

Public perceptions of bears and management interventions in Japan

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Abstract: Conservation of bears is a challenge globally. In Japan, Asiatic black bears (*Ursus thibetanus*) and brown bears (*Ursus arctos*) are considered a nuisance because of agricultural and property damage and personal human danger due to occasional human casualties. Reduction of human–bear conflicts in Japan would improve long-term conservation of bears and reduce risks to human health and safety. To understand Japanese perceptions of and experience with bears, we analyzed results of 5 public surveys and reviewed 29 articles from the research and gray literature in Japan. We compared recommendations for interventions to reduce human–bear conflicts with results from 45 North American articles that discuss public opinion about bear management. Most (91%) Japanese respondents thought bears were frightening; there was a strong association between the number of people who experienced damage by black bears and those who disliked black bears ($R^2 = 0.81$). Many researchers stressed the importance of public education to reduce human–bear conflicts. Yet, results of outreach programs were mixed or in need of evaluation. More effective programs are needed for Japanese residents to acquire accurate information about bears and skills to prevent conflicts with them to make informed decisions for sustainable management of bears.

Key words: Asiatic black bear, attitude, belief, brown bear, culture, experience, human–wildlife conflicts, intervention

Human–carnivore conflicts, which include threats to people and property caused by carnivores, are worldwide problems making the conservation of these animals extremely challenging (Kaltenborn et al. 1999, Treves and Karanth 2003, Treves et al. 2004, Johnson et al. 2006). Mitigating these conflicts is necessary, and effective interventions must be developed to sustain carnivore populations globally (Treves and Karanth 2003).

Asiatic black bears (*Ursus thibetanus*) and brown bears (*Ursus arctos*) inhabit Japan. Both are considered game species and are, therefore, unprotected in most areas. Asiatic black bears are categorized as a vulnerable species by the International Union for Conservation of Nature (IUCN) Red List of Threatened Species. In Japan, black bears used to be common in Honshu, Shikoku, and Kyushu (Figure 1). However, human population and land degradation have increased since the 1950s, leading to a reduction of black bear habitat (Japan Bear Network 2007b). Asiatic black bears are no longer present in Kyushu, and a very small population exists in Shikoku; most bears are in the mountains of eastern and northern Honshu. The current population of black bears in Japan is estimated

at 10,000 to 15,000, about 20% of the global population (Hazumi 1999).

Brown bears live on Japan's northernmost island, Hokkaido. Human–bear conflicts, such as crop damage and occasional human casualties, occur in areas adjacent to bear habitat. Despite strong harvest pressure, this species inhabits 70% of Hokkaido, and its population is estimated at 2,000 to 3,000 animals (Kameda et al. 2006).

Human–bear conflicts in Japan

Human–bear conflicts, consisting mainly of human casualties and damage to agriculture and forestry, are increasing in Japan (Japan Bear Network 2007b). The situation differs between black bears and brown bears. From April 2006 to March 2007, 4,340 threatened Asiatic black bears in Japan, representing approximately 40% of the estimated population, were trapped or shot to control their nuisance activities and numbers (Ministry of the Environment 2008). In the same 12-month period, 142 people were injured, and 3 people were killed by black bears, which was the highest rate on record (Ministry of the Environment 2008). Crop damage by black bears has increased rapidly since 1995,

costing 300 million to 400 million yen (U.S. \$3 million to \$4 million) annually (Japan Bear Network 2007b).

Casualties by brown bears have decreased in Hokkaido since 1960, although injuries to people from bear attacks occur every year (Tsuruga et al. 2002). From 1986 to 2005, 8 people were killed and 27 people were injured by brown bears in Japan (Japan Bear Network 2007b). Agricultural damage has increased, with costs of about 100 million yen (U.S. \$1 million) annually in the late 1990s (Tsuruga et al. 2002).

