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CARPATHIAN ECOREGION INITIATIVE

INSTYTUT OCHRONY PRZYRODY PAN

Carpathian List of Endangered Species

Contributors

This Red List is the result of the work of a group of scientists from countries located in the area of the Carpathian Mountains in Central Europe. It has been technically edited by Zbigniew J. Witkowski (chief editor), Wiesław Król and Wojciech Solarz.

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Digital maps of the Carpathians were prepared by Jan Seffer and Rastislav Lasak. Databases for data gathering were designed by Wiesław Król, Paweł Adamski and Zbigniew J. Witkowski.

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About the Carpathian Ecoregion Initiative

The Carpathian Ecoregion Initiative is a unique international partnership achieving conservation of nature in the globally important Carpathian Mountains and, at the same time, supporting local economy and culture for the lasting benefit of people living in the heart of Europe. Facilitated by WWF, more than 50 organizations from seven countries are working together to make this vision a reality.

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Contents

About this Book

While the importance of the conservation of species is globally recognized, the rate of man–made extinctions and the development of new threats to species are catastrophic. In response, WWF created its list of Global 200 ecoregions which represent the world's most outstanding areas requiring targeted conservation efforts. The Carpathian Mountains, perhaps Europe's richest mountains in terms of overall biodiversity, is one such Global 200 ecoregion.

The Carpathian Ecoregion Initiative, facilitated by the WWF International Danube Carpathian Programme, has been responsible for mapping overall biodiversity in the Carpathian ecoregion, as a first step in its targeted conservation efforts. Following initial analyses, the editors of this publication concluded that existing red lists and red books do cover parts of the Carpathians, but that no red list or book covers the entire Carpathian ecoregion as a whole. This publication is therefore an initial response to filling in that gap and constitutes the second step in the data analysis process of the Carpathian Ecoregion Initiative (CEI), following its earlier work on sectoral syntheses (Witkowski et al. 2000, Turnock 2001) and the report on "The Status of the Carpathians" (Webster et al. 2001).

The ultimate goal of this document is not only the presentation of a list of threatened plants, animals and plant alliances in the Carpathians, but also the popularisation of general knowledge about this region throughout Europe.

Part I of the publication begins with an introduction about the importance of species conservation, especially in mountain systems. It then defines red lists and red books, their origins and the need for a new comprehensive Carpathian List Of Endangered Species. The methodology used in compiling this Carpathian List Of Endangered Species is then explained, as are guidelines on how to understand the data presented.

Part II opens with a set of conclusions that summarize the overall results taken from the six separate chapters on species groups that follow.

The publication ends with additional information about the objectives and work of both the Carpathian Ecoregion Initiative and WWF.

PART I
Introduction

Species Conservation, Mountains and the Carpathians

The conservation of species, particularly those in danger of extinction, forms one of the basic elements of biodiversity conservation. As early as the 1980s, this principle of the preservation of genetic diversity was established as the foundation for the practice of conservation through the World Conservation Strategy, prepared jointly by IUCN, WWF and UNEP.

The lifespan of a species is not unlimited. Over a period of millions of years, species either become extinct in the ever–changing environment or develop into new distinctive forms. It is assumed that in natural conditions at least one species per year becomes extinct for purely natural reasons (Shaffer 1990). This situation has rapidly changed today, with people altering the biosphere and pushing an uncountable number of species to the verge of extinction.

