

PUBLIC OPINION TOWARD BEARS AND BEAR MANAGEMENT  
IN JAPAN AND NORTH AMERICA

By

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To all who nurtured my intellectual curiosity, academic interests, and sense of scholarship  
throughout my lifetime, making this milestone possible  
“We are where we are not by random chance but by following a logical course over four years.”  
— Philippe Troussier

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The threatened Asiatic black bear (*Ursus thibetanus*) and brown bear (*Ursus arctos*) are considered nuisances in Japan because of agricultural and property damage as well as occasional human casualties. I reviewed 64 articles from the research and gray literature both in Japan (26) and North America (38) which discuss the human dimensions of bear management. Findings revealed that in Japan, most respondents (average of 90.9%) thought bears are scary. A cross-cultural comparison showed that significantly more Japanese thought bears should be extirpated than US respondents ( $\chi^2=2569.223$ ,  $p<0.0005$  for black bears and  $\chi^2=1585.067$ ,  $p<0.0005$  for brown bears). Most Japanese and North American researchers emphasized the importance of education for residents and visitors to reduce bear-human conflicts. This study found that damage by bears can be contributing to the negative attitudes toward these animals in Japan, and therefore wildlife managers and governments need to focus on reducing these damages. Also, effective educational programs need to be conducted for residents so that they can acquire accurate information and skills to prevent bear conflicts, and make informed decisions as well as reasoned action for sustainable management of bears.

## CHAPTER 1 INTRODUCTION

### **Bears in Japan**

#### **Asiatic Black Bear and Brown Bear**

Two kinds of bears inhabit Japan: Asiatic black bear (*Ursus thibetanus*) and brown bear (*Ursus arctos*). Both are considered game species and are not protected. The current distribution of the two species is showed in Figure 1-1. Asiatic black bears are spread widely in Asia from Japan to Iran, and this species is categorized as a Vulnerable Species by the IUCN Red List of Threatened Species (Japan Bear Network 2007b). International trade of this species is controlled by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (UNEP-WCMC 2009).

The Japanese subspecies of Asiatic black bear is generally called “Tsukinowa-guma”, meaning moon bear as it has white fur like a new moon on its chest (Hazumi 1999). Asiatic black bear has similar characteristics with the American black bear (*Ursus americanus*) including its size (Roy 1998). In Japan, black bears used to be wide-spread in Honshu, Shikoku, and Kyushu, however human population and land use has increased since the 1950s and led to a reduction of black bear habitats (Japan Bear Network 2007b). Meanwhile, as people expanded their land use, damage to crops and forestry by bears increased and many bears were captured and mostly killed by hunters for their nuisance activities (Japan Bear Network 2007b). As a result, black bears are thought to be extirpated in Kyushu, and the population is endangered in Shikoku (Brown 2005; Hazumi 1999). Current population of black bear in Japan is estimated to number 10,000-15,000 which may count as more than 20% of the whole population of Asiatic black bears in the world (Hazumi 1999). Although, seven isolated local populations of black

bears are considered threatened in Japan, the national population of this species is considered stable (Ishii 2006).

Brown bears inhabit most parts of Asia, and in Japan this species lives in the northernmost island, Hokkaido (Japan Bear Network 2007b). Human-bear conflicts, such as crop damages and occasional human casualties, occur in those areas adjacent to bear habitat (Tsuruga et al. 2002). Hundreds of brown bear has been killed annually to control for damage (Tsuruga et al. 2002). Despite this strong pressure of harvest, this species still appears in 70% of the land of Hokkaido (Japan Bear Network 2007b) and the population is estimated to number 2,000- 3,000 (Kameda et al 2006), which outnumber brown bears living in the western United States outside of Alaska (Roy 1998). Although a small and isolated population in the Western Ishikari is listed as endangered in the Japanese Red List (Red Data Book of Hokkaido 2003), the population of brown bears in Hokkaido is considered stable (Ishii 2006).

### **Images of the Bear in Japan**

People traditionally had a variety of beliefs about bears in Japan. Both in Hokkaido, where brown bears live, and in other parts of Japan where black bears exist, bears are associated with mountain spirits (Knight 2003). The indigenous Ainu, who traditionally hunted bears in Hokkaido, believed that bears are a form of mountain spirits who visit the human world to give fur and meat (Knight 2003). In other parts of Japan, bears are thought as gods of mountains (Knight 2003). On the other hand, resemblance of the characteristics of bears with human such as the ability to use their hands and stand up erect generated anthropomorphism of bears in Japan (Knight 2000). Bears are sometimes called as mountain man, mountain uncle, lonely person, and single dweller (Knight 2003). Bears also are a symbol of family ties, particularly mothers love and nurturance. Mother bears which give a birth in the mountain at the coldest time of the year are respected for their maternal dedication (Knight 2003).

## Life History

Asiatic black bear males weigh around 60-120kg and females weigh 40-100kg with a body length of 110-140cm (Hazumi 1999). These bears are omnivorous and change their diet by season, however they mostly eat plant foods (Izumiyama & Shiraishi 2004). In spring, bears eat herbaceous plants and new green shoots on trees, in summer, leaves of trees, herbaceous plants, fruits of Japanese cluster cherry (*Prunus grayam*), and invertebrate such as ants (*Formica sp*), and in fall, mainly beechnuts and oak acorns (Roy 1998; Japan Bear Network 2007b).

In Japan, the black bear's home range corresponds with broad-leaved temperate forests, such as beech and oak, which produce nuts are important diet for this species (Izumiyama & Shiraishi 2004; Japan Bear Network 2007b).

Bears hibernate mostly in hollow trees, cracks of rocks, or in the ground in winter (Hazumi 1999). They start winter sleep from the beginning of November to the end of December until April for five to six months (Hazumi 1999). Females deliver generally two cubs during hibernation (Japan Bear Network 2007b). The mating season for this species is from June to August (Japan Bear Network 2007b; Ministry of the Environment 2008). Birth rate increases when they have a rich harvest of nuts in forests in the previous fall (Japan Bear Network 2007b). Bear home ranges are 66.06km<sup>2</sup> in males and 26.37km<sup>2</sup> in females on average (Hazumi 1999).

Brown bears weigh around 150-250kg, and 200-230cm in body length (Ministry of the Environment 2008). The diet of brown bears in Japan is similar to the black bears, eating herbs from spring to summer, insects in summer and nuts in fall, and especially those foods they harvest in fall are important to put on fat for hibernation (Japan Bear Network 2007b). They go into hibernation from around the end of November to the middle of December, and sleep the whole winter until the end of March to the end of April (Japan Bear Network 2007b). Similar to black bears, female brown bears also give birth to 1 or 2 cubs during hibernation every two-three

years (Japan Bear Network 2007b). Active ranges are 10-40 km<sup>2</sup> for females (Ministry of the Environment 2008), which tend to be smaller than brown bears in Europe and North America, and 200-500km<sup>2</sup> for males (Japan Bear Network 2007b).

### **Management of Bears in Japan**

Both Asiatic black bears and brown bears are designated as game species in Japan, by Wildlife Protection and Hunting Law (Ishii 2006). During hunting season for black bear, from November 15<sup>th</sup> to February 15<sup>th</sup>, about 500 bears are hunted except isolated and threatened populations in Western Honshu, Shikoku and Kyushu (Ishii 2006; Japan Bear Network 2007b). Bears are removed throughout the year under a nuisance control plan, and 1,000 to 2,500 black bear are captured and mostly killed to reduce damages to agriculture and forestry, and human casualties (Ishii 2006; Japan Bear Network 2007b). Hunting season for brown bear is from October 1<sup>st</sup> to January 31<sup>st</sup> and an average of 368 brown bears are killed for hunting and also nuisance control every year (Kameda et al. 2006).

In Japan, nuisance activities by Asiatic black bears include stripping bark from trees; raiding crops, orchards, apiaries, and fish farms; feeding from compost heaps and garbage bins; and attacking livestock as well as humans (Hazumi 1999; Huygens et al. 2001). Conflicts by brown bears include three categories: human casualties; agricultural damage such as crop damage, especially to corn, and livestock; and fear of bear attacks generated by their appearance around human settlements (Tsuruga et al. 2002; Kameda et al. 2007). The primary reaction to black bear depredation by hunters is to set cage traps to capture and kill nuisance bears (Hazumi 1999; Huygens et al. 2001). For brown bears also, damage control killing is currently the only method to deal with bear-associated problems (Tsuruga et al. 2002).

In order to hunt bears in Japan, hunters must have an appropriate hunting license, valid for three years, issued by the governor of the prefecture of his/her residence, and in addition, he/she

must register with the governors of the prefectures where he/she intends to hunt (Ministry of the Environment 2007c). This license is given only to those who passed a prefecture examination which tests characteristics of game species, as well as the applicants' health (Brown 2005).

### **Human-bear Conflicts in Japan**

#### **Black Bear**

Human-bear conflicts mainly consist of two factors: human casualties and damage to agriculture and forestry (Japan Bear Network 2007b). In Japan, both casualties and damage to crops by black bear are increasing (Japan Bear Network 2007b). For example, in Iwate prefecture, located in northeast of Honshu, the number of attacks on people has been increasing since 1993 (Japan Bear Network 2007b). The annual average victims of bear attacks were 5 people between 1980 and 1992; it has increased to 11.4 victims annually after 1993 and until 2005 (Japan Bear Network 2007b). In 2006, when black bears massively appeared around human settlements, 142 people were injured and 3 people were killed by bears which was the highest number on the record (Ministry of the Environment 2007b).

Crop damage by black bears also is increasing (Japan Bear Network 2007b). The amount of damage has increased rapidly since 1995, and almost every year, total damages weigh more than 10,000,000kg and the amount of damage is about 300 to 400 million yen (about \$3,000,000 to \$4,000,000) every year (Japan Bear Network 2007b). Black bears also cause damage to forestry by stripping the bark off the tree (Hazumi 1999). Damage has increased since 1960 in the western side of Honshu which recorded 400 to 500 ha of damage annually (Japan Bear Network 2007b). This damage has started to spread to the eastern side of Honshu recently (Japan Bear Network 2007b).

## **Brown Bear**

Casualties by brown bear are decreasing in Hokkaido since 1960, yet injuries to people by 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 (Japan Bear Network 2007b). According to Tsuruga et al. (2002), 35% of victims were attacked during sport hunting, 9% during control killing, 39% when edible plant or mushroom picking, 4% when fishing, and 9% when doing forestry activities. For agricultural damages, the loss has been increasing (Tsuruga et al. 2002). The annual amount of damage reached about 100 million yen (\$1,000,000) recently (Tsuruga et al. 2002). This damage by brown bears is serious and losses vary from corn, fruits and other diverse crops, livestock such as cows and horses, and apiary (Japan Bear Network 2007b).

