CURRENT STATUS AND CONSERVATION NEEDS OF BROWN BEARS IN THE POLISH CARPATHIANS

ROMAN GULA, Department of Wildlife Research, Jagiellonian University, Ingardena 6, 30-060 Kraków, Poland, email: gula@eko.uj.edu.pl
WITOLD FRACKOWIAK, Department of Wildlife Research, Jagiellonian University, Ingardena 6, 30-060, Kraków, Poland, email: fraco@eko.uj.edu.pl
KAJETAN PERZANOWSKI, Department of Wildlife Research, Jagiellonian University, Ingardena 6, 30-060 Kraków, Poland email: perz@eko.uj.edu.pl

Abstract: The present status and main threats to the future viability of brown bears (*Ursus arctos*) in Poland were evaluated. The remaining 80–90 individuals are found only in the Carpathian Mountains and feed on a variety natural foods, but occasionally kill livestock and cause damage to beehives. Several factors including poaching, local development, logging patterns, and increasing tourism may contribute considerably to the reduced viability of the population. Successful bear conservation will require collection of basic ecological data, wider public education, and especially changes in logging patterns and long-term local development plans. The coordination of bear research and joint management of the Carpathian population in the region is urgent.

Ursus 10:81–86

Key words: brown bears, conservation, management, Poland, *Ursus arctos.*

Poland has a small brown bear population, whose distribution is limited to the Polish Carpathian Mountains. Although bears are legally protected there, their small numbers ($n < 100$) and the intensity of development make their future uncertain. In this paper we summarize the knowledge of brown bears in Poland based on field research we did between 1989–1994 and on data routinely collected by Forestry Department and National Park staff.

Funding for the field surveys was provided by the Department of Wildlife Research, Jagiellonian University. We thank the many foresters and students who were helpful during fieldwork. For revision of the manuscript we thank to B. Peyton and 2 anonymous reviewers.

METHODS

Estimating Population Size

Every year employees of forest districts and the national parks administration count brown bears, including females with cubs, in the entire Carpathian range. These estimates based on field observations are closer to intuitive interpretations than the analysis of field data. We conducted a quantitative tracking survey of the minimum size of the brown bear population in a 737-km^2 part of the Carpathian range in the Bieszczady Mountains (Gula 1992, Gula and Frackowiak 1995). Tracking was done in November 1990 and March 1990 and 1991, a time when tracks were most visible in the snow and bears were looking for food and suitable den sites. We looked for bear tracks on forest paths and around baits placed by hunters to attract wolves (*Canis lupus*) and wild boars (*Sus scrofa*). We recorded the place, time, and width of a forefoot print when possible. When track size, or location, and track age were mutually exclusive, tracks were attributed to different bears. Minimum population estimates were obtained by counting tracks that were mutually exclusive in 5 forest management districts, (e.g., Balingród, Stuposiany, Lutowiska, Wetlina, and Cisna). The time spent tracking within districts was either 1 week or 1 month. When 1 week of tracking was completed, the number of mutually exclusive sets of tracks observed in a district was multiplied by an index calculated from districts where 1 month of tracking was done. The index was calculated by dividing the number of sets of individual bear tracks observed during 1 month by the number of bears tracked during the first week. Estimates were then interpolated to account for the larger area occupied by bears in the Bieszczady Mountains (1,340 km^2 or 60% of the Bieszczady Mountains; Gula and Frackowiak 1996).

Habitat Selection and Diet

The food habits and habitat selection of brown bears were studied in the Bieszczady Mountains between 1992 and 1994 using nontelemetry methods. Evidence of bear presence (e.g., tracks and feeding activities) were recorded and feces were collected along 34 transects (245 km total length) established in a 375-km^2 study area in the Stuposiany and Lutowiska forest districts. Feces were also collected during field tracking periods when snow or mud was present. The percent volume of each different food item found in scats was visually estimated (*sensu* Clevenger et al. 1992). Mean percent volume of each item was calculated for spring, (1 Mar–31 May), summer (1 Jun–31 Aug), and fall (1 Sep–30 Nov).

