CARPATHIAN ECOREGION INITIATIVE

Brown Bear
Wolf
Lynx
Otter

Status of Carnivores in the Carpathian Ecoregion

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Henryk Okarma
Yaroslav Dovhanych
Slavomir Findo
Ovidiu Ionescu
Petr Koubek
Laszlo Szemethy

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INTRODUCTION

The Carpathian Ecoregion Initiative began in 1999, when the Danube-Carpathian Programme (DCPO) launched conservation planning for the Carpathians on a regional scale, using the ecoregion-based conservation approach (ERBC). The aim of the ERBC is to conserve the full range of biodiversity within an ecoregion, taking into consideration socio-economic factors, and promoting opportunities for sustainable development. A key feature of the ERBC process is the development of a biodiversity vision for the Carpathians. This incorporates all biological features, how they are currently distributed, how they may need to be restored, and how to safeguard them over the long term, while taking into consideration socio-economic factors.

Large carnivores (brown bear, wolf, lynx and otter), constitute a very characteristic and important feature of the biodiversity of the Carpathians. The existence of large carnivores has always been important for local communities, and hunting carnivores, protecting livestock and dealing with damage caused by carnivores is an integral aspect of life in the region.

Environmental and development differences between countries sharing the Carpathians have resulted in considerable differences in the distribution, number, and conservation status of large carnivores across the region. In addition, it is very difficult to obtain the full range of information on these species because data on various aspects of their status, biology, and management is divided between various national agencies and institutions.

The aim of this rapid assessment is therefore to compile and synthesise available information, to present the judgement of experts on the status of large carnivores, and to reveal major threats to their existence. In addition, it aims to identify the most important gaps in knowledge and management and to suggest necessary action.

The assessment of the status of the large carnivores for the whole Carpathian range was compiled as a joint effort by seven national experts: Yaroslav DOVCHANYCH (Ukraine), Slavomir FINDO (Slovakia), Ovidiu IONESCU (Romania), Petr KOUBEK (Czech Republic), Henryk OKARMA (Poland), and Laszlo SZEMETHY (Hungary). Each of us contacted relevant national authorities, scientific and governmental institutions, fellow scientists, and NGOs (see Appendix I) to obtain the best available information on the legal status, distribution, habitat, and population numbers of these species. We also sought information on the state of knowledge, main threats, possible conflicts with humans, public attitudes, and NGOs/state involvement in various activities concerning these species. Additionally, existing literature was reviewed and the most important publications identified. (Appendix II). We also drew on our own personal knowledge, since we have been involved in research on various species of large carnivores in our countries for decades.

All opinions regarding the reliability of the official population numbers for large carnivores and the methods used for calculating these figures, and the assumed actual population size of these species for a given country, are the personal judgement of each national expert. We are aware that there is frequently a lack of data entirely to confirm our assumptions. We therefore take full professional responsibility for our views as expressed in this publication.

RESULTS

1. The Brown bear (Ursus arctos)

Legal status

Czech Republic: A protected game species. According to Ministry of Agriculture hunting legislation, it is a game species which can be hunted throughout the year. However bear hunting requires a special permit from the Ministry of Environment. Because the species is protected it is not possible to obtain such a permit.
Hungary: The species is strictly protected.
Poland: A strictly protected species. In rare cases of problem bears (mainly human habituated bears; damage to bee hives) individual management measures, including the capture or killing of a bear, might be considered with special permission from the Ministry of Environment.
Romania: In accordance with law no. 103/1996, the brown bear is a protected species but the same law states that this species can be hunted "with the approval of the Ministry of Waters, Forest and Environmental Protection and in accordance with the international conventions of which Romania is a part". This means that the brown bear is still a game species and can be hunted "in areas where they cause damage and their number is not endangered". The period of hunting is from 15th September to 15th December and from 15th February to 15th May. About 150 bears were hunted legally annually over the last 5 years.
Slovakia: A game species, fully protected all year round. Hunting is allowed only on the basis of exceptions granted jointly by the Ministry of Agriculture and the Ministry of Environment. Permission is given to the local hunting clubs which apply to hunt problem bears ie human habituated bears, causing damage to livestock, bee hives, fruit trees and agricultural crops. There is no hunting season for bears, but hunting in exceptional cases is mainly carried out from March to the end of November. According to the Slovak Ministry of Agriculture the following number of bears have been killed since 1994: 1994 – 49, 1995 – 61, 1996 – 34, 1997 – 46, 1998 – 46.
Ukraine: A game species; however hunting is prohibited. Permits to kill bears are issued only in extremely rare cases, usually in cases of excessive damage. During 1993-95, no bear was legally shot, in 1996 – 1, 1997 – 1, 1998 – 1.

Distribution

Czech Republic: The species is found only in one place, close to the Slovakian and Polish border (the area of Moravskoslezske Beskidy).
Hungary: No permanent population. Rare, irregular sporadic occurrences. The last ones were in 1992 in the Zemplén Mountains (two animals) and in 1997 in the Börzsöny Mountains (one animal) near Slovakian border.
Poland: Along the Ukrainian and Slovakian borders. Distribution not continuous in Polish Carpathians. There are 3 core areas: (1) Mieszczady Mts, Beskid Niski Mts, Beskid Sądecki Mts., Gorce Mts.; (2) Tatry Mts.; (3) Beskid Śląski Mts. and Beskid Żywiecki Mts.
Romania: Commonly found over all Carpathians.
Slovakia: Distributed more widely in the central part of the country. In the eastern part, bears inhabit a narrow stretch along the Polish border.
Ukraine: Continuous distribution over all Carpathians.

Habitat

Czech Republic: Mixed mountain forest.
Hungary: No information available.
Poland: Larger mountain forests areas (both mixed and coniferous) with remaining natural features.
Romania: The bears' habitat is located mainly in afforested mountains, between 800-1800m m. In years when beech nuts and acorns are plentiful, bears prefer beach/oak forest in the autumn. At the end of summer and in the early autumn bears can be found up to 2500 m searching for berries, but also down to 500 m looking for food in orchards, corn or potatoes fields.
Slovakia: Brown bears are found in coniferous and mixed forests. Preferred forests types are: *Fraxineto-Aceretum, Abieto-Fagetum, Abieto-Piceatum and Fagetum abietino-piceosum*. In autumn bears also frequent the lower beech and beech/oak forest belts searching for beech nuts and acorns. During snow- free periods, bears can be found in alpine meadows feeding on fruits (*Vaccinium sp*.). Main altitudes frequented by bears: 700-1250 m.
Ukraine: the most typical bear habitats are mature and over mature deciduous, coniferous and mixed forests. In spring bears concentrate on the southern well-heated slopes, where snow melts earlier. In summer bears live typically on reafforesting clear-felled areas, where raspberries and blackberries are plentiful. If blueberries are abundant, bears tend to stay on blueberry stands in spruce-blueberry forests. However, they do not concentrate in the subalpine zone because of heavy cattle grazing on clearings and uniform grass cover. In autumn bears come down to the beech forests. Winter bear habitats are in the lower levels of mountains at elevations of between 500 and 1200 m. They include mostly coniferous or mixed stands under 40 years old, with a high protective value. Less frequently, bears hibernate in forests with windfelled trees and hollow old firs. If bears remain active during the winter, they stay close to beech forests (if beech nuts are abundant) or in river valleys where ungulates concentrate. These days the brown bear can be met in virtually in all principal types of mountain forests. The reafforestation of gaps, where young forests replacing old spruce forests have created a wide diversity of habitats, has proved suitable for bears.

Population Status

Czech Republic: Very few animals (less than 5). Their occurrence was established through direct observations, footprints and other traces. This number has been stable for the last 10 years.
Hungary: Only sporadic occurrences, probably individuals migrating from Slovakia.
Poland: Official estimates of numbers are as follows: 1994 – 83 individuals, 1995 – 76, 1996 – 84, 1997 – 110, 1998 – 103. Numbers are estimated on the basis of questionnaires obtained from all forestry units and national parks within the species range. These estimates seem to be accurate. During the last 10 years population numbers have been relatively stable.
Romania: Official estimates for recent years are as follows: 1995 – 5550 individuals, 1996 – 5480, 1997 – 5280, 1998 – 5560, 1999 – 5620 The official number is estimated by counting and identifying each individual bear at feeding stations in spring, simultaneously over the whole bear range, and counting tracks in the first snow at the beginning of winter and in spring when bears emerge from the den. The monitoring system for bears is fairly intensive and the estimation of bear population size is the best in comparison with other large carnivores. Even so, there is an element of approximation. Population trends showed a steep decrease between 1990 and 1997, from more than 7500 to less than 5300 individuals. In recent years, the bear population has increased again.
Slovakia: The country harbours the second most numerous bear population in the Carpathians.

Bear numbers were estimated as follows: 1995 -1012 individuals, 1996 – 1269, 1997 – 1308, 1998 – 1148, 1999 – 1288. The number of bears is estimated by members of each hunting club (about 1700 clubs) on bait sites in autumn and spring (cub numbers are not calculated in spring). In addition, year-round observations are used for estimating numbers. Official figures are probably overestimates. Zoologists would currently estimate only 700-800 brown bears. Numbers have increased rapidly during last 10 years and this species has become the most numerous large carnivore in Slovakia.
Ukraine: Population size was estimated in 1990s as a few hundred individuals, as follows: 1994 – 517 individuals, 1995 – 474, 1996 – 443, 1997 – 407, 1998 -396. Most of bears occur in Zakarpatska and Ivano-Frankivska regions, and the rest inhabit the Lvivska and Chernivetska regions. The main method of census is interviewing forest guards, which gives relatively reliable results when applied to bears. From 1970 bear numbers steadily decreased and this trend continued to the late 1990s. During last 2-3 years, the number of bears has increased on the territory of the Carpathian Biosphere Reserve and on adjacent territories.

