Chapter 16 The Status of Bears in Japan
16.1 The Status of Brown Bears in Japan

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In Japan, brown bears (*Ursus arctos*) occur only in the Hokkaido, the northernmost island of Japan. They have been respected as the god of the mountain by the Hokkaido' s native people, the ainu for a long time. In the meantime, settlers from the southern main islands of Japan from the late 19th century onwards have been very afraid of bears and have killed them as pests. However, it is a fact that the brown bears occur in the area of about 70% of the island even now in spite of such a rough treatment of brown bears.

The key factors for the coexistence of brown bears and human beings in Hokkaido are whether or not we accept this consequence as a good fortune, and whether or not we establish required bear management and monitoring systems in Japan.

Biology

Taxonomy and morphology

The brown bears in northeastern Eurasia are divided into four subspecies based on cranial and dental morphology (Baryshnikov et al. 2004). Brown bears in Hokkaido (including southern Chishima = Kuril Islands) received the subspecific name *U. a. ferox* Temminck, 1842 (*U. a. yesoensis* Lydekker, 1897 is a junior synonym) and those of Sakhalin and Primorski the name *U. a. beringianus* Stroganov, 1962. The skulls of *U. a. ferox* in Hokkaido are generally smaller than the other three subspecies in northeastern Eurasia (Baryshnikov et al. 2004).

A brown bear in Hokkaido has a hump on its shoulders just as brown bears in the other regions. Fur color varies: black, dark brown, or bright yellowish brown (golden). Some bears have black fur with a golden or dark brown portion from the face to their back. Occasionally, a white patch was present on their breast (Imaizumi 1960).

For wild bears in Hokkaido, there were only a few published reports about body measurements. In adult bears, from the Oshima Peninsula in southern Hokkaido who were live-trapped, mean body weight was 81.7 kg (n = 17, SD = 17.2) for females and 127.6 kg (n = 8, SD = 33.9) for males (Hokkaido Institute of Environmental Sciences (IES) 2004a). Mean body weight of three adult females (6-7 years old) live-trapped in Urahoro, located in the central-eastern part of Hokkaido, was 104.7 kg (SD = 6.4) (Sato et al. 2004a). Among adult bears live-trapped from the Shiretoko Peninsula in eastern Hokkaido, mean body weight was 102.9 kg (n = 31) for females and 192.4 kg (n= 7) for males (no SD was given; Kohira et al. 2006). It is noted that direct comparison of body weight variation among these regions should not be done, since there seems to be a distortion of body weight, depending on type and size of traps used. In addition, a credible maximum recorded weight is for an adult male hunted in Shyari-cho, eastern Hokkaido during November, 2002, which weighed 400 kg (Nakamura 2003). This record is not much less than that of the maximum recorded weight (440 kg) of the captive bears at Noboribetsu Bear Farm (Maeda and Ohdachi 1994). Other external measures such as body length, body height, neck circumference, and width of forepaw of wild brown bears in Hokkaido were reported on in few papers (Hokkaido IES 2004a, Sato et al. 2004a). Thus, geographic, age, seasonal, and sexual variations in external measures for wild brown bears in Hokkaido should be investigated in the near future.

For the captive brown bears of Hokkaido, maximum body weight was 440 kg for males and 221 kg for females. Mean body weight of 4-6 years old bears (sample size is largest in this age class) was 115.0 kg for females and 219.0 kg for males (Maeda and Ohdachi 1994). For the other adult age class, males are also approximately twice as heavy as females. Chest girth and body weight were positively correlated ($p < 0.001$) and chest girth was a good indicator of body weight. In addition, the width of forepaw can discriminate adult males ($\geq$ 4 years old) from young males (1-3 years old) and females ($\geq$ 1 year old) with a 9.3% error rate (Maeda and Ohdachi 1994).

Skull size (condylobasal length) of the brown bear increases from south-west to north-east in Hokkaido (Yoneda and Abe 1976; Ohdachi et al. 1992). An adult male moved approximately 70 km distance in five days in central Hokkaido (Waseda 1999). Thus, these are interesting differences because they exist despite the small size of Hokkaido (ca. 78,400 km^2 for Hokkaido

mainland) relative to the potential high dispersal ability of bears.

Matsuhashi et al. (1999) revealed that there are three haplotypes of the mitochondrial control region in brown bears (see the genetic section below). Each of the three haplotypes specifically occurs in southern (south to Ishikari lowlands), central (east to Ishikari lowlands and north to Kushiro region), and eastern (Shiretoko and Akan areas) regions, respectively. Baryshnikov et al. (2004) compared cranial and dental morphology among bears of the three haplotypes. Skull size was smallest in the southern group of haplotype and largest in the eastern group. In particular, bears from eastern Hokkaido (including Kunashiri = Kunashir and Etorofu = Itrup Islands) had significantly larger skulls, smaller cheek teeth, and broader faces than the southern and central genetic groups. Thus, it is possible to suggest that the morphological difference in skull and teeth in Hokkaido brown bears might be associated with genetic differences.

Baryshnikov et al. (2004) implicitly pointed out that dietary difference is a cause of the geographic variation of cranial morphology in Hokkaido. In general, carnivorous Ursids tended to have smaller cheek teeth than omnivorous and herbivorous Ursids (but larger than insectivorous species) (Sacco and van Valkenburgh 2004). In the eastern Hokkaido, where bears have broader face and small cheek teeth, robust salmonoid fish were abundant. In addition, sika deer (*Cervus nippon yezoensis*) meat is recently an important food resource for bears in eastern Hokkaido (Sato et al. 2004b 2005a). Therefore, the broad face and small cheek teeth of the bears in the eastern group might be related to their food habits. However, bear diets are unstable even over a few tens of years (Ohdachi and Aoi 1987; Sato et al. 2004b, 2005a). Thus, we can not conclude that the dietary difference caused the morphological variation. The evolutionary interpretation of morphological variation in the skulls of Hokkaido brown bears should be carefully investigated.

(Satoshi D. Ohdachi, Hifumi Tsuruga)

Ecology and behavior

The Hokkaido brown bear is an omnivorous mammal that feeds primarily on vegetative materials. Herbaceous plants are the dominant food in spring and summer, whereas fruits are the dominant food in autumn (Aoi 1985; Abe et al. 1987; Ohdachi and Aoi 1987; Yamanaka and Aoi 1988). As for the consumption of other animals, insects such as ants of Formicidae and wasps of Vespidae are also consumed in summer. Previous studies reported a brown bear diet list consisting of 50 species in the Daisetsu Mountains, central Hokkaido (Itoh et al. 2001), and 75 species in Shiretoko Peninsula (Yamanaka et al. 1985).

In the 1990s, some studies showed extensive consumption of agricultural crops in late summer (August and September) and an increase in the consumption of sika deer meat by brown bears as the result of population increase of sika deer in eastern Hokkaido (Sato et al. 2004; Sato et al. 2005a).

Brown bears eat various items in late summer, when the nutritional values of herbaceous plants decrease and fruits - their major autumn food - are still immature (Sato 2005). Bears living in a habitat where premature herbaceous plants are available eat herbaceous plants. And bears living in a habitat where spawning fish are available eat fish. In most regions in Hokkaido, however, bears feed on crops because of the shortage of alternative natural food during this season. Invasion into farmlands and crop damage are one of the major causes of control killing.

Fruits in the autumn diet are significant because the bears must store accumulated fat in preparation for hibernation. The amount of seed and fruit produced fluctuates annually in most broadleaf tree species. In years of low seed and fruit production, lacking their major food source, brown bears increased the use of crops as an alternative food source (Sato and Endo unpublished data).

Knowledge of the life history of brown bears is insufficient. Cubs are born in dens between late January and early February, grow up accompanied by their mother for the first year, and experience their first hibernation with their mother. Separation from their mother is considered to be at the age of 15-27 months (Mano and Tsubota 2002). After the separation from their mother, young males are supposed to disperse from their natal place, though there are only a few illustrative cases (Kohira et al. 2006). From observation in captive condition, the mating season of brown bears is from early April to early July (Tsubota 1998). During this season, tree-rubbing behavior is observed frequently in the wild, which is considered to have some communicative function among bears (Sato 2004; Sato et al. 2005b). From the study of harvested bears in the Oshima Peninsula, the minimum age of first parturition was 4 years, but reproductive success among females less than 6 years old was low and they were more apt to produce single offspring and lose them during their 1st year (Mano and Tsubota 2002). Mean interval between births was 2.3-3.0 years, and mean litter size was 1 for females younger than 7 years and 1.8 for females older than 7 years (maximum 3) in the Oshima Peninsula (Mano and Tsubota 2002). In the Rusha area of Shiretoko Peninsula, which is known to be one of the most food rich environments for bears in Hokkaido, the reproduction rate was estimated to be ranging from 0.709 to 0.960 cubs /

female a year (Kohira et al. 2006).

Studies on the movement of brown bears in Hokkaido were conducted from the late 1980s in Oshima Peninsula (Mano 1994; Hokkaido IES 1996, 2000, 2004), Shiretoko Peninsula (Yamanaka et al. 1995), Tomakomai region (Waseda 1999) and Urahoro region (Sato 2002; Kobayashi 2004). These studies showed that adult females had a smaller annual home range size than adult males. Females used almost the same areas for years, and their home ranges overlapped with neighboring females. Annual home range size of adult females estimated by minimum convex polygon was 10-20km^2 in Shiretoko Peninsula, 3-40km^2 in Oshima Peninsula, and 30-40km^2 in Urahoro region. These sizes were smaller than that reported from North America and Northern Europe. Difference in annual home range size for adult females among populations seems to reflect the differences in the amount of available food or habitat quality. A few cases reported the home range size of adult males because of the difficulty to track males for broad areas. Annual home range size of adult males estimated by minimum convex polygon was 200-450km^2 in Shiretoko Peninsula and 300-500km^2 in Tomakomai region.

There are some studies in seasonal changes in the habitat use of bears. In summer, bears in Shiretoko Peninsula used alpine habitat (Yamanaka et al. 1995), and bears in Urahoro region moved from forest habitat to agricultural farmland (Sato 2002). Studies of habitat selection by vegetation types have also been conducted (Mano 1994; Kobayashi 2004; Yokoyama 2005). In the 2000s, preliminary studies of bear movement using GPS collars were started in Oshima Peninsula and Shiretoko Peninsula (Hokkaido IES 2004; Kohira et al. 2004; Mano et al. 2005). Progress is expected in studies using GPS collars to understand bear movement.

From field observations, Hokkaido brown bears enter dens to hibernate during late November to mid December and emerge from hibernation during late March to late April. It was pointed out that females with a cub that year were later to start their movement after the emergence from their den than lone adults and subadults (Aoi 1990; Mano 1995). The start of hibernation is assumed to be delayed in years of high food availability during autumn, although no demonstrative study has been conducted (Hazumi and Mano 1995).

Brown bears hibernate in self-dug dens, in most cases dug under a tree root spread on a slope (Inukai and Kadosaki 1979; Okawa et al. 1979). There are only a few observations of brown bears using a rock cavity (Okawa et al. 1979) or a hollow tree (Oda 1989) for hibernation.