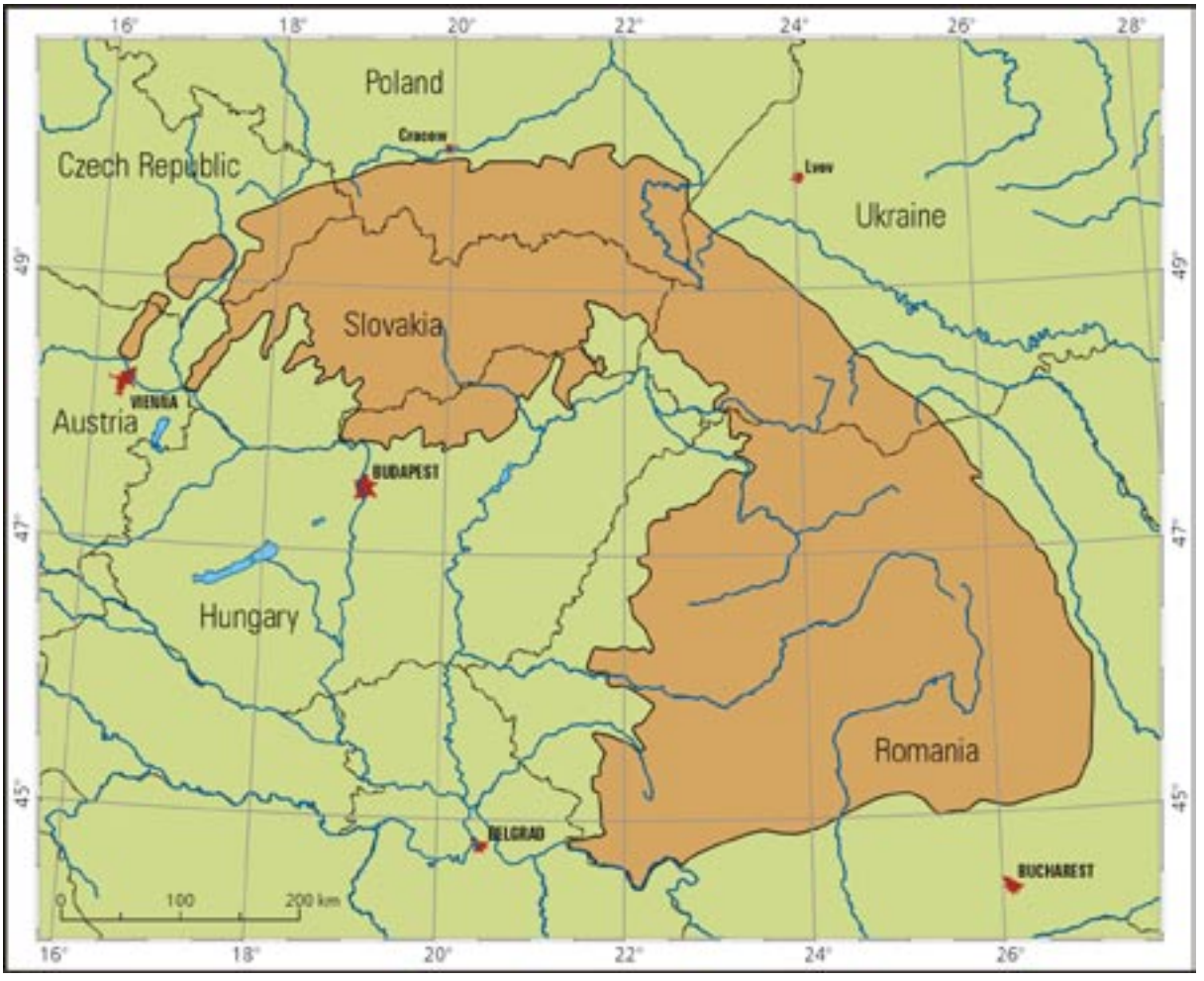
The rate of man–made extinctions is high enough to be called catastrophic. Every year, tens of thousands of species are disappearing from our planet (May 1999) and the intensity of the extinction process is as high as the mass extinctions known from paleobiological records (Sepkoski 1992). Bearing in mind that we have so far described less than 2 million species globally — only a 10% to 15% fraction of total world species diversity — the majority of extinct forms are not known and never will be known to science.

Progress in ecology and related sciences, including conservation biology, has proven that mountain areas are of particular value for human beings. These ecosystems are key sources and reservoirs of freshwater. The specific micro– and meso–climates of mountain areas play an important role in diminishing the global greenhouse effect (Cernuska et al. 1999). Vast complexes of mountain forests are vital for the timber production industry. Moreover, in the past several decades, mountains have become the main areas for the rapid development of tourism and recreation. First and foremost, however, mountains host a unique variety of species, many of which are rare, vulnerable or threatened. All over the world, mountains are the sites of continental or regional species diversity hot spots.