Knowledge about the species

Czech Republic: No local data available. A new project entitled "Management optimization of big game in the Czech Republic" was planned for January 2000.
Hungary: Almost no research in Hungary, except for some reports of sporadic occurrences.
Poland: Information on population numbers and damage caused by bears has been collected since the1970s. Recently, studies on food habits of bear have been carried out.
Romania: Diet, dispersal pattern, body size and ethological studies have been carried out. There is a telemetry study ongoing in the area of Brasov County. Recently, there have been two large projects including a substantial element of foreign funds: the Carpathian Large Carnivore Project and the Life Project "Enhancement of Piatra Craiului National Park". These projects aim at proving the value of the presence of large carnivores in the area.
Slovakia: Several aspects of bear biology have been studied, for example craniometry, body measures, genetic status, geographical and ecological distribution, feeding behavior, and contamination of bear tissues by heavy metals and other pollutants. There have also been studies on human habituated bears and the use of electric fences for protection of bee hives.
Ukraine: The ecology of the brown bear has been investigated fairly thoroughly. Since the 1970s Ukrainian scientists have studied the distribution and number of bears, their diet, and behavior, and the conservation and sustainable use of the bear population. Monitoring of the bear population is carried out only in the national parks (Carpathian, Synevyr, Uzhanska Dolina, Skolivski Beskydy, Horhany, Vyzhnytsya) and the Carpathian Biosphere Reserve.

Conflict with humans

Czech Republic: No conflict has been recorded yet.
Hungary: Very rare occurrences cause conflicts but these are based on emotion. People are frightened of bears. Some immigrating individuals display abnormal behaviour, and enter human settlements. In former times these animals were shot. Now the bears are completely protected and the state (the Ministry of Environment Conservation) has to pay compensation for proven damage. No damage has been reported in the last five years.
Poland: Cases of aggression to humans are rare: only 5 cases have been confirmed since 1997. Bear damage has been registered in about 50% of the forestry units inhabited by this species. This consisted mainly of bee hives being destroyed, and sheep and cattle killed. The level of damage is relatively small: 54 bee hives, 42 sheep, and 12 cattle were recorded in 1980-91. Compensation is paid by regional nature conservation authorities. Because of

changes in administrative divisions in Poland, data is only available from 1999 (about 23000 USD were paid for bear damage).
Romania: Between 1990 and 1999 there were 119 bear/ human accidents. 18 people were killed and 101 injured. 57% of the accidents were connected with raising livestock, 12% with hunting and poaching, 7% were represented by accidents connected with forestry activities, 7% for fruit and mushroom pickers, 4% for activities connected with agriculture and orchards, 3% with hiking and 7% unknown. In the same period, bears were reported to have killed 3232 sheep, 1003 cows, donkeys and horses, 186 pigs and 140 goats. (Not all the sheep killed were reported). Theoretically, the owner of the hunting rights and the Wildlife Department of the Ministry of Waters, Forest and Environment Protection, are responsible for damage, but only when the owner can prove that he took preventive measures to avoid damage.
Slovakia: Human habituated bears occur mainly in the Tatry National Park and the Nizke Tatry National Park. There are 5-10 cases of human/ bear encounters annually. In the last century nobody was killed by bears in Slovakia, but some people died as a result of blood infections after injuries. Conflict with hunters due to predation on wild animals is insignificant. There is a considerable level of damage to bee- hives, sheep, goats, cattle, fruit trees (orchards) and agricultural crops (maize, oats). Damage to orchards and agricultural crops are not officially recorded as evidence, because this is not compensated. In 1996-98, bears damaged 736 bee hives, and 829 sheep, 23 goats, and 65 cattle were killed. The total amount of compensation paid in that period was about 57000 USD.
Compensation is paid in two different ways: (1) Hunting clubs which are allowed to hunt bears during the year also have a duty to compensate local people for damage occurring in their hunting area. This system is based on the principle that hunting clubs which shoot bears get income from hunting tourism, and part of this income is used for compensation. (2) Damage caused by bears on other land (including those hunting areas which did not get permission to shoot bears) is compensated by the government via the Ministry of Agriculture.
Ukraine: Bears occasionally cause damage in late summer to immature oat and corn crops. They also cause some damage to bee-hives (more than 20 instances in 1970-1980). Sometimes bears attack cattle. Before 1955 damage by bears was not significant, because the number of bears was low (about 100 animals). But in the period 1956-1958, when about 600 bears inhabited the Ukrainian Carpathians, they killed 884 head of cattle in the Zakarpatska region alone. The damage was mainly caused by old, wandering animals. In the period 1955 to 1959 18 wandering animals were killed, and no damage was recorded thereafter. In 1963 in the Zakarpatska region bears killed 566 head of domestic animals, and the problem bears were again killed. Nowadays, the number of bears in the Carpathian Biosphere Reserve and adjacent territories is growing and this leads to increasing levels of damage. There is no compensation for bear damage.

Main threats

Czech Republic: Poaching, unfavorable changes in hunting systems (too small hunting grounds, lack of modern hunting law).
Hungary: The suitability of the environment is questionable. Intensive forest and game management acts against the large carnivores. Possibility of poaching cannot be excluded.
Poland: There is some poaching. However its scale and possible effect on population dynamics is impossible to assess.
Romania: Potential threats are poaching, changes to habitats as a result of the privatisation of the forests and building of roads, and changes to hunting as a result of the new system of renting hunting rights. Food supply for bears has been reduced by decreasing the number and extent of clear-felling in forests and the promotion of tree species which shade the forest floor.
Slovakia: The brown bear cannot now be considered a threatened species. Its number is the highest for last 150 years, and only 8-10% of the population may be shot annually. The existing system of bear management as well as the favorable attitude of public make the future of this species secure.
Ukraine: The brown bear has to a certain extent become adjusted to intensive forestry. The home ranges of individual animals do not change when logging occurs nearby if the den is not destroyed. Bears are met more frequently in timber cutting areas. A few dens are situated quite close to them, as well as to timber dragging trails and forest roads. The main reason for the sharp decrease in bear numbers is poaching. Bears are legally shot only in exceptional cases, but according to Hunchak (1999) poachers killed about 800 animals during the last 8 years.

Public attitudes and NGO/State involvement

Czech Republic: The Association "Beskydčan", Rainbow" and the local Association of Nature Conservationists operate in the Western Carpathians. Both associations have the protection of large carnivores (wolf, bear, lynx, and otter) in their programmes. Local projects are sponsored by the environmental offices of district administrations and the Czech Agency of Nature Conservation and they are controlled by Administration of the Beskydy Landscape Protected Area
Hungary: No significant activities in Hungary. Hunters oppose the resettlement of the bear.
Poland: There is no NGO involvement in bear conservation. Long term monitoring of population distribution and number has been conducted by the Institute of Nature Conservation in Cracow. Generally, the attitude towards bears is quite positive among hunters and farmers, with the exception of those individuals directly affected by bear damage.
Romania: There is a good deal of official, governmental interest in bear management, mainly from the Ministry of Waters, Forests and Environmental Protection and the National Forest Administration. Research is conducted by the Forest Research and Management Institute. Shepherds are mainly against the presence of the bears.
Slovakia: As far as we know, no NGO in Slovakia is concerned exclusively with bears. Some NGOs publish posters or leaflets focussing on the improvement of bear conservation, e.g. Sloboda zvierat, Bratislava, publish a leaflet on proper camping procedures within bear range and on the removal or storage of waste in bear territory. The Carpathian Wildlife Society recently began a program on livestock protection against large carnivores in the Slovak National Parks.
Ukraine: In the Carpathian region of Ukraine the public attitude to bears is one of indifference. Hardly anyone raises questions either about intensifying conservation measures on behalf of the bear or backing the struggle against it. Probably the main reason for this is the low level of public awareness of status of this species in the region.

Gaps in knowledge, legislation and management

Czech Republic: Lack of new hunting legislation and damage compensation law.
Hungary: Regular monitoring of the occurrence of bears would be useful but at present there are no plans for this.
Poland: There is an urgent need to work out a national strategy of bear conservation and to prepare management measures to limit the number of human habituated individual bears. Research should be conducted on bear ecology, spatial distribution, and the possibility of limiting bear damage to bee hives.
Romania: Research should be conducted on basic ecological parameters, fertility and mortality rate, food, space use, habitat relationship, community interaction and seasonal movements. There is a need to assess the accuracy of the existing monitoring system and to develop a national management plan for the brown bear.
Slovakia: Research into the estimation of bear numbers, population dynamics, landscape use, movements, suitable habitats, and bear / human conflicts.
Ukraine: Lack of basic knowledge on the brown bear (actual number, population structure, migrations, interactions with humans). It is impossible to start such a research programme without foreign funds.

Table 1. Official and expert assessment of brown bear numbers and population trends in various countries of the Carpathian region.

