

# STATUS AND MANAGEMENT OF THE BROWN BEAR IN EUROPE

ANDREAS ZEDROSSER, World Wide Fund for Nature-Austria, Ottakringer Strasse 114-16, A-1162 Wien, Postfach 1, Austria  
BJØRN DAHLE, Department of Zoology, Norwegian University of Science and Technology, N-7491 Trondheim, Norway  
JON E. SWENSON, Department of Biology and Nature Conservation, Agricultural University of Norway, Postbox 5014, N-1432 Ås, Norway, and Norwegian Institute for Nature Research, Turgasletta 2, N-7485 Trondheim, Norway, email: jon.swenson@ibn.nlh.no  
NORBERT GERSTL, WWF-Austria, Ottakringer Strasse 114-16, A-1162 Wien, Postfach 1, Austria

**Abstract:** The total number of brown bears (*Ursus arctos*) in Europe is presently about 50,000 (about 14,000 outside Russia), within an area of more than 2.5 million km<sup>2</sup> (800,000 km<sup>2</sup> outside Russia). About 37,500 bears are found in the northeastern European population; 8,100 in the Carpathian Mountains; 2,800 in the Alps–Dinaric–Pindos; 1,000 in Scandinavia; 520 in the Rila–Rhodope Mountains; 200 in the Stara Planina Mountains; 50–65 in the western Cantabrian Mountains; 40–80 in Apennine Mountains; 20 in the eastern Cantabrian Mountains; 6 in the Western Pyrenees; 5 in the Central Pyrenees; and 4 in the southern Alps. The brown bear is either a protected or game species in all of the countries discussed in this paper. Most countries manage the brown bear at the national level, although several ministries are often involved. All European countries with bears within their national borders (except Bosnia and Herzegovina and the Yugoslav Federation) have signed the Bern Convention; almost half have prepared, or are preparing, a management plan for brown bears. In addition, most countries engage in monitoring, research, information dissemination, and conservation activities. In areas where bear range includes human settlements, damage to livestock, orchards, and beehives occurs but, in most countries, stakeholders are compensated for damage, either by the state, regional government, or hunter clubs. In 1995–96 about 1.15 million US\$ was paid to compensate such damage throughout Europe.

*Ursus* 12:9–20

**Key words:** brown bear, Europe, population and management status, *Ursus arctos*

Brown bears originally occurred throughout Europe, except on large islands such as Iceland, Gotland, Corsica, and Sardinia; their former occurrence on Ireland is still debated (Kurtén 1976, Corbets and Harris 1991). Later the species disappeared from most areas as the human population grew and suitable habitat was destroyed by deforestation and agriculture. In addition, the extermination of bears was often encouraged as a means of eliminating livestock depredation, with bounties paid by the state, local authorities, or both, for killing bears. This was effective because bears have a low reproductive rate and are sensitive to high harvest rates. Eventually, the combination of human persecution and habitat destruction led to the extermination of bears from most of western Europe and many areas in eastern and northern Europe (Swenson et al. 1995, Rauer and Gutleb 1997, Breitenmoser 1998).

In this paper we summarize population status, distribution, and management status of the European brown bear populations covered in the *Action plan for the conservation of the brown bear in Europe* (Swenson et al. 2000). This action plan is complementary to, and a refinement of, the International Union for the Conservation of Nature and Natural Resources (IUCN) *Bears: Status survey and conservation action plan* (Servheen et al. 1999). The separate European action plan was prepared for several reasons.

1. Much of the data from Europe in the world-wide plan was collected in the early 1990s and was outdated when published in 1999.
2. Political conditions in large parts of Europe have changed rapidly over the last decade; the war in the former Yugoslavia ended and new countries were established with new legal conditions for bear

management and conservation; the European Union (EU) expanded its territory and as more countries joined (Austria and Sweden in 1995) and others applied for membership, large carnivore management and conservation changed.

3. Three re-introductions or augmentations of bear populations (in Austria, France, and Italy) have taken place in western Europe from 1989 to 2000.

The 2 action plans also adopted different approaches. Servheen et al. (1999) analyzed the needs and threats of each country's bear population separately. Swenson et al. (2000) used a population basis, stressing the need for a continental approach and co-ordinated national efforts. This pan-European approach was chosen because most European brown bear populations are shared by neighbouring countries. The European action plan was endorsed by the IUCN–Bear Specialist Group, the International Association for Bear Research and Management (IBA), and the Council of Europe. It was also published by the Council of Europe as an official document within the legal framework of the Bern Convention.

## METHODS

We used the following definitions:

Europe includes the countries west of the borders of the former Soviet Union and Turkey, but also includes the Baltic countries and Ukraine. This definition is consistent with that of the Large Carnivore Initiative of Europe (Swenson et al. 2000). In an effort to present complete population sizes, we include the bear populations in the former Soviet Union that are contiguous with the populations we consider in this paper.

A population consists of the bears in an area that are

genetically isolated, totally or substantially, from other bear populations. A population may consist of several sub-populations. A sub-population consists of bears in an area that have male-mediated genetic interchange with bears in nearby areas, but little or no contact or interchange among females.

All data were obtained by a standard questionnaire mailed out to bear researchers and governmental agencies dealing with bear management in each country with bear occurrence. We tried to obtain more than one answer per country. All respondents to our questionnaire are listed in Table 1; all the information in this paper, if not indicated otherwise, is based on their responses. We obtained data from all European countries with bear populations (Table 2).

We stress that population numbers are all estimates derived by different methods and are not directly comparable. Bears are notoriously difficult to census (Kendall et al. 1992, Miller et al. 1997), and many estimates, especially those based on observations from the public, are likely overestimates (Swenson et al. 1995). Estimates in south-eastern Europe are often derived from counts made by hunters at feeding sites that are carried out during 1 or

2 nights per year. These estimates are based on the untested assumptions that 80–90% of the bear population visits feeding sites during this period and that no bear visits more than one site (D. Huber, University of Zagreb, Zagreb, Croatia, personal communication, 1998). Even the estimates from Scandinavia, which are based on marked to unmarked ratios of bears observed in 2 areas, are based on an extrapolation to the rest of the brown bear range (Swenson et al. 1994). Given these uncertainties, estimates reported here must be regarded as approximate, but the ranking of the populations by size is relatively accurate.