Threats to bears in Japan

Hunting and depredation kills are significant sources of mortality of bear populations in Japan (Knight 2003, Japan Bear Network 2007b). In most cases when residents see bears, they call the local government, which, in turn, calls hunters to remove the bears (H. Hayashi, Shishu Black Bear Research Group, personal communication, 2008). Only 10 of 35 prefectures that were inhabited by bears limit the maximum number of bears that hunters can capture (Mano et al. 2008). Even in prefectures that set a harvest limit, more bears may be killed than the number established by prefectures. For example, Nagano prefecture has imposed a maximum harvest of 150 bears per year. However, in 2006—a year of widespread bear appearances—553 bears were killed to avoid harm to people, agriculture, and forestry (Nagano Prefecture 2007). Considering that the estimated number of bears in Nagano is around 1,900 to 3,700 (Nagano Prefecture 2007), this type of management may impact the sustainability of the bear population.

In Hokkaido, when brown bears are considered a threat to crops, property, or human safety, killing is the only intervention permitted in most communities by the prefectural government (Tsuruga et al. 2002). Brown bears appear near human settlements during general movement or to search for food. However, in most cases, bears are killed without investigation of the cause of their appearance (Japan Bear Network 2007b).

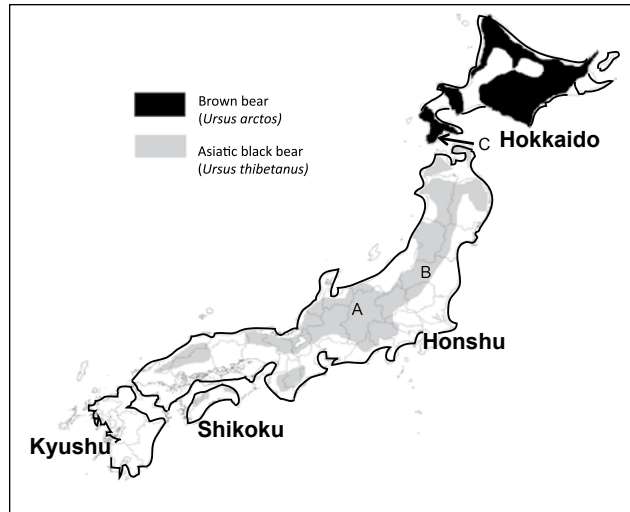


Figure 1. The distribution of brown bears (*Ursus Arctos*), and Asiatic black bears (*Ursus thibetanus*; Picchio 2008) and public survey sites in Japan (A = Iiyama and Fujimi; B = Kitakata, Kitashiobara, and Horikawa; and C = Assabu, Oshamambe, villages around Hakodate, Hakodate).

Social approaches for reducing human–wildlife conflicts

Citizen participation in decision making and in the implementation of wildlife management action can mitigate potential conflicts with bears and garner long-term public support (Raik et al. 2003, Riley et al. 2003, Fulton et al. 2004). For this reason, understanding public perceptions, values, and attitudes related to wildlife is recognized as a critical step in the management process (McDuff 1998, Decker et al. 2001, Jacobson and Fulton et al. 2004).

In Japan, relatively little research has been conducted in the field of human dimensions of wildlife management (Sakamoto 2002, Sakurai 2007). Interventions for conflict mitigation that are effective elsewhere also might work in Japan. Cross-cultural studies can improve understanding of relations between wildlife and people and the design of better management programs (Manfredo and Dayer 2004, Dayer et al. 2007, Teel et al. 2007, Manfredo et al. 2009).

Human dimensions research often uses a cognitive approach, which attempts to understand how people's values, attitudes, and social norms influence their behaviors (Vaske and Donnelly 1999, Decker et al. 2001). The Theory of Reasoned Action (Ajzen and Fishbein 1980, Ajzen 1985), which often has been used in resource management studies