(Yoshikazu Sato)

Physiology

Although hibernation is a major physiological characteristic of the brown bear, there have been few findings on the physiological mechanism of hibernation in this species. Since reproduction is associated with hibernation, this association will be documented.

First, recrudescence of spermatogenesis occurs annually during hibernation and the reproductive potential of male bears exhibits high levels only during a limited period around the breeding season. The recrudescence of spermatogenesis occurs in February during hibernation in the brown bear (Tsubota and Kanagawa 1989). Actual active spermatogenesis was observed in testes that were obtained from wild bears killed by hunters during March - May just after awakening from hibernation. During breeding season, active spermatogenesis and high levels of androgen (testosterone) in blood was also noted (Tsubota et al. 1993).

Second, implantation time of pregnant female bears coincides approximately with the beginning of hibernation. The breeding season of the brown bear is from May to July (Tsubota et al. 1985, 1986) and fertilization occurs within the reproductive tracts of female bears just after breeding. However, the embryo that differentiates from the fertilized egg discontinues development for several months until November or December. This phenomenon is the so-called "delayed implantation" that can control the gestation period with fixed species-specific breeding season, parturition period and fetal development duration. Because unimplanted embryos were detected between September and November (Tsubota et al. 2001), the occurrence of delayed implantation has been indicated to be at least until late November in the brown bear. It has also been suspected from the results of peripheral hormone concentrations that implantation may occur in late November-early December (Tsubota et al. 1987, 1992, 1994b). Fetuses grow up for about 2 months (Tsubaki et al. 1985; Tsubota et al. 1987) and parturition occurs between mid-January and early February (Tsubota et al. 1994a).

From the previous studies, it is considered that reproductive success or failure at the process of implantation, fetal growth, parturition and nurture during hibernation should be determined by the nutritional condition of the Hokkaido brown bear. Thus, a parameter is required to know the nutritional condition before hibernation. Studies on body weight, blood profiles, fat volume within the marrow of a thighbone and fat volume surrounding the kidney have been carried out (Hokkaido Environment Science Research Center 1996), but a precise parameter has not been obtained so far.

There are several vulnerable local populations in the west Ishikari, and Teshio-Mashike region (Enviroment Agency 2002; Hokkaido Government 2001). In the near

future, we may try to increase the number of bears in captivity and reintroduce them into the wild for the vulnerable local populations. Hence, studies on technical establishment of artificial breeding such as semen collection and preservation (Ishikawa et al. 1998, 2002) and monitoring of estrous cycles (Ishikawa et al. 2003) are being performed on the Hokkaido brown bear.

(Toshio Tsubota)

Molecular phylogeny and genetics

The Hokkaido population of the brown bear has been classified as one subspecies *Ursus arctos yesoensis*. Recent molecular phylogenetic studies demonstrated that there are three lineages which are distributed allopatrically on the island of Hokkaido.

Matsuhashi et al. (1999) studied mitochondrial DNA (mtDNA) phylogeography of the brown bears collected through Hokkaido. Of the Hokkaido brown bears, they have identified 17 haplotypes of the mtDNA control region, and classified them into three genetically distinct lineages (named clusters A, B, and C) with high bootstrap values (more than 90%). In addition, Matsuhashi et al. (1999) found that the three mtDNA lineages were located allopatrically on the island of Hokkaido: cluster A was distributed in north-central Hokkaido, cluster B was in eastern Hokkaido, and cluster C was in southern Hokkaido. The borderlines between cluster areas were clearly located.

Cluster A consisted of nine haplotypes (HB01-09), cluster B comprised four haplotypes (HB10-13), and cluster C had four haplotypes (HB14-17). Among cluster A of north-central Hokkaido, HB01 to HB03 were dispersed in a wide area, HB04 was concentrated in the Hidaka mountains, HB05 was distributed in the Ishikari lowlands, and HB06 to HB09 were restricted to northern Hokkaido. Among cluster B of eastern Hokkaido, HB10 to HB12 were located in the Shiretoko Peninsula (registered as a World Natural Heritage in 2005) and HB13 was located in the inland of eastern Hokkaido. Among cluster C of southern Hokkaido, HB14 to HB17 were separately distributed from north to south, respectively.

Based on molecular clock of the mtDNA control region, divergence among clusters A-C was estimated to have occurred more than 0.3 million years ago, indicating that the three mtDNA lineages were divided not on the island of Hokkaido but in the Asian continent (Matsuhashi et al. 1999). Since haplotypes belonging to each cluster (A, B, or C) are located separately within that cluster area, microevolution in each cluster could have occurred after their migration from the continent to Hokkaido.

In conjunction with mtDNA sequences of brown bears from Hokkaido (Matsuhashi et al. 1999), Europe (Taberlet and Bouvet 1994) and North America (Waits et al. 1998), Matsuhashi et al. (2001) reconstructed the phylogenetic relationships among worldwide brown bears. Consequently cluster A was close to the eastern European lineage. Interestingly cluster B was common in lineage to the eastern Alaskan group. No lineages common to cluster C have been found. The molecular phylogenetic data indicate that immigration of brown bears to Hokkaido from the continent could have occurred at least three times through landbridges which formed around the Japanese islands in Pleistocene. The first immigrant to Hokkaido could be cluster C, the second could be cluster B, and the last could be cluster A. The specific distribution pattern of three mtDNA lineages in the Hokkaido brown bear population has been established due to the dynamic migration history and their biological features such as matrilocality, hibernation, and ecological adaptation to environments. Since no fossils of the brown bear have been found from the Pleistocene layers on Hokkaido, it is still difficult to determine the precise dating of their migration to Hokkaido.

Tsuruga et al. (1996) examined protein polymorphism of 21 loci due to starch gel electrophoresis and found lack of polymorphism in the Hokkaido brown bears analyzed. In addition, Tsuruga et al. (1994) studied minisatellite DNA (DNA fingerprinting) and reported low genetic variations in local populations of the Shiretoko peninsula and the Oshima peninsula. Genetic population studies of brown bears from more extensive areas of Hokkaido are desired to further the understanding of their status for conservation and management reasons.

(Ryuichi Masuda)

Status

Present distribution

The brown bears inhabit the main island of Hokkaido and the islands of Kunashiri and Etorofu in Japan. Here on in described are brown bears on the main island of Hokkaido excluding the latter two islands which have been under administration of Russia through their illegal occupation since the end of World War II.

The area of Hokkaido, the northernmost island of Japan, is about 78,400 km^2. The Hokkaido Government has carried out distribution monitoring of brown bears with the periodical questionnaire on their distribution at a six to seven-year interval for the hunters, foresters, town officials, nature conservation groups, and so on (Hokkaido Government 1978, 1986; Hokkaido IES 1994, 2000, 2004b). The latest survey was done in 1997 and a supplemental survey was carried out in 2001 to

2002. Hokkaido was divided into 3,540 grids (5 km× 5 km) and information on the existence of bears was gathered for each grid. Such information was obtained for a total of 2,169 grids, which accounted for 61% of the total number of grids of the island (Fig.16.1.1, Hokkaido IES 2004b).

Historic range

Before the beginning of modern development in the late 19th century, brown bears had inhabited all through out the island of Hokkaido including coastlines and lowland planes. They were eliminated from the lowland habitats occupied mainly by the temperate deciduous forest as the progress of the development of the lowland habitats and their changes into farmlands or residential areas.

Population estimation

Haga (1967) estimated the population size of brown bears in Hokkaido to be 3,000 assuming a stable population size and kill numbers. Inukai et al. (1985) noted that the estimated brown bear population size in Hokkaido was between 1,880 and 2,285. The cumulative total population size of brown bears according to hunters of each local district during the 1990s was between 1,771 and 3,628 (Hokkaido IES 2000). Scientific investigations on brown bear population estimation such as radio-tracking, capture and recapture, and hair or scat sampling for DNA profiling have been carried out in some limited intensive study areas.

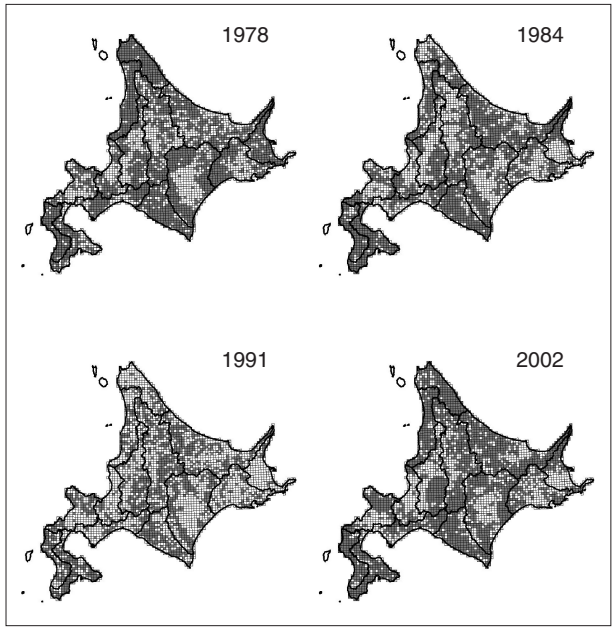

Fig.16.1.1: Brown bear distribution in Hokkaido explained by the 5×5km grids. The information was obtained through the 4-times questionnaire surveys conducted in 1978, 1984, 1991 and 1997-2002. Gray color grid shows the grid with bear existence information. Reproduction from Hokkaido-IES (2004b).

Bear kill statistics

Brown bear kill statistics has been obtained from 1873 to 1881, 1886 to 1888, 1901 to 1935, 1937, 1938, and 1945 to 2003. The average annual bear kills before 1938 and after 1945 were 315 and 413 respectively. After World War II, annual kills had been around the level of 500 until the early 1970s but declined to the level of around 200 in the late 1980s and increased again (Fig. 16.1.2).

Habitat conditions

Brown bear distribution ranges from the forested mountain range to the boundary of cultivated land or residential area. It also ranges from the sea level to an alpine zone of over 2,000 m. However, the most important factor prescribing brown bear distribution would be existence of the forest (Hokkaido IES 2004b). The present 55,800 km^2 forest area in Hokkaido occupying 71% of the island would be brown bear habitat; 55% (30,800 km^2), 11% (6,090 km^2), and 2% (980 km^2) of that brown bear habitat are owned by the National Forestry Agency, the Hokkaido Government and universities respectively. Privately owned forest occupies only 26% (14,690 km^2) of the all forests. Therefore, the public organizations own about three fourth of the forest in Hokkaido which is the highest percentage of all the prefectures in Japan.

Forested area in Hokkaido had declined from the beginning of modern development in the late 19th century until the 1970s but has been stable since the 1980s. Forest environment must have changed from the 1950s to the 1970s through the expansive afforestation policy; that is intensive deciduous forest cutting and increased conifer plantation. The present percentage of conifer plantation is 27% (15,200 km^2) of the all forests.

The brown bear is a game species in Japan and has been killed for sports hunting and nuisance control purposes. Protected areas including wildlife protection areas, special protection areas of the national and quasi-national parks, and nature conservation areas in Hokkaido are 4,466 km^2, which is 5.7% of the island.

