

CONFLICT ANALYSIS AND CAPACITY BUILDING FOR COMMUNITY-BASED
MANAGEMENT OF ENDANGERED AND NUISANCE WILDLIFE IN JAPAN

By

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To my parents

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Abstract of Dissertation Presented to the Graduate School
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By

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Human-wildlife conflicts which include agricultural damage and occasional human casualties are worldwide problems. Understanding social aspects of wildlife management including people's values and attitudes regarding wildlife and wildlife issues is important for mitigating potential conflicts and garner long-term public support.

In order to fill the gap of human dimension studies in Japan, I conducted studies to examine the contents of the media report regarding Asiatic black bear (*Ursus thibetanus*), local residents' perception regarding human-bear conflicts, and how those perceptions and behavioral intentions could be changed through a community wildlife damage prevention program. I conducted a content analysis of 348 articles of local and national newspapers and found that proportion of negative articles that explain risk from bears increased in a year when more bears appeared than normal year. The study suggested that researchers and government officials in Japan need to have more communication with media representatives to enhance people's knowledge regarding bears as well as broader perspective of bear management.

To understand residents' perceptions of risks and acceptance capacity of bears as well as the influence of social trust on the perception, I conducted a survey to residents in Hyogo

Prefecture. Based on 1,210 surveys (52% response rate), most of residents felt the risk from bears had increased (81%) and believed that there were too many bears around the village (83%). Social trust was significantly correlated with residents' risk perception, and significantly predicted residents' behaviors to report bear sightings. The study suggested the importance for agencies to strengthen the social trust to increase residents' actions for reducing human-bear conflicts and improve conservation of bears in Japan.

To evaluate the effects of the community wildlife damage prevention program, we compared residents' cognitive factors between a district which received the treatment program and a control district in Tochigi Prefecture. Based on 198 responses from both districts, residents in the model district had significantly higher scores in perceived behavioral control knowing methods to prevent damage by wildlife. The studies showed the important role the field of human dimensions of wildlife management can play to the scientific community and general public in Japan.

CHAPTER 1 INTRODUCTION

Human-wildlife conflicts which include agricultural and property damage as well as occasional human casualties occur all over the world where wildlife and people live in close proximity (Conover 2002; Johnson et al. 2006). In order to mitigate the conflicts, it is important that local residents have appropriate knowledge and techniques to prevent damage, and are motivated to engage in interventions. It is also important for agencies to implement outreach and communication programs that meet the needs of local residents (Decker et al. 2001). Citizen participation in decision making and implementation of wildlife management actions is also important since it can mitigate potential conflicts and garner long-term public support (Decker et al. 2001; Fulton et al. 2004). This makes it necessary to study people's values and attitudes regarding wildlife and wildlife issues, and factors that influence these cognitive factors. The academic field that was specifically developed to understand these social aspects of human-wildlife issues is called the human dimensions of wildlife management.

The human dimensions of wildlife management evolved in North America in the 1970s. The objective of this field was to gather information of social aspects of human-wildlife issues to help wildlife management stakeholders implement effective decision making actions (Manfredo 1989). Human dimensions studies contributed in providing information for mitigating conflicts between stakeholders (Gore et al. 2009; Baruch-Mordo et al. 2009), predicting local residents' attitudes and behaviors (Aipangiguly et al. 2002), and implementing policies that reflect local residents' opinions (Jacobson et al. 2010) regarding human-wildlife issues.

In Japan, the field of human dimensions of wildlife management is not well recognized and studies regarding social dimensions (e.g., public attitudes toward wildlife) is limited (Sakamoto 2002; Sakurai & Enari 2010). Several qualitative, anthropological studies have

examined Japanese perceptions of sika deer (Knight 2003), wild boar (Knight 2003), Japanese macaques (Maruyama 2006), and oriental white storks (Kikuchi 2003); however, the number of quantitative studies conducted are limited.

This dissertation research fills the gap of human dimensions studies in Japan by examining the contents of media reports regarding Asiatic black bear (*Ursus thibetanus*), local residents' perceptions and behavioral intentions regarding human-bear conflicts, and how those cognitive factors could be changed through a community wildlife damage prevention program.

The first study, "Media Coverage of Black Bear Management in Japan" used content analysis to understand how newspaper articles portrayed Asiatic black bears which are considered nuisances in Japan because of the agricultural damage and occasional human casualties they cause. Mass media is an important factor that influence people's perceptions toward a certain topic (Detjen 1995), and Japan is known as the "Newspaper Country" supporting three of the world's largest circulation newspapers (World Association of Newspaper 2005). I analyzed articles in five categories: topic, effect and interaction, solution, source of information, and risk regarding human-bear issues.

The second study, "Public Risk Perception, Social Trust, and Acceptance Capacity Regarding Bears in Hyogo, Japan" analyzed residents' perception of Asiatic black bears and human-bear issues in Hyogo Prefecture. We used variables related to risk perception, social trust, and acceptance capacity which are important factors for predicting people's attitudes and behavioral intentions (Slovic 1987; Siegrist et al. 2000; Decker & Purdy 1988). This study became one of the first efforts in Japan to examine the relation of these three cognitive factors in the field of wildlife management.

The third study, “Assessing the Impact of a Wildlife Education Program on Japanese Attitudes and Behavioral Intentions” evaluated the influence of a wildlife outreach program in Tochigi Prefecture by comparing residents who participated in the community boar (*Sus scrofa*) seminar (treatment group), non-participants living in the same district (semi-treatment group), and residents in the neighboring village (control group). I used variables of the Theory of Reasoned Action (Ajzen 1985) and risk perception and social trust for the analysis. I also qualitatively analyzed open-ended comments that respondents wrote in the questionnaire to understand residents’ opinions regarding wildlife issues.

These three studies revealed the important social aspects of wildlife management in Japan that stakeholders and managers can utilize when designing management interventions to meet residents’ needs. This is an important contribution to human dimensions research in Japan.

CHAPTER 2 MEDIA COVERAGE OF BLACK BEAR MANAGEMENT IN JAPAN

Asiatic black bears (*Ursus thibetanus*) are listed as threatened in Japan, but are generally considered nuisances due to agricultural and property damage as well as human casualties. We analyzed Japanese media coverage of black bears to better understand social discourse and potential influences on public perceptions about bear conservation. Content analysis of 348 articles in a local and national newspaper revealed that the number of articles regarding black bears and proportion of negative articles that describe risk of bears increased concomitant with a rise in bear sightings. Local newspaper coverage included more articles about risk from bears than national newspapers. This potentially reflects and can amplify local residents' perceptions of risk. The proportion of thematic and episodic articles was unrelated to increases in bear appearances. More extensive communications with media representatives by Japanese biologists, government officials, and police is necessary to enhance public knowledge of bears and lead to broader perspectives of bear management issues.

Opening Statement

Asiatic Black Bears in Japan

Asiatic black bear (*Ursus thibetanus*) is an IUCN (2008) Vulnerable Species, and has an estimated population of 8,400-12,600 in Japan (Japan Bear Network 2007). In rural areas of Japan, human-bear conflicts include damage to agriculture and forestry crops as well as human casualties (Japan Bear Network 2007; Ministry of the Environment 2008). Previous studies have found that people living near bear habitat in Japan tend to fear bears and have negative attitudes toward them, preferring to destroy bears that appear near a village (Kameda et al. 2007; Ministry of the Environment 2007; Uchikoshi 2007). In the drought of 2006, when large numbers of bears appeared around human settlements, 4,846 black bears were captured and most (n=4,340) were

killed (Ministry of the Environment, 2008). The mortality might have accounted for about 50% of the total population (Japan Bear Network 2007). In the same year, 142 people were injured and 3 people were killed by black bears (Ministry of the Environment 2008). In general, residents' response when they see bears near human settlements is to call the local government officials or police and ask them to kill the bears. The local governments and police in turn ask licensed hunters to kill the bears (Huygens et al. 2001; Huygens et al. 2004; Japan Bear Network 2007). Since there are few local or prefectural agencies that deal with wildlife issues, in Japan, police officers whose specialty is not wildlife, handle wildlife issues, in most cases (Yamanaka 2006). Residents' negative attitudes and perception of risks from bears have been identified as obstacles to conservation and sustainable management of bears in Japan (Roy 1998; Sakurai & Jacobson 2011).

Important factors that influences people's perceptions about an issue include social norm (Manfredo 2008), value (Decker et al. 2001), knowledge (Hungerford & Volk 1990), direct and indirect experience (Millar & Millar 1996), and media coverage (Slovic 1987; Detjen 1995; Muter et al. 2009). News stories potentially affect public perception of wildlife and how wildlife should be managed (Siemer et al. 2007). Wildlife often attracts people's attention and becomes newsworthy when their management becomes controversial or tragic incidents occur, such as a fatality caused by wildlife (Gore et al. 2005; Siemer et al. 2007). Conflicts and high consequence incidents are two features that are frequently covered in newspaper stories (Muter et al. 2009). In Japan, wildlife controversies routinely appear in newspaper stories (Knight 2003). As described below, media provide a dual role of both framing and reflecting public opinion. This study examines the newspaper coverage of black bears in Japan to assess how newspapers portray bears and bear incidents, and the implications for better management.

Conceptual Background

Risk perception is the instinctive risk judgment that people have and generally form through learning about a hazard (Slovic 1987). Risk perception can influence people's attitudes, beliefs and behaviors (Gore et al. 2005). The social amplification of risk is a concept based on a combination of consequence of actual events and psychological, social, and cultural processes (Jaeger et al. 2001). This concept suggests that mass media can amplify people's concern about a specific risk event even when the actual risk is relatively low (Gore et al. 2005). The media's tendency to describe a situation as more dangerous than it really is can increase people's risk perception, such as crime reporting leading to short-term panic about crime (McQuail 2005).

Media has dual role of both influencing public opinions and also reflecting public perceptions and political agendas (Boykoff & Rajan 2007). In general, media influence people's perception and opinion through agenda-setting and framing effects (Price et al. 1997). An agenda-setting effect refers to the selection of newsworthy stories that can lead audiences to a specific "media-induced" view (Price et al. 1997). For example, the number of stories or length of articles published about a topic can lead the public to think that the issue is important or not. The framing effect describes how media framing—the way incidents and issues are portrayed by media—affects how audiences understand them (Price et al. 1997).

Although television and the Internet have become the main sources that people rely on for news, newspapers still play an important role for the public to learn about social issues (Pew Research Center 2008). In Japan, most citizens depend on newspapers for general information. Japan is known as the "Newspaper Country," and supports three of the world's largest circulation newspapers: *Yomiuri* with 14,067,000 circulation, *Asahi* with 12,121,000, and *Mainichi* with 5,587,000 (Pharr & Krauss 1996; World Association of Newspapers 2005). Newspapers can be expected to influence people's awareness and attitudes toward a specific

topic, such as black bears in Japan, due to agenda-setting and framing effects (Mikami et al. 1995). A survey of rural Japanese residents revealed that newspapers were an important source of information regarding bears and bear issues (Sakurai et al. 2012a). The negative attitudes of rural Japanese toward bears (Uchikoshi 2007; Ministry of the Environment 2007; Sakurai & Jacobson 2009) emphasize the importance of analyzing how and what newspapers are reporting about bears.

Although news stories can influence people's perception toward human-wildlife interactions, few studies have attempted to understand news coverage of wildlife problems and their influence on public opinion (Siemer et al. 2007). Gore et al. (2005) found that mass media reports of the first fatality caused by a bear (*Ursus americanus*) in New York did not affect people's risk perception after the incident, and suggested this might be due to the fact that media reported the incident with statistical data showing how rare the incident was. A study of news coverage about cougars (*Puma concolor*) in California found that during the 1990s, when human-cougar conflicts increased, news articles became negative, yet editorial coverage remained supportive of cougar conservation (Wolch et al. 1997). Another study found that news coverage of bears in New York tended to be episodic rather than thematic (focusing on specific bear incidents rather than providing information about general management activities), and that coverage blamed problems on residents rather than the wildlife agency (Siemer et al. 2007). News coverage of the Florida panther (*Puma concolor coryi*) found more reports about the risks of panthers in local newspapers published near panther habitat and therefore in greater proximity to risks than newspapers with circulation far from panthers, however overall risks from panthers were portrayed as consistently low (Jacobson et al. 2011). The question of whether media cause social amplification of risk about wildlife is still largely unanswered and more research is needed

in this area. One of a few studies regarding media coverage of environmental issues in Japan suggested that agenda-setting effects of the newspaper on public perception is long-term and cumulative in nature (Mikami et al. 1995).