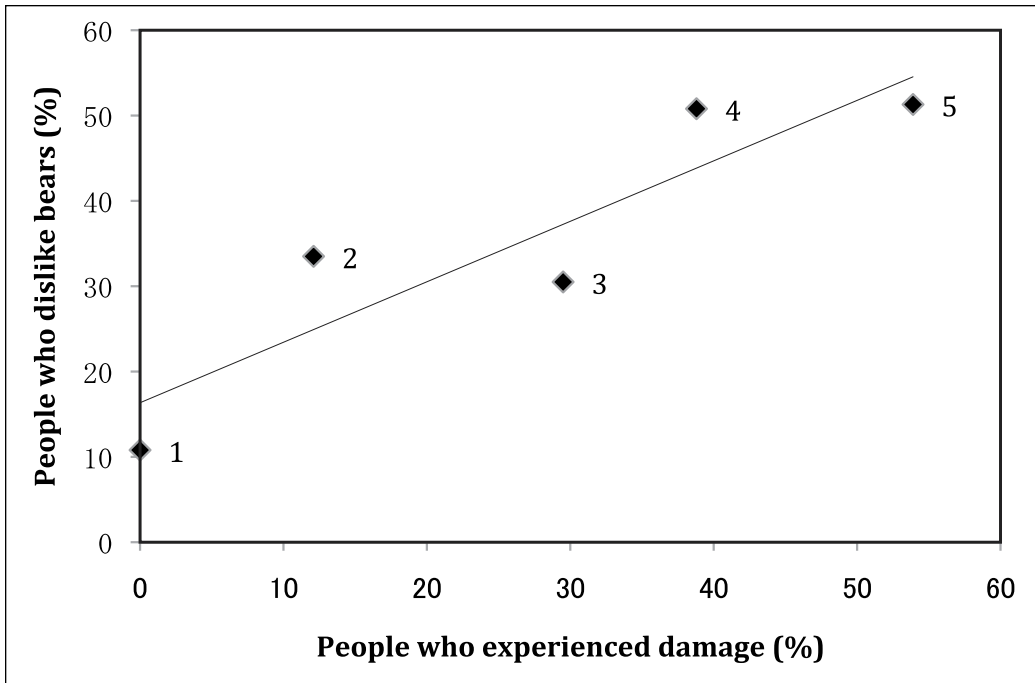


Figure 2. Correlation of number of people who experienced damage and who disliked black bears in 5 towns ($r^2 = 0.81$, $P = 0.04$): 1. Horikawa, 2. Fujimi, 3. Kitashiobara, 4. Kitakata, 5. Iiyama).

(Rossi and Armstrong 1999, Aipanjiguly et al. 2002; Fulton et al. 2004), suggests that attitudes can predict behavioral intentions that identify specific behaviors (Vaske and Donnelly 1999). It is important to understand the evaluative dimension of an attitude (e.g., whether a person views the object positively or negatively, that is, whether a person likes or dislikes bears) and the cognitive dimension (e.g., a person's beliefs about the object, such as "bears are frightening"; Decker et al. 2001). For example, 2 people, who have the same cognitive belief that bears are big, might have different attitudes about bears depending on whether they evaluate the large size as attractive or dangerous.

This study focuses on understanding attitudes and beliefs about bears and bear conservation in Japan. We examine management interventions that encourage more pro-bear behaviors (Gore and Knuth 2006). Our objectives were to: (1) review the attitudes and experiences of Japanese residents with bears, and (2) review recommendations for bear management interventions to reduce human–bear conflicts in Japan and compare these with recommendations in North American literature.

Methods

We collected results of Japanese surveys regarding people's attitudes and beliefs toward bears. By asking bear researchers in Japan, as well as using web-based search engines, we identified 7 surveys of Japanese attitudes toward bears. Of those surveys, 4 studies were used for the analysis of our objective 1 (Figure 1): Kameda and Maruyama (2003) with a sample size of 874; Uchikoshi (2007) with sample size of 730; Ministry of the Environment (2007a) with a sample size of 1,038; and Kameda et al. (2007) with a sample size of 423. Three other surveys were not used because samples were not selected randomly or sample sizes were too small. We compared the results of questions that had similar content and response choices from the 4 studies to understand the overall characteristics of Japanese experiences with bears and cognitive elements associated with them. Attitudes included (1) a cognitive belief that bears are frightening, and (2) evaluative elements (e.g., "I want to protect bears/I dislike bears; I feel positive/negative toward bears appearing around human settlements"). We conducted a regression analysis to test for an

Table 1. Experiences and attitudes associated with Asiatic black bears in Japan.