These were among the main reasons why WWF (World Wide Fund for Nature) identified montane forests and grasslands as ecosystems with global biodiversity importance in its Global 200 initiative (Dinerstein et al. 2000). The Carpathians are included in this list of global biodiversity hot spots as one of the world's key Palaearctic montane ecoregions (Webster et al. 2001).

Covering an area of approximately 206,000 square km, the Carpathians are one of Europe's largest mountain ranges (fig. 1). Owing to its relatively intact habitats and particularly extensive forest complexes, the Carpathians are one of Europe's most valuable refuges of primeval forest fauna. This is possibly the last place in Europe where all "big game" species can be found. Moreover, Carpathian populations of brown bear, wolf and lynx, numbered in the thousands, are the largest montane populations of these species in Europe (Witkowski 1998).

Fig. 1. General location of the Carpathians.



At the same time, Carpathian elevations are rather moderate, with less than 1% of the area exceeding 2,000 metres above sea level. Small, scattered areas of alpine landscape and vast areas of primeval forests distinguish the Carpathians from other mountain ranges in Europe. One consequence of these specific bio-geographical characteristics is

that the alpine flora and fauna of the Carpathians are restricted to small, patchy, and to a large extent, isolated areas scattered throughout the whole massif (Mirek, Piękoś–Mirkowa 1992, Tasenkevich 1997, Witkowski 1998). As a result, despite a considerable number of endemic species that only occur here, the diversity of high-mountain flora and fauna in the Carpathians is rather poor in comparison with other large European mountains.

Why a Carpathian List of Endangered Species?

This Carpathian List of Endangered Species is based upon the concept of a Red book of species which was forged in the early 1960s as a reaction to the urgent need of gathering, assessing and popularising information about the most threatened plant and animal species on Earth. The leading role was taken by the Survival Service Commission (currently the Species Survival Commission — SSC) of the International Union for Conservation of Nature and Natural Resources/World Conservation Union (IUCN). Early efforts resulted in the preparation and publication of red books on globally threatened mammals (Simon 1966) and birds (Vincent 1966).

In the following decades, a considerable number of red books and red lists were published. While red books contain in–depth analyses of species status, distribution, factors of decline and conservation measures, data published in red lists are usually restricted to a concise presentation of species distribution and status. At the same time, because red lists cover whole taxa, they include more species than do red books.

More recently, red lists and red books have been drawn up for geographic areas at different spatial scales: worldwide, continental, regional, country and local. For example, the Species Survival Commission of IUCN at Cambridge prepares red data books for species that are threatened globally or at the continental scale. At the other end of the spectrum are red lists and red books focusing on specific areas within one nation, defined either according to political or ecoregional (biome) divisions (e.g. Czylok et al. 1996, Kricfalusy et al. 1999, Parusel et al. 1996).

National and regional approaches operate on an intermediate scale, covering areas of one or more countries. The nation–based approach is far more widespread than the region–based approach: while country red lists and books have been developed in a considerable number of nations, regional initiatives covering many countries, such as this List of Endangered Species, are few and far between (e.g. Ingelog et al. 1993, Voloscuk 1996).

In the Carpathian countries, several red lists and red books of plants and animals have been developed. However, in these lists which cover separate countries (Austria, Czech Republic, Romania, Poland, Slovakia, Ukraine and Hungary), the Carpathians were included either as a part of a country's territory (Čeřovský et al. 1999, Dihoru, Dihoru 1994, Głowaciński 1992, Głowaciński 1993, Maglocký, Feráková 1993, Niklfeld 1999, Oltean et al. 1994, Rakonczay 1989, Shelag–Sosonko 1996, Sytnyk 1980, Zarzycki, Kaźmierczakowa 1993, Zarzycki, Szeląg 1992), or only a part of the range was covered (e.g. Kricsfalusy et al. 1999).

The only list where the Carpathians are considered as a whole, irrespective of political borders, is the *Red data book, Lists of threatened plants and animals of the Carpathian*

National Parks and reserves (Voloscuk ed. 1996). This list (in fact lists) includes the vascular plants and vertebrates of 17 national parks in the Carpathians. Along with threatened and rare species, the list also includes relatively common ones.

In conclusion, as a result of the analysis of the existing data, it was determined that there is a gap in knowledge about the pan–Carpathian status of threatened plant and animal species. This publication is an attempt to fill this gap.