In Japan, biologists have contended that mass media negatively affects how people perceive bears (e.g., causing them to assume bears are always dangerous) by featuring only tragic incidents of bear attacks (Japan Bear Network 2007; Yokoyama 2009). However, little research has been conducted to analyze the actual characteristics of the media coverage regarding bear issues and risk amplification in Japan.

Purpose of Study

This study used a content analysis of media coverage of bears to understand how bears and bear incidents are portrayed in Japanese newspapers. Content analysis is a systematic evaluation of text or images used in the communication context that can be replicable using valid measurement methods (Lombard et al. 2002; Riffe et al. 2005). We compared coverage during years with high bear appearance and low appearance rates and between local coverage in bear habitat and national coverage in Japan from 2005-2007. To understand how black bears are portrayed and bear incidents are reported, we selected the year 2006-2007 because of the large number of bears appearing in and near towns due to lack of food availability in forests (Japan Bear Network 2007), which resulted in some of the highest numbers of bears captured (n=4,839) and killed (n=4,335), as well as human injuries (n=145) on record (Ministry of the Environment, 2008). In contrast, 2005-2006 had relatively few bears appearing around residential areas, with a typical annual number of human injuries (n=56) and bears being culled (n=719) (Ministry of the Environment 2008). Understanding how media portrayed the bear incidents as public issues can help wildlife managers improve public outreach and better collaborate with stakeholders and residents in the management and policy-making processes.

Hypotheses

Our study tested two hypotheses based on predicted differences in newspaper coverage due to frequency of bear appearances and proximity to risk.

Hypothesis 1. During years of high bear appearances, newspapers will publish (a) more, (b) longer, (c) more episodic, and (d) more negative articles than in years with low bear appearances.

Hypothesis 2. The local newspaper with circulation in close proximity to bear risk will publish more negative articles emphasizing risk than the national newspaper.

Methods

Sample

Two trained coders examined and coded newspaper articles regarding bear issues published from April 2005 to the end of March 2007. We chose the *Yomiuri*, the largest newspaper in the world by circulation, which is published all over Japan with a circulation of 14,067,000 (World Association of Newspapers 2005) and *Shinano Daily*, the most popular newspaper in Nagano prefecture with a circulation of about 488,000 (Hamada et al. 2009). We chose Nagano because the prefecture had the highest number of bears captured (704 bears) and human injuries (16 cases) in 2006 in Japan.

The majority of articles that discussed bears in the *Yomiuri* used the word “クマ”(the Japanese Katakana character for “bear”) to refer to both Asiatic black bear and brown bear (*Ursus arctos*), which also inhabits Japan. We used an electronic search engine (G-search Limited) to identify those articles which included “クマ” in the text and identified 1,046 articles from April 2005 to March 2006, and 1,462 articles from April 2006 to March 2007. Articles in *Shinano Daily* used “熊” (the Chinese character meaning bear) to refer to both Asiatic black bear and brown bear; we searched the *Shinano Daily* for articles that included the word “熊” in the text. We identified 764 articles from April 2005 to March 2006, and 913 articles from April 2006

to March 2007 in *Shinano Daily*. We eliminated articles that did not mention the Asiatic black bear specifically in the headline. This sorting narrowed the samples to 194 articles in 2005 and 624 articles in 2006 in *Yomiuri* and 31 articles in 2005 and 118 articles in 2006 in *Shinano Daily*. For an adequate sample size (Lombard et al. 2002), we randomly chose 100 articles each from 2005 and 2006 in the *Yomiuri* and included all the articles from the *Shinano Daily*.

Coding

A coding sheet explaining categories and criteria for coding articles was created based on prior content analysis of bear-related media coverage in the US (Gore et al. 2005; Siemer et al. 2007). Two coders were trained to use this coding sheet and input their responses in Excel. Categories of codes included “topics discussed,” “impact of bear issues covered” (e.g. economic, health and safety, psychological, ecological, and social), “types of solutions discussed,” “the risks portrayed,” and “sources used for the information.”

To assess intercoder reliability, we used both the percentage agreement and Scott’s pi, which attempts to account for random agreement between coders (Riffe et al. 2005). After coder training, two coders evaluated 10 dummy articles about black bears published in a different newspaper (*Asahi*) in 2005 and got 92.4% agreement. Coders reviewed each variable that had different coding results to improve coding to increase the agreement level. A second evaluation, using 10 different dummy articles, resulted in a 93.0% agreement rate. We also conducted Scott’s Pi test for the sample articles (n=29) of *Yomiuri* 2005 that both Coder 1 and Coder 2 coded for this study. Overall, the Scott’s Pi value was 0.74. Both the Scott’s Pi and percent agreement reliability tests indicated adequate reliability for this study.

Analysis

We used analysis of variance (ANOVA) and Chi square tests to identify differences between comparison groups, with a p-value of less than 0.05 to designate significance (SPSS version 18).

Results

We analyzed a total of 149 articles from the local newspaper, *Shinano Daily*, and 199 articles from the national newspaper, *Yomiuri*.

Article Length and Frames

The number of articles about black bears increased from 764 to 913 in the national newspaper and 31 to 118 in the local newspaper from the low bear appearance (2005) to high bear appearance (2006) years. The average words per article was 332 (SD = 297) for the national newspaper in 2005 and 365 (SD = 261) in 2006. The average number of words in the local newspaper was 380 (SD = 156) in 2005, and 499 (SD = 236) words in 2006. Articles in the local newspaper were longer than the national newspaper ($F=7.966$, $p<0.01$), and articles in the high bear appearance year were longer ($F=5.545$, $p<0.05$), supporting the first hypothesis.

The majority of articles used episodic frames (65%) more often than thematic frames (26%). The national newspaper had more episodic stories than the local newspaper ($F=6.538$, $p<0.05$). The percentage of episodic articles decreased from 77% in 2005 to 68% in 2006 although this difference was not significant. Nevertheless, the difference within each newspaper was significant. For the national newspaper, episodic articles in 2006 (89%) significantly increased from those of 2005 (75%) ($X^2=4.798$, $p<0.05$). For the local newspaper, episodic articles in 2006 (50%) significantly decreased from 2005 (85%) ($X^2=9.453$, $p<0.01$). The results for the national newspaper supported the first hypothesis that the year with fewer bear

appearances would be associated with articles with more thematic frames while the results from the local newspaper did not support the hypothesis.

Coverage of Bear-Related Risks

Articles that mentioned the probability of threats/attack by bears increased from 36% in 2005 to 61% in 2006 ($\chi^2=18.440$, $p<0.01$). More articles referred to increased bear-related risk in 2006 than 2005 ($\chi^2=26.832$, $p<0.01$). This finding supported the last prediction of Hypothesis 1, that the year of high bear appearances would have more articles describing risk of bears. Slightly more articles mentioned that bear-related risk was unacceptable, increasing from 58% in 2005 to 62% in 2006, however this increase was not statistically significant.

The local newspaper had more articles that mentioned the probability of threats/attack by bears ($\chi^2=13.355$, $p<0.01$), bear-related risk as unacceptable ($\chi^2=11.297$, $p<0.01$), and bear-related risk as increasing ($\chi^2=19.357$, $p<0.01$) than the national newspaper (Yomiuri). Also the local newspaper had more articles that used negative words, “Kowai” (scary), “Osoroshii” (awful), “Kiken” (dangerous), “Abunai” (dangerous) than the national newspaper ($\chi^2=9.212$, $p<0.01$). These findings supported the second hypothesis.

Topics Covered in Articles

The four most commonly mentioned topics were: “a problem interaction with bears” (56%), “government’s response to a bear incident” (49%), “bear sighting” (47%), and “police response to a bear incident” (21%) (Table 2-1). Topics about “education” or “bear conservation” were mentioned in less than 20% of all articles. There were more articles about “a problem interaction with bears” in 2006 than in 2005 ($F=14.004$, $p<0.01$). The national newspaper had more articles regarding “police response to a bear incident” ($F=13.882$, $p<0.01$), while the local newspaper had more articles about “relocation of bears” ($F=15.963$, $p<0.01$).

Commonly mentioned impacts of bear included: “worry or fear about human injuries caused by bears” (51%), “damage caused by bears to either property or humans (39%)”, and “human injuries or deaths caused by black bears” (33%) (Table 2-1). Neither newspaper location nor year had a significant effect on portrayal of bear impacts. Ecological issues such as concern about maintaining a viable bear population were mentioned in only 7% of articles.

The most mentioned solutions to bear conflicts presented in the articles were “teach people how to live with bears” (51%), and “increase warnings and be more careful” (46%) (Table 2-1). More than 10% of articles mentioned: “trap and move bears” (17%), “lethal control of individual problem bears” (15%), “make noise while walking in the mountain” (13%), and “capture and release with aversive conditioning to let bears become afraid of people” (11%). Among those solutions, “trapping and moving bears” ($F=22.751$, $p<0.01$) and “capture and release with aversive conditioning to let bears become afraid of people” ($F=14.201$, $p<0.01$) were mentioned more in the local newspaper than the national newspaper. “Lethal control of individual problem bears” ($F=13.572$, $p<0.01$) and “capture and release with aversive conditioning to let bears become afraid of people” ($F=4.866$, $p<0.05$) were mentioned more in the 2006 newspapers than in 2005.

Probability of threats or attack was discussed in 51% of articles, however only 1% identified risk with supporting statistics. Most articles mentioned that “the level of bear-related risk is unacceptable” (61%), and 17% of articles mentioned that “bear-related risk is increasing” (Table 2-2).

Sources of information in the articles were mostly from the “police” (31%), “local government” (25%), “prefectural government” (22%), “regular citizens” (19%), “researchers” (16%), and “hunters” (10%) (Table 2-1). Among these information sources, “police” was

mentioned more frequently in the national newspaper ($F=32.340$, $p<0.01$) while “local government” ($F=18.733$, $p<0.01$), “regular citizens” ($F=6.856$, $p<0.01$), and “researchers” ($F=16.655$, $p<0.01$) were mentioned more in the local newspaper.

Discussion

Japan is known as one of the “most media-saturated societies in the world” (Pharr and Krauss, 1996), having three of the world’s largest newspapers in circulation. Newspapers play an important role as an information source for the majority of citizens (Minami, 2009). Newspapers are one of the most important sources of information regarding wildlife and wildlife issues in Japan (Sakurai et al. 2012a). Because of this saturation, public perception of black bears and bear-conflicts both influences and could be influenced by how the newspaper reports bear management and conflicts in Japan.

We found that most articles about black bears in Japan related problem interactions with bears, worry or fear about injuries by bears, and bear-related damage to property or humans. In other words, most articles about bears in Japan were about human-bear conflicts. These findings are similar to those of Gore et al. (2005) and Siemer et al. (2007), who found that wildlife topics appear in the news mostly when wildlife causes problems for humans. The majority of articles mentioned “teaching people how to live with bears” and “increasing warnings to be careful” as potential solutions to the problems; thus, more articles explained the need to change human behavior rather than the need to eliminate bears (e.g., increase hunting and lethal control of bears) to reduce the conflicts. However, most bears that appeared or were captured in 2006 were destroyed (Ministry of the Environment 2008). This discrepancy shows that although the importance of human actions (e.g., increasing residents’ knowledge and conducting interventions to reduce bear conflicts) was emphasized in the media, in reality destroying bears remained the primary management action. This could be due to various factors, such as lack of staff to educate

residents and/or government budget to translocate bears (Japan Bear Network, 2007), or it may reflect residents' negative attitudes and intolerance toward bears (Sakurai & Jacobson 2011).