Habitat availability for the following 5 variables were estimated by a nonmapping technique (sensu Clevenger et al. 1992): forest cover type, elevation, and distance to the nearest road, village, and place with bait for game animals. The relationships between use and availability of habitat features defined by these variables were tested using chi-square tests (Clevenger et al. 1992). The null hypothesis of these tests was that bears were not using habitats in proportion to their availability.

RESULTS

Population Size

In 1994 the bear population in the Polish part of the Carpathians was estimated by the Forestry Department and National Parks to be 80–90 individuals. According to our tracking surveys in Bieszczady in 1990–91, the population in that part of the Carpathians was estimated to be 68 bears (Gula 1992, Gula and Frackowiak 1995). Preliminary analysis of both sets of data indicate that both the minimum number of females with young and the average litter size are slowly decreasing (Gula and Frackowiak 1996, Frackowiak et al. In Press).

Distribution

The range of brown bears in Poland is limited to 7,400 km^2 in the Polish Carpathians (Fig. 1). Although brown bears are found along the Carpathian Range, there are 5 areas where they are most common.

The Bieszczady Region, the eastern part of the Polish Carpathians, is the mainstay of Polish bear population. Here females with cubs are observed regularly (Fig. 1). This area of approximately 2,000 km^2, with elevations up to 1350 m, is inhabited by about 50 bears (For. Dep. data, Krosno). The majority of the area is covered by a natural beech–fir (*Fagus silvatica–Abies alba*) forest, and former farmlands are forested mostly with spruce (*Picea excelsia*). Subalpine pastures characterize the higher elevations above timberline (1100 m). The region is relatively sparsely populated with humans (approx. 10 inhabitants\$km^2$), compared to the rest of the country (120 inhabitants\$km^2$). The Bieszczady Mountains region is also a popular tourist area, particularly Bieszczady National Park.

Beskid Niski, the lowest range in the Polish Carpathians (highest peaks are slightly over 900 m), is covered with mixed mountain beech–fir forest. The region is mostly undeveloped and has a low density of humans. The local economy is based on logging, small-scale agriculture, and relatively few tourists compared to the Bieszczady mountains region. In 1995, a new national park (Magurski Natl. Park) was established on 20,000 ha. This range contains a small, mostly resident population of bears (For. Dep. data, Krosno and Nowy Sacz).

The third area is the 3 neighboring mountain ranges to the west of Beskid Niski: Beskid Sadecki, Gorce Mountains, and Pieniny Mountains. The highest peaks there are >1300 m. Carpathian beech forest dominate in Beskid Sadecki and spruce stands dominate in Gorce. The density of the human population is higher than in Bieszczady and Beskid Niski. Bear density is slightly higher than in Beskid Niski, but much lower compared to Bieszczady and the Tatras (For. Dep. data, Nowy Sacz).

The Tatras Mountains, the fourth area, has an extensive alpine zone and is the highest part of the Carpathians, with peaks >2500 m. In the forest, spruce stands prevail that were artificially introduced at the end of 19th century. Most of the Tatras is protected by Polish and Slovakian national parks, but human disturbance is excessive due to extremely high numbers of tourists. Every year, 1 to 2 females with cubs have been observed on the Polish side of the range (Natl. Park data).

The fifth area of bear habitat is in subalpine and dwarf-pine zones of the Beskid Zywiecki and Wysoki. Here the highest peak exceeds 1700 m. Forests vary from artificially planted spruce stands to small patches of natural mountain beech–fir forest. The density of bears is close to the average for the Polish Carpathians, and females with cubs were observed every year along the Polish–Slovak border (For. Dep. data, Nowy Sacz).