## RESULTS

### Size and Distribution of Populations

*Northeastern Europe (37,500 bears).*—The Northeastern European population is estimated at about 37,500 bears, and is thereby the largest continuous brown bear population in Europe. The population is found between 53°N in the south to 69°N in the north and stretches from the Ural Mountains in the east to the west coast of Fin-

**Table 1. Researchers and managers contributing data for the compilation of the European Brown Bear Action Plan, 1997–99.**

Country	European Union member	Corresponding person	Affiliation
Albania	No	S. Pllaha	State Forest Service
Austria	Yes	N. Gerstl G. Rauer	World Wide Fund for Nature-Austria
Bosnia and Herzegovina	No	D. Huber	University of Zagreb
Bulgaria	No	K. Georgiev	Wilderness Fund
Croatia	No	D. Huber	University of Zagreb
Czech Republic	No	P. Koubek	University of Brno
Estonia	No	J. Randveer	Estonian Agricultural University
Finland	Yes	I. Kojola P. Tunkkari	Finnish Game and Fisheries Research Institute University of Oulu
France	Yes	A. Clevenger P.Y. Quenette O. Robinet	Banff National Park Diren Life Ministry of Environment
Greece	Yes	Y. Mertzanis	Arcturos
Italy	Yes	G. Boscagli E. Dupre M. Possilico	Parco Regionale Sirente Velino National Wildlife Institute Ufficio Amministrazione Foreste Demaniali
Latvia	No	V. Pilats	Latvian Mammalogical Society
Norway	No	J. Braa O.J. Sørensen	Directorate for Nature Management North Trøndelag College
Poland	No	H. Okarma	Polish Academy of Sciences
Romania	No	O. Ionescu I. Micu	Game Economy Department, National Administration of the Forest
Slovakia	No	M. Kassa	Slovak Environment Agency
Slovenia	No	M. Adamic	University of Ljubljana
Spain	Yes	J.C. Blanco A. Clevenger E. Valero	Asesores Técnicos de Medio Ambiente Banff National Park University of Leon
Sweden	Yes	A. Bjärvall F. Sandegren	Swedish Environmental Protection Agency Swedish Hunters Association
Ukraine	No	V. Domashlinets	Ministry of Environmental Protection
Yugoslav Federation	No	M. Paunovic	Natural History Museum Belgrade

**Table 2. Present status (1997–98), distribution, and expected population trend of European brown bear populations (including contiguous populations outside these countries). The populations are listed from the largest to the smallest.**

Population	Number of bears	Country	Number of bears	Distribution area (km <sup>2</sup> )	Present status
North-Eastern Europe	37,500	European Russia	36,000	1,700,000	Increasing?
		Finland	800–900	300,000	Stable
		Estonia	440–600	15,000	Stable
		Belarus	250 (120?) <sup>a</sup>	60,000	?
		Norway	8–21	5,000	Stable
		Latvia	20–40	10–5,000	Stable?
Carpathian Mountains	8,100	Romania	6,600	38,500	Decreasing
		Ukraine	400(970?) <sup>a</sup>	11,400	Decreasing
		Slovakia	700	3,000	Increasing
		Poland	100	4,000	Stable
		Czech Republic	2–3	2,000	?
Alps–Dinaric–Pindos	2,800	Bosnia-Herzegovina	1,200	10,000	Decreasing?
		Yugoslav Federation	430	2,000	Decreasing?
		Croatia	400	9,800	Stable
		Slovenia	300–500	3,000	Stable
		Greece	95–110	6,200	Decreasing
		Macedonia	90	820	Stable
		Albania	250	3,000	Stable
		Austria	23–28	8,000	Increasing
		Italy	?	?	Increasing
		Scandinavia	1,000	Sweden	1,000
Norway	18–34			60,000	Increasing
Rila–Rhodope Mountains	520	Bulgaria	500	10,000	Decreasing
		Greece	15–20	2,400	Decreasing
Stara Planina Mountains	200	Bulgaria	200	?	Decreasing
Western Cantabrian Mountains	50–65	Spain	50–65	2,600	Decreasing
Appenine Mountains	40–80	Italy	40–80	5,000	?
Eastern Cantabrian Mountains	20	Spain	20	2,500	Decreasing
Western Pyrenees	6	France	3–4	500	Decreasing
		Spain	1–2	500	Decreasing
Central Pyrenees	5	France	5	?	?
Southern Alps	4	Italy	4	1,500	?
Europe total	~ 50,000			~ 2,500,000	

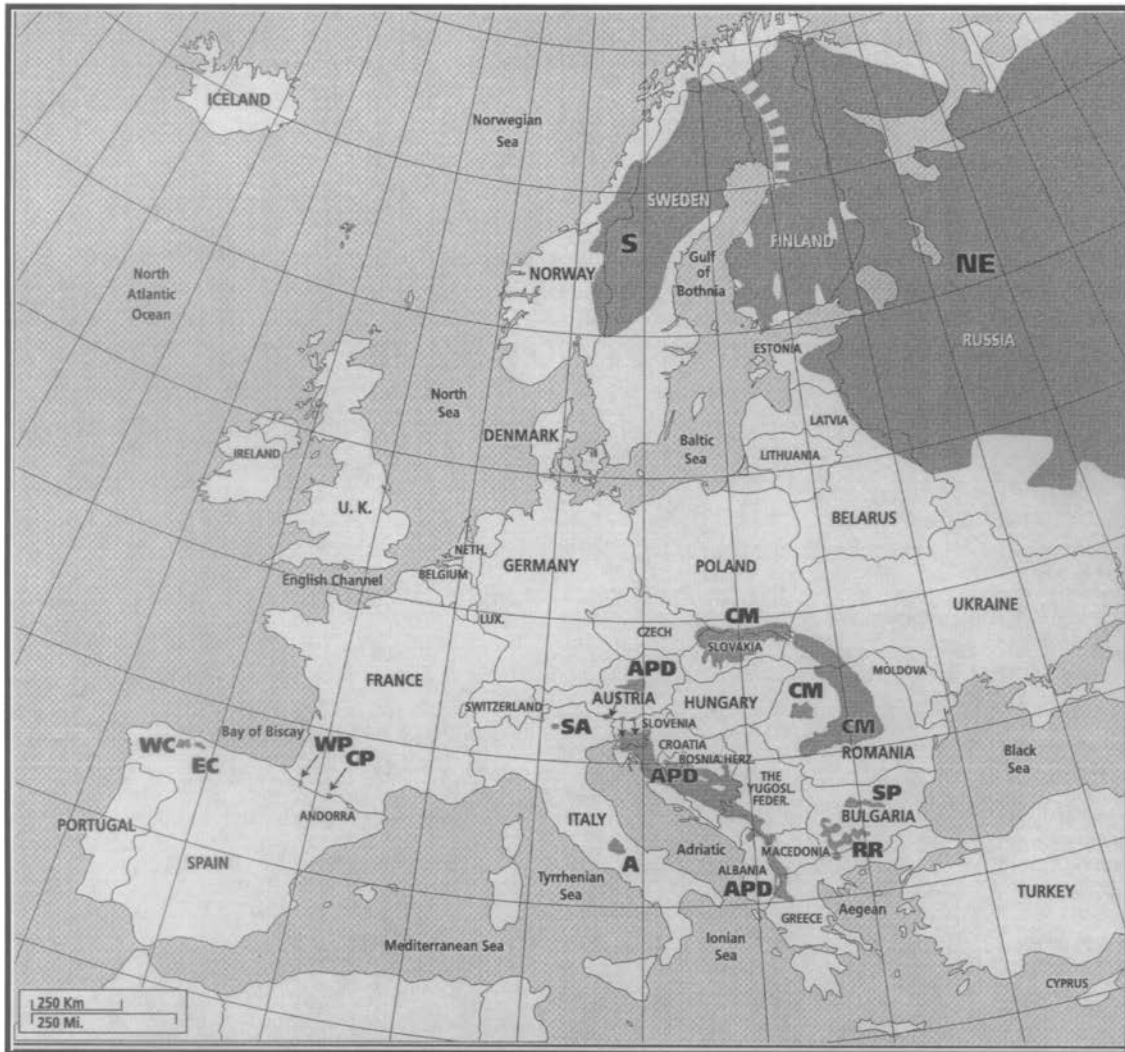
<sup>a</sup> Alternative, less accurate population estimates.