Bear-related risk was mentioned more in the high bear appearance year (2006) and in the local rather than national newspaper as predicted. It is likely that the more newspapers mention the risk of bears, the higher readers' risk perception toward bears becomes, potentially affecting people's attitudes toward the animals (Muter et al., 2009). The fact that people's attitudes toward bears tend to be more negative in rural than urban areas (Hosoda et al. 2009; Tsubota & Yamazaki 2011, p338) might simply reflect their closer proximity to the threats of bears, but also explained by the potential influence suggested by the media's role in amplifying the perception of risk (Gore et al. 2005). The local newspaper might be influencing local residents to feel more risk from bears and polarizing public opinion toward bears.

Less than 2% of the articles identified the risk with any supporting statistics about the frequency of risk. This finding is different from a study in New York where 60% of bear-related articles explained risk with supporting statistics (e.g., statements such as "1 out of 5 million encounters with bears generate a fatal attack") (Gore et al. 2005). People's risk perception may not change even if they are aware of experts' assessment of the real possibility of threats, especially if the hazard is not voluntary nor controllable (Slovic 1987; Thornton & Quinn 2010).

The primary information sources about bears cited in Japanese newspapers were the police, rather than government environmental personnel or wildlife experts at universities or non-governmental organizations. In Japan, when wildlife causes problems, police must resolve the situation and discuss the conflict with the press, in most cases, since local or prefectural agencies do not specifically deal with wildlife issues. This can result in reporting that does not cover the full range of management or conservation options and issues.

The proportion of thematic and episodic frames presented in the articles changed from 2005 to 2006. Episodic articles increased in the national newspaper which supported our hypothesis and followed the result of a study in New York that found that more bear encounters would result in more episodic articles covering these events (Siemer et al. 2007). In contrast, thematic articles increased in the local newspaper. Thematic articles explaining why bear incidents are increasing and how the general human-bear conflicts occur around the country, also increased in the year of high bear appearance. This might be because the local risks made the topic more salient, and therefore, more detailed information about the context and background of bear populations were of interest to the reporters, editors and the public. This was found in a study in Florida where newspapers published thematic articles about panthers, reflecting public interest in this issue (Jacobson et al. 2011).

Management Implications

Previous studies have found that local residents living adjacent to bear habitats in Japan tend to have negative attitudes toward bears, preferring to kill bears (Huygens et al. 2001; Uchikoshi 2007; Sakurai & Jacobson 2011). Most of the bears captured in 2006 were killed, which seemed to address local residents' demands, although the high mortality may affect Japan's bear population (Tsubota & Yamazaki 2011). Newspapers have the potential to influence people's perception of a topic (Detjen 1995; Muter et al. 2009), and officials in the Ministry of the Environment could reach out to reporters to ensure that bear incidents are accurately reported and that the conservation context and full range of management issues become part of public discourse if bears are to survive in Japan.

Currently, articles about bears appear in newspapers when they cause problems, and articles that explain ecological aspects of bears are limited. In order to improve public knowledge about bears and broader perspectives of bear issues, researchers and government

officials must work to provide objective, scientifically based information to the press. When reporting bear incidents, newspapers need to receive appropriate statistics regarding the possibilities of risk. Understanding the frequency of a threat does not necessarily hinder people from having negative affective responses to dramatic incidents (Riley & Decker 2000). Nevertheless, it can help people have a more accurate perception of the risks from bears and threats they are facing based on scientific data. Newspapers can play a role in disseminating accurate information from reliable sources (Mikami et al. 1995). Conservation of bears in Japan will depend in part on effective use of newspapers as a mean of public communication by biologists and government officials.

Table 2-1. A comparison of the most mentioned topics, impacts from bears, solutions, and sources of information in national and local newspapers

		Frequencies			
		national		local	
		2005 (n=99)	2006 (n=100)	2005 (n=31)	2006 (n=118)
Most mentioned topic	A problem interactions with bears	49%	57%	32%	69%
	Government's response to a bear incident	40%	43%	58%	59%
	Bear sighting	40%	54%	58%	43%
Most mentioned effect and interaction	Worry or fear about human injuries caused by bear	46%	46%	52%	61%
	Damage caused by bears to either property or humans	38%	29%	32%	49%
	Human injuries or deaths caused by black bears	35%	24%	23%	42%
Most mentioned solution	Teach people how to live with bears	51%	45%	61%	54%
	Increase warnings and be more careful	49%	43%	52%	44%
	Trapping and moving bears	5%	8%	23%	32%
Most mentioned source of information	Police	46%	45%	19%	10%
	Local government	19%	14%	45%	33%
	Prefectural government	23%	19%	10%	25%

Table 2-2. Reports of risk and negative wording regarding bears

	Frequencies			
	2005 (n=99)	national 2006 (n=100)	2005 (n=31)	local 2006 (n=118)
Probability of threats or attack by bears	32.3%	53.0%	48.3%	66.9%
Increase of the bear-related risk	2.0%	16.0%	6.5%	33.1%
Bear-related risk is unacceptable	52.5%	53.0%	74.2%	70.3%
Articles with negative words; “kawai” (scary), “Osoroshii” (awful), “Kiken” (dangerous), and “Abunai” (dangerous)	3.0%	1.0%	6.5%	11.0%

CHAPTER 3 PUBLIC RISK PERCEPTION AND SOCIAL TRUST OF BEARS IN JAPAN

Human-carnivore conflict challenges wildlife managers globally. In Japan, the Asiatic black bear (*Ursus thibetanus*) is listed as a Vulnerable Species under IUCN's Red List of Threatened Species. In Hyogo prefecture it is listed as an Endangered Local Population, but bears are considered a nuisance because of agricultural damage and occasional human casualties. The bear population in the prefecture is increasing and human-bear conflicts are concomitantly expected to worsen. We conducted a mail survey of residents in 58 villages to examine residents' perceptions of risks and acceptance of bears and the influence of social trust on perceptions. Based on 1,210 surveys (52% response rate), 81% of residents felt that risks from bears had increased and 83% believed there were too many bears around the village. Risk perception was negatively correlated with acceptance capacity of bears. Social trust was significantly correlated with residents' risk perception and was a significant factor predicting residents' behavior to report bear sightings. In contrast to expected findings, greater perceived risk from bears was correlated with increased social trust with government offices, but also was associated with efforts to take preventive action. This study reveals the importance for agencies to strengthen social trust to increase residents' activities to reduce human-bear conflicts and improve conservation of bears in Japan.

Opening Statement

Human-carnivore conflict stemming from economic damage to agriculture and forestry as well as human casualties is challenging world-wide (Bruskotter & Shelby 2010; Thornton & Quinn 2010). Asiatic black bear (*Ursus thibetanus*) is categorized as a Vulnerable Species by the IUCN Red List of Threatened Species and the international trade of this species is controlled by the Convention on International Trade in Endangered Species (Japan Bear Network 2007a). In

Japan, human-bear conflicts have been a serious problem resulting from agricultural damage and occasional livestock and human casualties (Roy 1998; Japan Bear Network 2007a; Sakurai & Jacobson 2009). In the decade 2000-10, large numbers of bears have appeared around villages during three years: 2004, 2006, and 2010, due to lack of food in their mountain habitat. Bears rely on mast and other foods, and are known to travel from the mountains to look for food in lean years (Yokoyama 2009). When natural foods are scarce, human-bear conflicts increase (Howe et al. 2010). During 2006, when large numbers of bears appeared near towns, more than 4,340 bears, estimated to be about 50% of the entire population in Japan (Japan Bear Network 2007a), were captured and mostly killed (Ministry of Environment 2008). Large-scale killing of bears affect Japan's bear population (Huygens et al. 2001). Management of a sustainable bear population with minimum human-bear conflicts has been a challenge for Japanese wildlife managers (Japan Bear Network 2007a; Sakurai & Jacobson 2011). One of the biggest challenges in large carnivore conservation is garnering and maintaining public support and understanding (Barlow et al. 2010; Bruskotter & Shelby 2010). For this reason, human values and attitudes must be considered if bear management programs are to be successful and sustainable (Fulton et al. 2004; Thornton & Quinn 2010).

In Japan, local residents' attitudes toward bears are generally negative and bears are seen as fierce animals because of occasional human casualties (Knight 2006; Japan Bear Network 2007a; Sakurai & Jacobson 2011). This is understandable considering that from April 2006 to March 2007, 142 people were injured, and 3 were killed by black bears (Ministry of the Environment 2008). Although agency managers ask residents to take preventive action such as reporting bear sightings and conducting interventions to minimize conflicts (Ministry of the Environment 2008), residents tend to ask the government to kill bears rather than take preventive

action (Hugyens et al. 2001). Residents' negative attitude toward bears is a major obstacle to bear conservation in Japan (Roy 1998).

To better understand people's perceptions toward black bears, we based our study on a framework of risk perception (Gore et al. 2009), social trust in management agencies (Siegrist et al. 2000), and wildlife acceptance capacity (Gigliotti et al. 2000). We conducted a survey of local residents in northern Hyogo prefecture. In Japan, few surveys have been undertaken to understand the cognitive components affecting people's perceived risk and social trust in the field of natural resource management. Literature on these factors outside of the US and Europe is lacking (Viklund 2003). Also, despite the broad array of human-wildlife interactions in Japan, few studies of wildlife acceptance capacity have been conducted. This study is one of the first to examine the relationship between social trust, risk perception, and wildlife acceptance capacity in Japan.

Conceptual Framework

Risk Perception

Risk assessment can be conducted by evaluating the risk itself and conceptualized or perceived risk that individuals express about the threat they believe they are facing (Renn 1998; Jaeger et al. 2001). Risk perception studies have examined people's evaluation of threats, dangerous activities and/or technology (Slovic 1987) and more recently, wildlife risks (for review, see Gore et al. 2009).

Studies have found that people can misjudge the level of risk, overestimating the relatively infrequent risks with catastrophic consequences such as airplane crashes, and underestimating the more frequent, but less consequential risks such as the negative effects of excessive dieting (Jaeger et al. 2001). This misjudgment contributes to the gap between the perceived risk of the lay, non-expert public, which is not necessarily based on the technical

probability of hazards, and that of experts, which is more likely correlated with technical risk estimates (Slovic 1987; Kleinhesselink & Rosa 1991). An encounter with or being attacked by carnivores such as bears is a low probability-high consequence event (Thornton & Quinn 2010).

To understand people's perception of risk regarding human-bear conflicts, we measured perceptions of frequency: "human-bear conflicts are increasing," and personal risk: "concerns over the safety of children because bears may live nearby," "concerns about the agricultural damage by bears," and "worry of walking outside where bears may live nearby." These variables were selected based on previous studies (e.g., Riley & Decker 2000; Gore et al. 2006), and through discussion with local wildlife managers for applicability to human-bear conflicts at the study site.

Social Trust

Another significant factor that influences people's perceptions of risk is social trust, defined as a willingness to depend on agencies or individuals responsible for managing environmental or public health and safety (Siegrist et al. 2000; Siegrist et al. 2005). Differences in perceived risk between experts and lay people are caused not only by misjudgment of the public, but also the level of trust the public has toward experts, agencies, and industries (Sjoberg 1999). Greater social trust is associated with greater support for managing agencies' practices (Cvetkovich & Winter 2003). Vaske et al. (2004) found that hunters who did not participate in hunting because of concerns about disease were less trusting of the managing agency.

A decline of trust in agencies can have critical consequences as people start to doubt management decisions and instead rely on less valid sources of information (Needham & Vaske 2008). Moreover, communication programs conducted by wildlife management agencies can be ineffective if people have distrust or high risk perceptions (Sjoberg 1999). Although the concept of risk perception has started to gain attention from wildlife managers (Gore et al. 2009), there

have been limited studies conducted to understand public risk perception and social trust in the field of wildlife management (Needham & Vaske 2008).

Vaske et al (2004) measured social trust toward a wildlife agency by using items about the agency's credibility based on their provision of opportunities to listen to people's concerns, and items about the believability of different types of information provided by the government. A study regarding public trust toward the government in Japan found that two-way communication between agencies and citizens is important for establishing trust rather than just information disclosure (Maeda & Miyahara 2003). In our study, we used items asking whether the local town or regional prefectural government provided adequate information to residents about bears and if the governments provided adequate opportunities to listen to people's concerns.