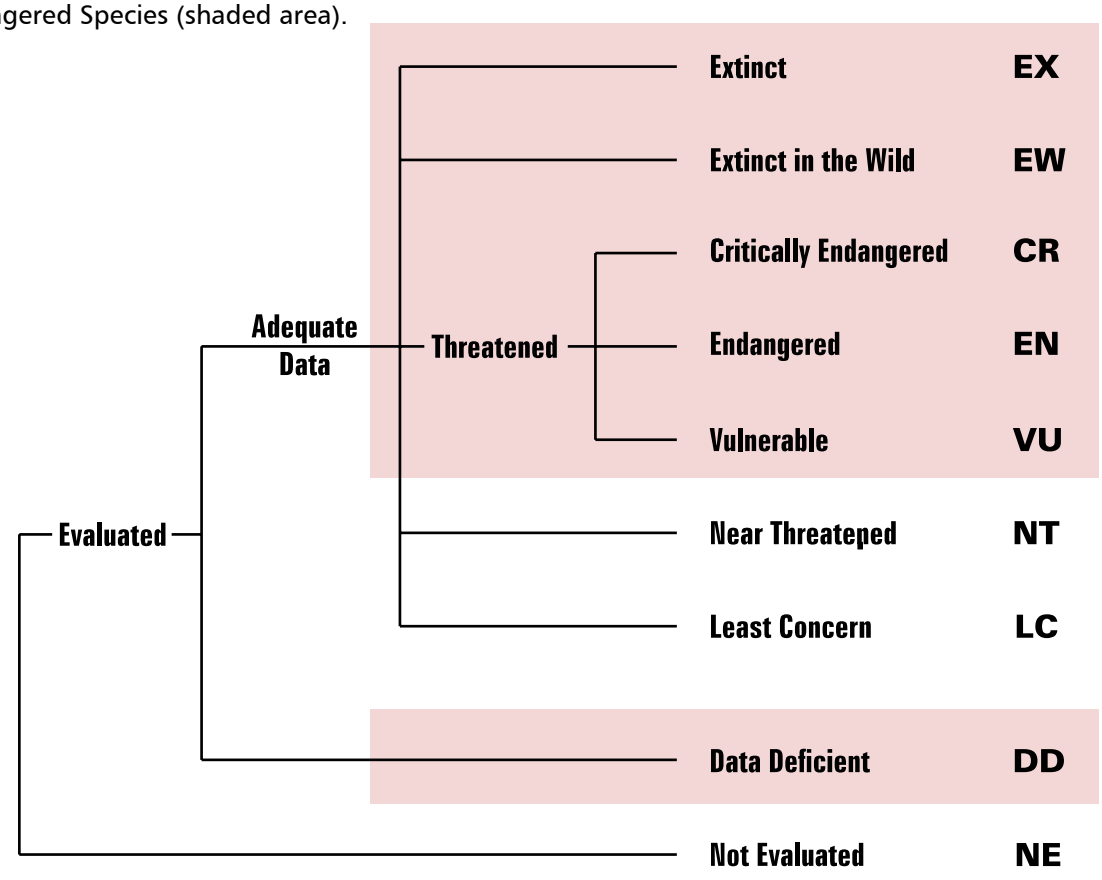
Methodology Used

Several authors participated in the data gathering process for the plant and animal species in this Carpathian List of Endangered Species. In order to make the data more consistent, a database was designed and species were selected according to unified criteria. The key criteria for choosing species for the Carpathian List of Endangered Species was based on the IUCN classification scheme for threatened species (IUCN 1994, 2001).

Categories of Threat and Protection Status

The authors assessed the status of species for the whole of the Carpathians using "categories of threats" in countries available from existing country red lists and red books. As a result, this Carpathian List of Endangered Species comprises species for which the category of threat in the whole region (see fig. 2) was estimated to be one of the following: Extinct (EX); Extinct in the Wild (EW); Critically Endangered (CR); Endangered (EN); or Vulnerable (VU).

Fig. 2. Categories of threat according to IUCN (IUCN 1994, 2001) used in this Carpathian List of Endangered Species (shaded area).