Diet and Habitat Use

The bears' diet in the Bieszczady Mountains consisted mostly of beechnuts (17% of scat volume), grasses (14%), herbs (9%), and deer (*Cervus elaphus*; 16%) in spring; blueberries (40%), grasses (8%), and insects (18%) in summer; and pears (20%), apples (19%), and beechnuts (9%) in autumn. During January and February active bears eat baits left by hunters to attract wild boars and wolves. Baits are usually carrion or offal, but they may contain corn and beets as well. Bait is also important in early spring and late fall (scat volume = 30% in March and 13% in November, respectively; Fig. 2). Just after leaving dens, bears in the upper elevations covered by mature forests move to areas close to bait stations used by hunters. In early summer bears feed in meadows at the higher elevations above the forest zone. In July many bears move to blueberry patches far from roads and villages. In September and October the main foraging sites are abandoned orchards in valleys. Bears in these areas, especially when near villages, cause the most agricultural damage in early

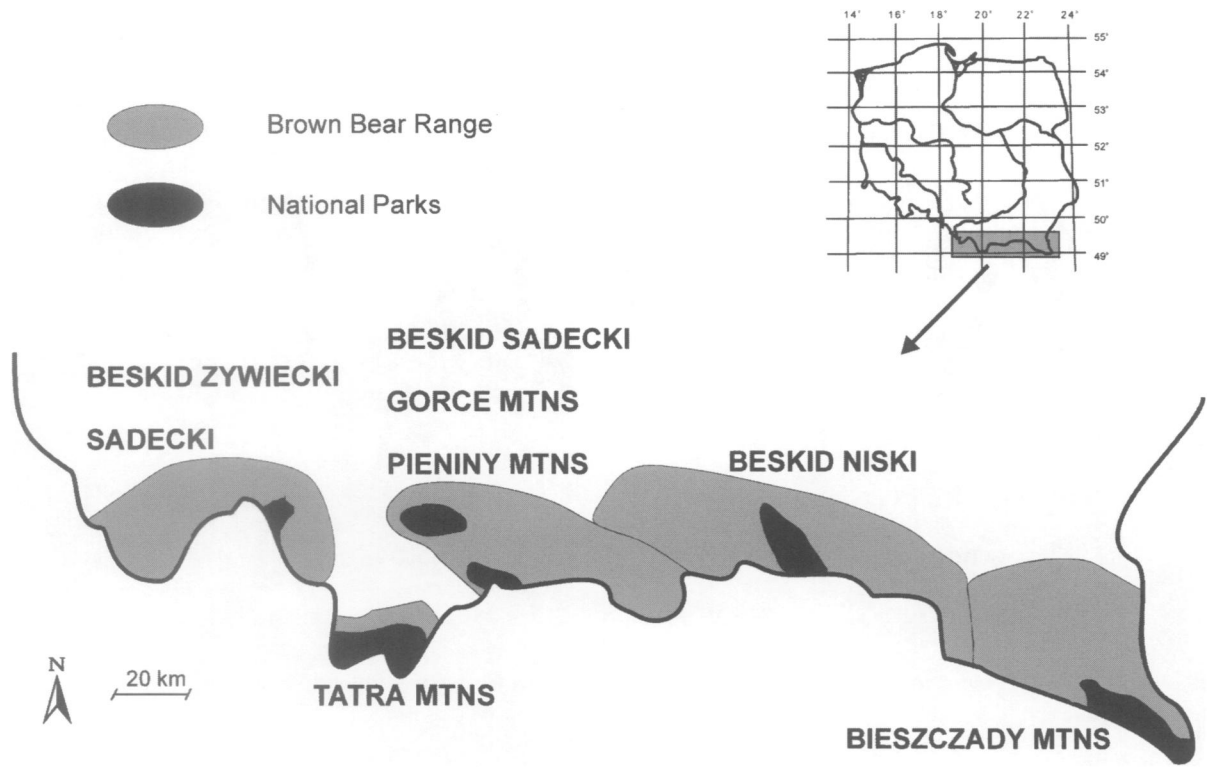

Fig. 1. The distribution of brown bears in Poland in 1994, including the presence of females with young observed between 1990–94, based on official data of the State Forest Administration and National Parks (after Frackowiak et al. In Press).

autumn. In late autumn bears tend to migrate toward baiting places in higher elevations and mature beech forests (Fig. 3). Spruce thickets are commonly used for bedding, especially in spring and autumn (Frackowiak and Gula 1996).

