ma, 2003; Dinerstein *et al.*, 2007).

There are many threats to the survival of endangered wildlife (Wilson, 1992). Poaching and illegal trade, disturbance by humans and loss of habitat were ranked as the top three threats by the public. Poaching and illegal trade and habitat loss have been widely judged to be the leading threats to wild tigers (Mills & Jackson, 1994; Ma, 2003; Dinerstein *et al.*, 2007; IUCN, 2013). However, biologists who have worked with tiger populations argue that poaching and illegal trade do not stand out as the primary threat they considered it to be in the past, which may be due to the level of illegal domestic trade of tiger parts that has greatly declined over the period since the Domestic Tiger Trade Ban took effect (Nowell & Xu, 2007). Medicinal use, healthcare use and status symbols are considered the main consumption motivations that trigger poaching and illegal trade, which are closely related to the traditional way of utilizing tiger parts and derivatives (CITES, 2007*a*; Cooperative Group of Chinese Medicinal Animal Records, 1979; Ma, 1979; Ma, 2003), and the rank of consumption motivations evaluated by the public is consistent with actual status (Nowell & Xu, 2007; Xu, 2008; Wasser & Jiao, 2010). Wild animals have intrinsic value and use value (Wilson, 1988). We found that ecological, cultural and aesthetic, and scientific and educational value were considered the top three with regard to the value of tigers, and medicinal and edible value was considered the lowest. As people's awareness of animal protection has been improved in the recent years, the
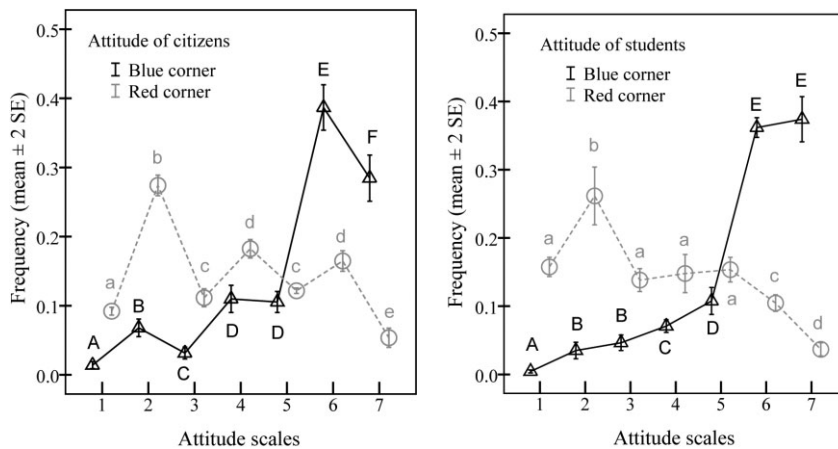
Figure 1 Selection frequencies of different attitude scales about the blue side's (anti) or red side's (pro) views of citizens and students. Different letters show significant differences.

direct value of wild animals has declined whereas their indirect value, such as ecological and cultural value, has risen (Jiang, 2001).

Attitude toward tiger farming and trade

A total of 63% of respondents thought that tiger should be farmed in China, and the main reason was the continuation of the populations and reintroduction to the wild. The population of farmed tigers should be controlled to a scale that has the potential to contribute to conservation of wild tigers instead of breeding for the trade of their parts and derivatives (CITES, 2007b). We found that respondents mainly considered farming of tigers to be a social undertaking and mainly for non-commercial purposes; for instance, individual and business enterprises were not considered suitable as tiger farmers and the farming funding should be mainly from government finance, especially since the number of farmed tigers only needs to reach a certain level for reintroduction to the wild. Chinese people were generally supportive of wild tiger conservation (Nowell & Xu, 2007; Gratwicke *et al.*, 2008b; Zhang *et al.*, 2008). The passing of legislation for wildlife conservation and strict enforcement actions, as well as the social community's promotion and education of tiger conservation, have helped conserve wild tigers and raised the public's conservation awareness (Nowell & Xu, 2007; Xu, 2008).

Tiger farms have complained that they cannot afford to support such large and rapidly growing captive populations, especially the large freezers where the carcasses of tigers that have died in the facilities are being stockpiled (Nowell & Xu, 2007). The continuing decline in wild tiger populations since 1993 and proposals from tiger farms to allow to sell tigers has encountered strong opposition and stimulated calls for a review of the domestic ban (Dinerstein *et al.*, 2007; Gratwicke *et al.*, 2008a; Kirkpatrick & Emerton, 2009). Our result showed that 'reintroduction to the wild' was mostly chosen by respondents when the population of farmed tigers reaches a larger size. How to dispose of farmed tigers that died of natural causes? It is a dilemma facing tiger farming enterprises in China (Nowell & Xu, 2007; Xiongsen Bear

and Tiger Mountain Village in Guilin, 2000). To obtain clearer answers, science and education and exhibition purposes were removed from the options partly because demand for tigers for these purposes is generally small and would not solve the problem. We found that most respondents selected 'temporary storage for future consideration', which was a more conservative answer than others and is not a choice that would contribute to the future, and more respondents selected 'commercial trade in products made of dead tigers' than 'destruction', indicating that the respondents were more supportive of business trade of tiger products. So, the solution to the problem of how to dispose dead farmed tigers remained inconclusive in this study. This response brings us back to the arguments about lifting the ban on tiger products (Mitra, 2005; Dinerstein *et al.*, 2007; Jiang *et al.*, 2007; Lapointe *et al.*, 2007).