Additional criteria applied when choosing species categories included whether the species was: Arctic/Alpine; Listed in the Bern Convention; Listed in the European Union's Bird Directive or Habitat Directive; A large proportion of the European population of a species situated in the Carpathians; Endemic to the Carpathians; High mountain; or Relic species.

On the basis of lists of protected and hunted species in the Carpathian countries, data on the protection status of species was also collected. Although land protection can be regarded as an additional form of species conservation, it is not covered in this List.

Species and Physiographic Units

The presentation of species distribution is a vital part of any list or book of endangered species. In order to present the distribution of Carpathian endangered species, it was necessary to use a consistent method for dividing the extensive mountain range into units.

The only available division that covered the whole region was elaborated by Kondracki (1978). The division is hierarchical and each unit is given a unique digital code. There are eight large units (sub–provinces): Outer Western Carpathians, Central Western Carpathians, Inner Western Carpathians, Outer Eastern Carpathians, Inner Eastern Carpathians, Southern Carpathians, Bihoru Mountains, and Transsilvanian Upland. These are delineated on the grounds of general geological, relief, hydro–graphical and bio–geographical characteristics. Sub–provinces are in turn divided into small units (mesoregions). Altogether, there are 186 mesoregions in the Carpathians. In addition to the criteria applied for the delineation of sub–provinces, mesoregions were delineated on the basis of geographic location, details of the relief, lithology, and in some cases, anthropogenic alternations as well.

Carpathian Region = 8 Sub–provinces = 186 Mesoregions

In order to present a map of the division units, the original 1:2,000,000 map of the Carpathians (Kamiński 1993) was wrapped to the Gauss–Kruger zone 34 projection system. Afterwards, on the basis of regional maps of orographical units, correction was carried out for Romania, Slovak Republic, Czech Republic and Hungary (Mazúr and Lukniš 1980, Posea and Badea 1984, Demek et al. 1987, Pécsi et al. 1989).

Limitations of the Methodology

Despite the efforts made to unify the work, some differences in interpretation between the authors became apparent as the work progressed. Discrepancies in the state of knowledge between separate taxa partly account for this fact. For instance, it was impossible to present species distribution consistently, invertebrates being a good example. There were also some differences in the selection of criteria of species between vertebrates, invertebrates and vascular plants. In the case of Arctic/Alpine and high mountain species, some authors used a broader approach, at times including boreal–montane species.

Regarding categories of "protection" status, these turned out to be too simplified, since potentially exploited species can at the same time be protected. For example, local or state authorities can decide to suspend or restrict exploitation of some threatened spe-

cies under hunting law. This in practice may lead to the protection of all or part of a population of species, temporarily or permanently.

The list covering vegetation taxa (plant alliances) is relatively more consistent than other lists in this publication because it was elaborated by only one author. It must be emphasized that the development of a complete Carpathian List of Endangered Species, for plant communities was not a goal of this project. The philosophy here was to have an overview about communities occurring within the Carpathians and to select the top 20 communities. The plant alliances section of this book differs thoroughly from the plant and animal species chapters. For example, the evaluation of plant alliances was done on the grounds of the occurrence of endemic vascular plant species. The selection was based on the endemism of communities and the high proportion of endemic vascular plants within communities.

How to Use This book

The Carpathian List of Endangered Species is divided into the following chapters:

1. Vascular Plants
2. Mammals
3. Birds
4. Reptiles and Amphibians
5. Fishes and Lampreys
6. Invertebrates
7. Plant Alliances

Each chapter begins with a textual explanation, followed by two sets of data tables:

1. Species Category of Threat and Protection Status
2. Species and Physiographic Units

To facilitate the use of this Carpathian List of Endangered Species, species of vascular plants within one class and vertebrates within one phylum are listed in alphabetical order (according to scientific name), irrespective of their exact systematic position.

The presentation of the data for plant and vertebrate species (chapters 1 to 5) differs considerably from that for invertebrates and plant alliances (chapters 6 and 7). Invertebrate distribution can be attributed only to countries, not to mesoregions (as with vascular plants and vertebrates). Furthermore, plant alliances are not strictly related to species lists; specific differences are explained below in descriptions to the tables.