Legal Status and Management

Brown bears became legally protected in Poland in 1952 (Dziennik Ustaw 1952). The species is categorized as rare with a high chance of extinction in the *Polish Red Data Book of Animals* (Glowaciñski 1992). The Department of Forestry, a part of the Ministry of Environment Protection, Forestry and Natural Resources (MEPFNR), is responsible for the management of protected species and may issue licenses to kill nuisance bears. Since World War II, 4 such individuals were shot (For. Dep. data). A nuisance female with 3 cubs was trapped in 1990 and moved from Tatra National Park to the Wroclaw Zoo. She subsequently died, probably due to improper handling procedures.

The MEPFNR is legally responsible for all damages done by bears to human property (e.g., livestock, crops, beehives, etc.). Damages are estimated by a committee consisting of representatives of the local administration and Department of Forestry. Bear-related damages and annual fluctuations by category for the last 5 years are listed in Table 1. These damages have an annual estimated value of US $6,400 (Bobek et al. 1993). Damage compensation is the only management practice for bears in Poland.

Factors Threatening Bear Populations and Their Habitat

Poaching.—After Word War II, at least 10 cases of bear poaching were documented in Poland (Podobinski 1962, Parusel 1985, Jakubiec and Buchalczyk 1987, Jakubiec 1990, Kiersnowski 1990, Frackowiak et al. In Press.). Recently wildlife poaching has become more frequent, especially poaching deer for meat. Neck snares, the most common poaching device, are quite dangerous for bears. The most recent case of bear poaching was documented in November 1994 in Bieszczady. A male, about 6 years old, was captured in a neck snare probably set for deer (For. Dep. Staff, pers. commun., 1994). In a

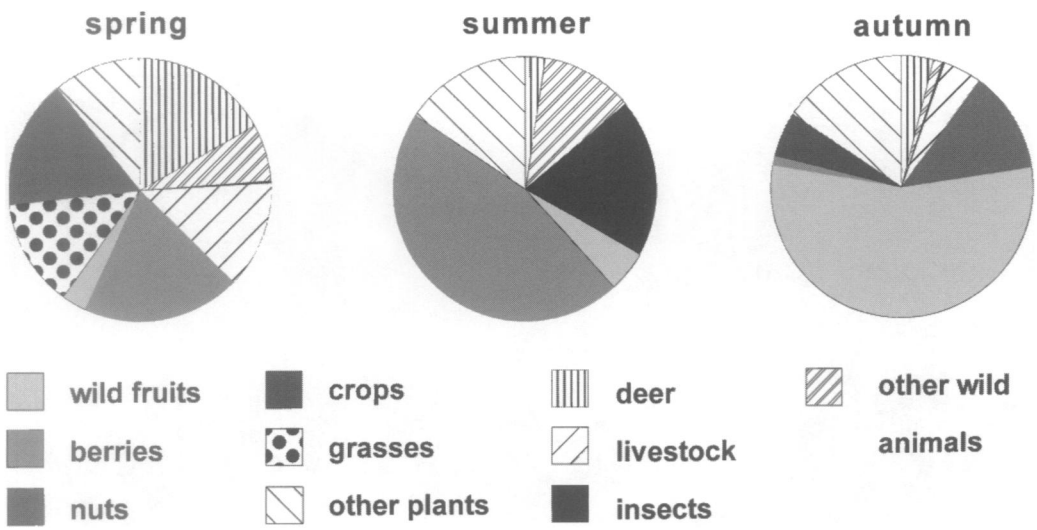

Fig. 2. Food habits of brown bears, by % scat volume, in the Bieszczady Mountains, Poland 1992–94.