Country	Official number in 1998	Expert judgement of the accuracy of official number in 1998	Population trend in 1990-1999
Czech Republic	Sporadic occurrence	< 5	Stable
Hungary	Only sporadic occurrence	Accurate	Stable
Poland	103	Accurate	Stable
Romania	5560	Accurate	Decrease, recently increase
Slovakia	1148	Overestimated, probably about 700-800 individuals	Increase
Ukraine	396	Accurate	Decrease, in some areas increase

Summary

Generally, in the Carpathian region the overall protection status of the brown bear is satisfactory. The species is either strictly protected, or, if some hunting exists, it is based on a relatively accurate estimation of population number and can thus can be considered a sustainable harvest. An official estimate of the whole Carpathian population of brown bears is about 7000 individuals. This is probably overestimated, but not heavily. Most of the national experts judge the official numbers of bears from their countries as relatively accurate. The general trend in numbers in the region is either stable or slightly increasing (see Table 1). The main threats to brown bears across the Carpathians is poaching (especially in Ukraine), habitat changes (privatisation of the forests, road construction), and recent unfavourable changes in hunting systems (too small hunting grounds, lack of modern hunting law).

2. The Wolf (Canis lupus)

Legal status

Czech Republic: A protected game species. According to Ministry of Agriculture hunting legislation it is a game species which can be hunted throughout the year. However wolf hunting requires a special permit from the Ministry of Environment. Because the species is protected it is not possible to obtain such a permit.
Hungary: The wolf has been totally protected in Hungary since 1993, but it is possible to kill wolves with the special permission of the Authority of Nature Conservation, if serious damage to livestock or game is proven. One animal has been shot in the last five years but not in the Carpathian region.
Poland: A strictly protected species. In cases of excessive wolf damage to livestock, permits to kill a certain number of individuals in a defined area are issued by the Ministry of Environment.
Romania: In accordance with law no. 103/1996, the wolf is a protected species but the same law states that this species can be hunted "with the approval of the Ministry of Waters, Forest and Environmental Protection and in accordance with the international conventions of which Romania is a part ". This means that the wolf is still a game species and can be hunted "in areas were they cause damage and their number is not endangered". The period of hunting is from 15 September to 28 February. About 450 wolves were hunted legally annually during the last five years.
Slovakia: Until 1994 the open season for wolf hunting was 16 September to 28 February (Decree 172/1975). From 1995-1998, the wolf was declared a strictly protected species, based on the Act No. 287/1994 on Nature and Landscape Protection. However, wolf protection was not respected by hunters. Since 1999, the wolf has been classified as a game species, with an open season from 1 November to 15 January. During the last 5 years the following number of wolves were shot: 1994 – 116, 1995 – 157, 1996 – 24, 1997 – 74, 1998 – 54 (figures for 1996-98 are underestimated as a result of unclear legislation and year-round protection).
Ukraine: A game species. Period of hunting - all the year round with special permits. The following numbers of wolves legally killed in the Carpathians are underestimates, because there were no figures from some regions. According to these state statistics, 33 wolves were killed in 1995 (data for only 2 provinces out of 4), 1996 – 34 (2 provinces), 1997 – 95 (3 provinces), 1998 – 87 (3 provinces).

Distribution

Czech Republic: The species is found only in one area, close to the Slovakian and Polish border (Moravskoslezske Beskidy).
Hungary: Permanent occurrences have reported from Zemplén Mountains. There have been sporadic occurrences near Aggtelek, in the Bükk Mountains and near the Ukrain-Romanian border. One to three animals were observed occasionally.
Poland: Relatively wide occurrence in all forested areas of Carpathians.
Romania: Commonly found over all Carpathians.
Slovakia: Species widespread over all Carpathian range.
Ukraine: Continuous distribution over all Ukrainian Carpathians.

Habitat

Czech Republic: Mixed mountain forest with clearings and mountain meadows
Hungary: No data available.

Poland: Wolves mainly inhabit areas with large forests, but they are also found in the relatively fragmented forest and human-dominated landscape in the northern and western parts of the Polish Carpathians. No single forest type is preferred. In the high mountains wolves occur up to alpine meadows.
Romania: The wolf's habitat is located mainly in forested hills and mountains, between 600m and 1800 m. An opportunistic species, the wolf with its broad ecological adaptability occupies any territory where it can find food and shelter against persecution.
Slovakia: The most important type of habitat for the wolf is a forest. The latest GIS analysis conducted at the Forest Research Institute in Zvolen showed a total wolf range 20,777 km^2 , of which forests cover constitutes 11,542 km^2 (55.12 %). Wolves occupy areas from 300 m up to the upper timberline and alpine meadows in summer. The wolf only uses open landscape for movement and hunting. Wolves inhabit coniferous and mixed as well as deciduous forests. The preference for forest habitat is mostly based on the availability of food and the absence of human disturbance. Wolves also use small patches of forest in field areas as temporary resting places.
Ukraine: In the Ukrainian Carpathians the most typical wolf habitats are mountain forests. Periodically wolves visit submountain zones and lowlands (in winter) and subalpine zones (in summer). Movements are influenced by snow depth and distribution of major prey, ie wild ungulates. Wolf dens are situated in out-of-the way places not far from streams, springs and lakes or ponds.

Population Status

Czech Republic: Only a small number of migrating animals. Local experts estimated from 3 to 18 wolves during the last 5 years and the highest number was recorded 1996-97. Estimates for 1999 gave a figure of 15 animals. This is probably quite an accurate estimate. Over the last 10 years, the population trend is slightly increasing. The number of migrating animals to the Czech Republic depends on wolf population dynamics in Slovakia.
Hungary: No official numbers. In our opinion it may be from 10 to 15 animals. The number is increasing slightly.
Poland: About 550 wolves are officially reported. The number of wolves is estimated at the end of each winter according to "year-round observations" and snow-tracking. It means that these estimates are not reliable and considerably overestimate the actual wolf numbers, by 2 or 3 times. According to estimates based on known density of wolves in the Carpathians (max. 5 wolves/100 km^2 from two different studies), the number of these predators should not exceed 250 individuals. The most likely number of wolves has increased during last 5 years.
Romania: The wolf population here is the most numerous in the whole Carpathian range. Official estimates produced the following figures for recent years: 1995 – 2650 wolves, 1996 – 3720, 1997 – 3290, 1998 - 3510, 1999 – 3440. The method of obtaining the official number is by counting the tracks of packs in wintertime. Data is collected at county level and separately for the owners of hunting rights (ie forest administration and hunting associations). Even if they have accurate information about the size of the packs some double counting occurs; up to 20% is overestimated. In recent years, the wolf population has increased, now standing at over 3000 individuals.
Slovakia: Official wolf numbers as compiled by the Slovak Ministry of Agriculture are as follows: 1995 – 1028 wolves, 1996 – 1250, 1997 – 1330, 1998 – 1079, 1999 – 1244. According to Dr. Findo, official wolf numbers are overestimated by an approximate factor of three. Currently, specialists estimate wolf numbers at about 300-450 individuals. No special method is used for calculating wolf numbers and the very rough estimate is based on year-round observations. All hunting grounds in Slovakia report wolf numbers annually up to March 31.

Population trend estimates based on annual hunting figures indicate that the wolf population was increasing until 1993. Since 1994 it has slightly decreased as a result of overhunting.
Ukraine: State statistics on wolf numbers are incomplete for 1994–1998. For all 4 regions the figures available are as follows:1994 – 412 wolves, 1997 – 400, and 1998 – 353. In the Chernivetska region, the reported number of wolves is much lower than for other regions. The method of collecting data on wolf numbers is by interviewing forest guards, which gives lower numbers than there are in reality. In the period 1951-1981 wolf numbers in the Ukrainian Carpathians were reduced more then 10 times. In the period 1982-1984 total wolf numbers in that area were only about 150 individuals. For the last decade wolf numbers have been more or less stable with no significant fluctuations. Although over recent years food supplies for the wolf have improved, with game increasing through the absence of pesticides and fertilizers in agriculture, shooting has kept wolf numbers more or less stable.

Knowledge of the species

Czech Republic: No research.
Hungary: Almost no research, except the regular, countrywide questionnaire surveys by the Department of Wildlife Biology and Game Management of Szent István University and snow tracking in the Zemplén mountains.
Poland: Good knowledge on distribution, diet composition, and impact on ungulate populations. Some attempts to improve effectiveness of measures to protect livestock (eg guard dogs for livestock, fences). Insufficient data on numbers, utilization of space, and interaction of wolves and other large carnivores.
Romania: There is a diet, territory size, body size and health study. Starting in 1994, there is an ongoing telemetry study in Brasov, Arges and Prahova counties. Recently there have been two large projects including a substantial element of foreign funds: the Carpathian Large Carnivore Project and the Life Project "Enhancement of Piatra Craiului National Park". These projects aim at proving the value of the presence of large carnivores in the area.
Slovakia: A considerable body of knowledge has been accumulated in Slovakia on wolf distribution, biometry (craniometry, body measures) and feeding ecology. Since 1995, information on wolf spatial requirements has been gathered using radiotelemetry.
Ukraine: The ecology of the Ukrainian Carpathians wolf has been investigated fairly thoroughly. There is also some information available on distribution, number, habitats, diet, and behavior of this species. Monitoring of the wolf population is carried out only in the national parks (Carpathian, Synevyr, Uzhanska Dolina, Skolivski Beskydy, Horhany, Vyzhnytsya) and the Carpathian Biosphere Reserve.

Conflicts with humans

Czech Republic: The greatest conflict between wolves, hunters and farmers took place in the years 1994-97, when 60 sheep were killed. In 1999 only 10 sheep were killed. In the absence of a damage compensation law in the Czech Republic, compensation is not paid.
Hungary: The rare occurrences cause conflicts but these are mainly based on emotion. The wolf has the worst image among hunters and farmers. Damage has been reported to game (red and roe deer, moufflons), but this is not significant. The state (the Ministry of Environment Conservation) has to pay compensation for proven damage.
Poland: Generally, hunters and wildlife managers have a negative attitude towards wolves, blaming them for killing too much game, especially red deer and wild boar. Farmers are also not favourably inclined towards the species, because wolves cause damage to livestock, mainly sheep. Compensation is paid by the regional nature conservation authorities. In 1999, about 12500 USD were paid, mainly for sheep killed.