In our study site, wildlife managers in both the town and prefectural government asked residents living adjacent to bear habitats to report sightings and signs of bears to help the government take preventive measures. Measures included radio broadcasts warning of nearby bears and information to prevent damage by bears, such as protecting persimmon (*Diospyros kaki*) and other fruit trees from bears, which are main attractants of bears to the villages (Hyogo prefecture 2009). We examined whether residents' actions of reporting bear sightings and protecting their property or their self-assessed knowledge about reducing bear conflicts are associated with social trust in local and prefectural governments.

Wildlife Acceptance Capacity

Wildlife acceptance capacity (WAC) is the maximum wildlife population level that people find acceptable in an area (Gigliotti et al. 2000). It is important for wildlife managers to understand public perceptions of the appropriate and acceptable population numbers of wildlife species because wildlife habitats include both public and private lands, and democratic

governments must heed public wants and needs (Zinn et al. 2000). Generally, wildlife acceptance capacity decreases as people perceive more risk (Riley & Decker 2000). We measured wildlife acceptance capacity by asking about people's preferences about current bear population numbers (e.g., Riley & Decker 2000).

Hypotheses

We tested three hypotheses for this study based on theories of social trust, risk perception, and WAC:

1. Trust in government is negatively correlated with perceptions of risks from bears.
2. Trust in government is correlated with 1) engagement in more behaviors to prevent human-bear conflicts, 2) increased self-assessed knowledge of ways to keep bears away from homes
3. Increased risk perception is correlated with decreased acceptance capacity of bears.

Methods

Study Site

We distributed our surveys in two towns: Kami and Tanto, which are located in the northern Hyogo Prefecture of Japan (Figure 3-1). Kami extends 369km² and includes 74 villages with 21,010 residents, whereas Tanto extends 162km² and includes 42 villages with 5,241 residents (Toyooka City 2010; Kami town 2011). The bear population in the prefecture once decreased to less than 100 in the 1990s because of hunting and depredation kills as well as habitat degradation (Wildlife Management Office 1996). Hunting has been prohibited since 1996, and the population was listed as an Endangered Local Population in Hyogo Prefecture in 2003 (Hyogo Prefecture 2009). Conservation efforts were made under the Specified Wildlife Conservation and Management Plan of Hyogo Prefecture enacted in 2003 (Hyogo Prefecture 2009), and the population of bears increased to approximately 650 according Sakata et al. (2011). With the increased bear population, the status of bears in Hyogo Prefecture was modified from

Endangered to Vulnerable Local Population in 2011 (Hyogo Prefecture 2011), however human-bear conflicts are increasing as well in these regions (Yokoyama et al. 2008). The amount of agricultural damage caused by bears varies annually. In a high-bear appearance year, such as 2006, agricultural damage amounted to about \$180,000 (Hyogo Prefecture 2009). There have been five cases of reported human casualties caused by bears in Kami from 1998 to 2009 and no incidents in Tanto (Hyogo Prefecture 2009). In 2010, a lack of food resources in the mountains resulted in reports of 1,623 bear sightings around the towns (Wildlife Management Research Center, Hyogo 2011) and five human casualties in Hyogo prefecture, the highest on record (Ministry of Environment 2011).

In Hyogo prefecture, both town government and prefectural government deal with bear management in different capacities. Managers in the town government have more direct communication with residents when human-bear conflicts occur since, in many cases, town staff goes to the damage sites first to investigate. In both Kami and Tanto, the town government warns residents through radio broadcasts when bears appear around human settlements. In Kami, the town government mails fliers with information about bears to all households every year. Managers at the prefectural government organize broader-scale interventions such as education seminars and participatory management programs in villages or certain regions of town. Researchers at the Wildlife Research Center associated with Hyogo's prefectural government release the captured bears after negative conditioning (e.g., scaring bears by making noise). In Hyogo, the prefectural government has the authority to allow the capturing of bears. The Specified Conservation and Management Plan provides the criteria of whether to release or kill the captured bears, and the prefectural and town governments as well as the Wildlife Research Center decide which criteria applies the situation after the discussion. Hyogo is one of the only

prefectures in Japan with a governmental wildlife research institution with trained staff to communicate with residents and conduct interventions to minimize human-wildlife conflicts (Japan Bear Network 2007b). In our survey, we distinguished between the local town and prefectural governments in questions regarding social trust to understand differences in people's trust in these agencies.

Survey Instrument

We distributed a written survey to all households in all 42 villages in Tanto where human-bear conflicts occur widely and in 16 of 74 villages in Kami, Hyogo prefecture, where there was a high occurrence of reported human-bear conflicts, based on information from government officials. To understand human-bear issues in the region before the development of the survey, we conducted personal interviews with 55 stakeholders, including residents, hunters, village chiefs, and town office managers in the study area (Sakurai et al. 2011). Survey design followed conventional guidelines (Dillman 2007) and was pilot-tested using a small number of residents and revised for clarity. The survey had 50 items including 4 risk perception items, 4 social trust items, 1 self-assessed knowledge item, 1 wildlife acceptance capacity item, 2 behavior, and 5 demographic items.

A total of 2,315 surveys were distributed with the help of village chiefs and district leaders in each village. Each survey was delivered to the post box at every house and was subsequently collected from each house by village chiefs and district leaders after 2-4 weeks in July 2010. We received 1,210 completed surveys, which corresponds to a 52.3% response rate.

Analysis

We used SPSS Version 18 for the statistical analysis. Internal consistency of variables in two categories, social trust and risk perception, were measured by reliability analysis reported as Cronbach's alpha. Linear regression and logistic regression analyses were used to measure the

association among variables (e.g. social trust, risk perception, and wildlife acceptance capacity). We included demographic variables as independent variables in linear regression and logistic regression analysis to account for demographic differences. We used ANOVA to measure the association between demographic factors (e.g., gender, age) and social trust. We selected a p-value of less than 0.05 for statistical significance.

Results

Demographic Variables

Among the respondents, 72% were male and 61% were older than 60 years old.

According to the most recent census, the male population was 45% in Kami and 48% in Tanto, and about 35% of residents were older than 60 in both Kami and Tanto (Ministry of Internal Affairs and Communication 2005; Kami town 2009)

Distribution of Cognitive Variables and Behaviors

In general, people thought town governments were doing a better job than the prefectural government in providing information about bears (mean score: town= 2.98, prefecture= 2.51) and opportunities to listen to people's concerns (mean score: town= 2.87, prefecture= 2.50) (Table 3-1). The four variables of the social trust had a Cronbach's alpha of 0.89, and removing any item lowered this value. Most residents felt that risk from bears was increasing for all four variables: "increase in human-bear conflicts", "concerns over children's safety", "concerns about crop damage", and "worry of walking outside" (mean score of four variables =4.16). The alpha reliability for four risk perception items was 0.85 and deleting any of the variables did not improve the alpha value. The mean score of self-assessed knowledge was 1.93, meaning only a small portion of respondents agreed that they knew how to keep bears away (Table 3-1). Most (83%) respondents thought that there were too many bears. Twenty-nine percent of respondents reported sightings of bears. The majority of respondents (83%) had persimmon and/or chestnuts

trees in their backyard, and among them, about half (46%) conducted activities to prevent wildlife damage.

The trust in government index was higher among women ($F = 22.616, p < 0.01$), and among respondents younger than 40 years old and those older than 70 years old ($F = 6.531, p < 0.01$). There were no significant gender differences in reporting bear sightings ($X^2 = 0.548, p = 0.459$) or conducting interventions to prevent damage by bears ($X^2 = 0.114, p = 0.736$). Age groups did not differ in reporting sightings (Wald = 0.227, $p = 0.634$), however older people were more likely to conduct interventions to prevent damage by bears (Wald = 11.210, $p < 0.01$).

Relationships between Social Trust and Risk Perception

Among the social trust variables, only “town government provided information” was correlated with perceptions of an increase of human-bear conflicts ($r = 0.04, p < 0.05$) (Table 3-2). “Town government provided information” ($B = 0.11, p < 0.05$) and “prefectural government provided information” ($B = -0.13, p < 0.05$) were significantly associated with people’s perceptions of an increase of human-bear conflicts. Gender was significantly associated with concerns over children’s safety ($B = -0.08, p < 0.05$), concerns about crop damage ($B = -0.08, p < 0.05$), and worry of walking outside ($B = -0.10, p < 0.01$). Age was significantly associated with people’s concerns about crop damage ($B = 0.08, p < 0.05$). Overall, the degree of predictability of risk perception was minimal. Only 1.1% of the variability was explained by social trust and demographic variables for perceptions of increases in human-bear conflicts (Table 3-2)

Relationships between Risk Perception and Acceptance Capacity

All four risk perception variables were negatively correlated with acceptance capacity of bears (human-bear conflicts: $r = -0.30, p < 0.01$, concerns over children’s safety: $r = -0.34, p < 0.01$, concerns about crop damage: $r = -0.37, p < 0.01$, worry of walking outside: $r = -0.33, p <$

0.01) (Table 3-3). Concerns over children's safety ($B = -0.11, p < 0.05$), concerns about crop damage ($B = -0.19, p < 0.01$), worry of walking outside ($B = -0.10, p < 0.05$) were negatively associated with the acceptance capacity of bears. Both gender and age were significantly correlated with acceptance capacity. Adjusted R^2 value showed that 16.7% of variability in people's acceptance of bears was explained by risk perception and demographic variables.

Relationships between Social Trust and Behaviors

Among four social trust variables, only "town government provided adequate opportunities to listen to people's concerns" was associated with people's behavior to report sightings of bears (Wald = 4.69, $p < 0.05$) (Table 3-4). While social trust variables were not significantly associated with people's behaviors to conduct interventions to prevent bear damage, age was associated with people's behaviors (Wald = 7.07, $p < 0.05$) (Table 3-5).

All four social trust variables were significantly correlated with people's self-assessed knowledge (Table 3-6). The item, "Town government listened to people" was significantly associated with whether people reported they knew how to keep bears away. Six percent of self-assessed knowledge variability was explained by social trust variables and demographic variables.

Discussion

Relationships between Risk Perception and Social Trust

Over 80% of residents in this study felt they were threatened by human-bear conflicts and believed there were too many bears around town, thus exceeding residents' tolerance or Wildlife Acceptance Capacity (Gigliotti et al. 2000). Women reported greater social trust than men in the context of this study of trust toward the government regarding bear management while other studies conducted in Western countries have found that men report more social trust in scientists (Siegrist 2000). This suggests possible cultural differences between Japan and the West. Elderly

residents over 70 years old were more likely to trust the government which has been reported in other studies (Zenkyo 2009; Ooyama 2010), and were more likely to conduct interventions to prevent bear damage. Several variables of social trust were significant factors in predicting risk perception regarding bear issues, and risk perception was significantly associated with the wildlife acceptance capacity. Greater social trust in the town government was associated with an increase of risk perception. This does not support our first hypothesis or results of previous studies (Siegrist et al. 2000; Vaske et al. 2004). A cross-cultural study by Viklund (2003) revealed that people's perceived risk of nuclear radiation risks and other general risks decreased as social trust increased in the UK, France, and Sweden. In our study, increasing perceived risk with increasing social trust may stem from the type of government information provided to residents in the area. The town government office usually uses radio broadcasts to alert people when bears appear around residential areas and warns them to be careful. This study indicates that the town effectively warned people of bear threats, yet concomitantly increased their perception of risk.

In contrast, greater trust in the prefectural government was associated with a decrease in risk perception. Public interventions and interactions by the prefectural government differed from the town government. The prefectural government organized general bear education seminars and outreach activities that are usually not related to specific bear damage, while the town government provides broadcasts and warns residents whenever there are bear incidents.