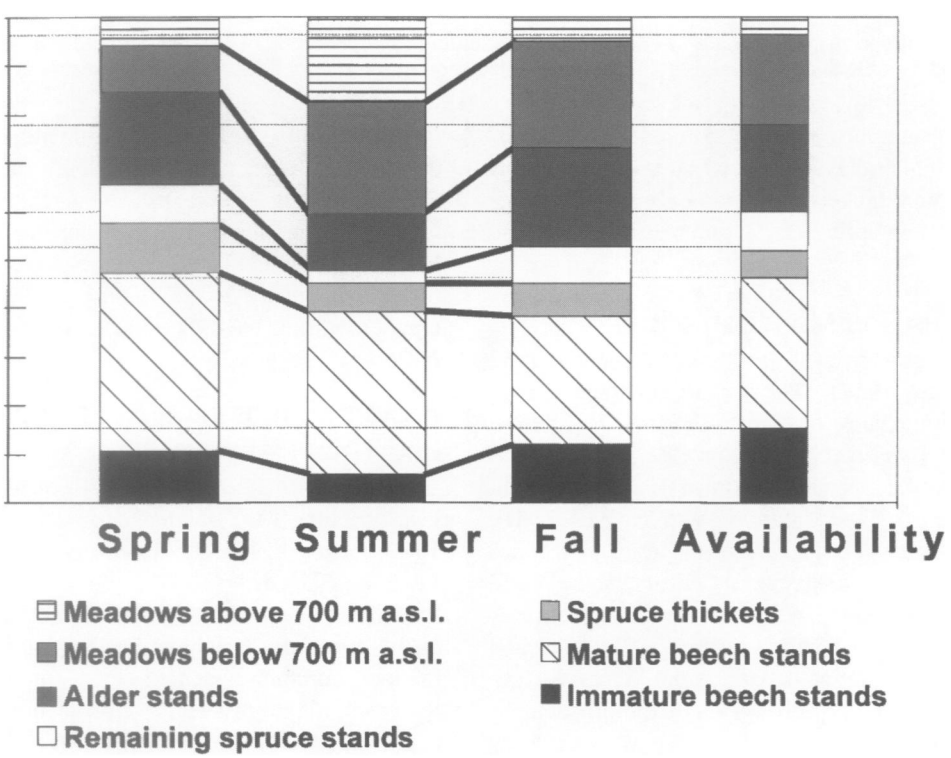

Fig. 3. Seasonal changes in brown bear habitat use versus availability in the Bieszczady Mountains, Poland 1992–94.

Table 1. The numbers of beehives destroyed and livestock killed by brown bears in Poland, 1987–91 (after Frackowiak et al., In Press).

Category	1987	1988	1989	1990	1991	Total
Beehives	49	42	98	140	56	385
Sheep	41	101	115	32	77	366
Cattle	27	15	21	16	4	80
Pigs	2	0	3	0	0	5
Goats	2	1	0	1	5	9
Horses	2	0	0	1	0	2

few cases, illegal bear hunting was organized for various officials before 1989 (For. Dep. Staff, Lutowiska, pers.commun., 1991–1994).

Local Development.—Rapid growth of local economies may significantly change areas of small-scale farming. Bieszczady and Beskid Niski, which are undeveloped, may be threatened in this way. Along these ranges, vast areas are being auctioned that formerly belonged to bankrupted state farms. The land will probably be split among many owners, which would increase habitat fragmentation. Habitat needs of large predators are not taken into consideration by local development plans. Therefore, the future of these areas and their ability to support bears is uncertain.

Tourism.—Large parts of the Carpathians are popular recreation areas for most of the year. Rapid development associated with the tourist business brings increasing numbers of visitors with related disturbance and infrastructure, including hotels, mountain shelters, and skiing stations. Area surrounding national parks are particularly threatened (Fig. 1).

Logging.—Logging is intensive in the Carpathians and only partially limited in national parks. Clear cutting is not permitted in the entire area. However the selective logging that takes place directly contributes to altered structure of tree stands, lowered age of the forest, and decreased biodiversity. New forest roads increase human access to remote forest areas, and logging activities contribute to disturbance.

MANAGEMENT IMPLICATIONS

Biological Data on Bears

Knowledge of brown bear status is limited to data on distribution, preliminary estimates of population size, bear diet, and habitat preferences. More specific data and actions are needed to conserve bear populations in Poland: (1) monitor populations by more efficient methods; (2) evaluate available habitat within brown bear range; (3) determine potential corridors between the main bear refuges; and (4) assess habitat requirements and preferences based on radiomarked bears.