Tables on Species Category of Threat and Protection Status

Tables for vascular plants and vertebrates include the following information (see Sample Table 1 below):

1. Category of Threat for Entire Carpathians and for Separate Carpathian Countries
   - EX – Extinct
   - EW – Extinct in the Wild
   - CR – Critically Endangered

- EN – Endangered
- VU – Vulnerable
- DD – Data Deficient
- + – species present but not threatened

2. Protection of Species in Carpathian Countries
   - SP – Strict protection
   - PP – Partial protection
   - E – Exploitation
   - NP – No Protection

3. Rationale for Including Species in the Carpathian List of Endangered Species
   - Arctic/Alpine species
   - Included in Bern Convention
   - Included in Bird Directive (in case of birds)
   - Carpathians hold large proportion of world population
   - Endemic
   - Included in Habitat Directive
   - High mountain species
   - Relic

Sample Table 1: Table on Species Category of Threat and Protection Status.

Species	Category of Threat for Entire Carpathians	Category of Threat in Carpathian Countries							Protection in Carpathian Countries							Arctic/Alpine	Bern Convention	Carpathian hold large proportion of world population	Endemic	Habitat Directive	High Mountain Species	Relic
		A	CZ	H	PL	RO	SK	UA	A	CZ	H	PL	RO	SK	UA							
Large Carnivores																						
Canis lupus Linnaeus, 1758	VU	EX	CR	CR	VU	VU	VU	VU		SP	SP	SP	E	PP	SP		+	+		+		
Felis sylvestris Schreber, 1777	EN		CR	VU	CR	VU	VU	VU			PP	SP		SP			+	+		+		
Lutra lutra (Linnaeus, 1758)	VU		CR	EN	VU	VU	VU	VU		SP	SP	SP	SP	SP	SP		+	+				

Tables on Species and Physiographic Units

Species distribution is presented in the form of a code list of physiographic units (mesoregions) in which the species is present (see the sample table below). To make the species distribution concise, ranges of mesoregion codes were used in some cases: for example, "513.43-513.54" means that a species is present in all units in this range (513.43, 513.44, 513.45 etc.). The full list of unit names and codes is given on the back of the map of the entire Carpathian Mountains, inserted at the back of this Carpathian List of Endangered Species. All codes have also been mapped onto this map.

Sample Table 2: Table on Species and Physiographic Units

Species	Physiographic Units
Large Carnivores	
Canis lupus Linnaeus, 1758	513.412, 513.43-45, 513.48-49, 513.51-52, 513.54-57, 513.65, 513.71-72, 514.9, 514.11-12, 514.14, 514.33-34, 514.43, 514.51-53, 514.62-64, 514.71-74, 514.84-85, 515.11-14, 515.23-29, 516.2, 516.4a, 517.1, 522, 523.1-2, 523.31, 523.41-42, 523.44-47, 523.51-54, 523.56, 523.61-66, 523.71-73, 524.1-2, 524.4-6, 525, 526, 531.4, 531.11-17, 531.21-25, 531.31-33, 531.35-37, 532.1-2, 533, 541.1, 541.3-4, 542.1, 542.21-22, 542.31-34, 542.41, 542.43
Felis sylvestris Schreber, 1777	513.412, 513.55-57, 513.64-65, 513.72, 514.9, 514.14, 514.33-34, 514.42-43, 514.51-53, 514.62-64, 514.71-74, 514.81-85, 515, 516, 517, 522, 523, 524, 525, 526, 531, 532, 533, 541, 542
Lutra lutra (Linnaeus, 1758)	513.31, 513.34, 513.411-412, 513.45-49, 513.51-57, 513.61-65, 513.67-69, 513.71-72, 514, 515, 516, 517, 522, 523, 524, 525, 526, 531, 532, 533, 541, 542

As with plants and vertebrates, the exact systematic order of invertebrates was not followed in the tables. Invertebrates within one phylum are listed in alphabetical order according to scientific name.

Due to a scarcity of data on invertebrates, it was impossible to avoid the following inconsistencies between data on invertebrates and data on plant and vertebrate sections:

1. There is no data on "Category of Threat" in Austria.

2. Data on the "Protection" of species is presented only for Poland, Slovakia and the Czech Republic.

3. Presentation of species distribution in physiographic units was not possible. A rough estimation of species distribution can be done on the basis of "Categories of Threat" in the countries.