## **Reasons for Human-bear Conflict in Japan**

Declines in food availability, such as forest mast that happens every several years in the Fall, may cause the widespread appearance of black bears around human settlements (Japan Bear Network 2007b). Consequently, more bears appear in farm lands, forestry, or around residences, and more conflicts occur. In 2004, during a small mast year, 111 people were injured and 2 were killed, and in the same year, 2485 black bears were killed for their nuisance activities, to control numbers, and for hunting (Ministry of the Environment 2007b). In 2003 and 2005, the number of casualties were 51 and 47 respectively, and the number of bears captured for nuisance activities and to control numbers were 1,409 and 719 respectively (Ministry of the Environment 2007b). However, correlations between lean mast years and widespread appearances of bears are not well documented (Japan Bear Network 2007a). Other factors also may influence bears' appearance such as reproductive success for females in the previous year (Japan Bear Network 2007a).

Secondly, as hunters are decreasing rapidly in Japan, the harvest of bears by hunting is decreasing. Lack of negative conditioning, such as hunting, can increase bears that have lost their

fear of humans (McCullough 1982; Staff at the Otari village, personal communication, June 5, 2008). Numbers of Japanese hunters decreased to less than 200,000 (Japan Bear Network 2007b) which is less than one third of a peak population of 530,000 in 1970 (Ueda et al. 2004). Ueda (2009) explains that one of the biggest factors that contributed to the decrease of hunters was the revision of Guns and Swords Act in 1978 which strengthened the regulation of the use of guns. The new act hindered the recruitment and retention of hunters (Ueda 2009). The hunters also are aging (Igota & Suzuki 2008) and it is certain that we will lose a main group who control wildlife in the near future in Japan (Ueda 2009). Without effective hunters, it will be difficult to manage and control numbers of nuisance bears and conflicts will likely increase in the future.

The third reason for human bear conflict is the change of land use in Japan. Agricultural and mountainous villages are losing populations and the population is aging, resulting in 49% of land cover classified as underpopulated in Japan (Japan Bear Network 2007b). In Japan, villagers used to manage forests around villages to get wood and necessities (Iwasa et al. 2003; Kohira et al. 2006). These forests, called Satoyama, played a role as a buffer zone between wildlife habitats and human settlements, because there were less refuges and food for wildlife in those areas, and constant appearance of humans made the areas unappealing for wildlife (Noma 2005; Kohira et al. 2006). However, because of depopulation in many villages, most of these Satoyama have been abandoned, becoming denser forests or bush, which make it easier for wildlife to appear around the village (Japan Bear Network 2007b). Abandoned planted forests and abandoned orchards attract bears to villages and cause human-bear conflicts.

### **Threats to Bears in Japan**

#### **Nuisance Kills**

In Japan, both black and brown bears are considered nuisances because of agricultural and property damage, as well as occasional human casualties (Knight 2003; Japan Bear Network

2007b). Hunting and depredation kills are significant sources of mortality affecting bear populations in Japan (Knight 2003; Japan Bear Network 2007b). In Hokkaido, people especially those living near brown bears' habitats think bears are fierce animals, and when bears are considered a threat to crops, properties or human safety, killing is the only choice in most of communities permitted by the Hokkaido government throughout the year (Tsuruga et al. 2002). There are various reasons for bears to appear near human settlements, such as a general movement and looking for natural foods. However in most cases, bears are judged as dangerous, without investigating the real cause of their appearance (Japan Bear Network 2007b). Damage by bears has been increasing in many towns in Hokkaido (Japan Bear Network 2007b). Tsuruga et al. (2002) report that if the current killing system is continued, the local brown bear population might become extinct.

The situation is similar with black bears. Pest control kills occur year-round (Roy 1998; Brown 2005). They remove more bears from the population than sport hunting (Roy 1998). In most cases when residents or villagers see bears, they call the local government which in turn calls hunters to remove bears (Hayashi, personal communication, June, 10, 2008). In 23 of 35 prefectures where bears live, the prefecture has the right to give permission to capture bears to prevent nuisance activities (Mano et al. 2008). Nine other prefectures delegate these rights to cities, towns, and villages (Mano et al. 2008). Only 10 prefectures impose a maximum number of bears that hunters can capture (Mano et al. 2008), and even in prefectures that set a bag limit, more bears sometimes are killed than the number established by prefectures. For example, Nagano prefecture has imposed the maximum harvest number as 150 bears a year (Nagano prefecture 2007). However in 2006, a year of widespread bear appearances, 553 bears were killed to avoid damage to people, agriculture and forestry (Nagano prefecture 2007). In the same

year, a total of 4,340 black bears were captured and mostly killed, which counted for 40% of the population (Ministry of the Environment 2007b). According to Huygens et al. (2004), no significant associations between depredation costs to people and nuisance kills were found at the municipal levels, and the current system of killing bears after depredation events may not help reduce depredation costs (including damage to trees, crops and other property). The fact that human-bear conflicts are increasing (Japan Bear Network 2007b) shows that the current management policy, which is mostly a lethal control method, has been ineffective (Brown 2004).

### **Habitat Degradation**

Asiatic black bear used to be widespread in Honshu, Shikoku, and Kyushu in the past, however their distribution retreated as people increased their population and land use after 1950s, when rapid economic growth occurred in Japan (Hazumi 1999; Japan Bear Network 2007b). Out of all land (370,000km<sup>2</sup>), flat land (non-mountainous areas) (30%) was developed to urban areas and farm lands, and natural forests (70%) was converted to planted coniferous forest mainly Japanese cedar, hinoki, and larch for timber after the second World War (Japan Bear Network 2007b). These timber forests currently occupy 45% of all forests in Japan except in Hokkaido where 27% is occupied by timber forest (Japan Bear Network 2007b; Hokkaido Forest Products Research Institute 2009). Black bears which prefer broad-leaved trees significantly lost their natural habitats (Japan Bear Network. 2007b). As a result, black bears are thought to be extirpated in Kyushu, and less than 20 bears are estimated in Shikoku (Ishii 2006; Japan Bear Network 2007b). In Honshu, isolated local populations in the Shimokita and Kii peninsula, and in the eastern and western Chugoku District have less than a few hundred bears in each, and they are classified as an Endangered Local Population on the Japanese Red List, organized by the Ministry of Environment (Ishii 2006).

Brown bears once lived all around Hokkaido including coastline and flat land, however modern development after the end of 19<sup>th</sup> century expelled bears from non-mountainous areas that were changed into urban and agricultural areas (Mano & Moll 1999; Japan Bear Network 2007b). The brown bear population of the west side of Hokkaido's Ishikari region is classified as an Endangered Local Population by the Japanese Red List (Red Data Book of Hokkaido 2003).

### **Utilization of Bear Bile**

Among bear body parts, only gall bladder, which has been utilized by people for more than 400 years in Japan, has a high financial value currently (Ishii 2006). More than 10% of Japanese have bought or obtained bear bile, and about one-third of shops that sell traditional medicine sell the product of bear bile (Ishii 2006). Currently, there are no regulations to restrict usage of bear bile of captured bears and it is difficult to prove if bladders are taken legally or illegally, when they are sold at the stores (Hughens et al. 2001; Ishii 2006). Therefore, it is unknown if the use of gall bladder has been a threat to the current bear population. However, the majority of hunters said that it has become hard to find a buyer for the bear gall bladders (Ishii 2006). Over-harvesting of bears to get gall bladders may not be a threat for the two bear species in Japan (Ishii 2006).

### **Public Attitudes toward Bears in Japan**

According to the literature in Japan, the image of bears, especially in rural areas, is mostly negative and people feel bears are scary (Hugyens et al. 2001; Knight 2003). The number of bear attacks has created an image of bears as an aggressor or fierce animal (Knight 2003; Japan Bear Network 2007b). Also, depredation of agriculture and forestry by these animals has led to frustration and discontent, and negative attitudes toward bears and the conservation of bears (Hugyens et al. 2001). However, traditionally, for the Ainu, native people of Hokkaido, brown bears were respected as the god of the mountains (Tsuruga et al. 2002; Japan Bear Network

2007b). Roy (1994) concluded from interviews with 62 bear researchers, government professionals, hunters, and farmers in Japan, that public's negative attitudes toward bears can be one of the biggest obstacles in conservation of bears in this country.

## **Bears in North America**

### **American Black Bear**

The American black bear (*Ursus americanus*) once occupied most forested areas in North America, and has disappeared from some regions due to habitat loss, overharvest and predator control. They currently inhabit in most of Canada, at least 35 U.S. states and northern Mexico (Pelton et al. 1999; Ternent 2003). The populations are isolated in some areas of Tennessee, Georgia, Florida, Mississippi, Alabama, and Louisiana. Black bears are categorized as a game species in 33 states, and in Louisiana, eastern Texas, and Southeastern Mississippi, they are federally listed as a threatened subspecies under the Endangered Species Act of 1973 (Pelton et al. 1999). Currently estimated 186,881 to 206,751 black bears inhabit the US, except Alaska, Idaho, South Dakota, Texas and Wyoming where population sizes are unknown (Pelton et al. 1999).

American black bear males weigh around 60-140kg and females weigh 40-70kg (Pelton et al. 1999) with a body length of 150-180cm in average (Ternent. 2003; Taylor 2006). These bears are opportunistic omnivores and eat any available food including both plant and animal matter, however more than 75 percent of foods are generally plant (Ternent 2003). As for hibernation, the pregnant females typically den first beginning in early November and sleep until April (Ternent 2003). Adult males can remain active into January and hibernate until late February to early March (Ternent 2003). Generally two cubs are delivered in January during the hibernation (Pelton et al. 1999; Ternent 2003). Home ranges of black bears averaged 173 km<sup>2</sup> in males and 41 km<sup>2</sup> in females in northeast Pennsylvania (Ternent 2003). Black bear populations in the US

are estimated to have grown by 13% from 1970 to the late 1980s (Hrstienko & McDonald 2007). 28 US states out of 33 states which reported to have black bear populations, stated an increase in abundance of these bears (Hrstienko & McDonald 2007). Concurrent to the growth of black bear populations, human-black bear conflicts are also increasing (Gore et al. 2006). Wildlife agencies in the US states estimated a 45% increase in spending for controlling bear-related damages and a 19% increase in the total number of complaints in previous 5 years, in 2004 (Gore et al. 2006). Currently, about 30 people are attacked and average of one person is killed by black bears every year in the US (Ternent 2003).