Public Education

Education should be directed toward the special interest groups, including hunters, foresters, tourists, farmers, and the general public. Hunters and foresters can help monitor bear populations because they have higher chances of encountering bears in the wild relative to the rest of the human population. With proper instruction, they could collect valuable data. Hunter education is urgent because of unofficial reports of bears being mistaken for wild boars. Tourists should be taught how to behave in bear country to avoid unnecessary disturbance of animals and to minimize the risk of a bear attack. Farmers should be given information about their legal rights to claim damages, and they should be taught appropriate measures to protect crops and livestock from bears. Through school education and the media, the general public should be informed about the status of the species, potential threats and possibilities for bear protection, and necessary measures for the future survival of bears in Poland.

Data on biological and habitat needs could be used to develop guidelines for local land developers and industry. These guidelines should be based on models of population trends, habitat changes, and habitat and food requirements of brown bears. The first sites to test such guidelines should be in national parks and biosphere reserves, with further extension considered for landscape parks, State Forest Districts, and hunting districts.

Bears found in Poland belong to the much larger Carpathian population. The existence of the species in Poland depends directly on conservation of bears in Slovakia, Ukraine, and Romania. Currently, research and management among countries along the Carpathians is not coordinated. Population viability of brown bears in the Carpathians cannot be assured while one state intensively hunts the species and the bordering state considers it a rare species worthy of full protection. Therefore, it is absolutely essential to establish a routine international monitoring program followed by consistent management measures. Due to the umbrella status of the brown bear, a successful program to ensure the survival of this rare species would provide appropriate conservation measures for the whole ecosystem.

LITERATURE CITED

BOBEK, B., K. PERZANOWSKI, Z. KWIATKOWSKI, A. LESNIAK, AND

B. SEREMET. 1993. Economic aspects of brown bear and wolf predation in southeastern Poland. Pages 373–375 *in* J.A. Bissonette and P.R. Krausman, eds. Integrating people and wildlife for a sustainable nature. Proc. First Intl. Wildl. Manage. Congr. The Wildlife Society, Bethesda, Md.

CLEVENGER, A.P., F.J. PURROY, AND M.R. PELTON. 1992. Brown bear (*Ursus arctos* L.) habitat use in the Cantabrian mountains, Spain. Mammalia 56:203–214.

FRACKOWIAK, W., AND R. GULA. 1996. The preliminary surveys of pre- and post-hibernation denning habits of brown bears in the Bieszczady Mountains. J.Wildl. Res. 1(2):190–192.

———, ———, AND K. PERZANOWSKI. In Press. Bear specialist group conservation action plan, Poland. *In* S. Herrero, C. Servheen, and B. Peyton eds. Bear Conservation Action Plan. Int. Union Conserv. Nat. Nat. Resour., Gland, Switzerland.

GLOWACIŃSKI, Z., EDITOR. 1992. Polskie Wydawnictwa Rolnicze I Lesne, Warszawa. 351pp. (In Polish.)

GULA, R. 1992. The density and age structure of the population of brown bear *Ursus arctos* in the Bieszczady Mountains, Poland. Int. Conf. Bear Res. and Manage. 9(1):119–127.

———, AND W. FRACKOWIAK. 1995. Size and age structure of the brown bear (*Ursus arctos*) population in the Bieszczady Mountains. J. Wildl. Res. 1:65–69.

———, AND ———. 1996. Status and management of brown bears in Poland. J. Wildl. Res. 2:221

JAKUBIEC, Z. 1990. Distribution of the brown bear in Poland and problems concerning its protection. Aquilo Ser. Zool. 27:51–57.

———, AND T. BUCHALCZYK. 1987. The brown bear in Poland: its history and present numbers. Acta Theriol. 32(17):289–306.

KIERSNOWSKI, R. 1990. Niedzwiedzie I ludzie w dawnych I nowszych czasach. Polski Instytut Wydawniczy. 471pp. (In Polish.)

PARUSEL, J.B. 1985. The occurrence of brown bear *Ursus arctos* L., in Babia Gora, Jalowiec and Polica ranges (High Beskid Mts.). Acta Zool. Cracov. 29:53–68.

PODOBINSKI, L. 1962. Zwierzeta TPN w 1961 I wiosna 1962. Wierchy 31:250–260. (In Polish.)