Data on plant alliances is restricted to distribution in the countries. Additionally, the list of endemic plant species and the list of the 20 most precious alliances are presented.

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PART II

Conclusions and Species Groups Analyses

Overall assessment of threat

A number of conclusions can be reached in assessing the data that has been compiled in this Carpathian List of Endangered Species. Table 1 below presents the number of species in each taxon classified according to categories of threat, according to data from the database. It can be seen that the majority of species fall into three categories: vulnerable, endangered or critically endangered.

Table 1. Numbers of species in each category of threat. EX — extinct; EW — extinct in the wild; CR — critically endangered; EN — endangered; VU — vulnerable; DD — data deficient.

Systematic group	EX	EW	CR	EN	VU	DD
Vascular plants*	13	1	39	135	155	1
Mammals	2	—	2	12	44	—
Birds	—	—	7	11	11	—
Reptiles and Amphibians	—	—	1	6	7	3
Fishes and Lampreys	2	—	3	14	11	—
Invertebrates **	—	—	74	125	141	—
Total	**17**	**1**	**126**	**303**	**369**	**4**

*including species and subspecies
**CR/EN Pan-Carpathian status of invertebrates was classified as CR; and EN/VU status as EN

While this table shows that extinct species are far less frequently represented than in existing Carpathian country red lists and books, one should not conclude that extinction processes do not occur in the Carpathians. Extinctions certainly do take place, as

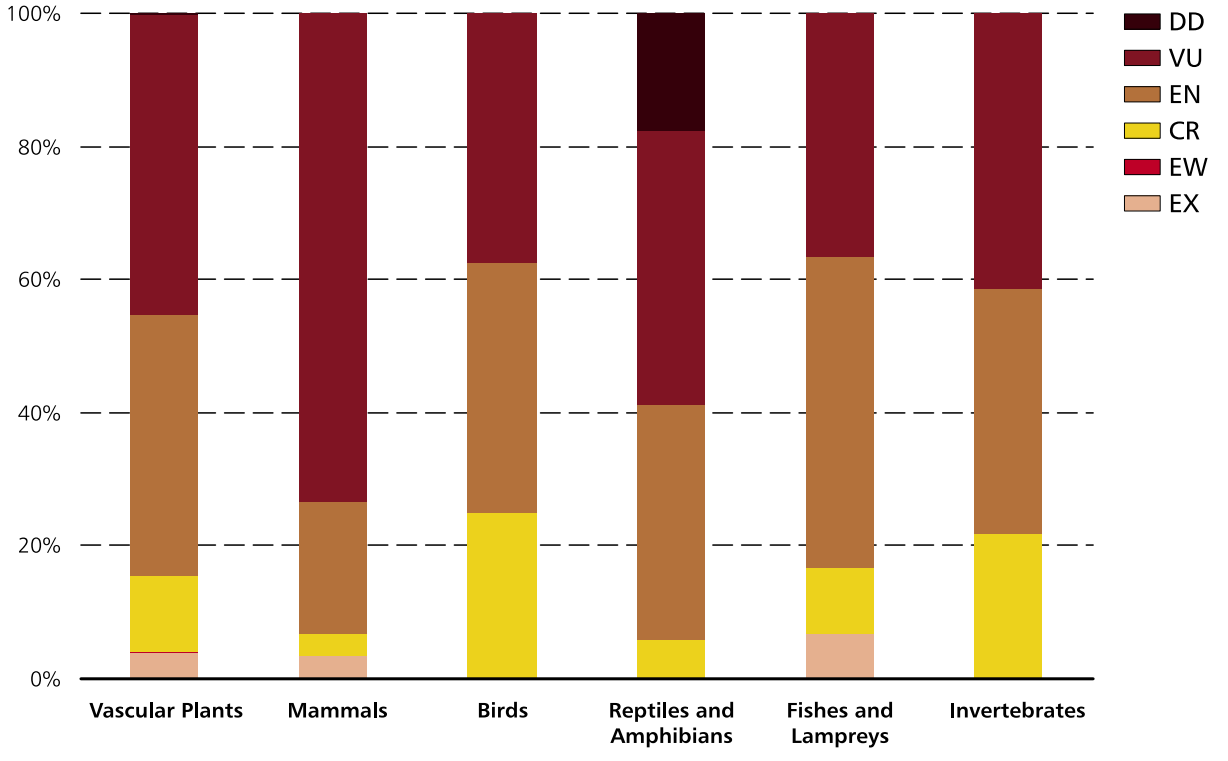
they do in other areas, but in the Carpathians only a small fraction may be detected due to the fact that no monitoring system has been developed for the whole ecoregion, except for vascular plants (Tasenkevych 1998) and bats (Wołoszyn, Bahsta 2001). It may be assumed, therefore, that in the case of groups for which data was relatively scarce in the Carpathians (e.g. invertebrates), actual numbers of extinct, and extinct in the wild, species are higher than those in the table.