### **Grizzly Bear**

The grizzly bear (*Ursus arctos horribilis*) inhabited at least 16 states of western United States with estimated 50,000 bears before 1800 (Servheen 1999). However the population started to decrease dramatically in response to immoderate human-caused mortality and habitat loss (Servheen 1999). The settlers shot, poisoned, and killed at wherever grizzly bears occurred because they believed that grizzlies were predators and competitors of humans (Servheen 1999). Hunting and killing of bears continued until 1970s, and by 1975 grizzly bears have declined to 7-800, occurring in less than 2% of their former ranges in the lower 48 states (Servheen 1999; Davis & Morgan 2005a). Grizzly bears in the lower 48 United States was listed as Threatened in 1975 under the U.S. Endangered Species Act (Servheen 1999). Grizzlies have been protected under Federal Law which prohibits killing of these animals except for self-defense or defense of others (Servheen 1999; Canepa et al., 2008).

Grizzly bear males weigh around 200-500kg and females weigh 100-280kg with a body length of 110-213cm (Talyor 2006). Omnivorous grizzly bears eat almost all food available including roots, bulbs, tubers, nuts, insects, and ungulates (Canepa et al. 2008). Grizzlies deliver an average of 2 cubs in winter (Canepa et al. 2008). Their home ranges are about 320-800km<sup>2</sup> in

males and 80-480km<sup>2</sup> in females (Davis & Morgan 2005a; Canepa et al. 2008). About 2 people are injured and less than 0.5 were killed in average every year by grizzly bears in Glacier and Yellowstone National Park since 1980 (Canepa et al. 2008).

### **People's Attitudes toward Bears in North America**

European settlers, who first came to the western U.S considered grizzly bear as a competitive and predatory animal, and killed them wherever they occurred. Currently there is a strong support for conservation of this animal as grizzlies are considered endangered in the US (Kellert 1994). A national study found that a majority of Americans expressed a willingness to create millions of acres of national forest land to protect the habitat of grizzly bear even if people might lose jobs (Kellert et al., 1996). However, on the other hand, residents living adjacent to grizzlies' habitat are generally less willing change their behaviors to conserve grizzly bears (Kellert et al. 1996). This fact might correspond to people's attitudes toward other predators, such as wolves and coyotes, in North America, where rural residents who suffer from direct depredation or any kinds of direct problems by those animals have negative attitudes toward them, while people living in cities have positive attitudes to those predators (Conover 2002; Naughton-Treves et al. 2003; Nie 2004). The perception of rare and endangered also affects people's impression of grizzlies. North Americans generally have positive attitudes toward grizzly bears even though they have potential for human injury or property damage (Kellert 1994). Overall, North Americans see bears in a positive manner which may be related to bears symbolic value that comes from myth, legend, and fairy tales; currently illustrated by Smokey the Bear, the Teddy Bear, etc. (Kellert 1994; Kellert et al., 1996).

### **Social Approaches for Solving Wildlife-Human Conflicts**

Concern about social and economic aspects of wildlife management grew, and entire sessions on people-wildlife topics appeared on the programs of major professional conferences in

1970s in North America. The breadth of topics, stakeholders, and processes studied by human dimensions experts continues to grow as research continues in traditional areas and has expanded to new topics, such as species restoration, people-wildlife interaction in metropolitan environments, and communication between agencies and stakeholders (Decker et al. 2001).

On the other hand, in Japan, the field of human dimensions of wildlife management is still not well-known and research in this area has scarcely begun (Sakamoto 2002; Sakurai 2007). A classic study about Japanese perceptions of wildlife was conducted by Kellert (1991). From a survey in urban and rural areas of Japan in 1986, he found that Japanese appreciation of nature is often lacking an ecological or ethical orientation, or a strong sense of responsibility to conserve or protect the natural environment (Kellert 1991). This result reflects a report by Oyadomari (1989) which stated that Japanese perception toward nature is emotional rather than analytical. Kellert (1991) found that the American public expressed a much stronger ethical and ecological perspective of nature and wildlife than the Japanese.

### **Importance of Understanding People's Attitudes and Beliefs**

Identifying social dimensions and socially defined impacts of wildlife management has been recognized as an indispensable process to make the process successful (Riley et al. 2003; Fulton et al. 2004). Also, involving stakeholders and the public has currently become one of the most important elements of wildlife management in the US (Raick et al. 2003). Direct citizen participation in decision-making and implementation of wildlife management action can mitigate potential conflicts and garner long-term public support (Raick et al. 2003; Riley et al. 2003; Fulton et al. 2004). In the past, failures of the management implementation by wildlife managers occurred when they did not assess social feasibility of the management process (Jacobson & McDuff 1998). These cases include the reintroduction of wolves in Michigan in 1974 which failed as all four released wolves were killed by people (Decker et al. 2001), and controversial

management of white-tailed deer in New York which resulted in a lawsuit between stakeholders and managers (Leong & Haigh 2007). On the other hand, sociological assessments including survey and outreach campaigns to local residents led to successful restoration and establishment of wolves in Yellowstone National Park (Jacobson 1999; Decker et al. 2001). For this reason, understanding public perception, values, and attitudes related to wildlife and their management action is recognized as a critical step in the management process (Jacobson & McDuff 1998; Fulton et al. 2004) and these studies have been one of the most important contributions of human dimensions research (Decker et al. 2001).

### **Importance of Cross-Cultural Research**

There is a critical need to conduct cross-cultural research for understanding the relation between wildlife and human as well as designing better management of wildlife (Manfredo & Dayer 2004; Dayer et al. 2007; Teel et al. 2007; Manfredo et al. 2009). Manfredo & Dayer (2004) suggested that cultural comparison is valuable for wildlife managers because (1) the finding in one study site can benefit other managers having similar human-wildlife conflicts at different locations, (2) the effective management of wildlife and ecosystem requires trans-boundary approaches which go beyond the sociopolitical borders, and (3) the efforts to accomplish wildlife management are usually launched by external groups rather than those people that will be directly affected. Researchers need to avoid assuming that certain interventions can work effectively in other culturally-different locations when conducting cross-cultural comparison (Manfredo & Dayer 2004). Managers need to account for the differences among people (Manfredo & Dayer 2004) before introducing certain management techniques. These types of investigations can uncover effective human-wildlife conflict mitigations. In addition, human-wildlife conflict is a worldwide phenomenon and cooperation by researchers from all over the world would be effective for the solution of universal wildlife problems.

Furthermore, Japan is far behind in the field of wildlife management compared to the US (Yamanaka 2006) and ideas and tools for conflict mitigation might work well if they are introduced from the US. However there are few cross-cultural studies conducted in the field of wildlife management in Japan, and this study is one of the first of this kind of investigation.

### **Theoretical Framework**

Human dimensions research has been developed by constructing from and contributing to related theories which helps strengthen the generalizability and validity of the research findings (Decker et al. 2001). There are two main areas that contributed to human dimensions work which are social psychology and economics (Decker et al. 2001).

A cognitive approach, which attempts to understand values, value orientations, attitudes/norms, behavioral intentions, and behaviors, is one of the most well used theoretical approaches from social psychology, in human dimensions research (Vaske & Donnelly 1999; Decker et al. 2001). These elements of cognitions are theorized to build one upon another forming an inverted pyramid: a cognitive hierarchy model (Fulton et al. 1996; Vaske & Donnelly 1999). This model suggests that people's values affect their attitudes via value orientations, and these attitudes, in turn, influence behaviors (Vaske & Donnelly 1999; Decker et al. 2001).

Values, which form the foundation of the cognitive hierarchy, are relatively stable and reflect people's most basic desire (Fulton et al. 1996; Vaske & Donnelly 1999; Decker et al. 2001). Value orientations consist of basic beliefs which indicate people's thought about specific objects (Decker et al. 2001), and strengthen the values (Fulton et al. 1996). Attitudes are people's evaluation toward an objective, and are predicted to be influenced by value orientations (Vaske & Donnelly 1999; Decker et al. 2001). Attitudes are typically defined by like-dislike, good-bad, or positive-negative (Vaske & Donnelly 1999; Decker et al. 2001). Norms are standards of

behaviors that an individual has with regard to his or her perception of the social pressure (Ajzen & Fishbein 1980; Decker et al. 2001).

According to the Theory of Reasoned Action (Ajzen & Fishbein 1980; Ajzen 1985), which is an extensively used theory in natural resource management (Rossi & Armstrong 1999; Aipanjiguly et al. 2002; Fulton et al. 2004), attitudes can directly predict behavioral intentions that identify specific behaviors (Vaske & Donnelly 1999). However, in order to predict behavior, it is important to understand an evaluative dimension: whether a person views the objective positively or negatively, and a cognitive dimension: a person's beliefs about the object, of attitudes (Decker et al. 2001). For example, even if two people had same cognitive beliefs that bears are big, they might have totally different evaluative attitudes about bears. One could feel positive about bears as if s/he thought bigger animals were more attractive, and another person could evaluate bears negatively if s/he associated big with scary and dangerous.

One implication of the cognitive theory in this study is to predict people's behavioral intentions to support or oppose conservation of bears by understanding attitudes and beliefs. Unless, attitudes and beliefs do not change, short term behavioral change will not last long time (Decker et al. 2001). By knowing underlying cognitive components we can predict behaviors more accurately.

Another use of this theory is to help managers design outreach intervention strategies to shift attitudes which can eventually change behaviors as well (Gore & Knuth 2006). Several studies have showed that effective intervention programs can enhance informative decision making and reasonable action on an individual level as well as community level (Raik et al. 2003; Gore & Knuth 2006).

## Objectives of this Study

The purpose of this study is to: (1) understand local residents' experience and attitudes toward bears and behaviors to guard against bears in Japan, (2) identify how Japanese evaluative attitudes toward bears compare to North America, (3) compare recommended interventions to prevent human-bear conflicts between Japanese and North American literature about bear management.