(Tsutomu Mano)

Management Issues

Bear-human conflicts

Although the incidence of bear-caused human injuries has declined since 1960s, bear-human interactions still happen occasionally. In the last two decades (1986-2005), 8 people were killed and 27 were injured by

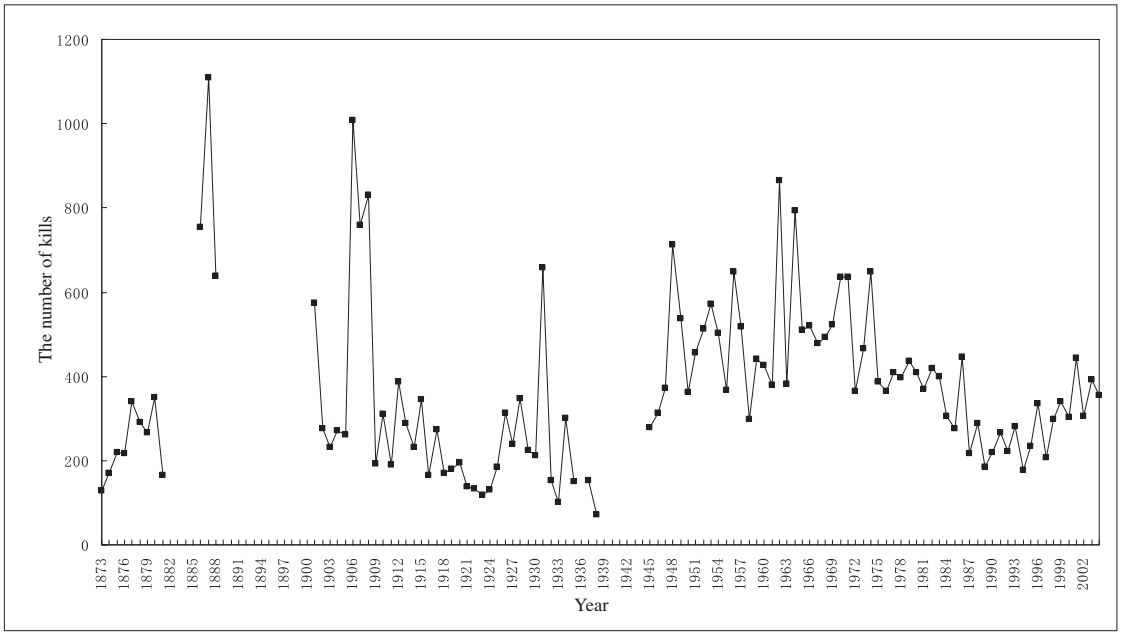

Fig.16.1.2: Brown bear kills in Hokkaido, 1873-2004.

bears. Half of them were hunters who had accidents during deer hunting or nuisance bear control. Others were people attacked when they were fishing, picking edible wild plants, or working in forestry. These incidents are mainly caused by accidental encounters with bears, which have learnt to eat human food, and bears defending their cubs or food (Hokkaido IES 2000; Herrero 1985). These incidents often affect how people feel about bears negatively and hinder the promotion of bear management. Thus it is important to educate people about bear facts in order to avoid the risk of bear damages.

As general omnivores, brown bears eat various agricultural products and damage corn, sugar beets, fruit trees, apicultures, and livestock. The amount of agricultural damage by bears is increasing gradually and has reached 100 million yen (1US$=115 yen) in recent years. Fear of bears also causes other kinds of damage, such as stopping and delaying agricultural operations, although such damages are not included in the officially reported depredation losses. Bear-caused damage often occurs during the late summer, when the nutritional values of herbaceous plants decrease and main autumn foods (berries and nuts) are still immature. In such transition, brown bears eat various items and come down to the fields to eat matured crops (Tsuruga et al. 2002).

Another problem, which may be subject to depredation control, is roaming bears near residential areas. In Hokkaido, there are many places where residential areas and agricultural fields are located adjacent to the forests that are habitats of bears. As most people think of bears as fierce animals, people feel latent fear and frustration from bears roaming town. When a bear appears near schools, public facilities, or residential areas, such feelings will be more exaggerated and, in the worst case, it causes panic in not only residents but also police, hunters, and mass media. There are various reasons why bears come to town: just moving to another place, eating natural foods near residential area, and being attracted by human food and garbage. Some of the potential dangers are real, but most of the cases are treated as dangerous situations without any scientific analysis of the real reason why bears come to town. Young or subadult bears just dispersed from their mothers are likely to relate to these conflicts, because they are very curious and they do not quite understand what is dangerous or not. Non-lethal measures to teach bears to avoid human and human-related areas should be conducted before implementation of lethal control actions.

(Koichi Waseda, Hufumi Tsuruga)

Public education

Public education regarding bears is necessary as an important measure to promote the conservation of bears and preventing problems between people and bears in Hokkaido. The image of brown bears continues to frighten people since the Japanese colonization of Hokkaido began in the late 19th century, and some tragic bear attacks triggered people to think of bears as fierce animals. This image still strongly remains in people's minds, and such attitudes make human-bear conflicts more difficult to resolve and often cause the unneces-

sary killings of bears.

Educational efforts have been undertaken by national parks, other governmental agencies, and nongovernmental organizations. The Brown Bear Association, composed of biologists, hunters, students, and journalists, was founded in 1978. The association has held forums on brown bears in order to educate public in various part of Hokkaido since 1989, but its activities have not been sufficient. Many of the educational activities in Hokkaido are providing information about bears through leaflets or Webpages while more proactive approaches, such as public lectures, are occasionally conducted by some NGO' s. In addition, there are very little opportunities to learn about bears in school. Thus, a limited number of people, who voluntary seek such information, have accurate knowledge of brown bears, but it is not widely disseminated in Hokkaido. Increasing the chance of accessing correct information about their behavior and ecology based on scientific research findings is the first step in enhancing public awareness. It should involve various media, including publications, brochures, TV and radio programs, and web sites. It is also important to educate people who are concerned in these media and cooperate with them. Some programs focusing on the biology and life history of bears, which bear researchers and non-governmental organizations recently produced, seem to be more effective. Though these programs are held sporadically now, it should be focused on especially children and delivered to elementary and middle school classes in the future.

More specialized information on preventing damage by bears should be provided to people who live and work near bear habitat. As agricultural damage is one of the most severe bear-related problems in Hokkaido and consequently increases demands for lethal control of bears, farmers especially should be educated about ways to protect crops and livestock. Large-scale mechanized agricultural systems make it difficult to protect their products from bears and many farmers think killing bears is the best way to defend crops. Preventive measures, such as electric fence, cleaning dense cover (such as tall grasses) around fields, and removing surplus crops entirely after harvests, should be addressed. Such education will help to increase their awareness of self-defense and diminish human-bear conflicts involving agricultural damage.

Preventing human-bear accidents is quite important in coexistence with bears, as well as preventing agricultural damage, because bear attacks subsequently increase bear mortalities and negative public attitudes towards all bears. Bear-inflicted human injuries and fatalities can be prevented if people appropriately behave in bear habitat and respond to bears when they encounter bears. It is essential for people who enjoy outdoor activities or work in bear country, to have sufficient knowledge of avoiding bear-human incidents. Intensive education efforts are needed especially for areas where bears have become more frequently sighted recently. Detailed explanations for bear ecology and avoidance of problems should be provided to people and the contents should be adjusted to areas, seasons, and the type of activities.

As tourism is a main industry in Hokkaido, visitor education is also important. Though people consider the brown bear a symbol of Hokkaido' s wilderness, it is very difficult to watch bears in the wild. However, in Shiretoko National Park, which is located at northeast end of Hokkaido and one of areas with a high density of brown bears, there are opportunities for visitors to observe brown bears. Although efforts to prevent bear-human interactions are required, the park has a great opportunity of educating many people through bear viewing programs. It will not only give chances to learn bear facts for visitors, but will also create an economic value for bears in local communities.

As described above, there are various types of bear-human conflicts in Hokkaido. Therefore, it is important to implement effective educational efforts designed for each target age group, in consideration of regional and seasonal conditions.

(Koichi Waseda, Akiko Kameyama)

Recommendations

Clarification of the responsibility for bear conservation must be the most fundamental issue in Japan. As already shown, wildlife including brown bears as considered by the Japanese legal system and the subject of who is responsible for wildlife management actions is usually ambiguous. Hunting regulations under the Wildlife Protection and Hunting Law have aimed chiefly to reduce dangers in the use of firearms or of hunting traps but have been poor from the viewpoint of sustainable hunting or biodiversity conservation. Responding to the establishment of specific wildlife management systems in accordance to the amendment of the law in 1998, the Hokkaido Government has been examining to initiate a legal brown bear management plan in 2008. Two essential issues have been recognized through examining the process:

(1) Clarification of responsibility for bear management action, and
(2) Practice of systematic bear damage prevention activities.

The Hokkaido bear management policies in the past have been only to issue permission for bear kills including sport hunting and nuisance control. Decisions on

the necessity for control actions and actual control actions have been ensured to persons in charge of the local government or private hunters who usually have little knowledge and experience regarding bear biology and conservation. Under such conditions, it would be difficult to introduce management options excluding immediate control kills or to guide appropriate measures for bear-caused danger and damage prevention; nothing besides bear control kills has been carried out for more than 130 years since the beginning of the modern development of Hokkaido.

It is necessary to regulate total kill numbers including sports hunting and nuisance control at a level lower than the sustainable level. However, with a lack of damage prevention programs and the leaving of the subjectivity and responsibility for bear management to private hunters, nothing but control kills would be employed as the only bear management measure in the future, which implies difficulties in regulation of total bear kills.

Thus, despite the importance and necessity of social system and structure recognized by some people, there is no prospect to embody them. Moreover, with the aging and declining population of hunters and progress of depopulation in rural areas, there is a concern that even killing problem bears could become impossible in some towns and villages within several years. The cause of the decline in hunters is due to the loss of interest in hunting by younger generations.

Agricultural crop damage caused by bears is the primary source of conflict between people and bears, and this phenomenon is characterized as the problem that should be solved for the coexistence with bears in the temperate zone. Generally, each incident of agricultural damage would be commonly caused by a specific single bear or a female with cubs, therefore people have only killed the troubled bear whenever damage occurs and have not been bothered with damage prevention. In addition, hunters who wish to satisfy their hunting instinct by control kill and the administrative agency that wishes to take the cheapest way, namely the issue of control kill permission have had a common interest in this matter. It is very regrettable that there is less social interest in brown bears now other than as a pest. This phenomenon of little social interest in necessary measures to avoid dangers and prevent damage should be changed in the future.

Thus, it is obvious that establishing a functioning bear management system to take the place of the present system owing to private hunters is urgent. In addition, appropriate measures to prevent bear-caused damage and dangers are necessary for people living next to a bear range, which should be publicized and enforced with tenacity. Although bear density has declined substantially regionally, the most forested area, which occupies about 60% of the island, is still potentially a brown bear habitat. Consequently, this urgency and importance of the proposed brown bear management system must reach all people living in Hokkaido.