Sites	People who saw wild bears (%)	People who said bears are scary (%)	People who experienced damage by bears (%)	People who disliked bears (%)			People who wanted to protect bears (%)		
				Yes	Neutral	No	Yes	Neutral	No
Iiyama (<i>n</i> = 435; Uchikoshi 2007)	20	94	54	51	19	30	22	24	55
Fujimi (<i>n</i> = 295; Uchikoshi 2007)	7	88	12	34	27	39	34	22	43
Kitakata (<i>n</i> = 731; Ministry of the Environment 2007a)	30	91	39	51	21	28	25	27	48
Kitashiobara (<i>n</i> = 173; Ministry of the Environment 2007a)	51	87	30	31	19	50	43	26	31
Horikawa (<i>n</i> = 134; Ministry of the Environment 2007a)	1	91	0	11	33	56	55	29	17

Table 2. Experiences associated with brown bears in Japan.

Sites	Encountered (%)	Saw from a distance (%)	Experienced property damage (%)	No experience (%)
Assabu (<i>n</i> = 177; Kameda et al. 2007)	25	36	16	15
Oshamambe (<i>n</i> = 246; Kameda et al. 2007)	4	19	2	48
Villages around Hakodate (<i>n</i> = 439; Kameda and Maruyama 2003)	15	28	2	34

association between the number of people who experienced damage by bears, and people who disliked bears or wanted to protect them.

For objective 2, we used web-based search engines, such as Google[®], to identify 29 research publications (papers in peer-reviewed academic journals), and gray literature (e.g., government documents available online), and 45 North American publications that discussed the human dimensions of bear management. Forty-eight of the 74 studies (listed as a footnote to Table 4) included management recommendations to reduce human–bear conflicts, and these were compared between Japan and North America.

Results

Most Japanese survey respondents (average of 91%), regardless of their actual exposure to black bears, thought bears were frightening (Table 1). This result also is supported by other literature on public attitudes toward bears in Japan (Knight 2003, Huygens et al. 2001, Japan Bear Network 2007b).

In Iiyama and Kitakata, where many people experienced damage by black bears, those who disliked bears outnumbered those who did not, and about twice as many did not want to protect bears as those who did (Table 1). In Fujimi, Kitashiobara, and Horikawa, where crop damage was less than in Iiyama and Kitakata,

Table 3. Attitudes toward brown bears appearing around human settlements and living in mountains in Japan.

Sites	Attitudes toward bears	Positive (%)	Neutral (%)	Negative (%)
Assabu (<i>n</i> = 177; Kameda et al. 2007)	Attitudes toward bears appearing around human settlements	9	6	81
	Attitudes toward bears living in mountains	19	25	50
Oshamambe (<i>n</i> = 246; Kameda et al. 2007)	Attitudes toward bears appearing around human settlements	11	8	76
	Attitudes toward bears living in mountains	28	35	32
Villages around Hakodate (<i>n</i> = 439; Kameda and Maruyama 2003)	Attitudes toward bears appearing around human settlements	17	10	65
	Attitudes toward bears living in mountains	27	34	32
Hakodate (<i>n</i> = 435; Kameda and Maruyama 2003)	Attitudes toward bears appearing around human settlements	22	12	60
	Attitudes toward bears living in mountains	36	38	20