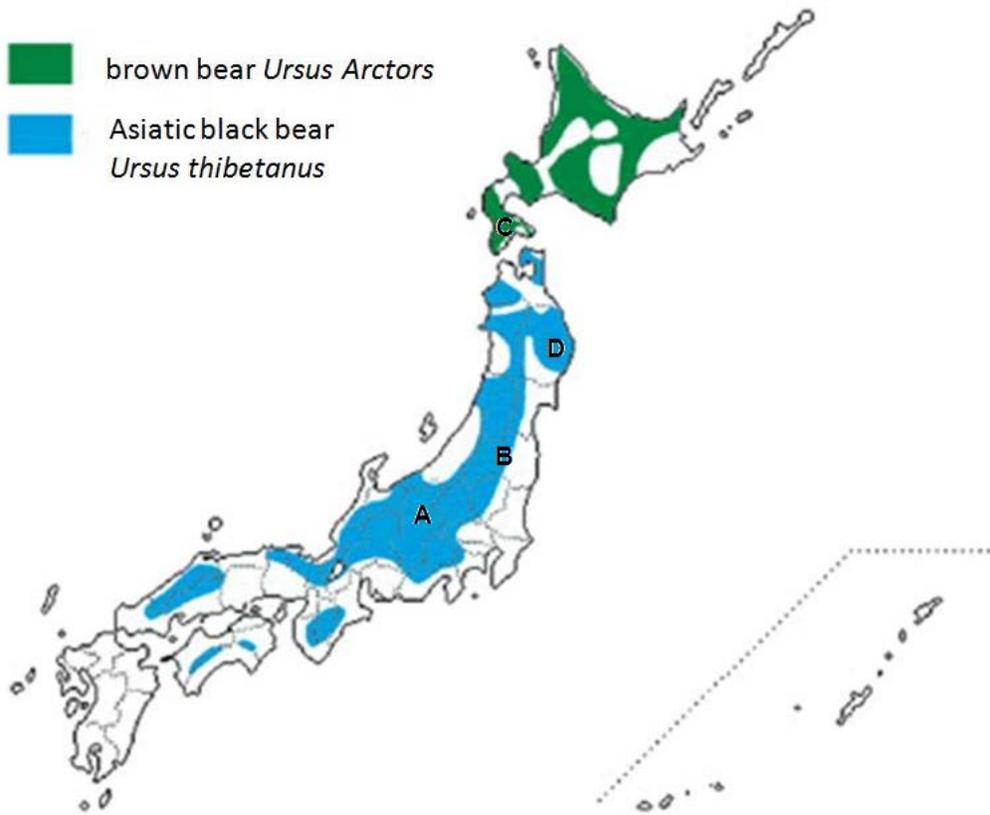


Figure 1-1. The distribution of brown bear (*Ursus Arctos*), and Asiatic black bear (*Ursus thibetanus*) (Picchio 2008) and study sites in Japan.

## CHAPTER 2 METHODS

**Literature Review:** I reviewed 64 research publications and gray literature both in Japan (26) and the US (38) which discuss the human dimensions of bear management (Table 2-1). Out of seven surveys that asked about people's attitudes and beliefs toward bears in Japan, four studies (Ushikoshi 2007; Ministry of the Environment 2007a; Kameda & Maruyama 2003; Kameda et al. 2007) were used for the analysis for Objectives 1 and 2. Three other surveys (Fujiwara 2000; Brown 2005; Roy 1998) were not used because either samples were not selected randomly or sample size was small. The results of similar questions among the four studies were compared to understand the overall characteristics of Japanese experience with bears, behaviors to guard against bears, and cognitive elements associated with bears for Objective 1 of this study. Cognitive components included (1) a cognitive belief of attitudes: bears are scary, and (2) evaluative dimensions of attitudes: I want to protect bears/ I dislike bears, I feel positive or negative toward bears appearing around human settlements.

Eight studies (Lafon et al. 2003; Garshelis et al. 1999; Bowman et al. 1999; Bowman et al. 2004; Responsive Management 1997; Pelton et al. 1976; McCool & Braithwaite 1989; Miller et al. 2008) out of 19 surveys in North America, were excluded from the study for Objective 2 either because samples were not chosen randomly or the contents of questions asked were incomparable. The remaining 11 surveys in the US were compared to the four surveys in Japan for Objective 2 by grouping questions of similar content and corresponding response scales. Study sites, sample size, and response rate of all studies compared for Objective 2 are provided in Table 2-2.

For Objective 2, similar responses were combined for comparison. First, responses in each survey which asked similar questions were put into 4 categories of "Should be extirpated",

“Neutral”, “Should exist in natural area”, and “Should exist everywhere”. For example, in Iiyama and Fujimi in Japan, I included the response category “If bears do not exist near settlements, they can exist” (Uchikoshi 2007), in the category “Should exist in natural area”. I compared results of Japanese and the US surveys using Chi-Square tests to determine significant differences.

For Objective 3, review of 36 research and gray literature was conducted to see if recommendations for interventions to prevent human-bear conflicts differ between Japan and North America. Interventions suggested by bear researchers or bear managers were compared. Suburban management objectives and strategies include mainly three aspects: change wildlife populations or behaviors, change wildlife habitat, and change human attitudes and/ or behaviors.

Two management options, government should open a bear hunting season and compensation for landowners for documented bear damage were compared, as several surveys in both Japan and North America asked about them.

Table 2-1. Research and gray literature reviewed for this study

Authors	Focus	Methods	Data used in the comparison study
Japan			
1. Uchikoshi 2007	Understanding residents' attitudes toward black bears in Nagano prefecture	Mail survey (some questionnaires were distributed by hand)	+
2. Ministry of the Environment 2007a	Understanding residents' attitudes toward black bears Fukushima prefecture	Mail survey (some questionnaires were distributed by hand)	+
3. Kameda & Maruyama 2003	Understanding residents' attitudes toward brown bears in Hokkaido	Mail survey	+
4. Kameda et al. 2007	Understanding residents' attitudes toward brown bears in Hokkaido	Mail survey	+
5. Fujiwara 2000	Understanding residents' attitudes toward black bears in Iwate prefecture	Interview survey	+
6. Brown 2005	Understanding attitudes of residents, junior high school students, and hunters toward black bears in Nagano prefecture	Mail survey	+
7. Roy 1998	Understanding bears researchers', government professionals', hunters', and farmers' views of bears in Japan	Interview survey	+
8. Ministry of the Environment 2008	Preventing damages by both black and brown bears in Japan	Secondary review	+
9. Nagano Environmental Conservation Research Institute 2004	Preventing black bear damages in Nagano prefecture	Secondary review	+
10. Hugyens et al. 1999	Preventing black bear damages using electric fences in Nagano prefecture	Secondary review	+
11. Hugyens et al. 2001	Problems and solutions for black bear conservation in Nagano prefecture	Secondary review	+
12. Hugyens et al. 2004	Relationships between black bear kills and depredation cost in Nagano prefecture	Secondary review	
13. Japan Bear Network 2007a	Synthesis of widespread appearance of black bears in 2006 in Japan	Secondary review	+

Table 2-1. Continued

Authors	Focus	Methods	Data used in the comparison study
Japan			
14. Japan Bear Network 2007b	Current situation of bears in Asia	Secondary review	+
15. Hazumi 1999	Current situation of black bears in Japan	Secondary review	+
16. Mano & Moll 1999	Current situation of brown bears in Japan	Secondary review	+
17. Knight 2000	People-wildlife conflicts from all over the world in anthropological perspective	Secondary review	
18. Knight 2003	People-wildlife conflicts in Japan in anthropological perspective	Secondary review	
19. Yamanaka 2006	Wildlife problems in Shiretoko National Park in Hokkaido	Secondary review	
20. Mano et al. 2008	Current situation of bears in Japan	Secondary review	+
21. Mano & Moll. 1999	Current situation of brown bears in Japan	Secondary review	+
22. Tsuruga et al. 2002	Current situation of brown bears in Hokkaido	Secondary review	+
23. Kanamori et al. 2008	Current issues of black bears in Chugoku mountains in Japan	Secondary review	+
24. Sato 2003	Management of black bears in Nagano prefecture	Secondary review	
25. Kodaira et al. 2006	Management of brown bears in Shiretoko National Park	Secondary review	
26. Mano & Ishii	Bear gallbladder trade issues in Japan	Secondary review	
North America			
27. Morzillo 2007b	Understanding residents' attitudes toward black bears in East Texas	Mail survey	+
28. Responsive Management 2004a	Understanding residents' attitudes toward black bears in Maryland	Telephone survey	+
29. Siemer et al. 2003	Understanding residents' attitudes toward black bears in New York	Mail survey	+
30. Rice et al. 2007	Understanding landowners' attitudes toward black bears in Texas	Mail survey	+
31. Canepa et al. 2008	Understanding residents' attitudes toward grizzly bears in Montana	Telephone survey	+

Table 2-1. Continued

Authors	Focus	Methods	Data used in the comparison study
North America			
32. Miller et al. 1998	Understanding residents' attitudes toward black and brown bears in Alaska	Mail survey	+
33. McFarlane et al. 2007	Understanding residents' attitudes toward grizzly bears in Alberta, Canada	Mail survey	+
34. Responsive Management 2006	Understanding residents' attitudes toward black bears in West Virginia	Telephone survey	+
35. Davis & Morgan 2003	Understanding residents' attitudes toward grizzly bears in Washington	Telephone survey	+
36. Responsive Management 2001	Understanding residents' attitudes toward grizzly bears in Wyoming	Telephone survey	+
37. Responsive Management 2004b	Understanding residents' attitudes toward black bears in New Hampshire	Telephone survey	+
38. Bowman et al. 2001	Landowners' attitudes toward black bears in Mississippi and Arkansas	Mail survey	+
39. Gunther et al. 1998	Casualties by bears in Yellowstone National Park	Secondary review	+
40. Gunther et al. 2004	Grizzly bear-human conflicts in the Greater Yellowstone Ecosystem	Secondary review	+
41. Spencer et al. 2007	Understanding agencies' responses to human-black bear conflicts	Secondary review	+
42. Burghardt et al. 1972	Understanding visitors' attitudes toward black bears in Great Smoky Mountain National Park	Interview survey	+
43. Schirokauer et al. 1998	Bear-human conflicts in Denali National Park	Secondary review	+
44. Siemer & Decker. 2006	An assessment of black bear impacts in New York	Focus group	+
45. Herrero & Higgins 2003	Human casualties by bears in Alberta	Secondary review	+
46. White et al. 1995	Black bear damages in Mississippi.	Mail survey	+
47. Dunn et al. 2008	Evaluating education program of black bears in New Mexico	Survey taken on site	+