Residents reported a lower trust in the prefectural government than town government. Previous studies in Japan found that people's social trust of the central government is generally lower than of local government due to less transparency in the central government (Ikeda 2010). In contrast, in Australia, people's trust of state government was higher than that of local

government (Mazur & Curtis 2006). Our results may reflect general trends in Japan regarding the central government, or may indicate less interaction or satisfaction with the Hyogo prefectural government

Relationship between Social Trust and Behaviors

The social trust variable, “town government provided opportunities to listen to residents’ concerns about bears,” was a significant factor in explaining residents’ reaction to report bear sightings, supporting our second hypothesis. The fact that “town listened to residents’ concerns” was more important in explaining the reaction than “town provided information,” suggests that not only a one-way information channel, but a two-way dialogue with citizens is important for building trust (Maeda & Miyahara 2003). Because people’s perceptions of government performance are correlated with the degree of social trust people have (Ooyama 2010), it will be vitally important for both town and prefectural government in Japan to increase public trust by improving activities to foster people’s behaviors to prevent bear damage. Social trust was correlated with residents’ self-assessed knowledge of how to keep bears away. In the short term, increasing social trust can be effective in encouraging people to engage in preventive behaviors such as reporting sightings and protecting crops, and giving confidence to residents in controlling and preventing bear conflicts. Taking action and believing that they can prevent the conflict are the first steps to create a community where residents feel that they can mitigate bear conflicts (Yokoyama 2009). It is important for residents to realize that they can prevent bear problems since a lack of perceived control in handling issues can foster more negative attitudes toward bears (Huygens et al. 2004).

Our findings revealed that people’s acceptance capacity of bears decreased as risk perceptions increased, which supports our third hypothesis. However, residents’ acceptance capacity of bears needs to increase before a sustainable bear population can be achieved. This

suggests decreasing both real and perceived risk would have an effect on residents' acceptance capacity of bears (Decker et al. 2001). Therefore, the town government's long-term policy to increase basic warnings about bears needs to include more detailed information and outreach activities or it might fail to build a community where residents are more wildlife tolerant and can coexist with bears.

Management Implication

For government entities charged with protecting public safety and managing wildlife, it is a balancing act between sufficiently warning residents of threats from bears in order to encourage preventive actions and not encouraging more negative attitudes and lowered acceptance capacity. It is important that engaging in preventive behaviors become the social norm in the region, so that interpersonal communication channels support efforts by government education and outreach programs to reduce conflicts (Pretty 2003; Pretty & Smith 2004).

Only 13% of respondents reported knowledge of how to keep bears away from their homes, similar to other studies that have found low public knowledge regarding bears and how to mitigate bear problems in Japan (Huygens et al. 2001; Japan Bear Network 2007a). According to the theory of planned behavior (Ajzen 1985), residents will take preventive actions only if they perceive that they have the knowledge and necessary skills to perform them. This suggests the need to communicate more effectively with residents about the characteristics and behaviors of bears so that people will have accurate knowledge about how to reduce conflicts (Marker et al. 2003; Thornton & Quinn 2010), which can potentially improve attitudes toward bear conservation (Espinosa & Jacobson 2012). In response to these study findings, the Tajima branch office of Hyogo prefecture has started a series of bear education seminars and active intervention programs for residents living in the region. Because knowledge alone does not necessarily reduce residents' worry regarding wildlife issues (Riley & Decker 2000; Jacobson 2009), other factors

such as social learning which provides opportunities for the public to participate and work together in reducing barriers and solving problems, may help residents to increase feelings of control and potentially increase the acceptance capacity toward bears (Pretty & Smith 2004). Previous studies have demonstrated that public participation can also increase people's acceptance and support for a management decision as well as the decision making process (Arvai 2003). Efforts made by the Hyogo prefectural government to provide opportunities for residents and managers to engage in a dialogue (Maeda & Miyahara 2003) and participate in goal-setting and management may eventually build a more trusting relationship and support sustainable bear management.

Limitation of Study

A limitation of this study is the difference of sampling in each town. While all villages in Tanto were included, 16 villages were purposefully selected in Kami town for the survey. However, results showed that a similar proportion of residents experienced agricultural damage by bears in each town (Tanto: 40.3%, Kami: 40.0%) which suggests residents had similar experiences with bears.

Another limitation is the small number of variables that were used to measure social trust. Other studies have included additional aspects of social trust (e.g., Vaske et al. 2004), such as agency credibility and trustworthiness. In our study, we included two variables and two levels of government, but because of space limitations we were not able to incorporate additional facets of social trust.

Table 3-1. Residents' average scores based on a 5-point scale of social trust of town and prefectural government, risk perception regarding bear issues, and self-assessed knowledge of avoiding bear conflicts¹

	Mean	SD	Cronbach's alpha
Social Trust			0.89
Town gov. provided adequate information about bears (n=1,103)	2.98	1.33	
Prefectural gov. provided adequate information about bears (n=1,091)	2.51	1.22	
Town gov. provided opportunities to listen to people's concerns regarding bear issues (n=1,088)	2.87	1.27	
Prefectural gov. provided opportunities to listen to people's concerns regarding bear issues (n=1,081)	2.50	1.20	
Risk Perception			0.85
Human-bear conflicts are increasing (n=1,125)	4.16	1.13	
Concerned about the safety of children (n=1,124)	4.26	1.08	
Concerned about agricultural damage (n=1,118)	3.93	1.24	
Worried about walking outside in my neighborhood (n=1,132)	4.27	1.05	
Self-assessed knowledge			
I know how to keep bears away from my house (n=947)	1.93	1.20	

¹ Variables coded on a 5-point scale: 1=strongly disagree, 2=disagree, 3=neither agree nor disagree, 4=agree, 5=strongly agree

Table 3-2. Multiple regression analysis using risk perception items as dependent variables and social trust and demographic items as independent variables

	<i>B</i>	<i>r</i>	<i>R</i> ²	<i>Adj. R</i> ²	<i>N</i>
Increase in human-bear conflicts					
Town gov. provided information	0.11*	0.04*	0.017	0.011	983
Prefectural gov. provided information	-0.13*	-0.05			
Town gov. listened to people	0.05	0.03			
Prefectural gov. listened to people	-0.04	-0.02			
Gender	-0.06	-0.06*			
Age	0.03	0.03			
Concerns over children's safety	<i>B</i>	<i>r</i>	<i>R</i> ²	<i>Adj. R</i> ²	<i>N</i>
Town gov. provided information	0.07	0.05	0.013	0.007	986
Prefectural gov. provided information	-0.03	-0.00			
Town gov. listened to people	0.07	0.04			
Prefectural gov. listened to people	-0.07	0.00			
Gender	-0.08*	-0.08**			
Age	-0.03	-0.02			
Concerns for crop damage	<i>B</i>	<i>r</i>	<i>R</i> ²	<i>Adj. R</i> ²	<i>N</i>
Town gov. provided information	0.04	0.01	0.015	-0.009	982
Prefectural gov. provided information	-0.04	-0.02			
Town gov. listened to people	0.02	0.00			
Prefectural gov. listened to people	-0.05	-0.03			
Gender	-0.08*	-0.07*			
Age	0.08*	-0.08**			
Worry of walking outside	<i>B</i>	<i>r</i>	<i>R</i> ²	<i>Adj. R</i> ²	<i>N</i>
Town gov. provided information	0.01	0.03	0.014	0.008	989
Prefectural gov. provided information	-0.01	-0.01			
Town gov. listened to people	0.07	0.05			
Prefectural gov. listened to people	-0.05	0.02			
Gender	-0.10**	-0.11**			
Age	0.02	-0.02			

B: Standardized coefficient/ *r*: correlation/ ***p* < 0.01/ **p* < 0.05

Table 3-3. Multiple regression analysis with acceptance capacity of bears as a dependent variable and risk perception and demographic variables as independent variables

Independent variable	<i>B</i>	<i>r</i>	<i>R</i> ²	<i>Adj. R</i> ²	<i>N</i>
Increase of human-bear conflicts	-0.07	-0.30**	0.174	0.167	718
Concerns over children's safety	-0.11*	-0.34**			
Concerns for crop damage	-0.19**	-0.37**			
Worry of walking outside	-0.10*	-0.33**			
Gender	-0.03	-0.08*			
Age	0.09**	-0.10**			

B: Standardized coefficient/ *r*: correlation

**p < 0.01/ *p < 0.05

Table 3-4. Logistic regression model used to predict people's behavior to report sightings of bears with social trust and demographic items as independent variables (n=576)

Variable	Wald	<i>B</i>	Exp. <i>B</i>	p-value
Town gov. listened to people	4.693	0.26	1.30	< 0.05
Prefectural gov. listened to people	2.764	-0.24	0.79	0.10
Town gov. provided information	0.467	0.07	1.08	0.49
Prefectural gov. provided information	0.060	-0.03	1.03	0.81
Gender	0.269	-0.11	0.89	0.60
Age	0.009	0.01	1.01	0.92

Table 3-5. Logistic regression model used to predict people's behaviors to conduct interventions to prevent bear conflicts with social trust and demographic items as independent variables (n=799)

Variable	Wald	<i>B</i>	Exp. <i>B</i>	p-value
Town gov. listened to people	1.695	0.12	1.13	0.19
Prefectural gov. listened to people	0.445	-0.06	0.93	0.51
Town gov. provided information	1.928	0.12	1.13	0.17
Prefectural gov. provided information	0.773	-0.09	0.92	0.38
Gender	0.069	-0.05	0.96	0.79
Age	7.076	0.17	1.18	< 0.05

Table 3-6. Multiple regression analysis with self-assessed knowledge (know how to keep bears away) as a dependent variable and social trust and demographic items as independent variables

Independent variable	<i>B</i>	<i>r</i>	<i>R</i> ²	<i>Adj. R</i> ²	<i>N</i>
Town gov. listened to people	0.13*	0.23**	0.063	0.057	869
Prefectural gov. listened to people	0.03	0.20**			
Town gov. provided information	0.08	0.21**			
Prefectural gov. provided information	0.04	0.19**			
Gender	0.00	-0.03			
Age	0.05	0.07*			

B: Standardized coefficient/ *r*: correlation

**p < 0.01/ *p < 0.05

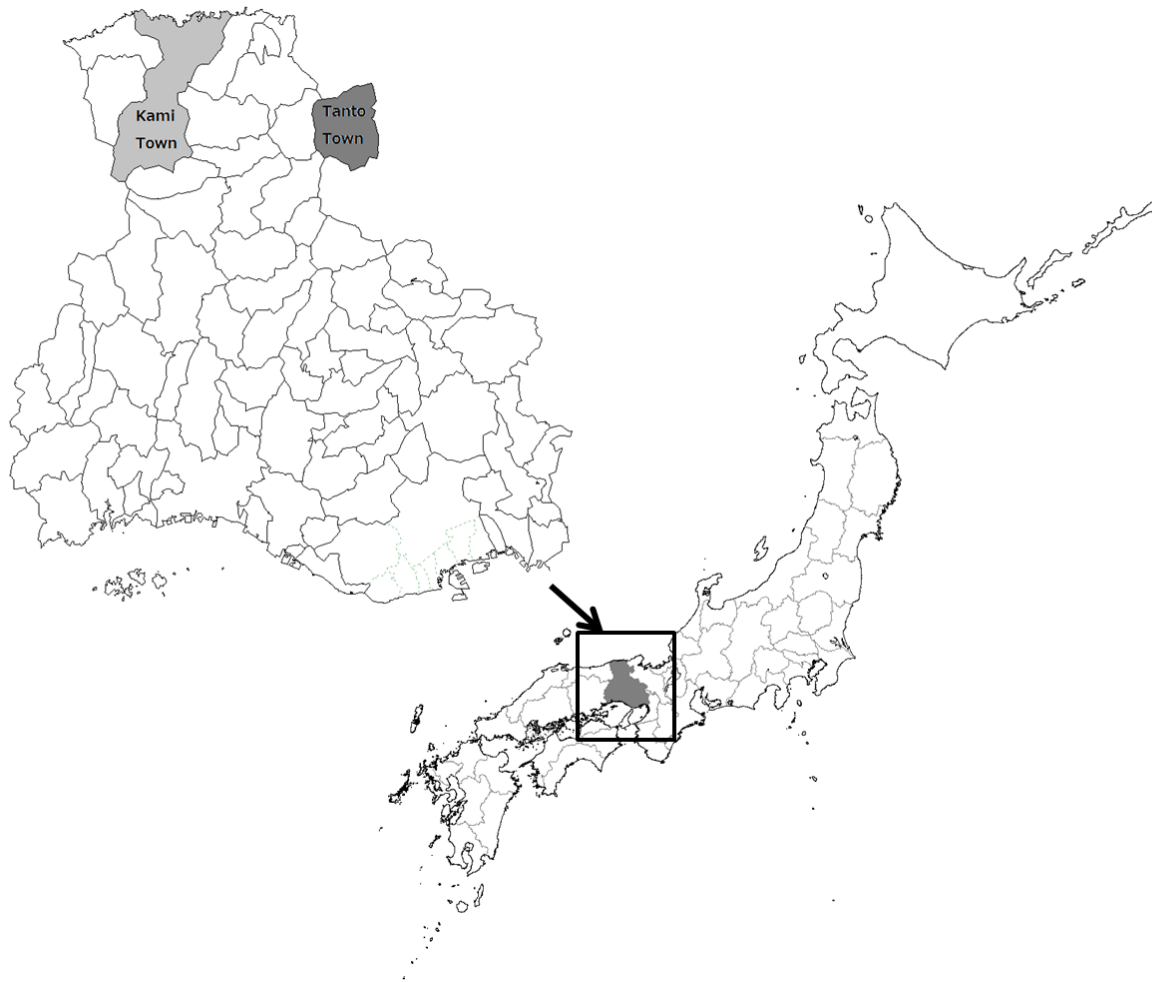


Figure 3-1. Location of the study sites; Kami town and Tanto town.