land (Fig. 1). As it is contiguous with bears on the east side of the mountains in Russia, it is part of the largest brown bear population in the world. Although the fence along the Finland–Russia border is a potential barrier, the Finnish–Norwegian population has received a net influx of dispersing bears from Russia (Pullainen 1990). In Finland, the species has re-established most of its former range after the population bottleneck at the beginning of the 20<sup>th</sup> century (Nyholm and Nyholm 1999). In Norway, 8–21 bears are restricted to Sør-Varanger Municipality (especially the Pasvik Valley), though there are occasional sightings in the eastern part of the Finnmark Plateau (Swenson and Wikan 1996).

*Carpathian Mountains* (8,100 bears).— The Carpathian population includes the brown bears in Slovakia, Poland, Ukraine, and Romania (Fig. 1). The Carpathian Mountains population is estimated to be about 8,100 bears and is the second largest in Europe. The population increased

rapidly in the second part of this century (Frackowiak et al. 1999, Hell and Findo 1999, Ionescu 1999), and recently the Slovakian and Polish bear population was re-connected with its Ukrainian counterpart. This range expansion occurred rapidly; about 200 km in less than 20 years. Knowledge of the status of females in this expansion area would be of great interest because, based on data from the Scandinavian population (Swenson et al. 1998), one would expect to find few females in this newly colonized area. Female brown bears in the Apusen Mountains of western Romania are probably partly isolated from the remaining Carpathian population, but interchange of males is suspected to occur.

The Carpathian population probably consists of 3 sub-populations. No further increase in range and population size is expected because the population in the 4 countries has reached or passed its optimal number, and nearly all suitable habitat is occupied (Frackowiak et al. 1999, Hell



A = Appenine Mountains population  
 APD = Alps–Dinaric–Pindos population  
 CM = Carpathian Mountains population  
 CP = Central Pyrenees population  
 EC = Eastern Cantabrian Mountains population  
 NE = North Eastern Europe population  
 RR = Rila–Rodope Mountains population  
 S = Scandinavia population  
 SA = Southern Alps population  
 SP = Stara Planina Mountains population  
 WC = Western Cantabrian Mountains population  
 WP = Western Pyrenees population

**Fig. 1: Present distribution of the brown bear in Europe.**

and Findo 1999, Ionescu 1999).

*Alps–Dinaric–Pindos (2,800 bears).*—This population consists of brown bears in the forested areas extending from the eastern Alps in Austria and northeastern Italy in the north to the Pindos Mountains in Greece in the south, and spans parts of Austria, Italy, Slovenia, Croatia, Bosnia and Herzegovina, former Yugoslav Republic of Macedonia, the Yugoslav Federation, Albania, and Greece. The total Alps–Dinaric–Pindos population numbers about 2,800 bears. The forested areas in these countries are less continuous than in the Carpathian area, separating the functional habitat into more or less isolated sub-areas, although there is some inter-connectivity. This suggests that the

population may be divided into several sub-populations (Sørensen 1990) or may become distinct populations if these corridors become unusable due to human activities.

The population estimates for the Yugoslav Federation, Bosnia and Herzegovina, and especially Albania are quite uncertain. Additionally, the effects of the war and political instability on the bear population are unknown, but may be severe, at least locally (Huber 1999). Three bears were released into central Austria in 1989–93 in an area with a naturally occurring male bear (Rauer and Gutleb 1997). Reproduction occurs regularly in this sub-population, which now consists of about 13–16 bears (Zedrosser et al. 1999). We consider this a sub-population because

there is movement of male bears, but not female bears, between central Austria and the rest of the Alps–Dinaric–Pindos population.

*Scandinavia (1,000 bears).*—After heavy persecution in Norway and Sweden, the once-numerous brown bear population in Scandinavia was reduced to about 130 individuals by 1930 (Swenson et al. 1995). The population has since increased to between 800 and 1,300, of which more than 95% are in Sweden. Female brown bears are mostly confined to 4 areas in Sweden that probably represent the areas where remnant populations survived in about 1930 (Swenson et al. 1994). Male bears may disperse between neighbouring female core areas, but when considering demographic viability, each of the 4 should be considered as separate sub-populations (Taberlet et al. 1995). In Sweden, the distribution of bears now resembles that of 1800, with bears occurring in 50% or more of the country. In Norway, bears are usually found along the Swedish border, and most individuals are dispersing young males from Sweden (Swenson et al. 1998). The population is the most productive yet documented in the world, and increased at a rate of 10–15% annually between 1985 and 1995 (Sæther et al. 1998).

*Rila–Rhodope Mountains (520 bears).*—This population is located in southwestern Bulgaria and northeastern Greece (Mertzanis 1999, Spassov and Spiridonov 1999). It includes 3 sub-populations in the Bulgarian Rila Mountains and Pirin Mountains, as well as the subpopulation in the western Rhodope Mountains on both sides of the border. Although the total population is about 520 bears, only 15–25 are found in Greece. The connection between the bears in Greece and Bulgaria is probably maintained by males from Bulgaria. No further increase in range or population size is expected because poaching in Bulgaria has increased since the political changes of 1989 (Mertzanis 1999, Spassov and Spiridonov 1999).