Balance on lifting the ban on tiger products

There is a high conservation awareness that tiger is protected and that trade is illegal (Nowell & Xu, 2007; Gratwicke *et al.*, 2008b). Most respondents have been supportive of banning the trade of tiger products in China (Nowell & Xu, 2007; Gratwicke *et al.*, 2008b). Conservation policy cannot be removed from the social and political environment in which it is implemented (Kirkpatrick & Emerton, 2009). The public in Beijing shared a clear position on arguments for and against lifting the ban on farmed tiger trade. Respondents generally chose 'somewhat agree' (scale of 5–6) about the blue side's (anti) views, and chose 'somewhat disagree' (scale of 3–4) about the red side's (pro) views. Compared with citizens, the students were more inclined to support the ban on trading tiger products. College students have a high level of animal protection awareness that will promote positive formulation and enforcement of animal protection laws and policies (Zhang *et al.*, 2011). Some environmental non-government organizations are predominantly college students or recent graduates who have a high level of animal protection awareness (Yang, 2005). There is a clear correlation between higher

Table 5 Descriptive statistics of including standard deviations, skewness and kurtoses of attitude scores toward opposite views

Arguments[a]	Citizens — Standard deviation Blue side	Red side	Skewness Blue side	Red side	Kurtosis Blue side	Red side	Students — Standard deviation Blue side	Red side	Skewness Blue side	Red side	Kurtosis Blue side	Red side	Citizens versus students	Independent t-test
1	1.33	1.70	−1.70	0.33	2.62	−1.04	1.21	1.74	−1.64	0.65	2.66	−0.75	Blue side	$t = -2.58, P < 0.05$
2	1.53	1.84	−1.12	0.19	0.46	−1.22	1.41	1.79	−1.32	0.31	1.09	−1.11	Red side	$t = 1.57, P > 0.05$
3	1.65	1.77	−1.05	0.21	0.17	−1.15	1.47	1.74	−1.27	0.23	0.78	−1.15	Blue side	$t = 1.20, P > 0.05$
4	1.47	1.79	−1.26	0.17	0.89	−1.22	1.26	1.70	−1.39	0.36	1.68	−1.02	Red side	$t = -2.05, P > 0.05$
5	1.46	1.78	−1.23	0.23	0.88	−1.17	1.26	1.78	−1.56	0.34	2.06	−1.04	Blue side	$t = -1.22, P > 0.05$
6	1.63	1.83	−0.90	0.14	−0.17	−1.23	1.43	1.73	−1.10	0.23	0.43	−0.88	Red side	$t = -2.69, P < 0.05$
Mean	1.51	1.78	−1.21	0.21	0.81	−1.17	1.34	1.75	−1.38	0.35	1.45	−0.99		
Standard error	0.05	0.02	0.11	0.03	0.40	0.029	0.05	0.01	0.08	0.06	0.34	0.06		
Paired t-test	$t = -7.19, P < 0.01$		$t = -10.48, P < 0.01$		$t = -5.27, P < 0.01$		$t = -9.08, P < 0.01$		$t = -12.62, P < 0.01$		$t = -7.65, P < 0.01$			

[a]The arguments were showed in Table 3.

wildlife law awareness and higher levels of education (Nowell & Xu, 2007). Some studies have shown that people with a higher education level consume less tiger products and bear bile (Gratwicke *et al.*, 2008*b*; Dutton *et al.*, 2011).

The dispersion degree and distribution characteristics of attitude scores for and against lifting the trade ban of tiger products showed that respondents were more balanced toward the red side's (pro) views than the blue side's (anti). The degree of holding different opinions or hesitating to make a decision about the red side's (pro) views was significantly higher than that of blue side's (anti) views, which was also reflected in the asymmetric frequency distribution of various attitude scales between the two sides' views (Fig. 1). To support endangered wildlife conservation does involve, at times, conflict of some human interests, and sometimes it is onerous or difficult to fulfill because it requires a real sacrifice of one's interests (Taylor, 2011). Compared with the citizens, the college students were less balanced toward the two sides' views and had a clearer position and higher conservation awareness. Although current attitude of respondents showed that they are willing to participate in wildlife protection, consumption of legally protected wildlife still exists (Nowell & Xu, 2007; Gratwicke *et al.*, 2008*a*; Zhang *et al.*, 2008; Zhang & Yin, 2014). The gap between protection attitude and actual consumption behavior needs to be diminished by public awareness and education and finding ways to change consumer behavior (Zhang *et al.*, 2008; Challender *et al.*, 2014).

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