Romania: Between 1990 and 1999 there were 7 wolf/ human accidents. Each time the wolf was acting in self-defence. Theoretically, the owner of the hunting rights and the Wildlife Department from the Ministry of Waters Forest and Environment Protection are responsible for damage but only when the owner can prove that he had taken preventative measures to avoid the damage. In practice there are very few cases when compensation is paid after a court decision.
Slovakia: Wolf/human conflicts should be considered for two groups, hunters and farmers. The main prey species for wolves are red deer, wild boar and roe deer. There is no reliable data on losses caused by wolves on these three ungulate species. Sheep are the most vulnerable livestock at camps on summer ranges from April to November. Young cattle are rarely taken by wolves on summer ranges. In general, wolf predation on livestock is not very serious problem. However, wolves can cause severe damage at unprotected sheep camps. There is no compensation system for damage caused by wolves to livestock. As a result, shepherds do not report losses caused by wolves on domestic animals.
Ukraine: Wolves often attack domestic animals, but there is no possibility of getting information about the scale of the damage. There is no compensation.

Main threats

Czech Republic: Poaching, unfavorable changes in hunting system (too small hunting grounds, lack of modern hunting law and damage compensation law), uncontrolled hunting on the Slovakian border.
Hungary: The practice of intensive game management works against the large carnivores. A high level of poaching can be expected. Leading game managers are prepared to accept the natural resettlement and protection of wolves. They are attempting to force the local hunters to tolerate the presence of wolves and to choose a legal solution to conflicts (eg compensation). Practical methods of achieving an objective estimate of damage and the compensation have not yet been worked out. Other threats are the fragmentation of the wolves' habitat, resulting from intensive forestry work and road construction, and human disturbance deep in the forests resulting from increasing tourism and recreational activities.
Poland: The survival of the species in Poland is not threatened. There is some poaching (illegal hunting and using snares), which in some locations may influence local wolf numbers.
Romania: Potential threats are represented by poaching, changes to habitat as a result of the privatisation of the forests and building of roads, and changes in hunting as a result of the new system of renting the hunting rights. The decrease in the number and area of clear-felling in places populated by wolves, and the promotion of tree species which shade the forest floor, have reduced the food supply for deer and wild boar, the main prey of wolves.
Slovakia: The major threats arise from hunting and poaching. In general terms, wolves are killed by hunters as well as by illegal gun owners at every opportunity. Moreover, many conservationists are hunters, and hunt wolves even within the national parks. Wolves are hunted and persecuted all over the country including protected areas. Hunting is banned only in National Nature Reserves, which are just small patches of the country irrelevant for the conservation of the wolf or other carnivores. Both the west and south-west of Slovakia, and the plain of eastern Slovakia, are too densely populated and altered by humans to provide a suitable habitat for the wolf.
Ukraine: This species is not seriously threatened in Ukrainian Carpathians.

Public attitudes and NGO/State involvement

Czech Republic: See brown bear.

Hungary: NGOs have no significant activities. The local hunters and farmers are against the resettlement of the wolf.
Poland: Generally, hunters oppose full protection of wolves; they blame wolves for the decrease in ungulate numbers to an unacceptable level. Because they are well organized, this point of view is put forward frequently both in their journals and in regular newspapers. The majority of farmers who have experienced wolf damage are also opposed to wolf recovery. However, in the public view, the wolf has become a symbol of nature conservation and several NGOs fight for its protection. The most important are: Stowarzyszenie dla Natury „Wilk" and Pracownia na Rzecz Wszystkich Istot.
Slovakia: There are two NGOs concerned with wolves: the Wolf Forest Protection Movement and the Carpathian Wildlife Society. The latter has a project entitled: "Conservation of Large Carnivores and Protection of Livestock in Slovakia" The aim of this project is to improve livestock protection using a local Slovak breed of a livestock guard dog called "Slovensky cuvac".
Ukraine: In the Carpathian region of Ukraine, the public attitude to the wolf is negative because of damage to domestic animals and game. Shepherds and hunters raise questions about intensifying the fight against this species.
Romania: There are some governmental institutions involved in wolf management: ie the Ministry of Waters, Forests and Environmental Protection, National Forest Administration, and Forest Research and Management Institute. Shepherds and hunters are against the presence of wolves.

Gaps in knowledge, legislation and management

Czech Republic: Lack of a new hunting law and damage compensation law.
Hungary: A national conservation action plan is being worked out. In addition, a National Biodiversity Monitoring System is being constructed and the wolf issue is included in the planned system. Country-wide questionnaire surveys should be conducted more regularly. The regular field monitoring of occurrence and the investigation of habitat use and movement would be useful. Migrations across the Slovakian border have special importance and international collaboration should be obligatory within such study.
Poland: Research focused on wolf numbers and population dynamics is necessary. A monitoring system should be worked out. There is an urgent need to improve a compensation system and to introduce effective measures of livestock protection.
Romania: Research is needed regarding basic ecological parameters, such as densities, growth, survival rate, sex ratio, age structure, fertility and mortality rate, food, teritorialism, habitat relationship, community interaction and seasonal movements. There is a need to assess the accuracy of the existing monitoring system and to develop a national wolf management plan.
Slovakia: Educational programs and public relations improving the wolf image may be the best way of mitigating human pressure on the wolf population. Research should be focused on spacing activity, landscape use, population dynamics and predator-prey relations including livestock protection.
Ukraine: Lack of basic knowledge on the wolf (actual number, population structure, migrations, interactions with humans). Foreign funds are needed to start such a research programme.

Summary

In general terms, the overall protection status of the wolf in the Carpathian region is not satisfactory. The species is strictly protected in countries where only a few individuals or

medium size population occur. In countries with larger number of wolves (Romania, Slovakia) these predators are intensively hunted, and the hunting season may be very long (more than 5 months in Romania). In the Ukraine, wolves are hunted all year round, in spite of the fact that the wolf number there is not particularly high. An official estimate of the whole Carpathian wolf population is about 5500 individuals. This is probably a substantial overestimate; the national experts put the figure at only about 3900 wolves. Only in the Ukraine is the official number considered an underestimate. The general trend in numbers in the region is increasing or stable, with a slight decrease reported only in Slovakia (see Table 2). Potential threats to the wolf across the Carpathians are overhunting, poaching, the decrease in natural prey populations, unfavorable changes in hunting systems (too small hunting grounds, lack of modern hunting law), absent or ineffective compensation laws, and lack of cooperation in management between neighboring countries.

Table 2. Official and expert assessment of wolf numbers, and population trends in various countries of the Carpathian region.

Country	Official number in 1998	Expert judgement of the actual number and/or the accuracy of official number	Population trend in 1990-1999
Czech Republic	No official number	15	Increasing
Hungary	No official data	10-15	Increasing
Poland	550	Considerably overestimated, probably about 250 individuals	Increasing
Romania	3510	Overestimated up to 20%	Increase
Slovakia	1079	Heavily overestimated, probably about 300-450 individuals	Slight decrease
Ukraine	353	Underestimated	Stable

3. The Eurasian Lynx (Lynx lynx)

Legal status

Czech Republic: A protected game species. According to Ministry of Agriculture hunting legislation it is a game species which can be hunted from 1 January to 29 February. However lynx hunting requires a special permit from the Ministry of Environment. Because the species is protected it is not possible to obtain such a permit.

Hungary: The lynx has been totally protected in Hungary since 1988. There have been no legal killings since than.
Poland: Strictly protected species.
Romania: In accordance with law no. 103/1996, the lynx is a game species. Hunting is permitted between 15 September and 31 March. Between 10 and 20 lynxes were hunted legally annually over the last 5 years.
Slovakia: Game species. There is controversy about the legislation. According to the Slovak Ministry of Environment, the lynx is protected all year round (Decree N. 93/1999). According to the Slovak Ministry of Agriculture there is an open season for lynx from 16 September to 28 February (Decree N. 172/1975). According to statistics from the Slovak Ministry of Agriculture, numbers of lynxes killed by hunting were as follows: 1994 – 44, 1995 – 67, 1996 – 25, 1997 – 37, 1998 – 22. Figures for 1996-98 are lower than actual number of lynx killed, because the lack of clarity in legal terms resulted in the failure to report all the lynx hunted.
Ukraine: Protected species included into the Red Data Book of Ukraine. Hunting is prohibited.

Distribution

Czech Republic: The species is found only in two locations in the eastern part of the country: close to the Slovakian and Polish border (the area of Moravskoslezske Beskidy) and along the Slovakian border (south of Zlin).
Hungary: According to the data provided by questionnaire surveys in 1997 permanent and sporadic occurrences were reported from different parts of the Börzsöny and Mátra Mountains; there were sporadic occurrences near Aggtelek in the Zemplén Mountains, where cubs were found. The permanent occurrences were not confirmed in 1998.
Poland: The species is recorded over a relatively wide forested part of the Carpathians.
Romania: Commonly found over all Carpathians.
Slovakia: Species widespread over all Carpathian range.
Ukraine: Continuous distribution over all Ukrainian Carpathians.