*Stara Planina Mountains (200 bears).*—This population of about 200 bears is located along a 120-km area that extends from Zlatitsa–Teteven in the east, to the Tryavna Mountains in west-central Bulgaria (Spassov and Spiridonov 1999). It became isolated from the populations to the south and west early in this century after an effort to exterminate the species. However, genetic interchange between the Stara Planina population and the Rila–Rhodope population may be possible through male dispersal. As in the Rila–Rhodope population, no further increase in range and population size is expected as a result of increased poaching since 1989 (Spassov and Spiridonov 1999).

### Small Isolated Populations

Five very small, isolated populations are found in southern and western Europe, representing the remnants of a

once widespread brown bear population. In at least 3 of these (Pyrenees, Southern Alps, and Eastern Cantabrians) the threat of extirpation is high. Unless prompt action is taken during the next few years, these populations will undoubtedly vanish. To underscore this point, a small, isolated European brown bear population in the Vassfaret area of southern Norway, died out as recently as the late 1980s (Bækken et al. 1994).

*Western (50–65 bears) and Eastern Cantabrian Mountains (20 bears).*—Brown bears are now found in 2 areas of the Spanish Cantabrian Mountains. These populations apparently have been separated since the beginning of the century, and now show genetic differences. Today, they are separated by 30–50 km of mountainous terrain, and interchange between the populations is unlikely (Cienfuegos and Quesada 1999), due to unsuitable habitat and a high speed railway and motorway that bisects the area. The most recent population estimate for western Cantabria is 50–65 bears, distributed over 2,600 km<sup>2</sup> (Palomero et al. 1993). The eastern Cantabrian Mountains population is estimated to contain about 20 bears. Both Cantabrian bear populations face similar conservation problems. The populations are in steady decline due to human-caused mortality, primarily a result of illegal snares intended for wild boars (*Sus scrofa*) and poison intended for wolves (*Canis lupus*) (Cienfuegos and Quesada 1999). High human-caused mortality, combined with small population size, makes survival of these populations very unlikely unless appropriate management actions are implemented soon.

*Apennine Mountains (40–50 bears).*—This population is located in Abruzzo National Park and the area surrounding Italy's Apennine Mountains and was estimated at 70–80 bears in 1985 (Boscagli 1990). However, since then the population is thought to have decreased, and 40–50 bears may be a more realistic estimate. This population may increase because poaching has been reduced in recent years and because areas surrounding Abruzzo National Park have been protected to secure suitable habitats. However, these bears survive in an area that is densely populated by humans and there are potential conflicts between bear conservation and human activities.

*Western Pyrenees (6 bears).*—The Western Pyrenees brown bear population inhabits a 1,000 km<sup>2</sup> area that straddles the national border between France and Spain (Fig. 1), although only half of this area is used regularly (Camarra 1999). Reproduction was most recently documented in 1995 and 1998, and the present population is estimated to be 6 individuals. (Camarra 1999). This remnant population is doomed to extinction unless drastic measures, such as population augmentation, are taken soon.

*Southern Alps (4 bears).*—This population is located

in the province of Trentino in the northeastern part of the Brenta Mountains in Italy (Osti 1999). The potential bear habitat covers 1,500 km<sup>2</sup>, of which only 240 km<sup>2</sup> is used regularly by bears. Reproduction has not been documented since 1989. Recently, DNA analysis of hair and excrement samples revealed that only about 3 individuals—and no more than 4—are likely to survive in this area (Genovesi et al. 1999). Augmentation of this population has begun, with 2 bears from Slovenia released in 1999 and another 3 in 2000. There are plans to release an additional 4 bears in 2001 and 2002. (P. Genovesi, National Institute for Wildlife, Bologna, Italy, personal communication, 2000).

### Reintroduced Populations

In Europe, bears were reintroduced into 2 areas with no bears, and 2 populations have been augmented. The first reintroduction occurred in eastern Poland, where 10 bears were introduced into the Bialowieza area between 1938 and 1944. This introduction was not successful. Tracks were last observed in 1947, except for one set of tracks observed in 1963 which may have been from a dispersing bear from Belarus (Buchalczyk 1980, Jakubiec and Buchalczyk 1987). The most recent introduction was in the central Pyrenees Mountains (3 individuals in 1996–97), and the population now numbers 5 bears; this newly-founded population is located about 150 kilometers east of the Western Pyrenees population. Two augmentations, one in central Austria and one in northern Italy, are described in the sections Alps–Dinarics–Pindos, and Southern Alps, respectively.

### International Agreements

A list of all countries participating in international agreements covered by this paper is presented in Table 3.

*Bern Convention: Convention on the Conservation of European Wildlife and Natural Habitats (19 Sept. 1979, Bern, Switzerland).*—The goal of the Bern Convention is to preserve wild animal species and their natural habitats. Member countries (Table 3) must pay special attention to endangered and potentially endangered species and include protective measurements in planning and development. Animal and plant species are listed within different appendices, each representing a different stage of endangerment. The European brown bear is listed in Appendix II (strictly protected fauna species). Actions must be taken to enhance the special protection of species listed in Appendix II; capture, keeping or killing, willful disturbance, and the possession and trade of these species is forbidden. The re-colonization of indigenous species must be promoted if doing so will enhance the likelihood of preservation. Member countries can make reservations to the Bern Convention regarding means or methods of kill-

ing, capture, or other exploitation of listed species.

*CITES: Convention on International Trade in Endangered Species of Wild Fauna and Flora (3 Mar. 1973, Washington).*—All European brown bear populations are listed in Appendix II. This appendix also includes all species not in actual danger of extinction, but potentially endangered if trade of specimens of this species is not strictly controlled. Trade control is accomplished through special export permits.

*Biological Diversity Convention: United Nations Conference on Environment and Development (UNCED) (5 May 1992, Rio de Janeiro, Brazil).*—The main objective of UNCED is the conservation and sustainable use of biological diversity. A presupposition is the preservation of ecosystems, natural habitats, and wild populations of species of wild fauna and flora. The brown bear *per se* is not mentioned specifically in this convention.