Moreover, securing talented personnel and funds for wildlife management activities in Japan, including Hokkaido, remains an unsolved issue. Provision of curricula for wildlife biology and management education of large mammals such as bears at higher education is still immature in Japan. Furthermore, interest and discussion on how governmental organizations should be involved in the management activities of the spot or population monitoring has been limited within small groups of concerned people.

Recently, with the deteriorating financial condition of the Hokkaido Government, it is becoming impossible to secure funds for wildlife conservation and management under the leadership of the government. Consideration should be given to increase the economic value of bears as a resource for tourism or sports hunting, in order to obtain funding for brown bear management and conservation.

(Tsutomu Mano)

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16.2 The Status of Asiatic Black Bears in Japan

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The Asiatic black bear is the largest mammal species in Japan outside of Hokkaido. The black bears were harvested intensively for food and medicinal resources in the past. Conflicts with humans, such as crop damage and injury to humans, are leading to increased number of bears culled over almost all their habitat except deep within mountainous areas. The effect of such kills on population viability is more serious in the eastern part of Japan. The habitat of the Asiatic black bear is also changing, and these changes influence the occurrence of conflicts with humans. Japan is now in a struggle to achieve appropriate land use by humans under depopulation, and to establish a wildlife management system with high public awareness in order to achieve the coexistence of bear and humans.

Biology

Taxonomy and morphology

The Japanese black bear (*Ursus thibetanus japonicus* Schlegel, 1857) is a subspecies of the Asiatic black bear (*Ursus thibetanus*, G. Cuvier) 1823 (Pocock 1932; Wozencraft 2005). This subspecies was originally distributed on the three main islands of the Japanese archipelago: Honshu, Shikoku and Kyushu (Fig.16.2.1). However, the Kyushu population is now recognized as extinct (Abe 2005). The distinguishing external characters of this subspecies are its small size relative to the other subspecies, and a dark colored muzzle but without prominent bushy cheek (Sclater 1862; Pocock 1932). Body length ranges from 120 to 145 cm and body weight ranges from 70 to 120 kg (Abe 2005).

Pocock (1932) reported that skulls of *U. t. japonicus* were the smallest of the seven known subspecies, and that teeth were also small. Total skull lengths reported by Pocock (1932), although within the range of lengths recently reported from Ishikawa Prefecture in central Japan (Nozaki and Mizuno 1986) and Iwate Prefecture in northern Japan (Amano et al. 2004), are near the small end of the range and appear therefore to have been taken from relatively small individuals. Additionally, the skull lengths reported in recent studies of *U. t. japonicus* (Nozaki and Mizuno 1986; Amano et al. 2004) fall within the lengths reported by Pocock (1932) for *U. t. formosanus* from Taiwan, *U. t. gedrosianus* from western Asia, and *U. t. moupinensis* from China. These results would seem to indicate that the skull size of *U. t. japonicus* is more similar to these three subspecies than previously suspected. In order to evaluate the taxonomic status of this subspecies in greater detail, further research on variation between the Japanese subspecies and the continental subspecies based on morphology and genetic markers should be conducted.

The Japanese black bear is sexually dimorphic and males are larger than females in most skull measurements (Kadosaki et al. 1986, 1987, 1988, 1989, 1990; Nozaki and Mizuno 1986; Amano et al. 2004). Several studies have been carried out to describe patterns of skull growth and skull sexual dimorphism in this subspecies. Based on specimens from Ishikawa Prefecture in central Honshu, Nozaki and Mizuno (1986) reported that most skull measurements ceased to increase at six years of age, canine measurements ceased to increase at four years of age, and canine weight ceased to increase at five years of age in both sexes. Amano et al. (2004), in a separate study of specimens from Iwate Prefecture in northern Japan, found that most skull measurements ceased to increase at around five years of age in males and four years of age in females. By the age of one year the molar row length had reached adult size and permanent teeth fully erupted.

Amano et al. (2004) reported significant differentiation in skull morphology in Iwate, where a river basin divides bears into eastern and western populations (the Ohu Mountains and Kitakami highlands, respectively). Significant differences were found between the two populations in relative width of the skull, and in measurements of masticatory organs, especially in the length of the molar row and palatal width. Their results suggest that gene flow has been limited, despite the fact that these two populations come within 5 km of each other at the narrowest point of the river basin. Similarly, genetic divergence and morphological differentiation have been reported between bear populations on the east and west side of the Yura river basin in the Kinki district, western Japan (Saitoh et al. 2001; Amano et al. 2001). Based on these studies it may be reasonable to assume the existence of other isolated and differentiated populations of Japanese black bear in Ja-

pan. However, to determine this will require further morphological and genetic study on the entire range of known populations within Japan.

(Sayaka Shimoinaba)

Ecology and behavior

The Japanese black bear lives in environments with four distinct seasons. Although omnivorous, bears eat more vegetation than meat, and food habits vary seasonally (Hashimoto and Takatsuki 1997). In spring, bears eat herbs, young leaves and buds of trees, and if available, nuts that fell in autumn of the previous year. In summer, bears eat tree leaves, herbs, berries, invertebrates of colony-forming insects (e.g., bees, ants). Summer food habits differ among areas and time-period within the summer season (Hashimoto and Takatsuki 1997). In autumn, hard mast of beech (*Fagus crenata*) and oak (*Quercus crispula*) is the staple food in central Japan (Hashimoto and Takatsuki 1997). The importance of nuts from species within the family Fagaceae was suggested by the close association between the geographic distribution of bears and that of broad-leaved deciduous forest dominated by beech and oak (Hanai 1980).

In central Japan, large annual fluctuations in autumn nut production were reflected in large variation in bear food habits (Hashimoto et al. 2003; Mizoguchi et al. 1996). Autumn staple foods also differed between the Pacific Ocean side and the Sea of Japan side. The composition of tree species differed between the areas; oak acorns were staple food for bears on the Pacific Ocean side (Hashimoto et al. 2003), whereas beechnut was important on the Sea of Japan side (Mizoguchi et al. 1996).

Japanese black bears enter dens in winter when food is scarce. They use caves, the roots of large trees or, clefts in rocks, and rarely dig dens (Hazumi 2000). Hibernation begins in November to as late as the end of December, depending on region. Females give birth during hibernation. Parturition is thought to occur from late January to early February.

Emergence from dens tends to differ between the sexes. Female who did not give birth emerge one month earlier than females who gave birth over-winter (Hashimoto unpublished data).

Mating of captive Japanese black bear occurs from June to August (Yamamoto et al. 1998), and it is thought to be similar for wild bears. Because birth rates are positively correlated with mast production during the previous fall, it appears that reproduction is a function of nutritional status in autumn (Hashimoto 2003).

Because foods used by bears vary seasonally and annually, home range sizes also vary. Because topography of most bear habitat is steep, habitat use descriptions are incomplete. Annual home range sizes investigated by radio telemetry were estimated as 40-100km^2 for males and 20-50km^2 for females (e.g., Hazumi and Maruyama 1986). Hashimoto (2003) reported that a female home range size expanded in summer (August), and shrank in autumn (September - November). In the Central Mountains, Izumiyama and Shiraishi (2004) reported a marked change in the elevation of home range with season.

Maita (1991) reported that activity of bears increased at early-morning twilight but this may vary seasonally and with the intensity of human activity. Bears that scavenge garbage tend to become nocturnal.

(Yukihiko Hashimoto)

Physiology

Although hibernation is a distinctive physiological characteristic of the Japanese black bear, there has been little research on the physiological mechanism of hibernation in this species. Reproduction that starts at 2-4 years old in male bears (Komatsu et al. 1994) and 4 years old in female bears (Katayama et al. 1996) is also associated with hibernation. Recrudescence of spermatogenesis occurs in March during hibernation (Komatsu et al. 1997a; Weng et al. 2006), and the reproductive potential of male bears exhibits high levels only during a limited period around the breeding season (Komatsu et al. 1996, 1997b; Okano et al. 2003).

Implantation in pregnant females coincides approximately with the beginning of hibernation. The breeding season of the Japanese black bear is from June to August (Yamamoto et al. 1998) and fertilization occurs within the reproductive tracts of female bears just after breeding. However, the embryo that differentiates from the fertilized egg discontinues development for several months until November or December. This “delayed implantation” controls the gestation period to a fixed, species-specific breeding season, parturition period, and fetal development duration. Because an unimplanted embryo was detected in August (Tsubota et al. 2001), the occurrence of delayed implantation has been shown at least until August in the Japanese black bear. From the results of peripheral hormone concentrations, it has been also suspected that implantation may occur in November-December (Sato et al. 2000a, 2001). Pregnant female bears give birth between January and February and then nurture cubs during hibernation (Sato et al. 2000b; Urashima et al. 1999, 2004).

From the previous studies, it is considered that reproductive success or failure in implantation, fetal growth, parturition, and nurture during hibernation of the Japanese black bear is determined by nutritional condition. Thus, a parameter is required to know the nutritional condition before hibernation. Studies on body weight,

thighbone marrow fat volume, and fat volume surrounding the kidney have been carried out, but a good predictor has not been obtained so far (Hashimoto and Yasutake 1999; Hazumi et al. 1985).

There are vulnerable local populations, mainly in the western regions of Japan. In the near future, we may try to increase the number of bears in captivity for the vulnerable local populations and reintroduce bears into the wild. Hence, studies on technical establishment of artificial breeding such as semen collection (Kojima et al. 2001; Okano et al. in press), semen preservation (Okano et al. 2004), and artificial insemination are being performed.

(Toshio Tsubota)

Genetic characteristics

Mitochondrial DNA (mtDNA) analysis suggest that the Asiatic black bear diverged from an ancient species of the Asiatic black bear, the American black bear, the brown bear, and the sun bear about 2 - 3.5 million years ago (Waits et al. 1999). The Asiatic black bear is thought to have come to Japan between 0.3 and 0.5 million years ago (Dobson and Kawamura 1998), and genetic structure might now diverge among local populations (Ishibashi and Saito 2004; Uchiyama 1998).

A phylo-geographical analysis using the western four populations revealed that two mtDNA lineages are separated by the Yura River. Haplotypes in the western three populations (western Chugoku, eastern Chugoku, and western northern Kinki) formed a separate clade from those in the north-eastern Kinki population (Ishibashi and Saitoh 2004). The two maternal lineages may have evolved in separate glacial refugia during the last glacial period. After this period, remnants with divergent mtDNA sequences may have expanded their distribution again from different refugia, and come into contact in the northern Kinki region. Such phylo-geographical structure may have been maintained for long time because females tend to be philopatric and to breed near their birth area.

Microsatellite DNA analysis has revealed that the three populations to the west of the Yura River had lower genetic diversities than the eastern northern Kinki population which is to the east of the river and appears to be connected with the central large population (Saitoh et al. 2001). Moreover, the genetic structures were significantly different among four populations. This low genetic variation in the western three populations might be caused by genetic drift and/or inbreeding events in the past (Ishibashi and Saitoh 2004); recent isolation may have then caused an additional decrease in diversity and increase in differentiation (Saitoh et al. 2001). Because loss of genetic diversity is associated with increased risk of extinction, it is also a concern for other isolated populations, such as the Shimokita, Shikoku, and southern Kinki populations.