Habitat

Czech Republic: Mixed mountain forest.
Hungary: No data.
Poland: Larger forest complexes, deciduous, mixed and coniferous with abundant natural prey (mainly roe deer and red deer). Lynx may penetrate more fragmented forests, closer to human settlements searching for prey in period of prey decline.
Romania: The lynx habitat is located mainly in forested hills and mountains, between 600m and 1800 m. The lynx inhabits all those territories where it can found food and shelter against persecution. This means the large forests in the Carpathian Mountains where access is still very difficult and natural prey still exist. Their habitat extends from alpine areas up to 2500m, in chamois territory, to the deciduous forests of the Carpathian foothills where they find more roe dear.
Slovakia: Heights range from 150 to 2054 m, with an optimum of 800 to 1000 m. Most frequent habitat: fir-beech vegetation zone (700-900 m), beech vegetation zone (500-700 m) and spruce-fir-beech vegetation zone (900-1200 m). In beech-oak or oak zone or above the timberline (alpine meadows and cliffs more than 1500 m) the lynx occurs only transitionally.
Ukraine: In the Ukrainian Carpathians the most typical lynx habitats are mature and over mature beech, fir and spruce forests with large numbers of wind-felled trees. The lynx uses these as shelter, together with holes in the rocks, sometimes natural underground caves, hollows, and heaps of dry branches. In the past this species inhabited the lowland forests as

well, but over the last 150 year its range has been reduced more than 3 times. Lynx habitats in the Ukrainian Carpathians reach an elevation of 1850 m.

Population status

Czech Republic: According to questionnaires answered by the Environmental Offices of District Administration, the Czech Hunting Association, and the Administration of the Beskydy Landscape Protected Area, there are probably 10-15 individuals. The main methods of estimating numbers are direct observation, footprints or other traces, remains of prey, and snowtracking attempts. The official estimates are probably correct. The number of animals observed during last 10 years is stable.
Hungary: No official numbers. Expert opinion is that there may be 15 –20 individuals. Numbers are fluctuating wildly.
Poland: Official numbers (about 250 individuals) are not reliable and overestimate lynx numbers. The main method of calculation is snow-tracking supported by "year-round observations". On the basis of a research project based on radiotelemetry, it is assumed that the number of lynxes is less than 150 individuals. There has been a sharp decline in numbers over the last 10 years.
Romania: Lynx numbers are the highest in the Carpathians. Official estimates are as follows: 1995 - 1740, 1996 – 1900, 1997 -1940, 1998 – 1970, 1999 - 1950.
The method of estimating the official number is by counting tracks of the lynxes in wintertime. Data is collected at county level and separately for the owners of hunting rights (i.e. forest administration and hunting associations) Even if they have accurate information about the presence of the lynx in their hunting territory some double counting occurs. It is assumed that there is an overestimate of up to 30%, but there is no data to prove this. In recent years the lynx population has increased, being estimated now at almost 2000 individuals.
Slovakia: Official lynx numbers compiled by the Slovak Ministry of Agriculture are as follows: 1995 – 768, 1996 – 969, 1997 – 950, 1998 – 865, 1999 – 1004. All hunting areas in Slovakia report on lynx numbers until the end of March. No special method is used for estimating lynx numbers, and the very imprecise estimate is based on year-round observations. The official numbers are overestimated by approx. 50 %. According to local experts, the actual lynx number is about 400-500 individuals or even less.
Ukraine: In recent years official estimates on lynx numbers have been incomplete, since some regions did not make reports. Data from all regions is available only for 1997 (295 animals) and 1998 (314 animals). Most lynx are reported for the Zakarpatska and Ivano-Frankivska regions. Data is mainly obtained by questioning the forest guards. However the quality of the forest guards is very low nowadays, and as a result this method as applied to the lynx gives lower numbers than actually exist. Over the last decade, lynx numbers in the Ukrainian Carpathians have been more or less stable with no significant fluctuations. In the last few years food supplies for the lynx have improved as small game increased in the absence of pesticides and fertilizers in agriculture.

Knowledge of the species

Czech Republic: there is a special lynx research program (distribution, population density, food composition, radiotracking). A new 4-year project "Management optimization of big game in the Czech Republic" was scheduled for January 2000.
Hungary: Almost no research, except the regular, countrywide questionnaire surveys by the Department of Wildlife Biology and Game Management of Szent István University and snow tracking in the Zemplén mountains.

Poland: Few attempts to study diet and impact on prey populations. Since 1998, data on space use, based on radiotelemetry, has been gathered as part of a project by the Institute of Nature Conservation.
Romania: There is a diet, territory size, body size and health study. Since 1994, a telemetry study has been proceeding in the area of Brasov, Arges and Prahova. There are two projects: the Carpathian Large Carnivore Project and the Life Project "Enhancement of Piatra Craiului National Park" which aim to prove the value of the presence of large carnivores in the area.
Slovakia: Research on distribution, numbers and population density, feeding ecology, impact on ungulate populations, craniometry, ethology. There are reintroduction programs to other European countries (Slovak lynx were used for reintroduction in Slovenia, Italy, France, Switzerland, Austria, Germany and Czech Republic).
Ukraine: The ecology of Ukrainian Carpathians lynx is not well investigated. Only limited information about the distribution, number, habitats, food and behavior of this species is available. Monitoring of the lynx population is carried out only in the national parks (Carpathian, Synevyr, Uzhanska Dolina, Skolivski Beskydy, Horhany, Vyzhnytsya) and the Carpathian Biosphere Reserve.

Conflicts with humans

Czech Republic: There are no conflicts in the Carpathians, but there is some conflict in the other habitat in the Czech Republic, in the Šumava Mountains.
Hungary: In spite of the rare occurrences several conflicts have been reported. Damage was detected to game (roe deer and moufflon *Ovis ammon*), but this was not significant. The state (the Ministry of Environment Conservation) must pay compensation for any proven damages.
Poland: No conflict.
Romania: Between 1990 and 1999 there were 6 known lynx /human accidents. On four of these occasions the lynxes were acting in self-defence. In practice there is no lynx damage to livestock and no compensation has been paid. Theoretically the owner of the hunting rights has to pay for damages.
Slovakia: In general the lynx does not come into conflict with humans. Recently lynx and wolf have been blamed for endemic chamois (*Rupicapra rupicapra tatrica*) population decline in the Tatry National Park. However, there has been no research on this problem.
Ukraine: Annually in the Ukrainian Carpathians lynx kill about 250-350 young roe deer and 180-250 young wild boar and other game. Although this is not major damage, hunters take the view that the numbers of lynx should be lower than 120. Conflicts with people and domestic animals are unknown.

Major threats

Czech Republic: Poaching, and changes in the hunting system (too small hunting grounds, lack of modern hunting law).
Hungary: The practice of intensive game management acts against the large carnivores. A high level of poaching must be assumed. Leading game managers are prepared to accept the natural resettlement and protection of lynxes. They are attempting to force the local hunters to tolerate the presence of lynxes and to choose a legal solution to conflicts (eg compensation). Practical methods of achieving an objective estimate of damages and compensation have not yet been worked out. Other threats are the fragmentation of the lynxes' habitat, resulting from

intensive forestry works and road construction, and human disturbance deep in the forests resulting from increasing tourism and recreation activities.
Poland: The decrease of natural prey populations (mainly roe deer) due to overhunting and severe winter conditions. Poaching (targeted mainly on ungulates) also has a considerable negative effect on the lynx population.
Romania: Potential threats are represented by poaching of lynxes and roe deer, changes to habitat as a result of the privatisation of the forests and building of roads, and changes in hunting as a result of the new system of renting the hunting rights. The decrease in the number and area of clear felling in lynx habitats, and the promotion of tree species which shade the forest floor, have reduced the food supply for deer species, the main prey of the lynx. Overgrazing of the alpine meadows has reduced the food base and number of chamois (*Rupicapra rupicapra*).
Slovakia: Currently in Slovakia, the most important threats to lynx population are over hunting and poaching. The main reason of this is the lack of clarity in legislation mentioned above. Lynx should be considered as the most endangered species of large carnivore in Slovakia.
Ukraine: The main threat for the lynx in the Ukrainian Carpathians is habitat changes (felling of old forests) and poaching.

Public attitudes and NGO/State involvement

Czech Republic: See brown bear.
Hungary: NGOs have no significant activities with the exception of the Hungarian WWF, who have issued pamphlets to explain the real status, habits and value the lynxes to local people. The local hunters and farmers are against the resettlement of lynxes.
Poland: Practically no activities of NGOs are focused on the species.
Romania: The Forest Research and Management Institute, National Forest Administration, and
Ministry of Waters, Forests and Environmental Protection are involved in lynx management.
Hunters are mainly against the presence of the lynxes, claiming losses in deer population.
Slovakia: None of the registered NGOs in Slovakia pay special attention to lynx. The most concerned group of people are hunters, who are lobbying for open season for hunting the lynx.
Ukraine: In the Carpathian region of Ukraine the public attitude to the lynx is one of indifference because of the relatively low numbers. Hardly anyone discusses either intensifying conservation measures on behalf of the lynx or opposing them. This is probably because of the very low level of public awareness about the status of this species in the region.