*European Parliament Resolution, 17 Feb 1989 (A2-339/88, ABL C 69/201, 20.3.1989) (applies to EU members*

**Table 3. Member countries of international treaties (1999) relevant to the brown bear in Europe. Entry of yes indicates treaty signed by country; (yes): treaty will be signed by country within next years (applicant countries to EU only); no: treaty not signed by country.**

Country	Bern Convention	Bern Convention Reservation	CITES <sup>a</sup>	Biological Diversity Convention	EU-directives
Albania	yes	no	no	no	no
Austria <sup>b</sup>	yes	no	yes	yes	yes
Bosnia and Herzegovina	no	no	no	no	no
Bulgaria	yes	yes	yes	yes	no
Croatia	yes	no	yes	yes	no
Czech Republic <sup>c</sup>	yes	yes	yes	yes	(yes)
Estonia <sup>c</sup>	yes	no	no	yes	(yes)
Finland <sup>b</sup>	yes	yes	yes	yes	yes
France <sup>b</sup>	yes	no	yes	yes	yes
Macedonia	yes	no	no	no	no
Greece <sup>b</sup>	yes	no	yes	yes	yes
Italy <sup>b</sup>	yes	no	no	yes	yes
Latvia <sup>c</sup>	yes	no	yes	yes	(yes)
Norway	yes	no	no	yes	no
Poland <sup>c</sup>	yes	no	yes	yes	(yes)
Romania	yes	no	yes	yes	no
Slovakia	yes	yes	yes	yes	no
Slovenia <sup>c</sup>	yes	yes	yes	yes	(yes)
Spain <sup>b</sup>	yes	no	yes	yes	yes
Sweden <sup>b</sup>	yes	no	yes	yes	yes
Ukraine	yes	yes	yes	yes	no
Yugoslav Federation	no	no	no	yes	no

<sup>a</sup>Convention on International Trade in Endangered Species of Wild Fauna and Flora.

<sup>b</sup>European Union (EU) member.

<sup>c</sup>Country has begun detailed negotiations with the EU that should lead to membership in 2002–05.

only). —The European Commission (EC) should promote programs to protect the brown bear in Europe and should continue existing programs. These programs should cover the entire EU. Actions for socio-economic development will be promoted in return for communities having protective measures for the brown bear. Systems for bear damage prevention and damage compensation should be developed. A network of connected reserves and specially protected areas should be established (called the “NATURA 2000 Network”).

*European Parliament Resolution, 22 Apr 1994 (A2-0154/94, ABL C 128/427, 09.05.1994) (applies to EU members only).* —The EC should not support and finance development that would have a negative effect on bear populations. Actions with negative impact on bear populations should be corrected by the establishment of protected areas and corridors for genetic exchange. Measures to prevent the killing and capture of bears and protect bear habitat should be undertaken. Financial support for damage compensation, and compensation for economic restrictions due to bear conservation, should be provided.

*Council Directive 92/43/EEC, Conservation of Natural and Wild Fauna and Flora (ABL L 206, 22.07.1992) (applies to EU members only).* —The main goal of the so-called Flora-Fauna-Habitat Directive is to secure species diversity by protection of habitats and protection of wild fauna and flora. Actions must be taken by the member countries to preserve all species of wild fauna and flora and their habitats. The European brown bear is a priority species of the European Union. It is mentioned in Appendix II (species needing specially protected areas) and Appendix IV (strictly protected species; capture, killing and willful disturbance not permitted). The possession, transport, and trade of Appendix IV species is strictly prohibited. Exemptions can be given only if this has no negative impact on the preservation of the species; to prevent serious damage to culture and livestock; public health, sanitary and safety reasons; and for scientific, restocking, and re-colonization purposes.

## National Management

Most (17 of 22) countries covered in this paper manage brown bears at the national level (Table 4). Although management is carried out by a national entity, in 4 countries more than one ministry or state agency is involved in bear management. Management is on the regional level in only 3 countries; in 2 cases management is shared by national and local (Croatia), or national, regional, and local (Italy) entities. Eight countries have prepared, or are preparing, a management plan for brown bears. Some type of monitoring program or activity is carried out in 17 countries.

## Hunting Management and Poaching

In Europe, as defined in this paper, the brown bear is totally protected in 12 countries and a game species in 6. In 4 countries the brown bear is a protected species, but hunting is allowed by special permission from the government (Table 4).

European brown bears, because of their high productivity (Sæther et al. 1998, Tufto et al. 1999), can sustain harvest rates exceeding sustainable harvest levels in North American populations. In Slovenia, legal harvest during the 1980s exceeded 14% of the estimated population annually (Krčič 1988). Over 700 bears were killed legally each year in the populations covered in this paper (Table 4). Some of these bears are killed legally in protected populations as a management tool. We do not have any evidence that legal hunting is reducing the size of a bear population in Europe, except in Romania where population reduction is a management goal.

In addition to legal hunting, bears are poached as nuisance bears, for trophies, or for economic reasons. As economic and social conditions have worsened in countries such as Albania, Bulgaria, Bosnia and Herzegovina, Romania, the Yugoslav Federation, and Macedonia, poaching probably occurs more often. Poaching of bears is also a problem in the Nordic countries, where semi-domestic reindeer are raised. However, illegal killing may also be unintentional, for example when bears are killed by snares set illegally for wild boars or by poisoned baits set illegally for wolves. In fact, these are important sources of bear mortality in Spain.

## Management of Bear-caused Problems

The effective guarding techniques necessary for coexistence of livestock husbandry and large carnivores have vanished in many areas of Europe (Kaczensky 1996); partly due to economic, social, and political changes, and partly as a result of the extermination of large carnivores in most of their former ranges. For this reason, damage to livestock occurs in many areas where the bear range includes human settlements. In addition, bears damage oats, orchards, and beehives in some areas. There is compensation for damage in most countries (64%), either by the national or regional government (57%) or hunter clubs (21%, Table 5). In Slovakia and Austria, damage is compensated by either national or regional governments, or by hunters. Usually compensation is not linked to the owner's effort to prevent damage. In 1995–96 about US\$ 1.15 million was paid to compensate for bear damage throughout Europe.

The vast majority of livestock lost to bear depredation in Europe are sheep (Table 5). In Finland, Norway, and Sweden, semi-domestic reindeer depredation is also sig-