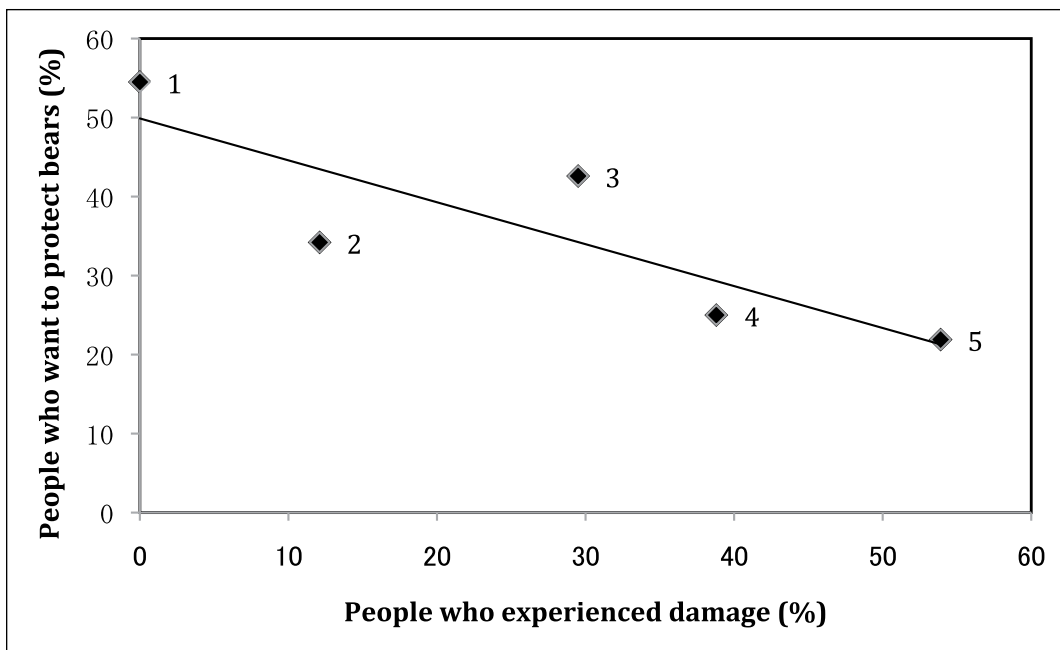


Figure 3. Correlation of number of people who experienced damage and those who wanted to protect black bears in 5 towns ($R^2 = 0.72$, $P = 0.07$): 1. Horikawa, 2. Fujimi, 3. Kitashiobara, 4. Kitakata, 5. Iiyama.

more people responded that they liked bears, and more people in Kitashiobara and Horikawa wanted to protect bears than those who did not (Table 1).

There was a positive correlation between people who experienced crop damage by bears and those who disliked bears ($R^2 = 0.81$, $P = 0.04$; Figure 2). There was also an indication of

a negative linear relation ($R^2 = 0.72$, $P = 0.07$) between the number of people who experienced damage by bears and those who wanted to protect bears (Figure 3).

In Assabu, where many people had experiences with brown bears (Table 2), almost all respondents had negative attitudes toward the appearance of bears around human

Table 4. Recommended interventions to reduce bear conflicts.

Change in human attitudes or behaviors	Japan	North America
Proper control of trash and food	A, B, C, D, E, F, G	1, 2, 3, 4, 5, 6, 7, 8, 9, 10
Clearing of brush at abandoned farmland or around houses	A, C, D, F	
Education about bears ecology, how to respond against approaching bears, and how to lessen the probability of bear–human conflicts to residents and visitors to preserved areas	C, D, E, F, G, H, I, J, K, L, M, N, O	1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26
Compensation for damages to agriculture and humans	K, N	4, 21
Erection of electric fences	B, C, D, F, G, M, N, P, Q, R	1, 3, 4, 7
Planting crops that are not attractive to bears	A, E	
Driving back bears appearing near human settlements with or without dogs	C	7, 8
Giving financial incentives for ranchers to retire sheep grazing on public lands		1
Restriction of human activities (e.g. road and travel restrictions to National Parks)		27
Communication among residents, stakeholders, and management agencies for better decision making		8, 28, 29, 30
Changing wildlife habitat		
Increasing the natural food and habitat for bears away from human settlements	E, M, N	