CHAPTER 4

ASSESSING THE IMPACT OF A WILDLIFE EDUCATION PROGRAM ON JAPANESE ATTITUDES AND BEHAVIORAL INTENTIONS

Human-wildlife conflicts are common in agricultural communities and mountainous villages in Japan. Tochigi prefecture has one of the highest amounts of wildlife damage in the country. To reduce wildlife damage, the Nature Preservation Division of Tochigi Prefecture launched a wildlife damage prevention program. We evaluated the effects of this program on residents' attitudes and behavioral intentions by comparing differences between a district receiving the treatment program to a control district. We conducted a written survey of every household in each district (n=423), and received a total of 198 responses. Residents in the model district reported significantly higher perceived behavioral control regarding wildlife damage than the control district residents ($t=1.956$, $p<0.05$), suggesting a meaningful impact was generated by the program. The evaluation identified some potential effects of the program on people's perceived behavioral control and knowledge level as well as the limitation of the diffusion effect among residents in the model district.

Background

Outreach programs and interventions to prevent wildlife damage have been implemented by local governments, NGOs, and other parties all over the world in areas where human-wildlife conflicts occur (Treves et al. 2009). However, most of these activities are focused on program implementation and lack a systematic evaluation process (Pullin & Knight 2001; Gore et al. 2006). Program evaluation is a process of systematically investigating the effectiveness of the programs by utilizing social research methods and can include both a scientific aspect (e.g. theory testing) and pragmatic aspect (e.g. audience satisfaction) (Rossi et al. 2004). According to Ferraro & Pattanyak (2006), the reasons for absence of evaluation in the field of wildlife management include lack of (1) political will for implementing accountability, (2) recognition of

evaluation techniques among practitioners, and (3) a long-term timeline and funding that allows practitioners to include the evaluation process in the project.

The situation is similar in Tochigi prefecture (Figure 4-1), located in central Japan which had the third highest amount of agricultural damage in the country in 2007 (Ministry of Agriculture 2007). Several projects have been conducted by local governments (e.g. city government, town office) and researchers to prevent wildlife damage. However, most of them were not evaluated in detail to determine whether the damage had decreased or residents had increased activities to prevent wildlife damage after the program. Without assessing the effect of the program, it is hard to judge if it should be continued, or how the program should be revised to increase its efficiency (Rossi et al. 2004; Jacobson 2009).

Only limited studies have been conducted to understand the effect of outreach programs and interventions to foster residents' awareness and increase their behavioral intentions for preventing wildlife damage world-wide. Previous studies have found mixed results, with some programs resulting in significant impacts (Pandion Systems, Inc 2006; Schwartz & Gunther 2006; Dunn et al. 2008; Espinosa & Jacobson 2012; Sakurai et al. 2012b) and others with little effect (Gore & Knuth 2006). Gore and Knuth (2006) implemented an outreach education program for one year to increase residents' awareness as well as behaviors in two towns in New York State, and evaluated the results by comparing treatment towns to control towns (where the outreach was not implemented). They found that only one of six bear- conflict related human behaviors (composting food waste) changed after the program, while no other behaviors, knowledge levels, or attitudes showed any changes, and concluded that a one-year program might not be enough to make a difference (Gore & Knuth 2006). In contrast, Sakurai et al.

(2012b) found from a time-series study that a one-day community bear education seminar in Japan influenced participants' attitudes and contributed to fostering damage prevention behaviors.

In Japan, human-wildlife conflicts are common problems in agricultural communities and mountainous villages and agricultural damage in the country amounts to about 20 billion yen (about \$200 million) every year (Ministry of Agriculture 2011). In order to effectively reduce human-wildlife conflicts in the village, it is important that residents and stakeholders cooperate in preventing wildlife damage (Nature Conservation Society of Japan 2010; Ford-Thompson et al. 2012). This collective action is needed because even if individuals conduct interventions to prevent damage, if neighbors fail to properly manage food and trash, wildlife will likely appear and cause damage in the village. In order to increase residents' capacity for solving wildlife problems and foster their damage prevention activities, it is important to increase residents' awareness and knowledge regarding wildlife issues. Currently, demographic trends, such as aging residents and depopulation of rural communities, combined with a lack of necessary knowledge regarding wildlife issues make it challenging for the local community to implement participatory and sustainable interventions (Kawai 2009).

In Tochigi, agricultural damage was mainly caused by boars (*Sus scrofa*) (56%), deer (*Cervus nippon*) (21%), masked palm civet (*Paguma larvata*) (13%), and macaques (*Macaca fuscata*) (7%) (Division of Rural Development of Tochigi Prefecture 2011). The Nature Preservation Division of the prefectural government is responsible for managing wildlife and preventing damage. To reduce wildlife damage by fostering residents' awareness and encouraging their damage prevention activities, the division launched a wildlife damage prevention project called a "Model District Program" in 2010. In this program, the Nature Preservation Division designated specific districts as model districts and offered a variety of

activities every few months, including seminars regarding wildlife issues, field trips to check damage sites, and implementation of interventions such as cutting abandoned fruit trees which attract wildlife (Table 4-1). Through implementing these activities, the Nature Preservation Division aimed to foster residents' knowledge regarding wildlife issues, confidence and willingness to engage in damage prevention actions. The goal for the Division was to provide opportunities and prompts through the program to trigger local residents to start implementing wildlife damage prevention activities on their own with sufficient skills, knowledge, and motivation. Therefore, although the districts were designated as model districts in a top-down approach, the goal was that the community-based management (Brosius et al. 1998; Cinner et al. 2009) would take place eventually in each district without help from the government. Six districts in the prefecture were designated as model districts based on the prevalence of wildlife damage.

The purpose of this study was to evaluate the effect of the Model District Program by understanding residents' attitudes and behaviors in the model district by comparing them with those in a control district. To better understand the impacts of the program, we framed our study using the three variables (attitudes toward damage control behaviors, subjective norm, and perceived behavioral control) related to the Theory of Planned Behavior, and additionally included variables associated with risk perception and social trust to analyze the program.

Theoretical Background

The main goal of the program was to foster residents' intentions to conduct damage prevention activities. We used several variables related to the Theory of Planned Behavior (TPB), which is a well-tested social psychological theory for understanding and predicting people's behavioral intentions, to identify the key constructs. TPB is a developed model of the Theory of Reasoned Action (TRA) and assumes that human beings engage in behavior based on their

available information and consideration of performance outcome (Ajzen 1985). Although testing the TPB requires measuring a set of variables including beliefs (behavioral beliefs, normative beliefs, and control beliefs), we had limited space to include items in the questionnaire and could not use all elements. We, therefore, used a mix of beliefs and attitudes statement about attitudes toward general behavior of wildlife damage prevention, expectation of neighbors or family (subjective norm), and the perception that an individual has the ability to conduct the behavior (perceived behavioral control).

According to previous studies in North America, these three factors significantly explained people's behavioral intentions in the field of wildlife management (Rossi & Armstrong 1999; Martin & McCurdy 2009; Sorice & Conner 2010). Previous studies have found that cognitive factors of TPB, such as perceived behavioral control, changed after interventions that in turn affected people's behavioral intentions as well as behaviors themselves (Darker et al. 2010). Social psychological theories are not widely recognized or tested in Japan compared to the U.S. (Suenaga 2003), although several studies based on TPB which examined environmental friendly behaviors found a significant relationship between TPB variables and behavioral intentions (Hayabuchi 2008). In addition to the three variables, we also analyzed people's risk perception and social trust to examine if these additional variables would strengthen the explanatory power of the model in predicting people's behavioral intentions. Risk perception is the threat or danger that individuals believe they are facing (Gore et al. 2009), and is examined by people's evaluation of threats or dangerous activities (Slovic 1987). Social trust is people's willingness to depend on agencies or individuals who are responsible for managing environment or public health (Siegrist et al. 2005). Social trust could be examined by items including agency credibility and believability of the information provided by the government (Vaske et al. 2004).

In this study, we measured one aspect of social trust which is people's perception of government performance. According to previous studies in Japan, the more people positively perceive government performance and higher risk they perceive, the more people engage in behaviors to prevent the damage (Sakurai et al. 2010).

In order to understand the potential effects of the program, we examined residents' cognitive variables related to TPB and additional variables, as well as level of knowledge regarding wildlife and damage prevention techniques between residents in the model district and a control district with no program.

Previous studies have found that people generate positive perceptions toward certain behaviors by learning about the benefits and engaging in the behaviors with others, as well as sharing experiences to develop a common framework for joint action (Krasny et al. 2009). If the program is successful, we predicted that participants of the education program in the model district will shift toward more positive attitudes, and increase subjective norm and perceived behavioral control regarding engaging in damage preventative actions. We also predicted that by knowing about the wildlife issues occurring in and around the district, participants will increase their risk perception toward these issues and enhance their agreement toward government performance in providing information regarding wildlife issues and opportunities to listen to people's concerns throughout the activities.

We expected that these increase in participants' cognitive factors will spread to neighbors by word of mouth based on the theory of diffusion of innovation (Rogers 1995). According to this theory, the new idea and changes spread and get accepted in the community from innovators and early adopters. In our study sites, village chiefs and leaders of agricultural associations who participated in most of the activities are most likely the early adapters. A previous study

regarding human-wildlife conflicts in Japan found that village chiefs were the main sources of the information for villagers (Sakurai et al. 2012a).

We predicted that residents in the model district will have higher scores in cognitive variables (attitudes toward behaviors, subjective norm, perceived behavioral control, risk perception, perception of government performance, behavioral intention) and knowledge regarding wildlife issues than residents in the control district after the Model District Program occurred for one year.

We also assessed if the five variables (attitudes toward behaviors, subjective norm, perceived behavioral control, risk perception and social trust) explain people's behavioral intentions in each district. By understanding which variables are strongly linked to behavioral intention among residents in the district, program administrators can revise the content of the activities to increase those key variables (e.g. perceived behavioral control). From previous studies (Rossi & Armstrong 1999; Martin & McCurdy 2009; Sakurai et al. 2010), we predicted that all five variables would significantly explain people's behavioral intention.

Open-ended comments written voluntarily, at the end of the questionnaire, were compared qualitatively to understand residents' opinions regarding wildlife issues in the two districts.

Hypotheses

We tested two hypotheses:

1. Residents in the model district will have significantly higher scores than residents in the control district, in attitudes toward damage control behaviors, subjective norm, perceived behavioral control, risk perception, social trust, behavioral intention, and knowledge.

2. Five variables (attitudes toward behaviors, subjective norm, perceived behavioral control and behavioral intention, risk perception and social trust) will significantly explain behavioral intention in both districts.

Methods

Study Site

We conducted a questionnaire survey at two districts; Fukahodo and Kuno (Figure 4-1). Both districts are located in the southwest part of Kanuma city (about 490km² with about 100,000 residents) of Tochigi Prefecture. Fukahodo has 198 households in 8.20km² and was designated as a Model District in 2010 because of its relatively high degree of wildlife damage occurring compared to other districts in the city. As a Model District, eight activities including a field trip to check the damage sites, several meetings, and a seminar targeting children and parents regarding boar issues were conducted from June 2010 until July 2011 (Table 4-1).