**Table 4. Management and legal status of the brown bear in European countries (1997).**

Country	Institution in charge	Management level	Management plan	Legal status	Monitoring	Bear deaths <sup>a</sup> (year)	
						legal	illegal
Albania	General Directorate of Forestry	national	no	protected	no	—	10 (1996)
Austria <sup>b</sup>	Regional Governments	regional	yes	protected	yes	2 (1991-99)	?
Bosnia and Herzegovina	Ministry of Agriculture	national	no	game species	yes	83 (1987)	?
Bulgaria	Ministry of Environment, Ministry of Agriculture, Forests and Agricultural Reforms	national	no	protected	no	8 (1996)	~ 30
Croatia	Ministry of Agriculture	national/ local	no	game species	yes	16/year (1986-92)	?
Czech Republic <sup>c</sup>	District Governments	regional	no	protected	yes	—	0
Estonia <sup>c</sup>	Ministry of Environment	national	no	game species	yes	34 (1996)	?
Finland <sup>b</sup>	Ministry of Agriculture and Forestry	national	yes	protected <sup>d</sup>	yes	97 (1996)	?
France <sup>b</sup>	Ministry of Environment	national	no	protected	yes	0	1 (1997)
Macedonia	Ministry of Forestry, Agriculture and Water Economy	national	no	protected	no	2 (1996)	?
Greece <sup>b</sup>	Ministry of Agriculture	national	yes	protected	yes	0	7 (1996)
Italy <sup>b</sup>	Regional Governments	national/ regional/ local	yes	protected	yes	0	5 (1989-96)
Latvia <sup>c</sup>	Ministry of Environmental Protection and Regional Development	national	no	protected		0	—
Norway	Directorate for Nature Management	national	yes	protected	yes	2 (1998)	2 (1998)
Poland <sup>c</sup>	Ministry of Environmental Protection, Forestry and Natural Resources	national	no	protected	yes	6 (1952-96)	7 (1995-96)
Romania	Ministry of Waters, Forests and Environmental Protection	national	no	game species	yes	299 (1992)	—
Slovakia	Ministry of Agriculture, Ministry of Environment	national	no	protected <sup>d</sup>		73 (1991)	—
Slovenia <sup>c</sup>	Ministry of Agriculture and Forestry, Ministry of Environment and Spatial Planning	national	yes	protected <sup>d</sup>	yes	37 (1996)	?
Spain <sup>b</sup>	Regional Governments	regional	yes	protected	yes	0	?
Sweden <sup>b</sup>	Environmental Protection Agency	national	(yes)	protected <sup>d</sup>	yes	30 (1996)	4 (1996)
Ukraine	Ministry of Environmental Protection and Nuclear Safety, State Forestry Committee	national	no	game species	yes	1/year	?
Yugoslav Federation	Ministry of Agriculture	national	no	game species	(yes)	19 (1987)	32 (1987)

<sup>a</sup> ? = unknown, - = no information

<sup>b</sup> European Union (EU) member.

<sup>c</sup> Country has begun detailed negotiations with the EU that should lead to membership in 2002-2005.

<sup>d</sup> Bears are protected, but hunting is allowed with special permission from the government.

nificant. Damage to beehives is only important in a few countries, with Greece experiencing the most cases of damage (Table 5).

## DISCUSSION

We have observed 2 trends regarding bear population

size and development in Europe. First, all large and viable populations (>1,000) are situated in either northern or eastern Europe, whereas bear populations in western Europe are usually very small and may not be viable (Table 2). This difference is most likely attributable to the different attitudes of people and the differing historical and economic development of the countries. Boitani (1995)



describes a similar pattern for the wolf in Europe. We believe that communism in eastern Europe was not nearly as destructive to bear populations as the political systems in western Europe. This is possibly due to the fact that in communist countries, bears were often managed for the hunting purposes of a few hunters, including foreign hunters with hard currency. Also, hunting and gun-ownership among the general public were strictly limited, thus reducing the potential for over-hunting and poaching.

Second, the only populations that we consider viable are those shared by 2 or more countries (Table 2). Almost all the bears in Europe live in large transboundary populations in eastern or northern Europe. Less than 1% of all European bears live in western or southwestern Europe. The few populations that exist within a single country are small and declining, and we do not consider them viable. Some are so small that immediate action must be taken. Conservation actions need to be taken on the national level, but could be facilitated by international funds and expertise.

We consider population reintroduction and augmentation of small populations necessary for the conservation of the brown bear in some areas of Europe. The Polish reintroduction of 1938–44 was unsuccessful because the released bears were born in captivity and approached people after their release. Most of these animals were killed very soon after their release because of their potential risk to human safety. (Buchalczyk 1980). In 1996–97, a second reintroduction of bears was attempted in the central Pyrenees in France. Some of these bears started to kill sheep in a nearby area. Local residents were not prepared for the arrival of bears and bear damage, and this led to major controversies and political troubles in France which are still unresolved (Direction Régionale de l'Environnement Midi-Pyrenies 2000). The failed reintroduction in Poland and the political problems in France indicate the importance of protecting existing bear populations (Zeiler et al. 1999). It may be easier to recover large carnivore populations when the population has not been absent for many decades (Boitani 1995). But if reintroduction is chosen, great care has to be taken in the preparation of the project and solutions for possible problems must be available in advance.

In some cases, augmentation is the only way to ensure the survival of a small population that might otherwise become extirpated. This has proven successful in Austria, where a population of 13–16 animals has been established (Zedrosser et al. 1999). The most recent augmentation of a bear population started in 1999 in the Adamello-Brenta National Park in Italy's southern Alps. In both cases, the few naturally occurring individual bears were doomed to extirpation. But despite the positive signs of population increase due to reproduction in Austria,

neither augmentation can be considered successful yet, and the populations will not be secure until they connect with the female population front of the expanding Alps–Dinaric–Pindos population (Zedrosser et al. 1999; P. Genovesi, National Institute for Wildlife, Bologna, Italy, personal communication, 2000). This again demonstrates the importance of cross-border cooperation in Europe.

Several international treaties affect the conservation of brown bears in Europe. CITES and the Biological Diversity Convention are world-wide treaties, whereas the Bern Convention applies to Europe, and the EU-directives only to EU member countries. The power of these treaties varies according to the situation. Enforcement of the treaties depends largely on the contracting parties and, unfortunately, they are poorly enforced in several countries. In addition, resolutions of the European Parliament are only recommendations. In this context, non-governmental organizations play crucial roles as the driving forces behind, and watch-dogs for the realization of treaties and laws.

Within the EU, brown bears have generally been considered protected species. This legal protection originated because bear populations in the original EU countries were small and threatened. With the accession of Sweden and Finland this situation has changed because both countries have large bear populations and a tradition of hunting. In 1992, the EU granted both Sweden and Finland exemptions from Council Directive 92/43/EEC (Flora-Fauna-Habitat Directive). Bear hunting in these countries is now officially viewed as a way to reduce serious damage to culture and livestock, and to protect public health and safety, although hunting is actually a way to control population increase. The situation for some of the new applicants to the EU is similar to that of Sweden and Finland: large bear populations are traditionally hunted, and changes to this practice might not be accepted and may result in increased poaching of bears. Here again, exemptions will most likely be granted. There might be a need for the EU to reconsider their general position on bears and hunting. Certainly, hunting in small and fragmented populations is not feasible, but legalization of bear hunting may increase acceptance for bears and thereby facilitate the conservation of viable bear populations.