Citation code: **A** = Kameda et al. 2007; **B** = Nagano prefecture 2008; **C** = Ministry of the Environment 2008; **D** = Nagano Environmental Conservation Research Institute 2004; **E** = Huygens et al. 2001; **F** = Japan Bear Network 2007b; **G** = Kanamori et al. 2008; **H** = Uchikoshi 2007; **I** = Kameda et al. 2003; **J** = Brown 2005; **K** = Roy 1998; **L** = Japan Bear Network 2007a; **M** = Hazumi 1999; **N** = Mano and Moll 1999; **O** = Ishida 2009; **P** = Fujiwara 2000; **Q** = Huygens et al. 1999; **R** = Kohira et al. 2009
1 = Gunther et al. 2004; **2** = Spencer et al. 2007; **3** = Davis et al. 2005; **4** = Terment 2006; **5** = Martin and McCurdy 2009; **6** = Baruch-Mordo et al. 2009; **7** = Cotton 2008; **8** = Madison 2008; **9** = Leigh and Chambrlan. 2008; **10** = Beckmann et al. 2004; **11** = Morzillo et al. 2007; **12** = White et al. 1995; **13** = Gunther et al. 1998; **14** = Burghardt et al. 1972; **15** = Herrero and Higgins 2003; **16** = White et al. 1995; **17** = Dunn et al. 2008; **18** = Kimberly 2007; **19** = Schwartz and Gunther 2006; **20** = Servheen 1999; **21** = Primm 1996; **22** = Pelton et al. 1976; **23** = McCool and Braithwaite 1989; **24** = Don Carlos et al. 2009; **25** = Wolfe. 2008; **26** = Conover 2008; **27** = Schirokauer et al. 1998; **28** = Morgan et al. 2004; **29** = Siemer and Decker 2006; **30** = Lemelin 2008.

settlements, and half of respondents also had negative attitudes toward bears' presence in the mountains (Table 3).

Most Japanese (72%) and North American (83%) researchers emphasized the importance of education and outreach campaigns to reduce human–bear conflicts (Table 4). Other interventions recommended in Japan included clearing brush at abandoned farmland and around houses, compensating for damage to agriculture and individuals, erecting electric fences, planting crops that are unattractive to bears, driving away bears that appear around human settlements, and increasing

native broadleaf forest habitat for bears. Some interventions mentioned only in North American papers included giving financial incentives to ranchers to retire sheep grazing on public lands, restricting human activities, and improving communication between residents, stakeholders, and management agencies for better decision making.

Discussion

Perceptions of bears

Most Japanese residents surveyed reported negative attitudes toward bears. This finding is corroborated in other literature (Huygens et

al. 2001, Knight 2003, Yamanaka 2006, Japan Bear Network 2007*b*, Mano and Ishii 2008). Researchers have found that, in Japan, residents who saw bears around houses or farms tended to call the local government and ask them to kill the bears (Japan Bear Network 2007*b*, H. Hayashi, Shinshu Black Bear Research Group, personal communication, 2008). Japan lacks a national wildlife agency with wildlife officers, and lethal control is a common intervention that is readily available to municipal governments.

Most respondents in Japan shared the belief that bears are frightening. Most people could not accept the appearance of bears around human settlements. These findings indicated that people in Japan evaluate bears negatively. Although it was beyond the scope of this study to compare differences in people's attitudes toward black bears and brown bears in Japan, attitudes toward brown bears seem to be more negative (Sakurai and Jacobson 2009). In some prefectures, when black bears appear around the village, they are captured and released in the mountains after negative conditioning (Nagano prefecture 2007). In contrast, brown bears are usually killed when they appear near human settlements (Tsuruga et al. 2002).

Some studies reported misconceptions among the Japanese public about bears. Several studies found that people misunderstood the characteristics of bears and thought they were larger than their actual size (Japan Bear Network 2007*b*). Moreover, landowners felt powerless to protect their property from bears because they lacked the necessary knowledge and resources (Huygens et al. 2001). People's negative attitudes toward bears might be exacerbated by misunderstanding or ignorance. Several social psychology models show that people's behaviors can be influenced by increasing their knowledge (Hungerford and Volk 1990, Kollmuss and Agyeman 2002, Schultz 2002), suggesting that information and education programs could help garner public support for sustainable bear management.