Table 2-1. Continued

Authors	Focus	Methods	Data used in the comparison study
North America			
48. Kimberly 2007	Understanding residents' opinions about translocating nuisance black bears in Florida	Secondary review	+
49. Schwartz & Gunther 2006	Management of grizzly bears in Yellowstone National Park	Secondary review	+
50. Servheen 1999	Management of grizzly bears in lower 48 United States	Secondary review	+
51. Gore 2004	Review of six intervention programs to reduce bear-human conflicts in North America	Secondary review	
52. Gore & Knuth 2006	Implementation and evaluation of the educational program of black bears in New York	Secondary review	
53. Gore et al. 2006	Review of education programs for reducing black bear-human conflict	Secondary review	
54. Ternent 2006	Management of black bears in Pennsylvania	Secondary review	+
55. Davis et al. 2005b	Assessment of the outreach program of grizzly bears in Washington	Secondary review	+
56. Lafon et al. 2003	Understanding stakeholders' opinions of black bear management in Virginia	Mail survey	
57. Responsive Management 1997	Understanding residents' attitudes toward reintroduction of grizzly bears in Idaho and Montana.	Telephone survey	
58. Morgan et al. 2004	Review of outreach project of grizzly bears in Washington	Secondary review	
59. Garshelis et al. 1999	Understanding landowners' perceptions of damages by and management of black bears in Minnesota	Mail survey	
60. McCool & Braithwaite 1989	Understanding campers' beliefs toward grizzly bears in Montana	Mail survey	+
61. Pelton et al. 1976	Understanding visitors' attitudes toward damages and/or injuries by black bears in Great Smoky Mountain National Park	Mail survey	+
62. Primm 1996	Review of grizzly bear conservation in North America	Secondary review	+
63. Bowman et al. 2004	Understanding landowners' attitudes toward black bears in Mississippi	Mail survey	

Table 2-1. Continued

Authors	Focus	Methods	Data used in the comparison study
North America			
64. Hristienko & McDonald	Review of black bear management in North America	Survey by telephone and email	

Table 2-2. Surveys used for Objectives 1 and 2

Author	Area of study and samples	Response/Sample (response rate)
<b>Japan</b>		
Uchikoshi 2007	Residents in Iiyama city and Fujimi town both in Nagano prefecture (A in Figure 1-1)	435/531 (81.9%) in Iiyama 295/975 (30.3%) in Fujimi
Ministry of the Environment 2007a	Residents in Kitakata city, Kitashiobara village, and Horikawa town in Fukushima prefecture (B in Figure 1-1)	731/1,115 (65.6%) in Kitakata 173/448 (38.6%) in Kitashiobara 134/480 (27.9%) in Horikawa
Kameda & Maruyama 2003	Residents in Hakodate city, and villages around Hakodate in Hokkaido (C in Figure 1-1)	435/955 (45.5%) in Hakodate 439/980 (44.8%) in villages around Hakodate
Kameda et al. 2007	Residents in Assabu village and Oshamambe village in Hokkaido (C in Figure 1-1)	177/370 (47.8%) in Assabu 246/513 (48.0%) in Oshamambe
<b>North America</b>		
1. Morzillo et al. 2007b	Residents in 12 counties in southeastern Texas	1,006/ 3,000 (40%)
2. Responsive management 2004a	Residents in Maryland	831/? (40-60%) (Duda, personal communication, February, 18, 2009)
3. Siemer & Decker 2003	Residents in New York State counties north of New York city	1,036/ 3,000 (40%)
4. Rice et al. 2007	Landowners in the Trans-Pecos region of Texas	444/ 1,100 (40%)
5. Canepa et al. 2008	Montana residents living in proximity to the Cabinet Yaak Ecosystem	502/594 (84.5%)
6. Miller et al. 1998	People registered to vote in Alaska	2,370/ 4,725 (57.2%)
7. McFarlane et al. 2007	Residents in Alberta, Canada	1,700/ 4,893 (35%)
8. Responsive Management 2006	Residents in West Virginia	1,206/? (40-60%) (Duda, personal communication, February, 18, 2009)
9. Davis & Morgan 2003	Residents in Skagit and Whatcom County in Washington	508/ 1181 (43%)
10. Responsive Management 2001	Residents in Wyoming	1,015/ 1,717 (59.11%)
11. Responsive Management 2004b	Residents in New Hampshire	519/ ? (40-60%) (Duda, personal communication, February, 18, 2009)

## CHAPTER 3 RESULTS AND DISCUSSION

### Results

#### **Objective 1: Japanese Experience and Attitudes toward Bears and Behaviors to Guard against Bears**

##### **Studies regarding black bears**

Quantitative surveys used for objective 1 (Uchikoshi 2006; Ministry of the Environment 2007) found that a majority of Japanese respondents (average of 90.9%), regardless of exposure to black bears, thought bears were scary (Table 3-1). This result corresponded to other literature (Knight 2003; Hughens 2001; Japan Bear Network 2007b) which discussed public attitudes toward bears.

In Iiyama and Kitakata, where many people experienced damage by bears, people who disliked bears outnumbered those who did not (Table 3-2). In those two sites, about twice as many people did not want to protect bears as those who did (Table 3-3). In Fujimi, Kitashiobara, and Horikawa, where crop damages were less than Iiyama and Kitakata, people who liked bears outnumbered those who disliked them (Table 3-2). In Kitashiobara and Horikawa, people who wanted to protect bears also outnumbered those who did not want to (Table 3-3).

Uchikoshi (2007) found from a cross tabulation analysis that people who dislike bears increased and people who want to protect bears decreased if they had seen wild bears ( $p < 0.01$ ) in Iiyama and Fujimi. Also, in Kitakata, Kitashiorbara, and Horikawa (Ministry of the Environment, 2007a), a correlation coefficient analysis showed that people who saw wild bears were significantly more likely to have experienced damage by bears (0.437), more likely to dislike bears (0.275), and less likely to want to protect these animals (-0.175).

When people were asked what kind of information they want to know about bears, “Number of bear appearances/ Type of damages” and “Methods to prevent human casualties”

were the most frequently chosen answers (Figure 3-1). About half the respondents in Kitakata and Iiyama where many people experienced damages by bears answered they want to know “Methods to prevent crop and property damages”, while in Kitashiobara and Horikawa with less damage experience, less people chose this category. However, this tendency did not apply to Fujimi which had less damage but about half of respondents wished to know this information. More respondents in those three sites with less damage answered they wanted to know “Characteristics of bears” (average of 35.7% in three sites) than those in two other sites (average of 25.6% in two sites). There might be tendency that the more people experience damages, the more they want to know how to prevent them, and the less they experience damages, the more people choose characteristics of bears as desired information.

Data from two studies about black bears (Uchikoshi 2007; Ministry of the Environment 2007a) showed that the more people experienced damages, the more people disliked bears (Figure 3-2) and a significantly strong linear association between these two variables ( $R^2=0.814$ ) was found from the statistical analysis ( $p<0.05$ ) (Table 3-4). Also, there was a strong negative linear relation ( $R^2=-0.712$ ) between the number of people who experienced damages and who wanted to protect bears (Figure 3-3) ( $p<0.1$ ).

### **Studies regarding brown bears**

In Assabu, where many people had experience regarding brown bears (Table 3-5), almost all respondents had negative attitudes toward appearance of bears around human settlements and half of respondents also had negative attitude toward their existence in mountains (Table 3-6). In Oshamambe and villages around Hakodate with lower damage experiences, less respondents than in Assabu, had negative attitudes toward both bear appearance and their existence in mountains.

Nearly 70% of people who enter the mountains when there is no snow (and bears are active) in Assabu, engage in behaviors to guard against bear encounters (e.g., make a noise in order to let bears know of people's existence while walking in the mountains), which were much higher than any other sites (Table 3-7).

Data from two other studies about brown bears (Kameda & Maruyama 2003; Kameda et al. 2007) showed that more people living in towns where many people had some experience with bears (e.g., encounter, property damages) had negative feeling toward bears appearance around human settlements than those towns where people had less experience associated with bears. A statistical analysis showed a positive linear association between the number of people who experienced damages by bears and who had negative feelings toward bears ( $R^2=0.570$ ) (Table 3-8).

## **Objective 2: Comparison of People's Attitudes toward Bears in Japan and North America**

More Japanese respondents believed that bears should be extirpated than those who thought bears should exist everywhere (Table 3-9 and 3-10). In North America, studies reported that most people surveyed thought bears should exist everywhere (Table 3-9 and 3-10). A comparison of attitudes toward black bears (*Ursus thibetanus* and *Ursus americanus*) found that significantly more Japanese respondents thought bears should be extirpated than North American respondents ( $\chi^2=2569.223$ ,  $p<0.0005$ ) (Table 3-11). Similarly, more Japanese respondents thought that brown bears (*Ursus arctos*) should be extirpated than North American respondents ( $\chi^2=1585.067$ ,  $p<0.0005$ ) (Table 3-11). However, when the percentage of people who thought black bears "should exist in natural areas" and "should exist everywhere" were combined, 70.6% of Japanese respondents thought black bears should live either in natural areas or everywhere. This percentage was similar to the number of North American respondents (70.6%) (Table 3-10).

On the other hand, there was a large difference between the percentage of Japanese who thought brown bears should exist in natural areas or everywhere (31.0%) and the percentage of North Americans (84.3%) (Table 3-11).

### **Objective 3: Comparison of Recommended Interventions to Prevent Human-Bear Conflicts**

Most Japanese and North American researchers emphasized the importance of education and outreach campaigns to residents and visitors to reduce bear-human conflicts (Table 14). Other interventions recommended in Japan included clearing bush at abandoned farmland and around houses, compensating for damages to agriculture and humans, establishing electric fences, planting crops that are not attractive to bears, driving back bears appearing around human settlements with or without dogs, and increasing native forest habitat for bears. Some interventions, such as giving financial incentives for ranchers to retire sheep grazing on public lands, restricting human activities, and creating a communication between residents, stakeholders, and management agencies for better decision making were only mentioned in North American papers.

More people thought that opening a bear hunting season would work well in North America (average of 65.0%) than respondents in Japan (average of 38.9%) ( $\chi^2 = 4.601$ ,  $p < 0.05$ ) (Table 15 and 16). The necessity of compensation to landowners is recognized by significantly more respondents in Japan (average of 69.5%) than in North America (average of 53.8%) ( $\chi^2 = 40.902$ ,  $p < 0.0005$ ) (Table 15 and 16).

### **Discussion**

Although the Asiatic black bear is a valuable wildlife species ranked “Vulnerable” in IUCN’s red list (Japan Bear Network 2007b), about 40% of the bear population in Japan (over 4,340 bears) were estimated to have been removed in 2006. As for brown bear, hundreds of bears have been killed annually (Kameda et al. 2006). If the passive and massive killing of these

animals is continued without evaluating impacts of this elimination toward the whole population nor making efforts to reduce the number killed, bears in Japan will become extirpated from some areas in the future.