Kuno is located next to Fukahodo and has 274 households in 6.36km². In Kuno, no activities to prevent wildlife damage have been conducted by the government.

We chose Fukahodo and Kuno as our study sites because these districts adjoin each other and have similar characteristics including number of residents and amount of damage caused by wildlife (Kanuma City Government, personal communication). By comparing residents' attitudes and behavioral intentions between these two districts, we aimed to understand the effect of the Model District Program.

In Fukahodo, we distributed a written questionnaire to all households (n=198) through community's bulletin with the cooperation of the non-governmental residents' organization in September of 2011. In Kuno, we distributed the questionnaire to all households (n=225) printed in the telephone book (NTT East 2011) via postal mail in November 2011.

We were unable to test for non-response bias because the survey was conducted anonymously and we could not identify the non-respondents.

Questionnaire

The survey had 37 items including: attitudes toward behavior (1 item), subjective norm (2 items), perceived behavioral control (2 items), behavioral intention (1 item), risk perception (2 items), social trust (4 items), knowledge (6 items), damage experience (1 item), socio-demographics (3 items), and free opinion (open-ended question) (Table 4-2 and 4-3).

Analysis

We used SPSS version 18 to conduct all the statistical analysis. We conducted a chi-square test to analyze the difference in frequencies in gender, occupation, and damage experience in two districts. We conducted one-way ANOVA with Post hoc Tukey comparisons and Independent Samples t-tests to analyze difference in people's cognitive factors between residents in the model and the control district as well as differences in people's demographic characteristics and cognitive factors. We also conducted a multiple regression analysis to understand the relationship between demographic characteristics, cognitive factors, and behavioral intention. We used a p-value of less than 0.05 for statistical significance.

Results

Descriptive Information

We received 99 responses (response rate=50%) in Fukahodo and 99 responses (response rate=44%) in Kuno. While respondents in both districts were similar in their average age (Fukahodo:56 years old, Kuno:59 years old), there was a significant differences in gender (Fukahodo: 75% male, Kuno:91% male) ($X^2=7.415$, $p<0.01$). Also, there was a significant difference in respondents' occupation in these two districts ($X^2=28.339$, $P<0.01$). More respondents in Fukahodo were company employees (Fukahodo: 42.9%, Kuno: 23.9%) and

homemakers (Fukahodo: 14.3%, Kuno:2.2%). In Kuno, more respondents were engaged in agriculture or forestry (Fukahodo: 4.4%, Kuno: 25.0%). There was no significant difference in wildlife damage experienced ($X^2=1.547$, $p=0.16$), by 56% of residents in Fukahodo and 46% in Kuno. In both districts, boars caused the most damage followed by monkeys and deer.

Comparison of Treatment District of Fukahodo and Control District of Kuno

Among the cognitive factors we examined, perceived behavioral control was the only factor that showed a significant difference ($F=3.826$, $p=0.05$) between the two districts. Residents in Fukahodo had higher confidence in their ability to preventing wildlife damage than those in Kuno ($t=1.96$, $p=0.05$). All other variables including risk perceptions and social trust did not show any significant difference (Table4-4). Trends showed respondents in Fukahodo had higher knowledge regarding boars and damage prevention than those in Kuno although the difference was not significant (Table 4-4).

ANOVA revealed the significant difference in residents' behavioral intentions between gender ($F=4.637$, $p<0.05$) and among occupations ($F=4.714$, $p<0.01$), as well as the significant difference in subjective norm among occupation ($F=3.024$, $p<0.01$). Men had significantly higher behavioral intention ($t=-2.153$, $p<0.05$). The post hoc Tukey comparison revealed that agriculture/forestry related residents had significantly higher subjective norm than company employee ($p<0.05$), and significantly higher behavioral intention than company employee ($p<0.01$), governmental official ($p<0.05$), and unemployed ($p<0.01$). The unemployed had significantly lower behavioral intention than self-employed ($p<0.05$) and student ($p<0.05$). There were no significant differences for other variables.

Assessing the Association between Five Variables and Behavioral Intentions

Regression analysis revealed that in Fukahodo, only subjective norm ($p<0.01$) and risk perception ($p<0.05$) significantly explained behavioral intentions while the effects of other

variables (attitudes toward behaviors, perceived behavioral control, and social trust) were not significant (Figure 4-2). Five variables explained 32.8% of the variance of behavioral intentions.

In Kuno, subjective norm ($p < 0.01$) and risk perception ($p < 0.01$) significantly explained behavioral intentions while the influence of other variables were not significant (Figure 4-3). Five variables explained 43.1% of the behavioral intentions.

Although two variables, significantly explained the behavioral intentions, hypothesis 2 was rejected as suite of variables did not influence the dependent variable.

Comparison of Reported Comments between Two Districts

Seven respondents provided comments at the end of the questionnaire regarding wildlife issues in Fukahodo; 21 respondents wrote comments in Kuno (Table 4-5).

Discussion

Program evaluation is still a developing area in the field of wildlife management (Gore et al. 2006; Dunn et al. 2008), and this study contributed to demonstrating the potential influence of the one-year program on residents' cognitive factors. The Model District Program has not yet achieved the full engagement among residents as we had not seen the district-wise difference. Since the Model District Program is still continuing and activities are implemented in the district, the results of the study serve to show the importance of a formative evaluation (conducted in the early stage of program development) which helps guide the program improvement and re-design the contents of the program. While the previous studies regarding the evaluation of programs in the field of wildlife management were mostly summative evaluations (Gore & Knuth 2006; Dunn et al. 2008), this evaluation is one of the few studies that assessed mid-term effects that could help improve the program, and enabled monitoring changes of people's attitudes, behavioral intentions, and behaviors in the future.

From the comparison of the two districts, respondents' perceived behavioral control differed. Respondents in the Model District Program of Fukahodo were more likely to report that they knew how to prevent damage by wildlife. It suggests that in Fukahodo, teaching methods to prevent wildlife damage in the seminar and providing opportunities where residents could discuss wildlife issues might have increased residents' confidence toward conducting wildlife damage prevention activities. Besides implementation of the Model District Programs, there are not any differences in the local situation regarding wildlife issues (such as degree of residents' damage experiences) between these two districts, and it might be natural to think that the difference in people's perceived control was caused by the program. Previous study regarding the evaluation of an intervention to promote walking among citizens revealed the increase of people's perceived behavioral control as well as the behavior (walking) itself (Darker et al. 2010). This followed the result of the previous study regarding the evaluation of the bear community seminar in Japan which found that perceived behavioral control had the biggest increase among participants' cognitive variables after the seminar (Sakurai et al. 2012b). Our study implied that intervention could possibly change people's key determinants of behaviors even in the different field such as the wildlife management.

Besides perceived behavioral control, no significant differences in other cognitive factors (attitudes toward behaviors, subjective norm, behavioral intentions, social trust, and risk perception) were found. These results imply the possibility that the Model District Program with several activities (seminars and meetings) for one year might not be enough to make a significant difference between residents at Fukahodo and those in Kuno. This followed the results of Gore & Knuth (2006)'s study which concluded that a long-term program at least more than a year is necessary to generate a town-level behavioral change.

Both in Fukahodo and Kuno, residents who felt more social pressure to conduct interventions and risk perception regarding wildlife issues more likely showed intentions to implement interventions.

Subjective norm was the strongest predictor of behavioral intentions in both districts. This is different from the results of previous studies conducted in the U.S. in which attitudes toward behaviors were greater predictors of behavioral intentions (Hrubes et al. 2001; Martin & McCurdy 2009). This suggests that cultural differences in collectivistic countries such as those in Asia where following what others do and meeting public expectation is indispensable part of people's daily lives will reflect differently than responses in individualistic-promoting countries such as the U.S. (Hashimoto et al. 2008). Because social norm helps predict behavioral intentions, for these behaviors to become a widely accepted norm, it may be important for the program to emphasize community activities. One way to achieve this is by targeting respected social groups or individuals (e.g. district chief) in outreach and education programs to increase their awareness and foster model behaviors. According to the Theory of Diffusion of Innovation, the new ideas and behaviors are more likely spread to people in communities influenced by groups and individuals with high social class (Rogers 1995).

Other potential way to increase the subjective norm might be to distribute leaflets that explain the activities implemented in the district, and comments of the residents who participated in the activity a few times every month. By reading the leaflets and knowing that other residents, including the village chief, have been involved in activities, and engaged in actions, residents may realize that engaging in wildlife damage actions has become the norm of the district and this in turn will increase participation in activities (McKenzie-Mohr & Smith 2006).

In both Fukahodo and Kuno, risk perception significantly influenced behavioral intentions. Standardized coefficient score of risk perception in Kuno was more than twice of Fukahodo implying a possibility that in a district without any interventions or outreach programs implemented, risk perception might define whether or not residents conduct damage prevention interventions.

Three times more respondents (20%) wrote comments in Kuno than in Fukahodo. Among 21 comments in Kuno, half of them were negative about worries, frustration, or requests to government regarding wildlife management issues. Prior research has shown that providing opportunities where residents can ask questions and interact with government agencies increased residents' understanding and support of government policy and fostered their trust toward government (Maeda & Miyahara 2003). In our example, seminars and meetings of the Model District Program in Fukahodo provided opportunities where residents could share their frustration and questions to officials of the government and researchers occasionally. This might have contributed to the limited number of comments written in the questionnaire in Fukahodo.

Understanding the outcomes and impacts of a program requires systematic evaluation using various methods and long-term observation. This study was the first approach to identify the effect of a newly launched wildlife damage prevention program in Tochigi, Japan. Offering a variety of activities over a year provides residents with multiple opportunities to participate even if they miss some of the activities. However, program staff found that implementing a program that lasts more than a year, presents challenges in keeping residents' motivation and attention as well as participation high (Tochigi Prefecture, personal communication).

Additionally, there was an unpredicted effect generated by the program. In Fukahodo, a designation of the Model District in 2010 prompted residents to organize a new group,

“Association for Protecting Satoyama” (forests around the villages managed by villagers), for preventing agricultural damage from wildlife. This residential association implemented activities to cut bush around the human settlements and agricultural fields to make a buffer zone between wildlife habitats. In 2011, dozens of residents participated (District Chief personal communication). The creation of such a residential association and implementation of those activities initiated by residents and not by the government, are important steps for community-based management; in which the community takes initiative in making decisions and conducting necessary measures reflecting local conditions (Cinner et al. 2009).

Longer-term observation to understand if the program’s objectives are achieved in the future and also utilizing other evaluation methods such as oral interviews and on-the-ground observations of program results would be important to understand the broader impact of the program.

Limitation of the Study

One of the limitations of this study is the design of the research. The most valid and reliable method to evaluate the effect of the program is the experimental design where randomly selected individuals are allocated to treatment or control group, and data are collected from these groups before and after the program (Rossi et al. 2004; Ernst et al. 2009). However, random assignment is often difficult in environmental education settings, and therefore experimental studies are seldom used (Ernst et al. 2009). In this study, since the Model District Program was already started when the authors began the evaluation study, and since the model district was not randomly selected, it was impossible to design and implement an experimental study. We, therefore, conducted a quasi-experimental design method, instead.

Other limitation of the study is the sampling bias which might have affected the lack of a significant difference in most of cognitive variables between respondents of two districts.

Although these two districts have residents with similar socio demographic characteristics, respondents in Kuno were more likely men and engaged in agriculture or forestry than those in Fukahodo. This might be due to the difference of survey methods. Previous studies found that the difference in survey methods could differ the characteristics of survey respondents such as gender (Sax et al. 2003). While people may feel more obligated to answer the questionnaire sent by district leaders whom they know well (in Fukahodo), people may be less likely respond to questionnaires and post it when the survey was distributed by mail by a stranger (in Kuno). Therefore, it might be possible that, in Kuno, residents who were interested in and/or concerned with wildlife issues more likely answered the survey.

The male bias of respondents was seen in a previous study conducted in Japan regarding wildlife issues in which the majority of respondents (75%) were found to be male, although the questionnaire specified a member of the households with the nearest birthday to answer the questionnaire (Sakurai et al. 2012a).