Reducing human–bear conflicts

Wildlife species have both positive and negative values for society (Conover et al. 1995). To alleviate human–wildlife conflicts, managers, local governments, and researchers need to increase the benefits and decrease

the liabilities of having those species nearby (Conover 2002). The liabilities of living adjacent to bear habitat for local residents include damage that they suffer to their crops and their properties, human injuries, and death. Our study found that damage by bears is associated with negative attitudes toward these animals in Japan; therefore wildlife managers and local governments need to focus on reducing this damage. A number of interventions to reduce damage by bears have been recommended (Table 4). However, concurrent with implementing these interventions is the need to evaluate how effective they are in reducing damage and conflicts in Japan, and consequently influencing residents' perceptions.

One recommended intervention to reduce human–bear conflicts in Japan is to compensate for damage. Currently, there are few government compensation programs for wildlife damage to agriculture, forestry, or humans in Japan. Wildlife historically does not belong to anyone under Japanese civil law, and it is not the government's responsibility to deal with damage by wildlife (Roy 1998, Sato 2003, Ministry of the Environment 2008). Wildlife, including bears, is managed and protected by the government under the Wildlife Protection and Hunting Law with the stated goal "to improve the living environment of people and protect biodiversity" (Ministry of the Environment 2007*b*).

One of the first compensation programs for bear damage in Japan was established in Hiroshima (Mano et al. 2008, Outback 2008). The prefecture and local town are responsible for paying for casualties by bears in this compensation program (Outback 2008). Since the establishment of this program in 1997, there were 4 cases in which people were compensated (Ministry of the Environment 2008). In North America, about one-third of states and provinces inhabited by black bears provide reimbursement for damages by bears (Ternent 2006). However, some studies have found that compensation did not necessarily improve the tolerance of recipients toward the species that caused damage (Naughton-Treves et al. 2003), nor did it provide incentives for residents to solve their own problems (Wagner et al. 1997). Therefore, if compensation systems are to be introduced widely in Japan, the potential cost

and benefit of this intervention needs to be assessed.

Education and outreach programs can be a successful conservation strategy (Jacobson et al. 2006), enabling local residents to acquire accurate information and skills to prevent human–bear conflicts and make informed decisions for the sustainable management of bears (Decker and Purdy 1988, Conover 2002, Gore and Knuth 2006, Sato 2008). Although it is important to understand and measure the effectiveness of such programs, relatively few evaluations have been conducted to determine if interventions designed to reduce human–bear conflicts were successful (Gore 2004, Gore and Knuth 2006, Dunn et al. 2008, Jacobson 2009).

A review by Gore (2004) of 6 case studies of intervention programs for reducing bear conflicts in North America found that only two of them established formal criteria to define success, and just one in British Columbia, Canada, succeeded in reducing human–bear conflicts significantly (about 75%) after the intervention. An educational program in Wyoming succeeded in increasing people's support for bear conservation from 42 to 61% (Schwartz and Gunther 2006). Another study found that an outreach program resulted in more accurate knowledge about bears in treatment sites (Dunn et al. 2008), while a third program did not change residents' knowledge nor their willingness to adopt desired behaviors (Gore and Knuth 2006). In Japan, outreach programs to reduce human–bear conflicts have been conducted by 13 of 35 prefectures (Mano et al. 2008), and nonprofit organizations also implement programs (H. Hayashi, Shinshu Black Bear Research Group, personal communication, 2008; K. Kojima, Hokkaido Oshima Branch Office, personal communication, 2008). However, a comprehensive evaluation process to measure the impacts of these programs is lacking.

Human–bear conflicts cost people and local governments much money, time, and human safety concerns; mitigating these conflicts is becoming increasingly dire in Japan. This study revealed the association between conflicts and people's attitudes toward bears. An understanding of public perceptions of bears should help in developing effective interventions that can be implemented and

assessed if bears are to continue to coexist with people in the Japanese landscape.

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