(Naoki Ohnishi)

Status

Changing habitat

Originally spread widely over Honshu, Shikoku and Kyushu, the Japanese black bear have decreased following the expansion of the human population. The decrease has been accelerated since the beginning of the twentieth century, when the human population started to increase rapidly. The black bear population declined especially after the 1950s, when rapid economic development began.

Japan has an area of 370,000 km^2 and a population of 120 million people; further, it suffers from having only 30% of its land available as flat space. Such limited land space was rapidly turned into farms and towns. The remaining 70% of Japan is mountainous, and has also suffered from human induced changes in the form of intensive logging done to fuel the redevelopment of the country after World War II. The mountains were quickly afforested with conifers such as cedar (*Cryptomeria joponica*), cypress (*Chamaecyparis obtusa*) and larch and as a consequence, bear habitat, which relies on natural forests, was disrupted and decreased rapidly.

At the same time, while black bear habitat was being altered, damage to agricultural and forestry products by bears also increased, which led to nuisance kill of bears. Control actions also contributed to the declining bear population. Especially in the areas of western Japan where forestry is one of the main industries, numerous box traps were deployed in the mountains in order to prevent bears from scratching the barks of trees grown for commercial use. In this way, an active kills throughout the year was ensured, aimed at the elimination of the "pest." Following such practices, the isolated bear populations in Shikoku and the Kii Peninsula decreased quickly.

Recently, things have begun to swing back the other direction. The rapid economic development in Japan has been facilitated by industrialization, and therefore people have migrated to cities, drawn by an abundance of job opportunities, leaving the mountainous areas depopulated. The level of depopulation became particularly severe after the 1990s, resulting in a massively reduced workforce and many neglected lands in agricultural and forestry villages. The number of hunters also decreased. With this background, the populations of many large mammals in Japan that surviveed previous eras, and crammed deep in the mountains, are now showing recovery nationwide. This also applies to the

black bear population (Japan Wildlife Research Center 2004, Fig. 16.2.1).

(Toshihiro Hazumi)

Threatened local populations in the Red Data Book (Ministry of Environment 2002)

(1) Kyushu: The population on Kyushu Island is thought to have gone extinct during the 1940s. In 1987, a hunter on Mt. Sobo in Oita Prefecture captured a bear, although whether it was a wild bear is still questioned. There has been no confirmed reports of bear presence since 1987.

(2) Shikoku: Shikoku is where many people traditionally engage in the forestry industry. This is also where nuisance kill using box traps was carried out during the 1970s in order to prevent bears from damaging tree bark, which led to a rapid decrease in the bear population. At present, the Shikoku Natural History Research Center is obtaining data relating to their presence. The population still remains in critical condition.

(3) Chugoku: There are two isolated populations located 100 km away from each other, one in the western Chugoku Mountainous Area encompassing Yamaguchi, Hiroshima and Shimane Prefectures, and one in the Hyonosen Mountainous Area encompassing Tottori, Okayama and Hyogo Prefectures. However, there have been signs that continuity between these two separate populations in Chugoku may have been re-established, with increasing reports of bear habitation in the middle area. But because the mountains in this region are close to developed areas, encounters between humans and bears are frequent, which leads to both deliberate capture for nuisance kill and accidental captures with foot snares set in the mountains intended to capture wild boars.

(4) Kii Peninsula: The population here can be found in the steep mountainous areas encompassing Mie, Nara and Wakayama Prefectures. Active captures using box traps and accidental captures with foot snares in the past reduced the population in this region to a critically low number. Although such captures were now restricted and low in number, this population remains in critical condition.

(5) Shimokita Peninsula: This population, the northernmost in Japan, has been isolated since early times due to human development activities in the narrow area where the Peninsula is connected with the mainland. The bears are culled without the knowledge of the population size, and the critical situation has not improved for this population.

(Toshihiro Hazumi)

Nationwide population

Due to the nature of its habitat - characterized by steep topography, dense vegetation, and heavy snowfall - and the fact that bears move widely and cover a wide area, it is difficult to obtain a density index for bears. Nevertheless, during spring (when snow remained on the ground) between the 1960s and 1980s, local authorities

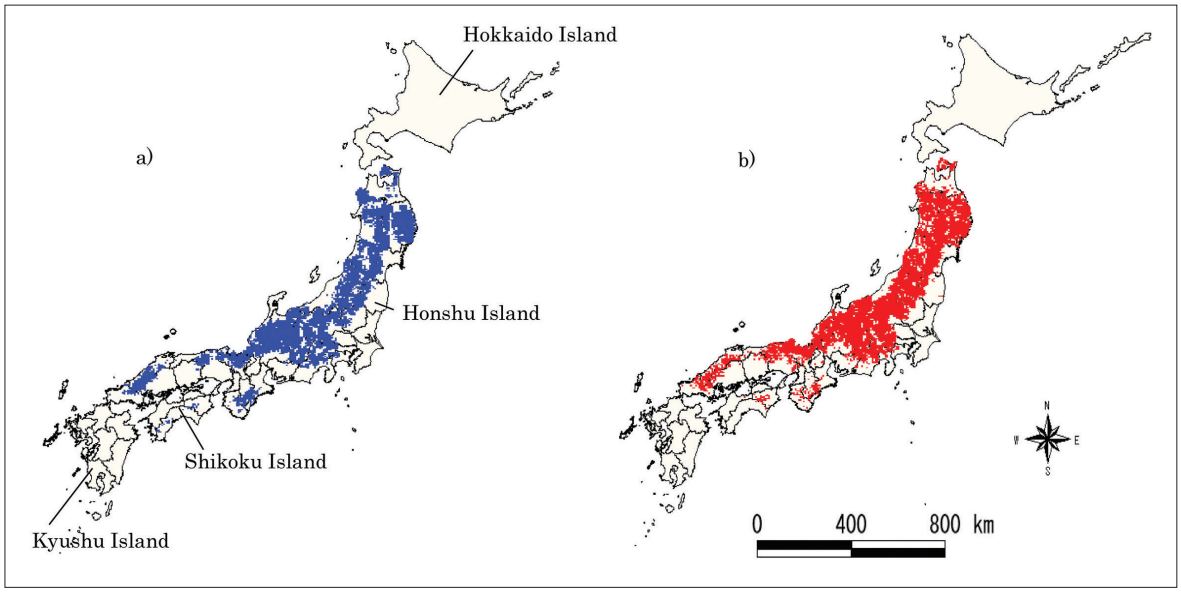

Fig.16.2.1: Distribution of the Japanese black bear in 1978 (a) and in 2003 (b). Black bear is occurred in Honshu and Shikoku Island, but may extinct from Kyushu Island for the last few decades. Each colored square represents 5 × 5km mesh occupied by black bears. The data was obtained and modified from Biodiversity Information System of the Biodiversity Center of Japan, Ministry of Environment.

in Tohoku and Hokuriku areas carried out density research using sighting surveys. Based on these surveys, the Ministry of Environment estimated the black bear population nationwide to be between 8,400 and 12,600 (Japan Wildlife Research Center 2000). However, this is no longer considered an accurate estimate because of differences in methods employed by each prefecture, and the fact that it was based on data more than 25 years old. Today, the distribution of black bears is spread out across most of Honshu, with the exception of some endangered small populations. Ideally, a similar population survey should be conducted with a new and uniform design.

(Toshihiro Hazumi)

Number captured

Approximately 500 black bears are killed annually by hunters during the hunting season (15 November - 15 February) nationally. The number of bears killed as pests varies from 1,000 to 2,000 annually (from Wildlife Statistics of Ministry of Environment. Fig. 16.2.2).

The number of hunters in Japan continues to decline every year, and now falls just short of 200,000. Most of them are now older in age, and this means that there are even fewer hunters who go into the steep mountains to hunt large mammals. It is therefore unlikely that the number of kills by hunters will increase.

At the same time, there have been an increasing number of bears coming down to areas of human settlement, including agricultural areas and also towns and cities in many regions. This means that kills for pest control purposes is unlikely to decrease.

(Toshihiro Hazumi)

Conflict with humans

Conflicts between humans and the Japanese black bear can be categorized as one of two types: those resulting in injuries or death, and those causing damage to agriculture and forestry. Iwate Prefecture, located in the Tohoku region, where many injury and death causing accidents occur, is an illustrative example: damage has increased particularly since 1993 (Fig. 16.2.3). The average number of incidents for the 13 years 1980-92 was 5.0 persons; for the 13 years 1993-2005, the average was 11.4 persons.

Damage to agricultural products has also continued to increase. According to the Ministry of Agriculture, Forestry and Fisheries, the amount of damage by bears in 2003, in terms of weight, was the fourth largest, and the cost of the damage was the third largest among animal species. The amount of damage has been rapidly increasing since 1995. (Fig. 16.2.4). Damage costs are also increasing annually to three to four hundred million yen. Capture for the nuisance control using barrel traps is carried out as countermeasure from summer to fall.

In years when the reproduction of the forest food for bears is low, many bears tend to appear in human villages and damage increase. In 2004, an unusually high number of bears entered villages and other residential areas in Central and Western Japan. 94 cases of human injury (including 2 deaths) were reported, which is contrasting to the cases in 2002-03 (51 cases of human injury) (Japan Wildlife Research Center 2005). In 2005, however, both bear appearances and the number of the nuisance kills were low. For example, in Toyama Prefecture, the captured bears decreased from 121 in 2004 to

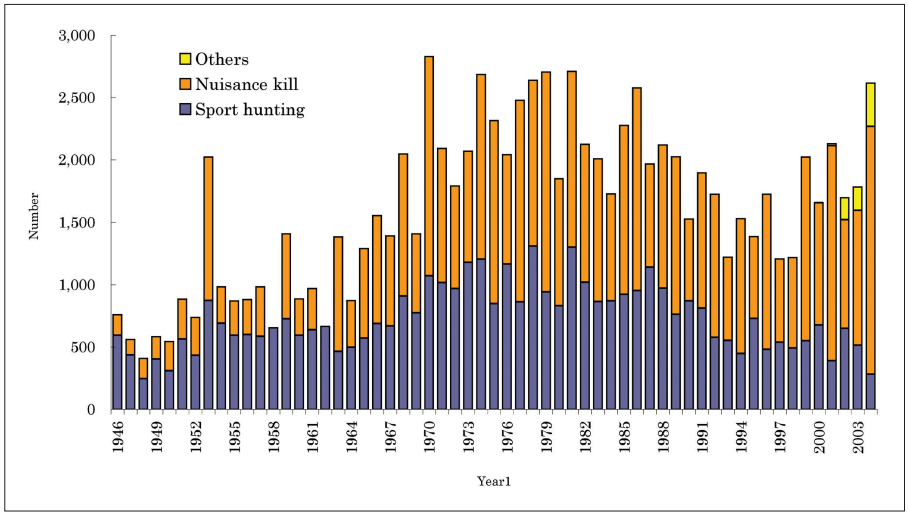

Fig.16.2.2: Annual harvest of the Japanese black bear in 1946-2004. The year runs from April 1 through March 30 of the following year, and the data of nuisance kill in 1958 and 1962 were lost. The others is harvested number by population management.