### **Japanese Perceptions of Bears**

This study showed that the majority of residents had negative attitudes toward bears (e.g., felt bears should be extirpated) and was more negative than the finding from Brown (2005) who found 58% of respondents in his survey, including residents, hunters, and junior high school students, believed it is good to have bears in Japan. However, the finding of this study is reflected in the general perspective of secondary literature (Hugyens et al 2001; Knight 2000, 2003; Yamanaka 2006; Japan Bear Network 2007b; Mano & Ishii 2008). Researchers have found that in Japan, residents who saw wild bears around houses or farmlands tend to call local government and ask them to kill the bears (Japan Bear Network 2007b; Hayashi personal communication, June, 10, 2008). These behaviors reflect people's negative attitudes toward bears.

Most respondents in Japan shared the same cognitive belief: bears are scary. This finding corresponded with the results of personal interviews conducted by Fujiwara (2000) which found that almost all respondents (14 out of 17) felt bears are scary in Iwate (D in Figure 1-1). Also two evaluative attitudes were revealed: a majority of people had negative attitudes toward bear appearances around human settlements, and a fair number of respondents felt bears should be extirpated. These factors indicate how people in Japan evaluate bears negatively (Figure 3-4).

Overall, the findings of this study were not specific nor accurate enough to test the main elements of social psychological theories such as the cognitive hierarchy model (Vaske & Donnelly 1999) or the Theory of Reasoned Action (Ajzen & Fishbein 1980). More specific research needs to be conducted to identify each component of these theories to measure the

strength of the relationship between each of those factors, in order to develop the generalizability and validity of the findings.

Some studies also found cognitive misconceptions among the Japanese public. Several reports found that people misunderstood the characteristics of bears by assuming them to be bigger than the actual size (Japan Bear Network 2007b). A mail survey in Hokkaido found that about 70% of respondents assumed that the number of people attacked by bears between 1991 and 2000 was greater (from 10 to 90 people) than the real number (7 people) (Kameda et al. 2003). Moreover, landowners felt powerless to protect their property from bears because they lack the necessary knowledge and resources (Hugyens et al. 2001). Therefore, people's negative attitudes toward bears might come from misunderstanding and lack of knowledge of this animal. Several social psychological theories and models suggest that people's behaviors can be changed by increasing their knowledge (Hungerford & Trudi 1990, Kollmuss & Agyeman 2002, Schultz 2002) and therefore, education, which will be discussed later in detail, can help wildlife managers to garner public support for bear management.

### **Reducing Human-bear Conflicts**

Wildlife species have both positive and negative values for society (Conover et al. 1995). This study found that in Kitashiobara, where part of Bandai-Asahi National Park is located, the majority of respondents had positive attitudes towards bears even though nearly 30% of people experienced damages by bears. Many people moved into Kitashiobara more than ten years ago, specifically to live near the natural environment, and residents' appreciation toward nature and wildlife might be the reason that a lot of villagers are tolerant towards bears and damages by bears (Ministry of the Environment 2007a).

In order to alleviate wildlife conflicts, wildlife managers, local governments and researchers need to increase the benefits and decrease the liabilities of having those species in the

community (Conover 2002). One of the liabilities of living adjacent to habitats of bears for local residents is damage that they suffer either to crops, properties, or humans. This study found that damages by bears can be contributing to the negative attitudes toward these animals in Japan, and therefore wildlife managers and governments need to focus on reducing these damages. Possible interventions to prevent damages by bears are raised in the Table 3-12 such as “proper control of trash and food”, “clearing the bush at abandoned farmland or around houses”, and “establishing electric fences”. However, concurrent with implementing these methods, future research needs to evaluate how effective these interventions are in reducing damages in Japan.

In a broader perspective, the cross-cultural comparison of people’s attitudes toward bears showed that significantly more people in Japan wanted bears to be extirpated than those in North America, although the majority of people thought black bears should exist either in natural areas or everywhere in Japan and North America. In addition, a comparison of management options showed that less people think of hunting as a potential intervention in Japan. Hunting and eating game meats have not been very popular among Japanese (Igota & Suzuki 2008). Even now, hunting has not gained a status as a national sport in the society (Ueda et al. 2004). Meanwhile, the number of hunters in Japan has been decreasing rapidly and as a result, the current percentage of hunters among the whole population is 0.16% in Japan while in the US, hunters represent 7% of the population (Igota & Szuki 2008). These factors help explain why hunting is not considered an effective method of the management of bears among the public in Japan.

Interventions to reduce human-bear conflicts in Japan include recommendations for compensation of damage for agriculture and people. Currently, there are few government compensation programs for damage to agriculture, forestry or humans caused by wildlife in Japan, because wildlife does not belong to anyone under Japanese civil law and it is not

government's responsibility to deal with damage by wildlife (Roy 1998; Sato 2003; Ministry of the Environment 2008). However, wildlife is managed and protected under the Wildlife Protection and Hunting Law by the government, to improve the living environments and protect biodiversity (Ministry of the Environment 2007d).

Some local cities and towns have damage control programs (Ministry of the Environment 2008). The first compensation program for damage by bears in Japan was established in Hiroshima (Mano et al. 2008; Outback 2008). The prefecture and the local city, town, or village is responsible to compensate 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 et al. 2003), nor provide incentives for residents to solve their own problems (Wagner et al. 1997). Therefore, if the compensation systems are to be introduced in Japan, studies to assess the potential cost and benefit of this intervention needs to be conducted at the same time.

Other interventions in Japan include forest restoration and public education. Some prefectures have begun to restore natural habitat for bears (Ministry of the Environment 2008), as recommended by Huygens et al. (1999), Hazumi (1998), and Mano and Moll (1999). For example, in Aki Ohta town in Hiroshima prefecture, in response to the increase of casualties and damages to crops by bears, the town started to create a natural forest in remote mountains by planting chestnut trees in the 1990s (Rokin Morinogakko 2006; Ministry of the Environment 2008). This provides nuts for bears and wood for humans (Rokin Morinogakko 2006). This

project is the object of bear researchers' and managers' attention in Japan as a model of reducing bear appearance around human settlements by restoring natural habitats for bears (Ministry of the Environment 2008).

Educational programs can be successful by distributing effective messages and choosing specific target audiences to share information (Jacobson 1999; Jacobson et al. 2006). If the managers and local governments could design and implement effective outreach programs, local residents would be able to acquire accurate information and skills to prevent bear conflicts which can eventually increase the benefits of having bears as neighbors (Decker & Purdy 1988; Conover 2002; Sato 2008). Also by understanding appropriate information, the local community can make informed decisions as well as reasoned action (Gore & Knuth 2006), which will lead to the sustainable management of bears.

In addition to implementing effective educational campaigns, it is important to understand and measure the effectiveness and success of the program (Jacobson 1999; Boone et al. 2002; Jacobson et al. 2006). Nevertheless, few evaluations have been conducted to determine if the intervention programs designed to reduce human-bear conflicts were successful (Gore 2004; Gore & Knuth 2006; Dunn et al, 2008). Gore (2004) reviewed 6 case studies of intervention programs for reducing bear conflicts in North America, and found that only 2 of them established formal criteria to define success, and just one case 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 & Gunther 2006). Another study showed that respondents in treatment sites, where outreach education was conducted, had more accurate knowledge about bears than those in reference sites (Dunn et al. 2008). In contrast, the New

York NeighBEARhood Watch program which attempted to change residents' attitudes and knowledge by distributing educational materials did not change respondents' knowledge nor their willingness to adopt desired behaviors (Gore & Knuth 2006). Gore & Knuth (2006) suggested that implementing outreach educational campaigns for one season (6 months) might not be long enough to generate behavioral change at the community level.

Education programs to reduce bear-human conflicts have been mostly conducted by local governments in Japan: 13 prefectures of 35 where bears exist conduct outreach programs (Mano et al. 2008). Non-profit organizations also implement intervention programs in some prefectures (Hayashi, personal communication, June, 10, 2008; Kojima, personal communication, November, 27, 2008). In Oshima peninsula, the Oshima Branch Office provided 17 educational classes to residents on biological characteristics of brown bears as well as the skills to prevent conflicts from 2005-2008 (Kojima, personal communication, November, 27, 2008). In Nagano prefecture, a non-profit organization "Shinshu Black Bear Research Group" has implemented educational programs to students in local schools as well as visitors to zoos (Hayashi, personal communication, June, 10, 2008). Although, staff in these two programs occasionally ask participants for feedback after the program (Hamaguchi, personal communication, June, 26, 2008; Kojima, personal communication, November 27, 2008), a comprehensive evaluation process is needed to measure how the impacts and success of the program (Jacobson 1999; Boone et al. 2002).

Future studies should focus on understanding people's knowledge of and attitudes toward bears in more detail so that the managers can design and implement interventions to reduce conflicts. These interventions should be monitored and evaluated to determine the effective activities to ensure a sustainable future for bears in Japan.

