

# Understanding residents' risk perceptions associated with fatal brown bear accidents: A case study in Shibetsu town, northern Japan

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The purpose of this study is to examine how residents around the protected areas perceive risk from fatal brown bear (*Ursus arctos*) accidents. In addition, we investigate the association between their risk perception and their backgrounds in order to design an effective risk communication. The protected areas are set up for the conservation of wildlife, but there is significant potential for human-wildlife conflicts, and the areas could well become a target for criticism (e.g., Treves 2009). Hence, it is important to understand the attitudes, behavior, and perception of stakeholders around the areas and reflect them in wildlife management. In particular, brown bear management poses a challenge for wildlife managers because bears routinely leave the areas and have strongly negative impacts – including fatal accidents on surrounding communities. To consider an appropriate bear management, information about the communities' risk perceptions is needed. That is because the risk concept is integral to bear management, and may help the wildlife managers in decision-making (Gore et al. 2009).

Our research site is the town of Shibetsu in Hokkaido, northern Japan. It is located near the Shiretoko National Park (a World Natural Heritage Site). The park is a high bear density area and provides visitors with bear-viewing opportunities; however, the town has the problem of nuisance encounters with bears. The number of nuisance encounters has increased rapidly in recent years, and managers are experiencing difficulty in balancing the conservation and mitigation such conflicts.

## Methods

We conducted a questionnaire survey. In July 2011, we mailed questionnaires to 1,200 residents, aged from 20 to 79, who were selected randomly. A total of 515 questionnaires returned, representing a 43.2 % response rate (excluding eight non deliverable questionnaires). The questionnaire included 12 questions designed to evaluate the risk perceptions of fatal bear accidents. The questions were developed from studies of risk perception (Gore et al. 2006; Kubo et al. 2011; Slovic 1987). Risk perception was measured using the five-point Likert scale. In addition, we examined residents' backgrounds (characteristics, experiences with bears, and attitude toward bears) to identify any association with their risk perceptions. In this study we analyzed data from 470 questionnaires with completed questions.

## Results and discussion

Four principal factors concerning fatal bear accidents were obtained from a principal component analysis (PCA).

The first component is escapability: this rated highly in accident-avoidance statements. The second component is control: this rated highly in statements of intervention by public authorities. The third component is seriousness: this rated highly in the statements of magnitude of an accident. The last component is responsibility: this rated highly in accident-liability statements.

Furthermore, a cluster analysis using the PCA factor loadings identifies three groups of respondents with significantly different risk perceptions. The first group (n = 145) regards the risk as serious and uncontrolled. In addition, it has a negative attitude toward bears because its members are engaged in agriculture and have had negative experiences with bears. The management of this group needs to be prioritized because it has a strong perception of risk on the basis of negative experience but does not perform action voluntarily. Thus, the managers should therefore actively design risk communication to alter their behavior. The second group (n = 117) does not consider the risk as serious but controlled. Members of this group tend to engage in work outside agriculture and have less experience with bears. In addition, they are older than those in the other groups. Thus, they could be interpreted as people who understate the risk because they have had less exposure to bears. The managers should pay attention to the human-bear interaction trend (i.e., the number of encounters), although they need not perform any particular action for this group. The last group (n = 208) regards the risk as uncontrolled and cannot be escaped. In addition, it shows a positive attitude toward bears. Members of this group are younger than those in other groups and satisfied with current bear management practice. In addition, they express the intention of attending lectures about bear management. This group could be interpreted as a desirable group from the managers' point of view in terms of achieving a balance between conservation and mitigation. However, the members should draw a positive image of bears because they only have experienced of bear viewing.

## Conclusions

To sum up, residents have heterogeneous risk perceptions of fatal bear accidents, and their risk perception is associated with their backgrounds. To improve risk communication, it is necessary to consider this association.

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