26 in 2005 (Toyama Prefecture Government). That decrease is considered to have resulted from the abundance of nuts, particularly of beeches, during the autumn, as well as the possible decrease of bears because of lots of kills in the preceding year.

Meanwhile, damage to planted trees such as cedar, continues to occur at the average level of 400-500 hectares annually (Fig. 16.2.5), and is recently expanding from to the eastern part of Japan.

Land use practices in Japan are the primary source of conflict between humans and bears. Forests occupy about 70% of the land in Japan, and farmlands; residential lands are often mixed with surrounding forests in a complicated mosaic fashion. Thus, there are many places where damage by bears can occur. In addition, the conditions of forests are changing, which might cause the change of home range use of bears and influence the occurrence of the damage by bears. Furthermore, decreasing hunting pressure resulting from the decreased hunter population and aging of Japanese society may increase the possibility of conflict. Unless these possible causes are analyzed and necessary measures are taken, conflicts between humans and bears in Japan will not diminish.

(Toshiki Aoi)

Habitat conditions

Forest conditions have been changing. Beginning with the end of World War II, Japan's government promoted artificial regeneration of lands that had been devastated because of the war in an effort to increase Japan's lumber resources. Trees of considerable area of forest lands have converted into two coniferous trees: cedar and Japanese cypress. The percentage of artificial forests is now 45.2% except in Hokkaido (Forestry Agency 2005). However, the change of economy influenced forest management. Recent declines in lumber prices and Japan's self-sufficiency rate (18.5% as of 2003) have resulted in the lack of maintenance activities such as forest thinning. Consequently, many unthinned stands remain nationwide. In these unthinned man-made forests, the forest floors are not sunlit. Vine plants and undergrowth which produce food for wild animals are unavailable, making such areas poor wildlife habitat. Moreover, some forest stands have destroyed into barren land because of natural disasters such as typhoons; others might foster broad-leaved plants that have propagated as the result of the abandonment of forest management. Whichever pertains in most cases, these forests play an important role in segregating habitation areas of humans and bears. Therefore, it is necessary to assess the current state and implement appropriate forest management.

In addition, abandonment of rural mountains (Satoyama) and their surroundings may contribute to transformation of such areas into bear habitats as well as attracting bears to enter human residential areas. Recent depopulation of rural villages in Japan is becoming more serious with the increasing aging of Japanese society. Regions designated as depopulated areas account

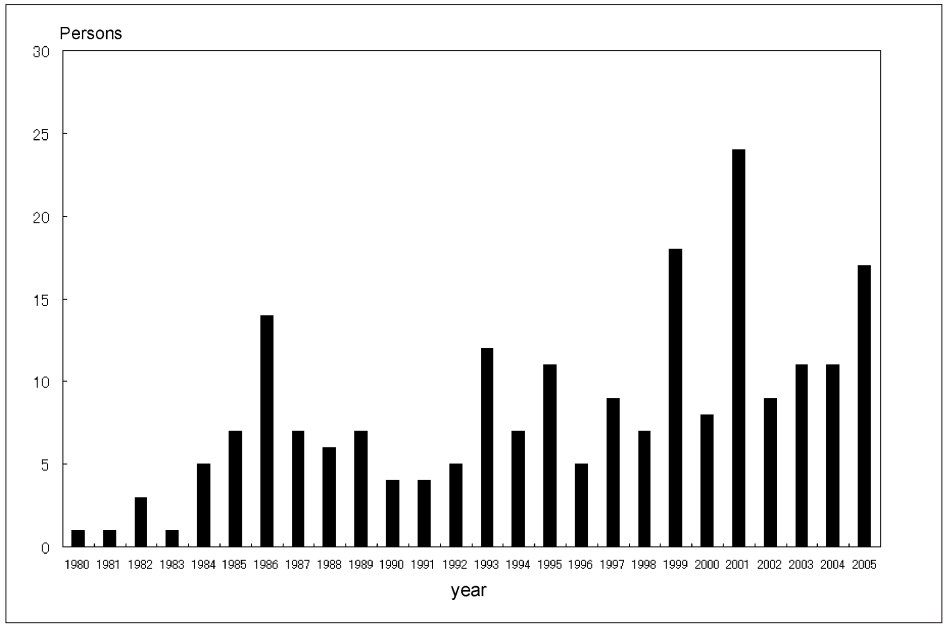

Fig.16.2.3: The number of persons injured and killed by the Japanese black bear in Iwate prefecture (Iwate Prefecture Government).

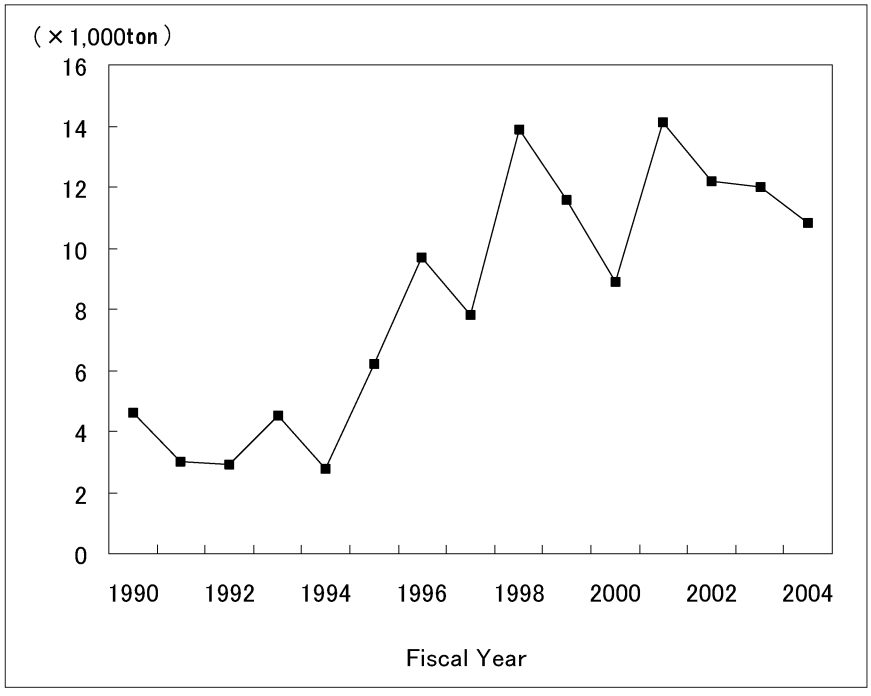

Fig.16.2.4: Annual change in the amount of nationwide agricultural products damage by bears (Ministry of Agriculture, Forestry and Fisheries 2003).

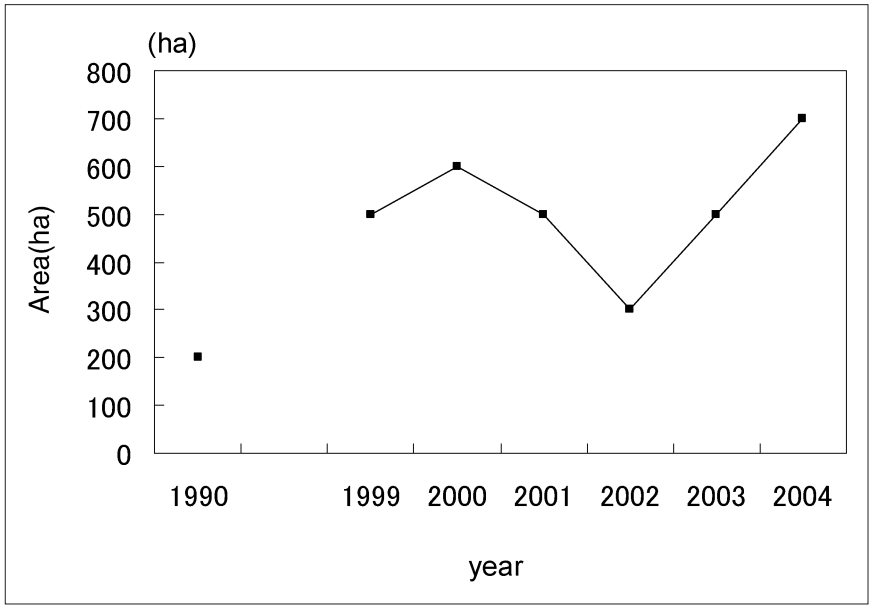

Fig.16.2.5: Affected forestry area damaged by the Japanese black bear (Forestry Agency Working Data 2005).

for 49% of national territories, but those who live in such regions account for only 5% of the population (Study Group on Depopulation 2002). In other words, rural villages, which used to be more active with more people, are now quiet with much less activity. In these regions, people no longer use the surrounding forest mountains: the forests are reverting to their original natural forest states. In these areas, the vegetation is becoming more diversified, perhaps transforming such areas into good lands for bear habitation, with

increasingly numerous edible plants to sustain them.

Moreover, many artificaial food entice bears into the human settlement and agricultural area: unharvested persimmons, chestnuts and agricul crops, fish farms, bee faems, waisted fruits and vegetables which are unsuitable for sale.

(Toshiki Aoi)

Educational programs for the public

Educational programs for the public that deliver accurate biological information of bears is a very important adjunct to proper management programs based on scientific research data. In Japan, it is difficult to draw clear boundaries between bear habitat and developed areas for humans, because of the small spatial scale; therefore understanding and cooperation from the public toward bear management programs are vital for securing bears a future.

There are two primary targets for educational programs: local people who live in and around bear habitat, and urban people who occasionally visit bear habitat for recreational activities. Programs for school children who will become future leaders could be very effective as well. Information needed for educational programs varies depending on the targets and occasions. Regardless however, information such as the biological characteristics and status of bears, details of the bear management system, how to avoid luring bears to human settlements, and how to protect oneself from bear attacks if encountered, are needed in each area. Unfortunately it is not only urban people, but also local people who lack familiarity with mountain life and do not have adequate knowledge to co-exist with their neighbors, black bear, and are thus have an unnecessary fear of bears. In the result, they bring about needless encounters with bears.

In surveys of the general public and primary school students (Yamazaki 1993; Yamazaki unpublished data), it was noted a lack of accurate information on black bears (e.g. confusion between black bears and brown bears, over-estimation of body size, and misunderstanding of their habits). Thus most of the respondents had a negative image of bears that makes coexistence more difficult.

With this back ground, voluntary based educational programs have been carried out in some areas since the 1990s. Examples of workshops for the general public organized by NPOs: include the Meeting for Talking about Bears (13 times since 1993) and the Meeting of the Conservation Society for Japanese Black Bears in the East Chugoku Mountain Range (5 times since 1996). Although the primary target audience is traditional bear hunters, there is another unique meeting that is even open to the general public called "Matagi Summit" (17 times since 1991). The Japan Bear Network (JBN) is a non-profit organization established in 1996 that has been holding workshops and symposiums annually for both the general public and the wildlife managers of local governments in various places. In January 2005, the JBN also held an urgent symposium due to the frequent bear appearances during the fall 2004 in western Honshu.