Table 3-1. Experience, belief, and cognitive attitude associated with black bears

	People who saw wild bears (%)	People who say bears are scary (%)	People who want to protect bears (%)
Iiyama (Uchikoshi 2007) (N=435)	20	94	22
Fujimi (Uchikoshi 2007) (N=295)	7	88	34
Kitakata (Ministry of the Environment 2007) (N=731)	30	91	25
Kitashiobara (Ministry of the Environment 2007) (N=173)	51	87	43
Fukushimashi Horikawa (Ministry of the Environment 2007) (N=134)	1	91	55

Table 3-2. People who dislike black bears

	People who dislike black bears (%)		
	Yes	Neutral	No
Iiyama (Uchikoshi 2007) (N=435)	51.3	18.9	29.8
Fujimi (Uchikoshi 2007) (N=295)	33.5	27.3	39.3
Kitakata (Ministry of the Environment 2007) (N=731)	50.8	20.8	28.4
Kitashiobara (Ministry of the Environment 2007) (N=173)	30.5	19.2	50.3
Horikawa (Ministry of the Environment 2007) (N=134)	10.8	33.1	56.1

Table 3-3. People who want to protect black bears

	People who want to protect black bears (%)		
	Yes	Neutral	No
Iiyama (Uchikoshi 2007) (N=435)	21.9	23.6	54.5
Fujimi (Uchikoshi 2007) (N=295)	34.2	22.1	43.3
Kitakata (Ministry of the Environment 2007) (N=731)	25	26.7	48.2
Kitashiobara (Ministry of the Environment 2007) (N=173)	42.6	26	31.4
Horikawa (Ministry of the Environment 2007) (N=134)	54.5	29.1	16.5

Table 3-4. Experience and cognitive attitudes associated with black bears, and a linear regression model

	People who experienced damages by bears (%)	People who dislike bears (%)	People who want to protect bears (%)	Linear association between damages (predictor) and dislike bears (dependent variable)	Linear association between damages (predictor) and desire to protect bears (dependent variable)
Iiyama (Uchikoshi 2007) (N=435)	53.9	51.3	21.9		
Fujimi (Uchikoshi 2007) (N=295)	12.1	33.5	34.2		
Kitakata (Ministry of the Environment 2007) (N=731)	38.8	50.8	25.0	R <sup>2</sup> =0.814* Slope (SE) =0.709 (0.196)	R <sup>2</sup> =0.723** Slope (SE) =-0.531 (0.189)
Kitashiobara (Ministry of the Environment 2007) (N=173)	29.5	30.5	42.6		
Horikawa (Ministry of the Environment 2007) (N=134)	0	10.8	54.5		

\*p<0.05 \*\*p<0.1

Table 3-5. Experiences regarding brown bears

	Encountered (%)	Saw from the distance (%)	Experienced property damages (%)	No experience (%)
Assabu (Kameda et al. 2007) (N=177)	25	36	16	15
Oshamambe (Kameda et al. 2007) (N=246)	4	19	2	48
Villages around Hakodate (Kameda & Maruyama 2003) (N=439)	15	28	2	34
Hakodate (Kameda & Maruyama 2003) (N=435)	6	14	1	53

Table 3-6. Attitudes toward brown bears

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

Table 3-7. Behavior to guard against brown bear encounters

	People who enter mountains when there is no snow (%)	People who engage in behaviors to guard against bear encounters in mountains (% out of those enter mountains)
Assabu (Kameda et al. 2007) (N=177)	75	68
Oshamambe (Kameda et al. 2007) (N=246)	50	53
Villages around Hakodate (Kameda & Maruyama 2003) (N=439)	66	56
Hakodate (Kameda & Maruyama 2003) (N=435)	50	54

Table 3-8. A linear regression model of association between number of people who experienced damages and who had negative attitudes toward bear appearances around human settlements

	Experienced property damages (%)	Having negative attitudes toward bear appearance around human settlements (%)	Linear association between damages (predictor) and negative attitudes toward bears (dependent variable)
Assabu (Kameda et al. 2007) (N=177)	16	81	
Oshamambe (Kameda et al. 2007) (N=246)	2	76	
Villages around Hakodate (Kameda & Maruyama 2003) (N=439)	2	65	R <sup>2</sup> =0.570* Slope (SE) =1.018 (0.624)
Hakodate (Kameda & Maruyama 2003) (N=435)	1	60	

\*p<0.5

Table 3-9. Evaluative attitudes toward black and brown bears in Japan and North America (Key: bb = black bear; *Ursus thibetanus* and *Ursus americanus*, BB = brown bear; *Ursus arctos*)

	Should be extirpated (%)	Neutral (%)	Should exist in natural area (%)	Should exist everywhere (%)
<b>Japan</b>				
Iiyama (Uchikoshi 2007) (N=435) bb	30	9	58	3
Fujimi (Uchikoshi 2007) (N=295) bb	28	12	57	4
Kitakata (Ministry of the Environment 2007) (N=731) bb	17	9	61	14
Kitashiobara (Ministry of the Environment 2007) (N=173) bb	10	5	51	33
Fukushimashi Horikawa (Ministry of the Environment 2007) (N=134) bb	5	7	58	29
Villages around Hakodate (Kameda & Maruyama 2003) (N=439) BB	32	34	27	NA
Hakodate (Kameda et al. 2003) (N=435) BB	21	38	36	NA
Assabu (Kameda et al. 2007) (N=177) BB	50	25	19	NA
Oshamambe (Kameda et al. 2007) (N=246) BB	32	35	28	NA
<b>North America</b>				
East Texas (Morzillo 2007b) (N=1006) bb	20 (Bears don't have the right to exist)	17	NA	62 (bears have the right to exist wherever they may occur)
Maryland (Responsive Management 2004a) (N=831) bb	7	11	NA	77

Table 3-9. Continued

	Should be extirpated (%)	Neutral (%)	Should exist in natural area (%)	Should exist everywhere (%)
North America				
New York (Siemer & Decker 2003) (N=1036) bb	14 (Intolerant of the presence of bears)	NA	13 (Tolerant of presence of bears, but intolerant of any actual interactions)	73 (Tolerant of all bear-human interaction+ except those that involve a clear personal threat+ Tolerant of occasional, but not frequent interactions with black bears)
The Trans-Pecos region of Texas (Rice et al. 2007) (N=444) bb	47 (bears should not be allowed to naturally recolonize)	NA	NA	53 (should be allowed to naturally recolonize)
Montana (Canepa et al. 2008) (N=502) BB	24	11	NA	64
Alaska (Miller et al. 1998) (N=2,370) bb and BB	NA	NA	NA	48 (like having bears in and around urban areas in Alaska)
Alberta (McFarlane et al. 2007) (1,700) BB	NA	NA	NA	48
West Virginia (Responsive Management 2006) (N=1,206) bb	13 (Black bear should be decreased)	24	NA	63 (Black bear should be increase + remain the same)
Skagit and Whatcom County in Washington (Davis & Morgan 2003) (N=508) BB	16 (oppose grizzly bear recovery)	5	NA	76 (support recovery)

Table 3-9. Continued

	Should be extirpated (%)	Neutral (%)	Should exist in natural area (%)	Should exist everywhere (%)
North America				
Wyoming (Responsive Management 2001) (N=1015) BB	11 (disagree that grizzly bears benefit Wyoming)	3	NA	74 (grizzly bears benefit Wyoming)
New Hampshire (Responsive Management 2004b) (N=519) bb	10 (black bear should be decreased)	4	NA	65 (black bear should be increased + remain the same)

Table 3-10. People's attitudes toward bears based on average percentage of studies

		Should be extirpated %	(n)	Neutral %	(n)	Should exist in natural areas %	(n)	Should exist everywhere %	(n)
Japan	Black bears	20.5	(364)	8.9	(158)	58.1	(1032)	12.5	(223)
	Brown bears	32.8	(401)	36.3	(444)	31.0	(379)	NA	
North America	Black bears	16.9	(754)	12.5	(559)	3	(135)	67.6	(3,015)
	Brown bears	11.6	(313)	4.1	(110)	NA		84.3	(2,274)

Table 3-11. Results of Chi-square tests comparing people's attitudes toward black bears and brown bears, between Japan and North America

		Should be extirpated (%)	$\chi^2$	P-value
Black bears	Japan	20.5	2569.223*	<0.0005
	North America	16.9		
Brown bear	Japan	32.8	1585.067*	<0.0005
	North America	11.6		

\*Degrees of freedom=1

Table 3-12. Recommended interventions to reduce bear conflicts

	Japan	North America
Change in human attitudes and/or behaviors		
Proper control of trash and food	2, 5, 6, 7, 9, 10, 16	D, H, Q, T
Clearing the bush at abandoned farmland or around houses	2, 6, 7, 10	
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	1, 3, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16	A, B, C, D, E, G, H, I, J, K, L, M, N, O, P, Q, T
Compensation for damages to agriculture and humans	12, 15	N, T
Establishing electric fences	4, 5, 6, 7, 8, 10, 14, 15, 16	D, Q, T
Planting crops that are not attractive to bears	2, 9	
Drive back bears appearing around human settlements with or without dogs	6	
Giving financial incentives for ranchers to retire sheep grazing on public lands		D
Restrictions on human activities (e.g. road and travel restrictions to National Parks)		F
Communication between residents, stakeholders, and management agencies for better decision making		R, S
Change in wildlife habitat		
Increase the natural food and habitat for bears away from human settlements	9, 14, 15	

Citation Code

**1:** Uchikoshi 2007; **2:** Kameda et al. 2007; **3:** Kameda et al. 2003; **4:** Fujiwara 2000; **5:** Nagano prefecture 2008; **6:** Ministry of the Environment 2008; **7:** Nagano Environmental Conservation Research Institute 2004; **8:** Huygens et al. 1999; **9:** Huygens et al. 2001; **10:** Japan Bear Network 2007b; **11:** Brown 2005; **12:** Roy 1994; **13:** Japan Bear Network 2007a; **14:** Hazumi 1999; **15:** Mano & Moll 1999; **16:** Kanamori et al. 2008

**A:** Morzillo et al. 2007b; **B:** Bowman et al. 2001; **C:** Gunther et al. 1998; **D:** Gunther et al. 2004; **E:** Burghardt et al. 1972; **F:** Schirokauer et al. 1998; **G:** Herrero & Higgins 2003; **H:** Spencer et al. 2007; **I:** White et al. 1995; **J:** Dunn et al. 2008; **K:** Kimberly 2007; **L:** Schwartz & Gunther 2006; **M:** Servheen 1999; **N:** Primm 1996; **O:** Pelton et al. 1976; **P:** McCool & Braithwaite 1989; **Q:** Davis et al. 2005b; **R:** Morgan et al. 2004; **S:** Siemer & Decker. 2006; **T:** Ternent 2006;

Table 3-13. Hunting and compensation management options recommended by respondents

	Open a bear hunting season	Compensate landowners for documented bear damage
Japan		
Hakodate (Kameda & Maruyama 2003) (N=435)	29% (opening spring hunting season)	NA
Villages around Hakodate (Kameda & Maruyama 2003) (N=439)	44% (opening spring hunting season)	NA
Assabu (Kameda et al. 2007) (N=177)	52% (opening spring hunting season)	67% (damages to crops and humans)
Oshamambe (Kameda et al. 2007) (N=246)	38% (opening spring hunting season)	71% (damages to crops and humans)
North America		
Maryland (Responsive Management 2004a) (N=831)	65%	49% (damages to livestock)
Montana (Canepa et al. 2008) (N=502)	65%	62% (damages to livestock)

Table 3-14. Results of Chi-square tests comparing number of people who recommended hunting and compensation for the management options

		Recommended by respondents	$\chi^2$	P-value
Open a bear hunting season	Japan	504/1297	4.601	p<0.05
	North America	866/1333		
Compensate landowners for documented bear damage	Japan	294/423	40.902	p<0.0005
	North America	718/1333		