Gaps in knowledge, legislation and management

Czech Republic: New hunting law and damage compensation legislation is required. The Ministry of Agriculture and Ministry of Environment are working on this.
Hungary: A national conservation action plan is being drawn up. In addition, a National Biodiversity Monitoring System being worked out and the lynx issue is included in the planned system. Country-wide questionnaire surveys should be conducted more regularly. The regular field monitoring of occurrence and investigation of habitat use and movement

would be useful. Migrations across the Slovakian border have special importance and international collaboration should be obligatory within such a study.
Poland: Studies should be carried out on space use patterns, population numbers and dynamics, demographical parameters, the genetic identity of the Carpathian lynx, impact on prey populations, and relationships with wolves.
Romania: Research is required regarding basic ecological parameters, such as densities, growth, survival rate, sex ratio, age structure, fertility and mortality rate, food, territorialism, habitat relationship, community interaction and seasonal movements. There is a need to assess the accuracy of the existing monitoring system and to develop a national management plan for the lynx.
Slovakia: Free ranging lynx have never been studied in Slovakia. Therefore all questions related to field research (movements, landscape use, habitat suitability, census methods etc.) and genetics should be studied. To improve lynx protection, harmonization of hunting and conservation legislation should be priority. A ban on hunting within the national parks of Slovakia should improve conservation of all large carnivore species.
Ukraine: There is a lack of basic knowledge on the lynx (actual number, population structure, migrations, interactions with humans). Foreign funds are needed to start such a research programme.

Summary

Generally, the overall protection status of the lynx in the Carpathian region appears to be quite satisfactory: the species is strictly protected in four countries and is hunted only in Romania and Slovakia. However, the national experts' assessments indicate that the lynx should be considered the most vulnerable species of large carnivore in the region. In countries with legal killing, the hunting season is very long (5-6 months). An official estimate of the whole Carpathian lynx population is about 3400 individuals. This is probably a substantial overestimate; national experts calculate there are only about 2400 lynxes. Only in the Ukraine is the official number considered an underestimate. The general trend in numbers in the region is decreasing or stable, with an increase in numbers reported only in Romania (see Table 3). Major threats for the lynx across the Carpathians are overhunting, poaching, decreasing populations of natural prey (especially roe deer and chamois), and unfavourable changes in hunting systems (too small hunting grounds, lack of modern hunting law).

Table 3. Official and expert assessment of lynx numbers, and population trends in various countries of the Carpathian region.

Country	Official number in 1998	Expert judgement of the actual number and/or the accuracy of official number	Population trend in 1990-1999
Czech Republic	No official number	10-15	Stable
Hungary	No official data	15-20	Heavy fluctuations

Poland	250	Considerably overestimated, probably less than 150 individuals	Sharp decrease
Romania	1970	Overestimated up to 30%	Increase
Slovakia	865	Heavily overestimated (by 50%), probably about 400-500 individuals	Decrease
Ukraine	314	Underestimated	Stable

4. The Otter (Lutra lutra)

Legal status

Czech Republic: A protected game species. According to Ministry of Agriculture hunting law the otter is a game species which can be hunted all year. However otter hunting requires a special permit from the Ministry of Environment. Because the species is protected it is not possible to obtain such a permit.
Hungary: The otter has been totally protected in Hungary since 1974. The Authority of Nature Conservation may give permission for live trapping and relocation of species, if

serious damage is reported and proved especially on fish ponds. Six permits were given in the last five years and five animals were captured and alive and relocated.
Poland: Strictly protected species. In commercial fish ponds it can be live-trapped and removed out of area with the permission of regional nature conservation authority.
Romania: In accordance with law no. 103/1996, the otter is a protected species. Up to 1996, between 10 and 20 otters were legally hunted annually.
Slovakia: Game species protected all year round since 1975 (Decree N. 172/1975).
Reported mortality (according to hunting statistics of the Slovak Ministry of Agriculture): 1995 – 7, 1997 – 4, 1998 – 5.
Ukraine: Protected species included into the Red Data Book of Ukraine. Hunting is prohibited.

Distribution

Czech Republic: The occurrence of the species is recorded only in one location close to the Polish border (east of the town of Frydek-Mistek).
Hungary: According to data from questionnaire surveys in 1997 and 1998, permanent occurrences were reported from 13 different parts of the Carpathian region and more sporadic occurrences were detected in similar locations. It is assumed that otters also occur in other areas where there are no reports of sightings. Typical locations are valleys among the hills, along small streams and rivers, and in lakes, especially artificial fish ponds.
Poland: The species is widely distributed in the Carpathians. On the basis of the national field survey, its presence was found in nearly all UTM squares there.
Romania: Common in all clean water rivers over the Carpathian range.
Slovakia: Species widespread over all Carpathian range. The most important core areas are the following catchments areas of rivers: the upper Kysuca, Orava, the upper Vah, Poprad, Dunajec, the upper Ondava, the Topla, some tributaries of the Uh, the upper Hron, the Hnilec, the Ipel and the Slana.
Ukraine: Species found in practically all rivers, mainly in their deeper parts.

Habitat

Czech Republic: Mountain rivers, dams with clear water.
Hungary: No detailed data from the region.
Poland: Rivers, lakes, ponds, and even small mountain streams. Well vegetated river banks are preferred, while polluted waters are avoided. Fish supply is an important factor, however the species is also found in locations where it mainly preys on amphibians, insects, and crustaceae.
Romania: Otter habitats are located mainly in unpolluted rivers, with enough food, throughout the Carpathian range.
Slovakia: Clear larger foothill rivers and mountain streams and their tributaries with permanent water and sufficient food supply in northern and north-eastern Slovakia.
Ukraine: The most typical otter habitats are the banks of the rivers in the deciduous, mixed and coniferous forests beside settlements. Otter prefers the parts of the rivers with depths of more than 1-1.5 m and with clay and steep banks, at heights of up to 900-1200 m.

Population numbers

Czech Republic: 20 animals, according to winter tracking efforts organized by the Administration of the Beskydy Landscape Protected Area. The number of animals has shown a decreasing trend during the last 10 years.

Hungary: No official numbers. It cannot exceed 100 specimen in our opinion. Numbers are relatively stable.
Poland: Neither numbers nor density for localities in the Carpathians have been established.
Romania: There is no continuous set of data for recent years. Official numbers are available as follows: 1991 – 1550 otters, 1992 – 1440, 1993 – 1610, 1994 – 1630, and 1998 – 2470. The method of estimating the official number is by counting tracks of the otters in wintertime. Since the otter is no longer a game species, the interest in estimating the population has decreased substantially and the 1998 estimate is just an approximation. There is no realistic data for numbers in the Carpathians for the last 5 years.
Slovakia: Official otter numbers compiled by the Slovak Ministry of Agriculture are as follows: 1995 – 157 otters, 1996 – 325, 1997 – 170, 1998 – 139, 1999 – 245. The official numbers can not be considered reliable. The Slovak Environmental Agency started long-term monitoring of otter distribution and numbers in 1989. So far only some of the river catchments are well documented. Otters were counted in winter on fresh snow and the individual home range was estimated at 7-19 km of shore line. Otter distribution has not changed significantly for 20 years.
Ukraine: Data is not available for all regions and years. There is no data from the Zakarpatska region. For the other 3 regions, official statistics are complete only for 1997 (393 otters), and for 1998 (677 otters). Average density of for the otter is about 1 animal per 10-15 km of shore line. The method of census used for obtaining this data was mainly through questioning the forest guards. Applied to otters this method gives satisfactory results but not all locations with otters are covered by the census. For the last decade, otter numbers in the Ukrainian Carpathians were more or less stable and even began to rise. The main reason for this was the decrease in water pollution owing to the lack of pesticides and fertilizers in agricultural enterprises. Food supplies for the otter therefore improved.

Knowledge of the species

Czech Republic: No special reasearch programme.
Hungary: Occurrences are monitored by countrywide questionnaire surveys by the Department of Wildlife Biology and Game Management of Szent István University, Gödöllő, Hungary and personal interviews made by the Foundation for Otters.
Poland: Good information on distribution throughout the country and some data on diet in various localities.
Romania: Very low level of knowledge.
Slovakia: Information on distribution, otter tissue and fish tissue contamination by pollutants (heavy metals, PCB, DDT, HCH etc.), the reasons of otter mortality, feeding ecology, habitat use.
Ukraine: The ecology of otter is quite poorly investigated. Only limited information is available on the distribution, number, habitats, food and behavior of this species. Monitoring of the otter population is carried out only in the national parks (Carpathian, Synevyr, Uzhanska Dolina, Skolivski Beskydy, Horhany, Vyzhnytsya) and the Carpathian Biosphere Reserve.

Conflicts with humans

Czech Republic: No conflict has been recorded to date.
Hungary: When present, otters causes conflict in fish ponds. There is no accurate figure for damage. The state (the Ministry of Environment Conservation) has to pay compensation for any proven damages.

Poland: There is some conflict on commercial trout ponds, but its extent has not been determined. There is no compensation for damage by otters.
Romania: There is no data about conflicts between otter and man. The only complaints about damage are sometimes made by trout fish-farms in the Carpathian area. Owners usually take their own measures to protect their farms (illegally kill otters).
Slovakia: Otters cause local damage to fish ponds. As a result, they are sometimes killed by fisherman. There is no central evidence about damage and no compensation system.
Ukraine: Otters cause some damage in fish ponds. There is no data on the scale of damage, but it is probably small.

Main threats

Czech Republic: Poaching, changes in hunting system, absence of modern hunting law, habitat changes (water quality, food supply).
Hungary: The major threats are the illegal killings, mainly in fish ponds (three cases are known about in the last five years and one fur was confiscated), and traffic accidents (five road accidents and two injuries by motor boat).
Poland: Some illegal killing occurs, mainly in trout ponds. There is, however, no data on mortality factors in otters.
Romania: Potential and actual threats are represented by the poaching of otter during musk rat hunting, illegal killing in fish farms, and habitat modification as a result of water pollution and the destruction of vegetation on banks.
Slovakia: The main cause of mortality is road traffic (more than 40%), and other factors are poaching and killing by dogs. Another threat is the shrinking of suitable habitats due to water pollution and lack of food supply.
Ukraine: Habitat changes (mainly water pollution) and poaching.