Those symposiums were mainly lecture style programs, but recently, outreach education programs using hands-on materials have been developing. In 2000, an educational loan program was developed that focused on coexistence with black bears in the Tokyo area. Called the Bear Trunk Kit, this program contained instructor resources such as fact sheets (Yamazaki 2001). Following this, similar programs, each adapted to the situation of its area, have been developed. In 2003, the JBN held a special event with performances using hands-on materials for zoo visitors in the Tokyo area. In 1999, the Okutama Black Bear Research Group held a special classroom with a special teacher, Linda Wiggins from the Northern Slope Grizzly Bear Project, at a primary school in Tokyo for sharing scientific knowledge about bears. With the cooperation of people from urban areas, the group and local governments also held a special event to pick unattended persimmons to avoid attracting bears to human settlements in 2002 and again in 2003. There were more than 1,000 applicants at each of the 30 capacities, suggesting that potential demand was strong. Similar programs to utilize fruits left around houses were later carried out in Hyogo, Hiroshima., and Nagano Prefectures.

Governmental organizations also conducted some educational programs. In 1994, a special exhibition regarding relations between bears and humans was held at Tateyama Museum in Toyama Prefecture. Following that, two more special exhibitions about black bears in Tokyo were presented at the Takao Museum of Natural History of Tokyo in 1997, and at Tama Zoo in 1998. However, all of the special exhibitions that were carried out in museums were by public educational organizations, not by wildlife management organizations. These museums have recently been entrusted to private sector to reduce public expenditures and thus careful monitoring is needed to assure that they are properly operated.

Presently, voluntary efforts of NPOs and individuals sustain most educational programs. In 1998, the Japanese government established an NPO foundation system, and some NPO foundations related to Japanese black bear conservation were organized, including the Japanese Black Bear Research Center, Picchio, Shinshu

Black Bear Research Group, and Shikoku Natural History Research Center. However, the financial situation of each foundation is still poor, and they have not yet employed the required number of permanent staff.

Finally, volunteer-based activities have their limitations in terms of who is responsible in case of a serious incident caused by bears. NPO foundations have benefits in that they cover for shortages in both manpower and budget of governmental organizations by using the vitality of the private sector. However, we should be reminded that for educational programs on wildlife that conflict with human interests, the involvement of governmental organizations is indispensable.

(Koji Yamazaki)

Recommendations

Every year, 1,200 to 2,600 Japanese black bears are harvested by sport hunters and killed due to being a nuisance on Honshu Island (see "Status, Number captured"). Although such high pressure has existed for many years, bears continue to appear in conflict settings. Moreover, black bear distribution has been expanding for the last 10 years (refer the status section). We thus need estimates of bear density to determine whether our management is reducing bear populations, or allowing them to increase.

In fall 2004, many Japanese black bears appeared in and around human settlements, resulting in over 2,000 bears being killed and many people being injured (Japan Wildlike Research Center 2005). These incidents helped us to realize that there were no immediate response systems for such emergency conditions. As well, we do not fully understand the causes for such appearances because we lack sufficient biological data. We also noticed there were an insufficient number of black bear biologists to record and analyze those incidents.

We should be reminded that the IUCN bear status report published in 1999 (Servheen et al. 1999) has described the status of Asiatic black bears as "highly fragmented; virtually unknown in the wild; ongoing killing of bears for parts trade; no conservation efforts".

There are numerous subjects on securing the future of Japanese black bears, but here we suggest some ideas for improving the present bear management systems The goal is to maintain all bear populations with genetic diversity, including isolated populations such as the Shikoku, Chugoku, Kii and Shimokita populations that are listed as endangered by the Ministry of Environment, into the future.

Establishment of an integrated information gathering system

So far, the only information available on bear management on a national scale (Honshu and Shikoku Islands) are current distribution and the approximate population estimates. The distribution information accurately indicates the present situation, but the latter lacks reliability and its seems to be an underestimate. Because accumulation of information on the range and density of population is fundamental, data gathering systems have been established independently in some areas by local governments (i.e. prefecture scale) in recent years. However nationwide data-gathering systems using standardized methods (e.g. hair sampling for more accurate population estimation) is highly desireable. For this to take place, cooperation among national and local governments, research institutes, museums, universities and NPOs is essential. Positive measures from both the Ministry of Environment and the Forestry Agency, which is are vital.

Establishment of bear management system

Establishment of integrated management units for each local bear population, beyond boundaries of local governments, is the next subject. Such management units have been suggested in the past by the Ministry of Environment, but have yet to be adequately incorporated. For example, the Specified Wildlife Conservation and Management Plan, which was enacted in 1999, has carrying out in some are as, but in most cases the plan was put into action as a local government unit, and the local bear populations were divided by the local government boundaries. Hence, cooperative work among local governments is needed. After establishing management units, preparing monitoring systems is also extremely important. Monitoring is an essential factor to give plasticity to a management plan, but it seems that little attention is paid to this in most cases. Assuming the management unit stretches over multiple local governments, allotment and responsibility of the management plan must be clarified among local governments. Once again, the Ministry of Environment must act in the role of coordinator.

Setting of management goal

Management plan goals and details should be promulgated widely. This is important to attain understanding and cooperation from the public. Population control has been widely used as a numerical goal, but recently it has been suggested that individual management (e.g. determination of nuisance of a bear and its control) also seems to be important for Japanese black bears. Range management has not been discussed to a great extent. However, the Japanese black bear distribution seems to

be expanding in recent years, and one of the reasons could be that Satoyama, a traditional agricultural area between the mountains and town (Washitani 2001), which originally divided the major bear habitat from human activity, has lost its function as a buffer zone due to the decline of these areas (Yamazaki 2004). Therefore future Satoyama management systems should be reconsidered and new-zoning plans between bears and humans must be suggested.

Lastly, in order to realizing the above objectives, we must acquire more bear biologists via the securing of funds. As of October 2006, there were only about 10 individuals (5 teachers who specialized in Japanese black bears at universities, and about 5 at universities or research institutes whose majors are not bears but who will be able to affect student training of the next generation in south of Honshu Island) specializing in Japanese black bears.

At the same time, the number of students wanting to be field biologists has been decreasing. One reason may be a change in their study objectives (e.g., preference for laboratory work), but possibly is related to instability of an offer for a job position after graduation.

Even if the students regard an ideal highly, the continuation of will is difficult unless a living income is assured. Thus, funding for bear biologists must be secured. We will have to try to secure more human resources, and this is the most influential way to improve the current management status.

(Koji Yamazaki)

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16.3 Conservation Management Laws and Systems

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The Asiatic black bear and the brown bear are considered big game animals in Japan and thus subject to the hunting regulations of the National Wildlife Protection and Hunting Law. The brown bear and the black bear hunting seasons are from October 1 until January 31 and from November 15 until February 15, respectively. Once registered, hunters can kill as many bears as they want during the season due to no bag-limit.

Hunting regulations, including registration and permits, fall under the authority of prefectural governments. No hunting is permitted within Wildlife Protection Areas, Temporary Non-Hunting Areas, Special Protection Zones within National Parks and Quasi-National Parks, and Nature Reserves. Any form of hunting is forbidden in 16 prefectures in western Japan. In the parts of Japan where hunting is permitted, only gun hunting is permitted, and the use of traps is strictly prohibited.

When deemed necessary to prevent and/or control damage caused by problem bears, the killing of bears is permitted anywhere, including protected areas. In such cases, all means of removal, including guns, box type traps and snares, are permitted. In 23 of 32 prefectures, permits to nuisance kill of brown and black bears are handled at the prefectural level. In eight of the remaining 9 prefectures, permits for black bears are handled at the municipal government level and, remaining one; at municipal levels in the specific region of the prefecture (From the document issued by Wildlife Conservation and Management Committee of the Ministry of the Environment. As of November 2005. http://www.env.go.jp/council/13wild/y134-02b.html). Applications to remove problem bears are usually submitted by mayors, agricultural cooperatives, forestry management offices, construction companies and others. A professional hunter residing in the affected municipality carries out the actual removal. In some rare cases, there are municipal offices such as that of Sharicho (Hokkaido), in which the implementation of bear control measures are directed by a municipal official.

In Hokkaido, the use of systematic and scientific conservation management plans for brown bears targeting the Oshima peninsula has been promoted from 2000. There have been three targets of the plan, i. e., prevention of human injuries by bears, prevention of agricultural damage by bears and guarantee of the bear population sustenance (Mano 2003). It has become clear that securing financial and social foundation must be necessary for the enforcement of required measures.

As for the Japanese black bear, conflict with humans occurs in most of the areas where bears inhabit. However, only 11 prefectures have established bear conservation and management plans. Even in the 11 prefectures which do have wildlife management plans, the upper limits of hunting quotas or nuisance kills are not always enforced.

Black and brown bears in Japan have been listed as international endangered species by the Law for Conservation of Endangered Species of Wild Fauna and Flora of Japan. Products such as furs or stuffed specimens should be registered with the government to be certified as legal materials under the law. Nevertheless, bear body parts such as gallbladders or paws were excluded for registration.

Under the national Wildlife Protection and Hunting Law, in order to possess processed bear pelts and trophies, they must first be registered with the appropriate government agency. No such registration requirement exists for possession of the gall bladder or other bear parts. This has led to inconsistencies between existing national and international laws. It is vital that these inconsistencies be addressed to improve conservation and management of the Japanese bears. (Please refer also to the “bear-parts trades” in the following section.)

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16.4 Bear Gall Bladder Use and Trade in Japan

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In Japan, bear parts including gall bladders, meat, fat and fur are utilized. However, of these parts only the gall bladders are of significant economic value, with all the other parts considered to be of little value. Bear gall bladder is known as *kuma-no-i or yutan* in Japanese and is used as a medicine. It is considered to be effective for treating analgesic, stomachic, cardiotonic, antiphlogistic and other conditions, and some reports also note its effectiveness in treating hepatitis. Tauroursodeoxycholic acid (TUDCA) is an active ingredient of bear gall bladder.

Japan has substantial wild populations of two bear species -the Asiatic black bear (*Ursus thibetanus*), distributed in Honshu and Shikoku, and the brown bear (*Ursus arctos*) in Hokkaido. The living conditions of these bears differ markedly according to region, and while neither species is considered to be threatened with extinction nationally, some isolated populations are in danger of extinction (Ministry of the Environment 2002). Japan appears to be unique in being a country where bear populations are currently being maintained even while bear gall bladder is in widespread use. However, it is possible that the use of bear gall bladder in Japan is stimulating the illegal harvesting of bears and trade in bear parts, and that excessive harvesting may have negative effects on wild bear species both in Japan and elsewhere.

Between 1994 and 1998, the investigations were carried out into 13 suspicious cases of bear poaching, and in five of these cases prosecutions were brought about (Ishihara 2005). Between 1995 and 2004, a total of 647 cases of bear gall bladder importing in violation of CITES were discovered, with many of them involving pharmaceutical manufacturers. In connection with these cases, a total of 14,537 bear gall bladders were seized by Japanese Customs (Ishihara 2005). However, the actual condition is unknown.