\*Degrees of freedom=1

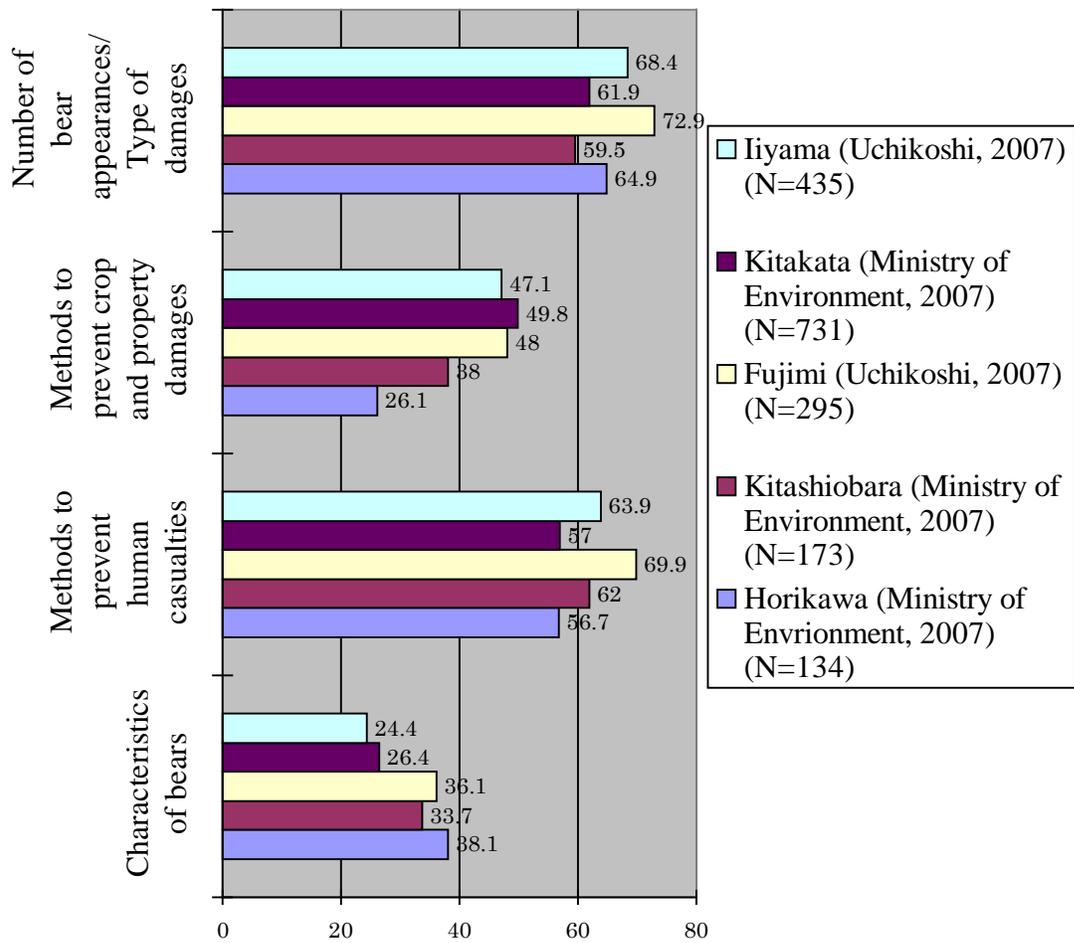


Figure 3-1. Information people want regarding bears (%).

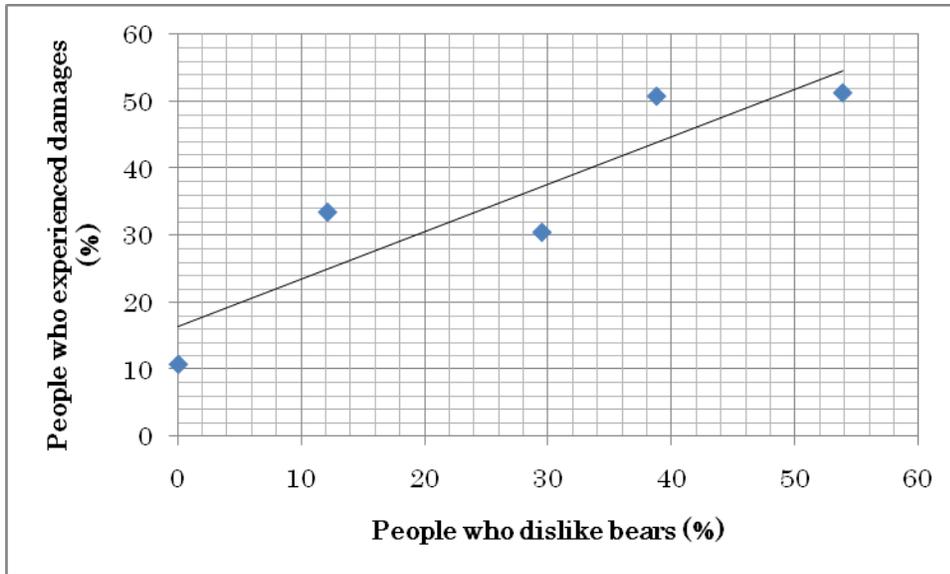


Figure 3-2. Correlation of number of people who experienced damages and who disliked black bears among towns (Iiyama, Fujimi, Kitakata, Kitashiobara, Horikawa).

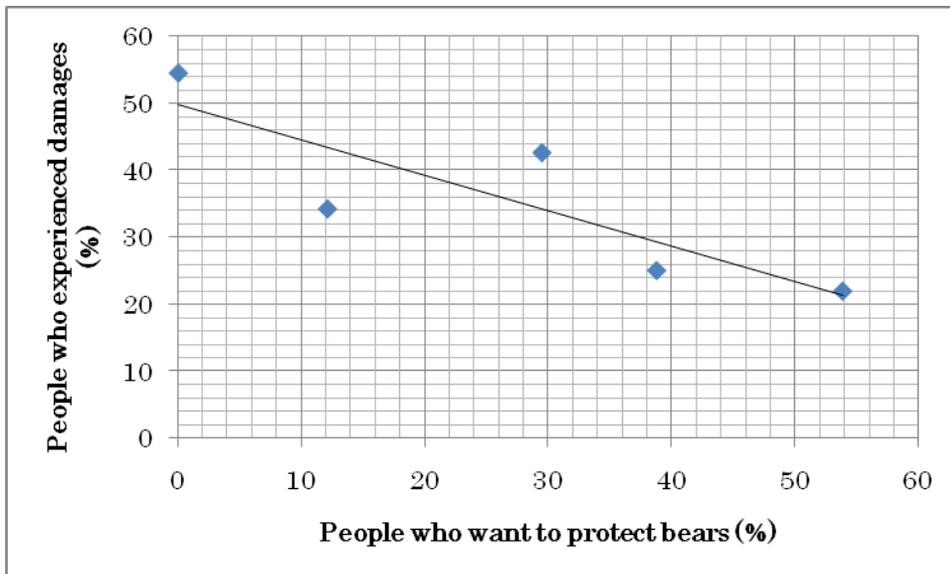


Figure 3-3. Correlation of number of people who experienced damages and who wanted to protect black bears among towns (Iiyama, Fujimi, Kitakata, Kitashiobara, Horikawa).

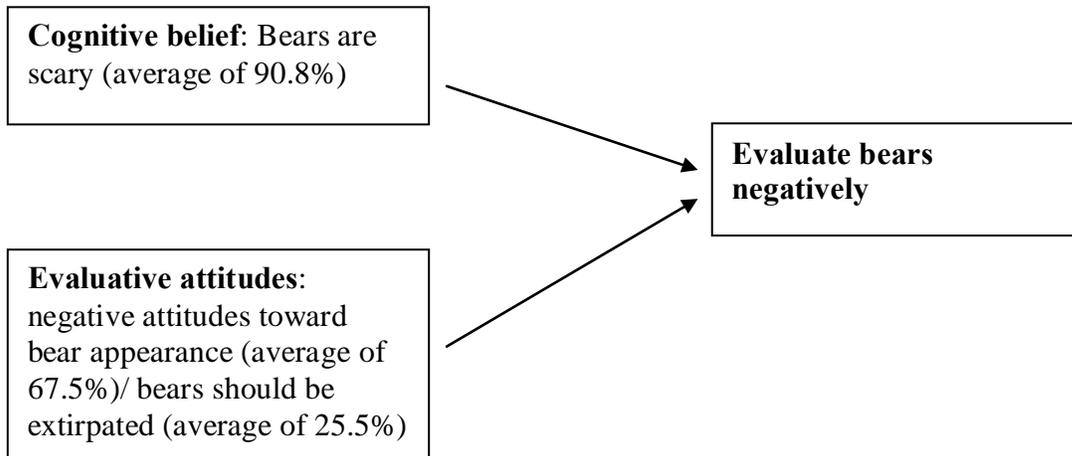


Figure 3-4. Cognitive and evaluative dimensions of people's attitudes toward bears in Japan.

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Ryo Sakurai graduated from Keio University, Tokyo in Japan in March 2007 with a Bachelor of Law. During his undergraduate years, he has participated in various wildlife conservation activities all over Japan, including a conservation survey of wild bears at Karuizawa in Nagano, and a research intern of endangered Tsushima wild cat at Tsushima Wildlife Conservation Center of Ministry of Environment at Tsushima in Nagasaki. In August 2007, he began his graduate work, as an Ambassadorial Scholar of Rotary Club, in the School of Natural Resources and Environment with the Department of Wildlife Ecology and Conservation at the University of Florida. He maintained an A average in his courses in graduate school, and received an “Outstanding Achievement Certificate” from the International Center of University of Florida. He plans to pursue his career as a researcher of human dimensions of wildlife management, hoping to contribute to solving human-wildlife conflicts in Japan. He published, *Considering the introduction of the wolf (Canis lupus) as a national barometer of environmental consciousness: A model comparison of European, American and Japanese cases* (2007) in *Studies in Politics-Faculty of Law* of Keio University. His popular writing includes, *Save the armadillos: They are symbol of a rich and special tropical environment* (2007) published in *The Gainesville Sun* in Florida. His article, *A Review of Public Attitudes Toward Bears in Japan* (2009) is in press in the journal, *Human Dimensions of Wildlife*, and was based on his presentation at the international conference: “Integrating Human Dimensions into Fish and Wildlife Management” in Colorado in 2008. He is also the co-translator of a book, *Wildlife and Society- The Science of Human Dimensions*, which has been translated into Japanese and now in press.