The *Action Plan for the Conservation of the Brown Bear in Europe* (Swenson et al. 2000) has now been published as an official document of the Bern Convention and the Council of Europe, and thus must be considered by all member countries (only 3 European countries have not yet signed: Georgia, Russia, and San Marino). Although we believe the larger populations in Europe are viable, we are concerned that the smaller, isolated populations are on the verge of extirpation. Because countries in Europe are small in area, a bear dispersing 200 km may cross several national borders and enter several different juris-

**Table 5. Damage and compensation due to the brown bear in European countries; the time period is indicated next to each country. Livestock numbers are from official damage statistics in numbers killed or destroyed. (Abbreviations: ? = unknown; -- = no information; none = not found in the country).**

Country	sheep	goats	cattle	horses/ donkeys	reindeer	beehives	Compensation	Amount (Euro)
Albania	?	?	?	?	none	?	no	0
Austria (1990-96)	30/year	none	1/year	0	none	30/year	yes, by hunters and state insurance	3,689 (1996)
Bosnia- Herzegovina	—	—	—	—	none	—	no	0
Bulgaria	—	—	—	—	none	—	no, but in preparation	0
Croatia	5/year	0	1/year	0	none	1-3	yes, by hunters clubs	?
Czech Republic	0	0	0	0	none	0	no	0
Estonia	—	—	—	—	none	—	no	0
Finland (1996)	?	?	?	?	800	?	yes, by state	461,114
France (1996)	0	0	—	—	none	—	yes, by state	0
Macedonia	—	—	—	—	none	—	no	0
Greece (1996)	12	4	124	21	none	331	yes, by state	66,330
Italy (1996, Appenine Mountains)	2	1	8	4	none	2	yes, by regional government	5,061
Latvia	—	—	—	—	none	—	no	0
Norway (1995)	1,821	0	0	0	32	0	yes, by state	454,047
Poland	35/year	0	0	0	none	40/year	yes, by state	?
Romania (1998)	4,000	—	—	—	none	—	yes, by hunters clubs in some places	—
Slovakia	—	—	—	—	none	—	yes, by state or hunters	—
Slovenia (1996)	~300	~30	~10	1-2	none	~20	yes, by hunters clubs	48,509
Spain	9/year	9/year	19/year	21/year	none	—	yes, by regional government	41,700/year
Sweden (1995)	24	0	0	0	496	0	yes, by state insurance	172,790
Ukraine	—	—	—	—	none	—	no	0
Yugoslav Federation	—	—	—	—	none	—	no	0

dictions. Thus management actions applied in any given country may affect not only bears in that country, but the entire population shared by several neighbouring countries. The adoption of this action plan by the Bern Convention represents a unique opportunity for the conservation of the brown bear in Europe.

## ACKNOWLEDGMENTS

We are grateful to the many people who have assisted us in the preparation of the European Action Plan by providing information on the brown bear and its management and providing comments on the text. We thank M. Adamić, L. Balčiauskas, A. Björvall, J.C. Blanco, G. Boscagli, J.T. Braa, U. Breitenmoser, A. Clevenger, V. Domashlinets, E. Dupre, E. Fernandez-Galiano, S. Findo, K. Georgiev, D. Hodder, D. Huber, O. Ionescu, M. Kassa,

I. Kojola, T. Komberec, P. Koubek, A. Landa, C. Martinka, Y. Mertzanis, B. Micevski, I. Micu, F. Moutou, J. Naves, H. Okarma, M. Paunović, V. Pilats, S. Pillaha, M. Possilico, N. Powell, W. Pratesi-Urquhart, P.-Y. Quenette, J. Randveer, G. Rauer, H.V. Reynolds, O. Robinet, F. Sandegren, C. Servheen, V. Sidorovich, P.S. Soorae, O.J. Sørensen, M. Sylvén, V. Titar, P. Tunkkari, B. Tuson, E.F. Valero, and M. Veleviski.

## LITERATURE CITED

- BÆKKEN, B.T., K. ELGMORK, AND P. WABAKKEN. 1994. The Vassfaret brown bear population in central-south Norway no longer detectable. *International Conference on Bear Research and Management* 9(1):179-185.
- BOITANI, L. 1995. Ecological and cultural diversities in the evolution of wolf-human relationships. Pages 3-12 in L.N. Carbyn, S.H. Fritts, and D.R. Seip, editors. *Ecology and*