A history of bear gall bladder use

Knowledge of the effects and methods of the use of bear gall bladder was originally brought to Japan from China, and it is thought that the practice began some time during the Asuka Period (542-646). Together with other forms of animal-derived medicines such as musk, bear gall bladder is believed to have been used secretly as a medicine by members of the aristocracy in the Nara and Heian Periods (710-1185) (Uji 1991). During the Nara Period (710-794), it is recorded that bear gall bladder was supplied from Etchu (Toyama Prefecture) as a special product under the tax system of the time (Kamata 1996). Also, according to the Engishiki, a collection of books on ceremonial regulations completed in 927, from the tenth century onwards bear gall bladder was supplied as tribute from Mino (Gifu Prefecture), Etchu (Toyama Prefecture) and Shinano (Nagano Prefecture) (Murakami 2002).

The use of bear gall bladder spread among the common people during the Edo Period (1603-1868), mainly as a result of its prescription as a patent medicine. Around the middle of the 17th century, in Morioka Han (Iwate Prefecture) and Hirosaki Han (Aomori Prefecture), the price of a bear gall bladder paid to hunters was officially set at 20% of the price of the fur. In the middle of the 19th century, by which time the price of bear gall bladder had risen considerably, the authorities in Hirosaki Han, Morioka Han, Akita Han (Akita Prefecture) and Hachinohe Han (Aomori Prefecture) were purchasing this item directly from the hunters. The purchasing price differed greatly from one han to another, with the price paid by Akita Han being particularly high. It is believed that the han authorities paid special attention to the selling of bear gall bladder or bile as a drug.

At that time, the average price of a bear gall bladder weighing 10 momme (approx. 37.5g) was 9 ryo 2 bu, an amount sufficient to purchase roughly 990kg of rice at the time, but there are records of prices rising as high as 33 ryo in 1867 (Murakami 2002).

After the middle of the Edo Period, Toyama, a home base of medicine peddlers, began to import bear gall bladder as a medicine from Osaka's Doshomachi, which was well known as a center for pharmaceutical merchants (Nishikawa 1974; Matsui personal communication to TRAFFIC East Asia-Japan, June 2006).

The Ainu, who were the indigenous people of Hokkaido, regarded bear gall bladder and fat taken from the brown bear as essential medicines. After the Ainu were brought under the control of the mainland Japanese, whenever a brown bear was harvested, officials of the Matsumae Han (Hokkaido) would impound the fur and

the gall bladder. Thus leaving only the meat for the Ainu, the fur was used for battle surcoats of military commanders, and bear gall bladder was transferred to mainland Japan. At the time, when the name of the island of Ezo was changed to Hokkaido in 1869, brown bear gall bladder was still considered a precious raw material for making medicines. It was told that Japanese and Chinese medicine makers rushed across the sea to obtain this product (Suzuki 1991).

The bear gall bladder use situation today

At present in Japan, bear gall bladders obtained from domestically harvested bears and imported bear gall bladders are used in the form of dried bear gall bladders as well as in the form of crystallized and powdered bile, and as a component of manufactured medicines.

Bear gall bladder obtained from the bodies of harvested bears is primarily used for personal consumption or sold to pharmacies or traditional Chinese medicine (TCM) dealers. The average number of bears killed annually in Japan for sport and nuisance animal control over the past five years is 2,212. In 2004, a total of 2,623 Asiatic black and brown bears were hunted, making it the highest annual number during the past 15 years (Ministry of Environment 2006). It is unknown how the gall bladder from a harvested bear is handled because the current system makes no obligation to report such details.

According to the CITES annual report compiled by the Japanese government, legal imports of bear gall bladder into Japan during the period 1993-2003 comprised only of items taken from American black bears (*Ursus americanus*) originating in Canada and from brown bears originating in Russia. The annual amount imported varied widely over this period, with the peak year being 1996, when 2,355kg were imported. In 2004, the latest year for which figures are available, Japan imported a total of 5.7kg of bear gall bladder originating from Canada or Russia (Ministry of Economy, Trade and Industry 1988-2003). These imported products were mainly used in ordinary prescription medicines.

The regulations governing the trade in bear gall bladder in Japan differ in the cases of the import/export trade and the domestic trade. Since 1992, when all species of the bear family were brought under CITES regulations, international trade in all bear derivatives including items described as bear bile on packages has become subject to regulation. International commercial trade in derivatives from the brown bear (except for the populations in Bhutan, China, Mexico and Mongolia), The American black bear and polar bear (*Ursus maritimus*), which are listed on Appendix II of CITES, is allowed with close monitoring and regulation. Apart from these species, all bears are listed on Appendix I of CITES, meaning that in principal the international trade in the species and their derivatives is prohibited. On the other hand, in domestic trade, species listed on Appendix I of CITES are regulated under the Species Preservation Law. However, in the cases of the Asiatic black bear, which is listed on Appendix I, and the brown bear, which is listed on Appendix II, the domestic trade in bear gall bladder is excluded from the regulations for the following reasons. Firstly, these species are not hunted animals in danger of being driven to extinction throughout their ranges in Japan. And secondly, identifying a particular species of bear from the shape of the gall bladder is difficult.

According to surveys carried out by TRAFFIC in 1994 and 1997, the amount of bear gall bladder traded by TCM retailers and pharmaceutical companies was declining, and the possibility of obtaining bear gall bladder on the market was also in actual decline. On the other hand, pharmaceutical companies responded to a 1998 questionnaire survey by the Japan Wildlife Research Center by stating that, "bear gall bladder is an irreplaceable drug." Moreover, 11.9% of members of the general public who were subjected to the same survey replied that they had obtained bear gall bladder as a commercially available drug. From the above results, it is anticipated that the demand for bear gall bladder as a drug will be maintained in the future, although it has been declining slightly in recent years.

Future tasks

At present, there are no regulations concerning the handling of bear gall bladder obtained from bears harvested in Japan, and information concerning the trade has not been consolidated. Even when bear gall bladder is smuggled into the country from abroad or taken from bears poached in Japan for sale, it is extremely difficult to establish its illegality. Moreover, it is impossible to accurately estimate the influence that the harvesting of and trade in bear gall bladder, including its illegal component, has on the living conditions of wild bears both in Japan and overseas. Accordingly, in order to eliminate the illegal harvesting of bears and the trade in bear gall bladder both in Japan and overseas, it is necessary to study the mechanism of bear gall bladder trade management in Japan.

Moreover, the utilization of bear gall bladder is an important aspect of the relationship between bears and people. Thus, in clarifying the actual situation surround-

ing the bear gall bladder trade in Japan and considering the management of this trade, it is important to preserve bears both in Japan and overseas, as well as to attempt to realize coexistence between bears and people.

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16.5 The People Worship Bears and Then Hunt Bears

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It is well known that the Ainu people have a ceremony called "Iomante" which is performed to send a bear's soul back to "Kamui-moshir" (heaven or the spirit world), which is believed to exist in the east. They hold the ceremony to send elemental gods a message telling of how warmly the bear was tended to by people of the earthly world ("Ainu-moshir" on earth). They offer many gifts, "inau", on the bear spirit. The process of sending the bear's soul is seen as a communication between the gods (Kamui-moshir) and people (Ainu-moshir).

These processes are commonly found in hunter-gatherer communities within regions from northern Eurasia to North America. Many studies have shown that the processes are generally divided into two types. One of them is a ceremony performed when people hunt a bear, called "Opunire" form (means "sending off" or sending a spirit home), and found widely in the regions from northern Eurasia and North America. It is also seen among the Matagi, professional hunters who use traditional methods and inhabit the Tohoku Region, the northern section of Honshu, Japan's largest island.

Another form is "Omante" form, a ceremony performed when people sacrifice a bear cub which they have captured and specifically raised for the ceremony for several years. This type of ceremony is found in several tribes such as Ul'chi, Orochi, and Orok (Uilta) in the lower basin of Amur River, Nivkh (formally called Gilyak) in Sakhalin, and the Ainu in Hokkaido Island.

When the Ainu capture a bear cub, they also hunt the mother bear and hold a sending ceremony for the hunted bear. A sending ceremony for a raised bear cub (Omante) is associated with the ceremony for the hunted bear (Opunire). The omante is recognized as a form evolved from opunire. However, the omante form is found only in a part of the region from the lower basin of Amur River to Hokkaido, which overlaps with a fur trading zone during the Qing Dynasty of China. Valuing bears as a sparse resource, the omante form is considered to have been influenced by and fused with the culture of fur trade and livestock farming, which then it spread throughout the region. The form originated in the Okhotsk culture developed in the eastern part of Hokkaido from the sixth to the seventh centuries. By the eighteenth century, it grew into the large-scale ceremony as we know today (Hallowell 1926; Васильев 1948; Obayashi 1991).

These procedures of sending wildlife spirits back are important for hunting as well as hunting skills since people on the islands of Japan believe that the land of spirits (elemental gods) place equal value on wildlife and humans. This illustrates the belief that humans are animals and animals are humans, based on "La Pensee Sauvage (Wild Thought)" which underlies the values of the people in this region.

The Matagis, traditional hunters, perform the "Opunire" form ceremony after they hunt a bear although not all members of the community participate in it. The "Kebokai" ceremonies are still practiced in the Ani area of Akita Prefecture. Kebokai is a process in which the hunters send "Yama-no-kami"(the mountain deities), who influence the mountains and forest, a message in order to report their harvesting of a bear, a valuable resource, and ask for leave to utilize it. This process is conducted by a "Shikari". Matsuji Suzuki (1920-2005), who was a "Shikari" in the Utto village in the Ani area, carried out the ceremony in the following manner. After the Matagis hunt a bear, they take it to their village, after which they select a host among hunting members of the day. When disassembling the bear in the yard of the host, they first place the bear with its head pointed northward and then skin it. Next, the process of "Kebokai" begins. They hold the head part of the skin pointed southward (the tail is pointed the opposite direction) and the "Shikari" says a prayer. In this prayer, they pledge to continue hunting in the proper way following the law of the forest and ask for the lasting harvest of bears to the mountain deities. After the "Kebokai," all members of the village, without distinction of age or sex, are allowed to have the flesh of the hunted bear (Taguchi 1994).

Like the Ainu, the Matagis collectively and individually have the spirit common to people in the northern regions; however, they heavily depend on agriculture such as paddy or slash and burn agriculture. There are many semi-agricultural and semi-hunting (making a living in primary agriculture and other multiple works such as hunting, fishing, logging, making charcoal, or woodworking) groups and individuals in the mountain-ringed region of eastern Japan. Their hunting has served as a deterrent to crop-damaging wildlife. They have generally engaged in agriculture but have occasionally

hunted wildlife for subsistence and monetary resources. Relationships between people and wildlife in the Japanese archipelago are closely linked to the reclamation and cultivation process of lands in the region.

After the Meiji period, the Japanese have had the tendency to hold their historical perspective as one based on rice cropping and also to treat the lifestyle of the peoples in the mountain-ringed area as special cases. However, recent studies have shown that it was taboo in Japan to eat the meat of livestock used for agricultural works, but not the meat of wildlife. The Ainu and the Matagi can be called "people who worship bears and then hunt bears" (Taguchi 2006). It is necessary for us to study them in more detail by considering the processes of their social and historical development on the islands of Japan as well as to learn the way of sustainable use of natural resources from them. This will provide us with many indications for dealing with wildlife management issues of the decreasing population, abandonment of villages, and declining pressure of human use on the surrounding nature.

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