On the other hand, our analysis revealed that there is not any significant association between gender or occupation and perceived behavioral control suggesting that sampling bias did not affect this result. There was a significant association between gender/occupation and behavioral intention, and also between occupation and social norm. Since respondents in Kuno were biased to male and agriculture/forestry related occupation, there is a possibility that social norm and behavioral intention scores in Kuno were higher than those of general population in the district. It is difficult to speculate the actual scores of general population as the questionnaire was answered anonymously, and a non-response follow-up survey was not conducted.

Finally, the broad term we used for the variables of the survey, such as “conducting interventions to prevent wildlife damage” might have prevented us from assessing the specific

effects of the program and/or examining the direct relationship between variables. There are various actions effective for preventing wildlife damage such as erecting fences and cutting bush. Future studies need to include a specific behaviors such as “I will erect an electronic fence” and “I will cut the bush around my house” in the survey instrument to conduct more rigorous assessment of the impact of the program.

Table 4-1. Activities implemented in Fukahodo as a model district from June 2010 to July 2011

Activities	Date	Number of participants
Kickoff meeting	June 8 th , 2010	14
Residential meeting	June 10 th , 2010	31
First seminar regarding wildlife issues	July 7 th , 2010	16
Second seminar regarding wildlife issues	October 6 th , 2010	31
Field trip to check damage sites in the district	January 23 rd , 2011	24
Meeting to discuss future interventions	March 24 th , 2011	18
Meeting to discuss program activities for 2011	June 22 nd , 2011	16
Community boar seminar	July 27 th , 2011	About 100 ^a

^a Approximately 40 all-day participants and 60 part-day participants. Stakeholders include community leaders, farmers, hunters, and officials of governments.

Table 4-2. Questionnaire items and response scale of cognitive factors.

Category	Items	Response scale
Attitudes toward behaviors	Conducting wildlife damage prevention intervention is good	
Subjective norm	Neighbors expect me to conduct wildlife damage prevention interventions Family expect me to conduct wildlife damage prevention interventions	
Perceived behavioral control	I know how to prevent damage by wildlife Conducting wildlife damage prevention intervention is difficult ^a	5 point scale
Behavioral intention	I will conduct interventions to prevent wildlife damage	ranged from 1=Disagree to 5=Agree
Risk perception	Human-wildlife conflicts are increasing I worry about the agricultural damage by wildlife	
Social trust	City government provided opportunities to listen to people's concerns regarding wildlife damage Prefectural government provided opportunities to listen to people's concerns regarding wildlife damage City government provided enough information regarding wildlife issues Prefectural government provided enough information regarding wildlife issues	
Knowledge	Boars are nocturnal (Correct answer=2) Boars eat different foods in each season (Correct answer=1) Boars are cautious animal (Correct answer=1) Boars and pigs are different species (Correct answer=2) Erecting only fences can prevent damage by boars (Correct answer=2) Wild pigs are more fertile than boars (Correct answer=2)	3 choices (1=Yes, 2=No, 3=Don't know)

^aItems are reversed coded

Table 4-3. Questionnaire items and response scale of experience and socio-demographics factors.

Category	Items	Response scale
Damage experience	I experienced damage by wildlife	2 choices (1=Yes, 2=No)
Socio-demographic variables	Age	7 choices (1=Younger than 20s, 2=20s, 3=30s, 4=40s, 5=50s, 6=60s, 7=More than 70s)
	Gender	2 choice (1=Female, 2=Male)
	Occupation	7 choices (1=Company employee, 2=Agriculture/forestry, 3=Self-employed, 4=Governmental official, 5=Housemaker, 6=Student, 7=Unemployed)

Table 4-4. Residents' scores of cognitive variables in Fukahodo and Kuno. Mean score was calculated from 5 point Likert scale (1=Disagree, 2=Slightly disagree, 3=Neither of options, 4=Slightly agree, 5=Agree) for all variables except knowledge level which is average score of 6 knowledge questions (0=Wrong answer/I don't know, 1=Correct answer)

	Fukahodo		Kuno		Significance test	
	Mean score (sample size)	Standard Deviation	Mean score (sample size)	Standard Deviation	F-value	P-value
Attitudes toward behaviors	4.55 (96)	0.74	4.66 (98)	0.69	1.18	0.28
Social norm	2.73 (97)	1.30	2.70 (98)	1.37	0.02	0.89
Perceived behavioral control	2.25 (97)	0.96	1.98 (99)	0.92	3.83	0.05
Risk perception	4.56 (99)	0.75	4.56 (99)	0.74	0.00	1.00
Social trust	3.02 (97)	1.00	2.98 (99)	1.01	0.07	0.79
Behavioral intention	3.80 (92)	1.05	3.86 (96)	1.11	0.15	0.70
Knowledge level	0.47 (96)	0.22	0.42 (98)	0.20	2.84	0.09

Table 4-5. Comments provided by residents in the two districts (numbers represent the frequencies of the comments).

	Fukahodo	Kuno
Requests toward government for support and implementation of interventions	3 (e.g. “Please provide more financial support for mitigating wildlife problems”)	8 (e.g. “Damage by wildlife especially macaque, boar, deer, Masked palm civet are becoming serious, and government should cooperate with local communities to implement necessary interventions”)
Worry and frustration regarding wildlife appearance and damage	2 (e.g. “I used to rent a field and grow crops, however I had to give up growing potatoes since boar and macaque start to appear and steal crops”)	5 (e.g. “Damage by boar is increasing every year and the number of abandoned fields are increasing as well”)
Positive effect generated by the activities	1 (“In those area where we erected electronic fence, it seems like boars do not show up”)	0
Lack of necessary knowledge or experience to answer the questionnaire	0	3 (e.g. “Since I am not a farmer, I do not know anything about damage or interventions”)
Requests, worry/frustration, and local information	0	2 (e.g. “Government should get rid of wildlife. Wildlife are appearing near houses and we cannot go out to reap crops or take a walk, since there is a possibility that we would get attacked by those wildlife”)
Providing information of local situation	0	2 (e.g. “According to the local hunters, while number of boars decreased in Iriawano {north of Kuno}, damage started to occur around human settlements in Kuno”)
About the questionnaire	1 (“I did not understand what the Question No. 18 was asking.”)	1 (“This questionnaire provided me a good opportunity to think about wildlife issues and that I need to be more aware of damage by bears and boar.”)



Figure 4-1. Location of Fukahodo and Kuno in Utsunomiya Prefecture

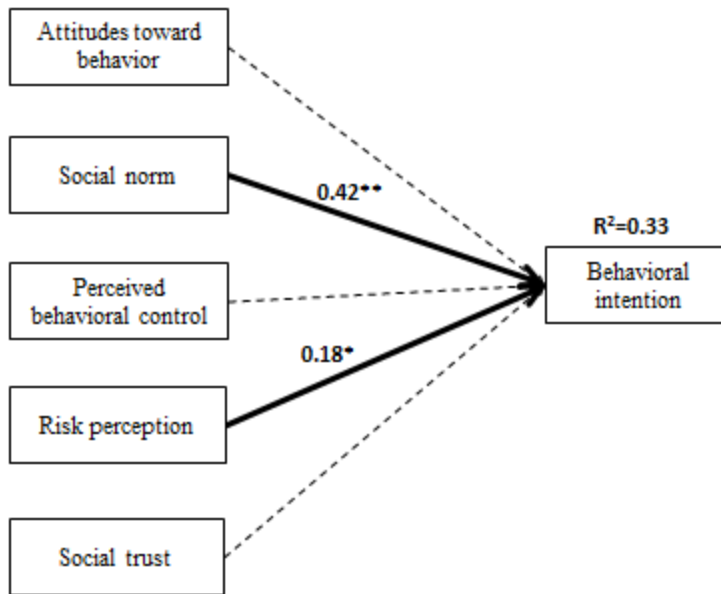


Figure 4-2. Association of cognitive variables and behavioral intention in Fukahodo. The numbers represent standardized coefficients. (* $p < 0.05$, ** $p < 0.01$)

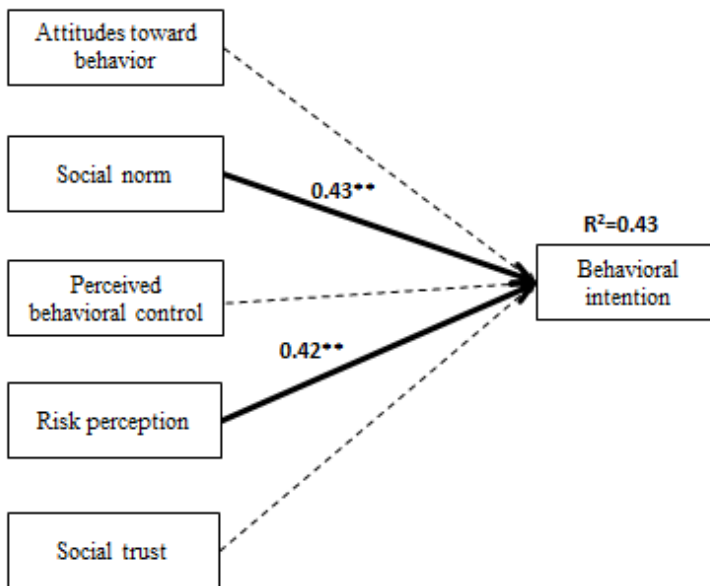


Figure 4-3. Association of cognitive variables and behavioral intention in Kuno. The numbers represent standardized coefficients. (* $p < 0.05$, ** $p < 0.01$)

CHAPTER 5 CONCLUSION

Human dimensions of wildlife management is a developing field in wildlife conservation in Japan. The findings of the dissertation studies suggest ways to improve media content to increase readers' awareness regarding bear issues and increasing people's social trust toward wildlife agencies and public acceptance capacity of bears. Results also suggest how programs can influence local residents' willingness to engage in damage prevention activities to mitigate wildlife conflicts.

Content analysis of Japanese newspapers regarding black bears revealed that most articles published were about human-bear conflicts; problem interactions with bears and bear-related damage. Also bear-related risk was mentioned more in years of high bear appearances and in the local newspaper. There were few articles that explained risk with any supporting statistics. Results of the study shows the importance for researchers and government officials to work together to provide objective and scientific information to the press, so that readers would improve their knowledge about bears and have a broader perspectives of this management issues.

Surveys of residents' perception of black bears found that most respondents perceive bears as a risk and believe there are too many bears around their villages. The study showed the more people trusted the government, the more likely that they took damage prevention actions. The study revealed how social trust influences people's risk perception and behaviors, and suggest that the government needs to understand residents' perceptions and increase public participation in decision making to increase trust.

The evaluation study of a wildlife damage prevention program revealed that residents in the model district had significantly higher perceived behavioral control than those in the neighboring (control) district suggesting the potential impact of the program. Participants of the

community bear seminar had significantly higher behavioral intention, social norm, knowledge, and perceived behavioral control regarding wildlife issues than non-participants in the same district or residents in the control district. On the other hand, there was no significant difference between non-participants of the model district and residents of the control district which might imply the limitation of the diffusion effect to neighbors in the model district. It is important for the government to continue implementing outreach activities to foster residents' motivation for engaging in damage prevention actions, and also to keep monitoring the outcomes of the program, including changes in residents' attitudes and behavioral intentions.

The series of studies in this dissertation found that research methods (e.g., content analysis) and theories (e.g., Theory of Planned Behavior) that are well-used in North America could be applied to Japan to understand people's cognitive factors as well as local situation. The three studies contributed in providing information for building the practical and theoretical basis in human dimensions of wildlife management in Japan. The studies also had practical value. The Hyogo Prefectural government launched a community bear education seminar throughout the prefecture for enhancing people's behaviors to prevent bear damage based on the results this dissertation. Tochigi Prefectural government utilized the outcome of this research to improve the content of their activities to address the local situation and reflect the residents' needs. These case studies of social aspects of wildlife issues as well as application of the results in Japanese management settings indicate the important role the field of human dimensions of wildlife management can play to the scientific community and general public in Japan.

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BIOGRAPHICAL SKETCH

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 and received Master's degree in May 2009. He started his PhD program in August 2009 in the same school and the department at the University of Florida and until now (November 2012), he has published ten peer-reviewed papers both in English and Japanese, and received an "Outstanding Graduate Research Award" from the Department of Wildlife Ecology and Conservation 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.