Public attitudes and NGO/State involvement

Czech Republic: See brown bear.
Hungary: The Foundation for Otters, mentioned above, is quite active in this area. The Foundation has issued pamphlets about the otter with the support of the Ministry of Environment Conservation.
Poland: The species attracts little attention from the public. There is no NGO activity focused on otter. Only the owners of trout ponds are more aware of the presence and problems caused by the species.
Romania: The Forest Research and Management Institute has made some studies about diet and distribution. The Ministry of Waters, Forests and Environmental Protection is theoretically responsible for otter management and protection.
Slovakia: There are specialists dealing with otter monitoring and research employed by the Slovak Environmental Agency mentioned above. This is government institution under the umbrella of the Slovak Ministry of Environment which also funds otter research in Slovakia. National projects are connected to the European Ecological Network - EECONET. Currently we are not aware of any NGOs focused on otter conservation.
Ukraine: In the Carpathian region of the Ukraine the public attitude to otter is one of indifference because of the relatively low numbers. Apart from some fishpond owners, hardly anyone discusses either strengthening otter conservation measures or opposing them.

Gaps in knowledge, legislation and management

Czech Republic: New hunting law, damage compensation law.

Hungary: Country-wide questionnaire surveys should be conducted more regularly. Regular field monitoring of occurrence and investigation of habitat use and movement would be useful. The National Biodiversity Monitoring System is being developed and these tasks are included.
Poland: Studies on spatial requirements, numbers, population dynamics, and impact on commercial trout industry are needed. Measures to limit access of otters to fish ponds should be introduced.
Romania: Research is required on basic ecological parameters, such as densities, growth, survival rate, sex ratio, age structure, fertility and mortality rate, food, teritorialism, habitat relationship, community interaction and seasonal movements. There is a need to assess the accuracy of the existing monitoring system and to develop a national management plan.
Slovakia: There is a need to complete a survey of otter distribution and to conduct regular population estimates every 5-7 years. Technical measures to decrease mortality should be undertaken, eg to construct barriers to prevent otter access to fish breeding ponds and to build over- and under- passes on roads. Studies on habitat use by radio-tracking, feeding ecology, and effect of environment contamination should be started or continued.
Ukraine: Lack of basic knowledge on the lynx (actual number, population structure, migrations, interaction with humans). There is a need for foreign funds to start such a research programme.

Summary

Generally, in the Carpathian region the overall protection status of the otter is very good. The species is strictly protected in all countries, and only animals causing damage in fish ponds may be removed by live trapping and relocation. Otters are widespread over the whole Carpathian range, and are common in all unpolluted rivers and streams. Very little is known about otter numbers. The official estimate for the whole Carpathian population of the species is about 3400 individuals. However, these figures are considered a rough approximation rather than a reliable estimate. For Poland, where the otter is common, no estimation of numbers exists at all. For this reason, actual otter numbers are probably much higher than officially reported. The general trend in numbers in the region is stable or increasing; only in the Czech Republic is a decrease reported. (see Table 4). Major possible threats for the otter across the Carpathians are illegal killing (mainly in fish ponds), poaching, traffic accidents, deterioration of habitat (water pollution, decrease in food supply, regulation of river banks, destruction of river bank vegetation), and the absence of modern hunting law.

Table 4. Official and expert assessment of otter numbers, and population trends in various countries of the Carpathian region.

Country	Official number in 1998	Expert judgement of the actual number and/or the accuracy of official number	Population trend in 1990-1999
Czech Republic	No official number	20	Decrease
Hungary	No official data	Up to 100	Stable
Poland	No official data	Common species, no reliable assessment of number	Increase
Romania	2470	Not reliable number	No reliable data, probably stable or even increase

Slovakia	139	Not reliable	Stable
Ukraine	677	Underestimated	Stable or even increase

CONCLUSIONS

- Pan-Carpathian populations of brown bear, wolf, lynx, and otter still exist in considerable numbers. However, there is a great difference in density in the countries included in the present assessment. Generally, Romania and Slovakia harbour the largest populations, Poland and Ukraine have medium sized populations, while the Czech Republic and Hungary have the smallest number of individuals.
- Among those carnivores assessed, the brown bear and wolf are the most numerous, while lynxes occur in smaller numbers. Otters are common in all countries but their numbers are unknown.
- Official data on the number of carnivores is inaccurate: it is likely that the actual number of large carnivores is considerably overestimated, while otter numbers are basically unknown.
- The legal status of all four species is generally favourable; they are mostly fully protected or, if hunted, there is a set hunting season and quotas. Brown bears are hunted only in Romania and Slovakia, wolves in Romania, Slovakia and Ukraine, and lynxes in Romania and Slovakia. Only one species, the wolf, is hunted all year round (in Ukraine).

- Legislation is not clear in all countries. For example, in Slovakia, there is a controversy about legislation in respect of the lynx (the same problem affected the wolf in 1995-98). According to the Ministry of Environment the species is protected, while the Ministry of Agriculture maintain the lynx may be hunted.
- There is no regional co-ordination of management policy regarding large carnivores. The same population of a species can be fully protected in one country, and simultaneously heavily hunted in a neighboring country.
- The level of knowledge on carnivores is very different in the countries involved. Generally, there have been few studies where numbers of a species are small. In countries where large populations exist, there is a lack of research focused on spatial requirements, population dynamics, and impact on prey populations.
- Poaching is an important factor in the mortality of carnivores, eg in the Ukrainian Carpathians, poachers killed about 800 brown bears during the last 8 years.
- Important threats for carnivore conservation in some countries are recent changes in hunting systems (too small size of hunting units), unfovourable attitude of hunters and wildlife managers, and low levels of law enforcement.

RECOMMENDATIONS

- The Carpathian countries share the same populations of large carnivores. For this reason management policy should be coordinated on a regional level and between neighbouring countries. Ideally, a Pan-Carpathian Conservation Agreement on Large Carnivores should be created.
- Controversies over legislation regarding carnivores should be clarified within particular countries.
- Proposed changes in national hunting laws should take into consideration the needs of proper conservation of carnivores.
- National management plans for carnivores should be developed according to guidelines worked out by the Large Carnivore Initiative for Europe and adopted by the Bern Convention. National plans should be discussed and, ideally, coordinated with neighbouring countries.
- Population dynamics of large carnivores should be monitored.
- There is a need to work out and apply more accurate methods of estimating carnivore numbers. Only accurate methods can provide a basis for the reliable management of the species.

- Compensation systems should be developed and applied to mitigate conflicts with local human populations.
- The existence of large carnivores should be integrated with local (rural) development, eg. ecotourism.
- Additional funds should be secured to start basic research projects on ecology and population dynamics of carnivores. Priority in funding should be allocated to transboundary projects.
- Education programmes for gaining public acceptance by various target groups (livestock owners, hunters, game managers) should be started.

APPENDIX 1

Relevant contacts – Institutions and People

Czech Republic

Institute of Vertebrate Biology, Květná 8, 603 65 Brno, Czech Republic. (Petr Koubek, Jaroslav Červený)

Administration of the Beskydy Lanscape Protected Area, Nádražní 36, 756 61 Rožnov pod Radhoštěm, Czech Republic. (Dana Bartošová)

Administration of the Šumava National Park, 341 92 Kašperské Hory, Czech Republic. (Luděk Bufka)

Czech Agency of the Nature Conservation, Department of Fauna Protection, Pavlov 54, 584 01 Ledeč nad Sázavou, Czech Republic. (Aleš Toman)

Hungary

Ministry of Environment Conservation, Authority of Nature Conservation, Költő str. 21, Budapest, H-1121, Hungary. (Katalin Rodics)

Ministry of Agriculture and Country Development

Szent István University, Department of Wildlife Biology and Game Management Páter K. str, 1., Gödöllő H-2103, Hungary (László Szemethy, Miklós Heltai)

Foundation for Otters, Nyírpalota str. 60. Budapest, H-1156, Hungary.
WWF Hungary, 1124 Budapest Nemetvolgyi u. 78/b, Hungary
Gábor Firmánszki, Harsányi str. 10, Abaújszántó, H-3881, Hungary. (The person conducting snow tracking in the Zemplén mountains)

Poland

Institute of Nature Conservation, Polish Academy of Sciences, Lubicz 46, 31-512 Cracow, Poland. (Zbigniew Jakubiec, Henryk Okarma, Wojciech Śmietana)
Jagiellonian University, Department of Wildlife Research, Ingardena 6, 30-060 Cracow, Poland. (Bogusław Bobek).
Ministry of Environment, Department of Forestry, Protection of Natural Resources and Landscape, Wawelska 52/54, 02-067 Warszawa, Poland
Polish Hunting Association, Main Headquarters, Nowy Świat, Warsaw, Poland.
Pracownia na Rzecz Wszystkich Istot, Krasińskiego 5, 43-304 Bielsko-Biała, Poland.
Stowarzyszenie dla Natury „Wilk", ul. Górska 69, 43-376 Godziszka, Poland.