- conservation of wolves in a changing world. Proceedings of the Second North American Symposium on Wolves. Canadian Circumpolar Institute, Occasional Publications 35, Edmonton, Canada.
- BOSCAGLI, G. 1990. Marsican Brown Bear population in central Italy—status report 1985. *Aquilo, Serie Zoologica*. 27:81–83.
- BREITENMOSER, U. 1998. Haben Grossraubtiere in den Alpen eine Zukunft? Pages 58–62 in Commission Internationale pour la Protection des Alpes, editor. *Alpenreport*, Verlag Paul Haupt, Bern, Stuttgart, Wien, Germany. (In German.)
- BUCHALCZYK, T. 1980. The brown bear in Poland. *International Conference on Bear Research and Management* 4:329–332.
- CAMARRA, J.J. 1999. Status and management of the brown bear in France. Pages 68–72 in C. Servheen, S. Herrero, and B. Peyton, editors. *Bears: status survey and conservation action plan*. International Union for the Conservation of Nature and Natural Resources, Gland, Switzerland.
- CIENFUEGOS, J.N., AND C.N. QUESADA. 1999. Status of the brown bear in western Cantabria, Spain. Pages 104–111 in C. Servheen, S. Herrero, and B. Peyton, editors. *Bears: status survey and conservation action plan*. International Union for the Conservation of Nature and Natural Resources, Gland, Switzerland.
- CORBETS, G. B., AND S. HARRIS, EDITORS. 1991. *The handbook of British mammals*. Blackwell Scientific Publications, Oxford, UK.
- DIRECTION REGIONALE DE L'ENVIRONNEMENT MIDI-PYRENIENES. 2000. Bilan public "Ours". Direction Regionale de l'Environnement Midi-Pyrenies, Toulouse, France. (In French.)
- FRACKOWIAK, W., R. GULA, AND K. PERZANOWSKI. 1999. Status of the brown bear in Poland. Pages 89–93 in C. Servheen, S. Herrero, and B. Peyton, editors. *Bears: status survey and conservation action plan*. International Union for the Conservation of Nature and Natural Resources, Gland, Switzerland.
- GENOVESI, P., E. DUPRE, AND L. PEDROTTI. 1999. First Italian brown bear translocations. *International Bear News* 8:14.
- HELL, P., AND S. FINDO. 1999. Present status, conservation, and management perspectives of the brown bear population in the Slovak part of the western Carpathians. Pages 96–100 in C. Servheen, S. Herrero, and B. Peyton, editors. *Bears: status survey and conservation action plan*. International Union for the Conservation of Nature and Natural Resources, Gland, Switzerland.
- HUBER, D. 1999. Status and management of the brown bear in former Yugoslavia. Pages 113–122 in C. Servheen, S. Herrero, and B. Peyton, editors. *Bears: status survey and conservation action plan*. International Union for the Conservation of Nature and Natural Resources, Gland, Switzerland.
- IONESCU, O. 1999. The management of the brown bear in Romania. Pages 93–96 in C. Servheen, S. Herrero, and B. Peyton, editors. *Bears: status survey and conservation action plan*. International Union for the Conservation of Nature and Natural Resources, Gland, Switzerland.
- JAKUBIEC, Z., AND BUCHALCZYK, T. 1987. The brown bear in Poland: its history and present numbers. *Acta Theriologica* 32:289–306.
- KACZENSKY, P. 1996. Large carnivore–livestock conflicts in Europe. Munich Wildlife Society, Linderhof, Germany.
- KENDALL, K.C., L.H. METZGAR, D.A. PATTERSON, AND B.M. STEELE. 1992. Power of sign to monitor population trends. *Ecological Applications* 2:422–430.
- KRČE, B. 1988. Rjavi medved. Pages 23–62 in B. Krystufek, B. A. Brancelj, B. Krče, and J. Čop, editors. *Zveri II*. Lovska zveza Slovenije, Ljubljana, Slovenia. (In Slovenian.)
- KURTÉN, B. 1976. *The cave bear story: life and death of a vanished animal*. Columbia University Press, New York, New York, USA.
- MERTZANIS, G. 1999. The status of the brown bear in Greece. Pages 72–81 in C. Servheen, S. Herrero, and B. Peyton, editors. *Bears: status survey and conservation action plan*. International Union for the Conservation of Nature and Natural Resources, Gland, Switzerland.
- MILLER, S.D., G.C. WHITE, R.A. SELLERS, H.V. REYNOLDS, J.W. SCHOEN, K. TITUS, V.G. BARNES, R.B. SMITH, R.R. NELSON, W.B. BALLARD, AND C.C. SCHWARTZ. 1997. Brown and black bear density estimation in Alaska using radiotelemetry and replicated mark–resight techniques. *Wildlife Monographs* 133.
- NYHOLM, E.S., AND K.E. NYHOLM. 1999. Status of the brown bear in Finland. Pages 63–68 in C. Servheen, S. Herrero, and B. Peyton, editors. *Bears: status survey and conservation action plan*. International Union for the Conservation of Nature and Natural Resources, Gland, Switzerland.
- OSTI, F. 1999. Present status and distribution of the brown bear (*Ursus arctos* L) in Trentino (Italy). Pages 84–86 in C. Servheen, S. Herrero, and B. Peyton, editors. *Bears: status survey and conservation action plan*. International Union for the Conservation of Nature and Natural Resources, Gland, Switzerland.
- PALOMERO, G., A. FERNANDEZ, AND J.Y. NAVES. 1993. Demografía del oso pardo en la Cordillera Cantabrica. Pages 55–72 in J.Y. Naves and G. Palomero, editors. *El oso pardo en España*. Colección Técnica, Instituto Nacional para la Conservación de la Naturaleza, Madrid, Spain. (In Spanish.)
- PULLIAINEN, E. 1990. Recolonisation of Finland by the brown bear in the 1970s and 1980s. *Aquilo, Serie Zoologica*. 27:21–25.
- RAUER, G., AND B. GUTLEB. 1997. *Der Braunbär in Österreich*. Federal Environmental Agency, Monographs 88, Vienna, Austria. (In German.)
- SÆTHER, B.E., S. ENGEN, J.E. SWENSON, AND F. SANDEGREN. 1998. Assessing the viability of Scandinavian brown bear, *Ursus arctos*, populations: the effects of uncertain parameter estimates. *Oikos* 83:403–416.
- SERVHEEN, C., S. HERRERO, AND B. PEYTON, EDITORS. 1999. *Bears: status survey and conservation action plan*. International Union for the Conservation of Nature and Natural Resources, Gland, Switzerland.
- SØRENSEN, O.J. 1990. The brown bear in Europe in the mid 1980's. *Aquilo, Serie Zoologica*. 27:3–16.
- SPASSOV, N., AND G. SPIRIDONOV. 1999. Status of the brown bear in Bulgaria. Pages 59–63 in C. Servheen, S. Herrero, and B. Peyton, editors. *Bears: status survey and conservation action plan*. International Union for the Conservation of Nature and

- Natural Resources, Gland, Switzerland.
- SWENSON, J.E., B. DAHLE, N. GERSTL, AND A. ZEDROSSER. 2000. Action plan for the conservation of the brown bear in Europe. Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention), Nature and environment, N. 114, Council of Europe Publishing, Strasbourg, France.
- , F. SANDEGREN, AND A. SÖDERBERG. 1998. Structure of the expansion front of an increasing brown bear population. *Journal of Animal Ecology* 67:819–826.
- , ———, P. WABAKKEN, A. BJÄRVALL, A. SÖDERBERG, AND R. FRANZEN. 1994. Bjørnens historiske og nåværende status og forvaltning i Scandinavia. Norwegian Institute for Nature Research, Forskningsrapport 53, Trondheim, Norway. (In Norwegian with English summary.)
- , P. WABAKKEN, F. SANDEGREN, A. BJÄRVALL, R. FRANZÉN, AND A. SÖDERBERG. 1995. The near extinction and recovery of brown bears in relation to the bear management policies of Norway and Sweden. *Wildlife Biology* 1:11–25.
- , AND S. WIKAN. 1996. A brown bear population estimate for Finnmark County, North Norway. *Fauna Norvegica. Series A* 17:11–15.
- TABERLET, P., J. E. SWENSON, F. SANDEGREN, AND A. BJÄRVALL. 1995. Localization of a contact zone between two highly divergent mitochondrial DNA lineages of the brown bear *Ursus arctos* in Scandinavia. *Conservation Biology* 9:1255–1261.
- TUFTO, J., B.E. SÆTHER, S. ENGEN, J. SWENSON, AND F. SANDEGREN. 1999. Harvesting strategies for conserving minimum viable populations based on World Conservation Union criteria: brown bears in Norway. *Proceedings of the Royal Society London B* 266:961–967.
- ZEDROSSER, A., N. GERSTL, AND G. RAUER. 1999. Brown bears in Austria. Federal Environmental Agency, Monograph 117, Vienna, Austria.
- ZEILER, H., A. ZEDROSSER, AND A. BATH. 1999. Attitudes of Austrian hunters and Vienna residents toward bear and lynx in Austria. *Ursus* 11:193–200.