Romania

Institutul de Cercetari si Amenajari Silvice, Closca 13, 2200 Brasov, Romania. (Georgeta Ionescu, Ovidiu Ionescu, Avram Sandor, Minca Mugurel, George Predoiu)
Universitatea Transilvania, Facultatea de Silvicultura si Exploatari Forestiere. Sirul Beethoven nr. 1, 2200 Brasov, Romania. (Aurel Negrutiu, Dan Iordache)
Regia Nationala a Padurilor / Directia Silvica Miercurea Ciuc. (Ion Micu)
Regia Nationala a Padurilor / Directia Silvica Pitesti. (Mitica Georgescu)

Slovakia

Forest Research Institute, Masaryka 22, 960 92 Zvolen, Slovakia. (Pavel Hell)
Technical University, Faculty of Forestry, Masaryka 24, 960 Zvolen, Slovakia. (Josef Sládek)
Slovak Environmental Agency, Center for Nature and Landscape Protection, Lazovná 10, P.O. Box 5, 974 01 Banská Bystrica, Slovakia. (Martin Kassa)
The National Parks Headquarter of the Slovak Republic, Hodžova 11, 031 01 Liptovsky Mikuláš, Slovakia.
Carpathian Wildlife Society, Tulská 29, 960 01 Zvolen, Slovakia. (Slavomir Findo)
"Wolf" Forest Protection Movement, 082 13 Tulčik 27, Slovakia.
Zoological Garden, 972 01 Bojnice, Slovakia. (Eva Gregorová)
Otter contacts:
Kadlečík J., SAZP Správa CHKO Veĺká Fatra, Čachovsky rad 7, 038 61 Vrútky, Slovakia
Urban P., SAZP – COPK, Lazovná 10, 974 01 Banská Bystrica, Slovakia

APPENDIX II
Important Publications

1. BROWN BEAR

Hungary

Faragó, S. 1993. Large carnivores re-settling in the Hungarian fauna: Will there be room for them? Proceedings of the XXI IUGB Congress, Halifax, Canada: 257-264.

Poland

Buchalczyk T., Jakubiec Z. 1992. Niedźwiedź brunatny *Ursus arctos* (Linne, 1758). In: Z. Głowaciński, ed. Polska Czerwona Księga Zwierząt, PWRiL, Warszawa: 71-73. [In Polish with Englishc summary]

Frąckowiak W. 1992. The seasonal changes in the diet composition of brown bear in the Bieszczady Mountains. Proceedings of the 9th International Conference on Bear Research and Management. Grenoble: 241-248.

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Romania

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Georgescu M. 1970. Ursul si lupul in Carpati. Ed. AGVPS. Bucuresti. [In Romanian]
Ichim R. 1991. Cu privire la efectivele de urs in padurile din nordul tarii si masurile de gospodarire care se impun. Revista padurilor nr. 1. Bucuresti. [In Romanian]
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Micu I. 1993. Ursul brun din muntii Harghitei, VPR 1-2 Bucuresti. [In Romanian]
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Slovakia

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Jamnicky J. 1988. The food of the brown bear (*Ursus arctos*) in the Tatra region. Folia venatoria 18: 197-213. [In Slovak with English summary]
Janik, M. 1982. The brown bear ecology and conservation in the Western Carpathians. Vyskumne práce z ochrany prirody 4: 138-190. [In Slovak]
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Ukraine

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Slobodyan A. A. 1993. Ukraine. Bears (distribution, ecology, use and protection). Izdatelstvo "Nauka", Moscow: 67-91.
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Tatarynov K. A. 1987. Ryad khyzhi. In : Ratsional'ne vedennya myslyvs'koho hospodarstva. L'viv: Kamenyar: 59-60. [In Ukrainian]
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2. WOLF

Hungary

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Poland

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Romania

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Promberger C., Ionescu O. 1997. Carpathian Large Carnivore Project, anual Report.
Ionescu O. 1998. Large carnivores in the Romanian Carpathian. Carpathian Large Carnivore Project, annual Report: 4-23.

Slovakia

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Ukraine

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Tatarynov K. A. 1987. Ryad khyzghi. In: Ratsional'ne vedennya myslyvs'koho hospodarstva. L'viv: Kamenyar: 59-60 [In Ukrainian]
Turyanin I. I. 1975. Khutrovo-promyslovi zviri ta myslyvs'ki ptakhy Karpat. Uzghorod: Karpaty: 72-74 [In Ukrainian]

3. LYNX

Czech Republic

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Hungary

Faragó S. 1993. Large carnivores re-settling in the Hungarian fauna: Will there be room for them? Proceedings of the XXI IUGB Congress, Halifax, Canada: 257-264.
Szemethy L., Heltai M. 1996. Néhány védett emlős ragadozó faj helyzete Magyarországon 1987-1994. Vadbiológia 5: 1-17. [In Hungarian]

Poland

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Jamrozy G. 1994. Występowanie, rozmieszczenie i stan populacji ssaków łownych w Polskich Karpatach. Zeszyty Naukowe AR Kraków, Rozprawy No 190: 1-104. [In Polish]
Okarma H. 1984. The physical condition of red deer falling prey to the wolf and lynx and harvested in the Carpathian Mountains. Acta Theriologica 29: 283-290.
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Romania

Promberger C., Ionescu O. 1997. Carpathian Large Carnivore Project, annual Report.
Promberger F., Promberger C., Ionescu O. 1998. Large carnivores in the Romanian Carpathian. Carpathian Large Carnivore Project, annual Report 1998: 4-23.

Slovakia

Hell P., Sládek J. 1974. The trophy carnivores of Slovakia. Priroda, Bratislava: 1-254.

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Heráň I., Sládek J. 1970. Research of Carnivora in Czechoslovakia. Lynx, n.s. 11, Supl. 1: 1-88. [In Czech with English summary]
Chudik I. 1972. The influence of large carnivores (wolf, lynx) on ungulates (red and roe deer) in relation to damage to forests in the Tatry National Park. Čs. ochrana prirody 13: 249-267. [In Slovak with German summary]
Koubek P., Červeny J. 1996. Lynx in the Czech and Slovak Republics. Acta Sc. Nat. Brno 30 (3): 1-78. [In English. The appendix of this publication contains nearly complete relevant bibliography on lynx until 1995 from the former Czechoslovakia, as well as from Slovakia and Czech Republic after seperation in 1993].

Ukraine

Tatarynov K. A. 1956. Zviri zakhidnykh oblastey Ukrainy. Kyiv: vyd. AN URSR: 84-87. [In Ukrainian]
Tatarynov K. A. 1987. Ryad khyzghi. Ratsional'ne vedennya myslyvs'koho hospodarstva. L'viv: Kamenyar: 59-60. [In Ukrainian]
Turyanin I. I. 1966. Rys' v Karpatakh. Okhota i ochotnich'ye khozyaystvo No 7: 15. [In Russian]
Turyanin I., Koljusev I. 1968. Occurrence of the lynx in the Ukrainian Carpathians. Acta Sci. Nat. Acad. Bohemoslovenicae. V. 2. N 5-6: 236-240.
Turyanin I. I. 1975. Khutrovo-promyslovi zviri ta myslyvs'ki ptakhy Karpat. Uzghorod: Karpaty: 72-74. [In Ukrainian]
Turyanin I. I. 1988. Koshach'i Ukrainskykh Karpat. Voprosy okhrany i racyonal'nogo ispol'zovaniya rastitel'nogo I zghivotnogo mira Ukrainskikh Karpat. Uzghorod: 126-131. [In Russian]

4. OTTER

Czech Republic

Czech Agency of the Nature Conservation published bulletin „Otter" with articles containing original information in to any aspects of otter ecology in the Czech and Slovak Republics.

Hungary

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Poland

Bieniek M. M. 1992. Wydra *Lutra lutra* (Linne, 1758). In: Z. Głowaciński, ed. Polska Czerwona Księga Zwierząt, PWRiL, Warszawa: 76-77. [In Polish with English summary]
Brzeziński M., Romanowski J., Cygan P., Pabin B. 1996. Otter *Lutra lutra* distribution in Poland. Acta Theriologica 41: 113-126.
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Romania

Almasan H. si col. 1978. Dieta vidrei. Extras din Studii si cercetari de vanatoare. ICAS, Bucuresti.

Ionescu O. 1994. Otter from Danube Delta to Carpathian Mountains in Romania. Proceedings of otter symposium "Conservation of European Otter (*Lutra lutra*)", Leeuwarden , Holland: 73-78.

Slovakia

Bulletin "Vydra" (Otter) yearly published 1990-1998. Total number of issues 8. This journal contents nearly all articles on otter from Slovakia and the Czech republic.

Kadlečik L., Urban P. 1995. Preliminary draft of the action plan for conservation of the otter and its habitat in Slovakia. Bulletin Vydra 6: 6-8. [In Slovak with English summary]

Kadlečik L., Urban P. 1997. European otter (*Lutra lutra L.*) In Slovakia and its conservation. Folia venatoria 26-27: 87-105. [In Slovak with English summary]

Kožená I., Urban P., Štouračová I., Mazur I. 1992. The diet of otter Lutra lutra in the Polana protected landscape region. Folia zoologica 41: 107-122. [In English].

Polakovičová E., Urban P. 1995. Euroasian otter (*Lutra lutra* L. 1758) - its distribution and conservation in Slovakia. Selected bibliography containing 404 records and citations. [In Slovak and English].

Ukraine

Tatarynov K. A. 1956. Zviri zakhidnykh oblastey Ukrainy. Kyiv: vyd. AN URSR: 84-87. [In Ukrainian]

Tatarynov K. A. 1987. Ryad khyzghi. Ratsional'ne vedennya myslyvs'koho hospodarstva. L'viv: Kamenyar: 59-60. [In Ukrainian]

Turyanin I. I. 1975. Khutrovo-promyslovi zviri ta myslyvs'ki ptakhy Karpat. Uzghorod: Karpaty: 72-74. [In Ukrainian]