Extinction processes in the past have been poorly monitored across the planet. This Carpathian List of Endangered Species could only use local data related to changes to the flora and fauna of some regions. Therefore, the final extirpation of populations can only be estimated based on red data books for particular Carpathian countries or from the repeated monitoring of species. The process of data collection on extinctions used here was not standardized, as such data was very limited in space and time.

Overall assessments of threat

Fig. 3 presents the percentage of species in taxonomic groups in different categories of threat. Generally, vulnerable (VU) species account for 45% of all species; endangered species (EN), for approximately 37%; and critically endangered (CR) — for more than 15% of species. The fraction of critically endangered species in the Carpathians is particularly high among invertebrates (21.8%). Vertebrates as a whole are the least threatened group, while birds are the most threatened among vertebrates. Mammals are the least threatened group of vertebrates, with as many as 73.3% of species classified as vulnerable.

Fig 3. Percentage of species in taxonomic groups in different categories of threat; explanations as in Table 1.



Comparisons with other lists

These results are concordant with results obtained in other national and regional lists, pointing to the fact that, in the Carpathian ecoregion, flora and fauna are threatened as in other areas in Europe.

Out of approximately 3,988 native and archaeophyte vascular plants recorded in the Carpathians (Tasenkevych 1998), 344 — or 9% of Carpathian flora — were classified as endangered, on the verge of extinction, or extinct. In comparison, a total of 40% of European flora species is estimated to be threatened (Lucas and Walters 1976, Kornaś 1982). This European evaluation, however, also included species classified as of rare or lower risk, and these groups were not covered in this Carpathian List of Endangered Species. At the same time, one can observe that, in the Carpathians, the process of flora degradation is less intensive than in the majority of the European biomes.

More informative is a comparison of the results in this Carpathian List of Endangered Species with results obtained in the two red lists of the Carpathian countries of Poland and Slovakia (Zarzycki and Wojewoda 1986). Here, if only the species which fall into the five categories of threat included in this Carpathian List of Endangered Species are considered, then the threat to Carpathian flora appears to be similar or even higher than that in these two countries. However, one has to bear in mind that any general conclusions drawn on the basis of simple comparisons of the Carpathian List of Endangered Species, Polish and Slovakian red lists may be misleading because the lists differ in terms of methodology of data gathering and analysis, as well as in different spatial coverage.

While threat status of the Carpathian mammals and reptiles in this Carpathian List of Endangered Species are concordant with results obtained in the red lists of different European countries (Głowaciński 1992, Nowak et al. 1994, Rassi, Vaisanen 1987), birds and fishes in the Carpathians appear to be less threatened compared to their status in each Carpathian country even though these two groups are the most threatened among the Carpathian vertebrates (Fig. 3).

In the case of birds, the result can easily be explained by the fact that waterfowl and waders, which are among the most threatened groups of birds throughout Europe, do not find favourable breeding habitats in the Carpathians. Fishes of the region have been better preserved than in rivers outside of the region due to the fact that Carpathian rivers still constitute one of the major reservoirs of clean waters in central Europe.

A regional approach, similar to the one followed here, was also applied in the Red Data Book of the Baltic Region (Ingelog et al. 1993). Among the Carpathian countries, only Poland is included in this book, and as it focuses on marine and lowland vascular plants and vertebrates, any comparison with the Carpathian List of Endangered Species is irrelevant.

Comparison with the only other Carpathian list

As noted in the Introduction, this Carpathian List of Endangered Species is the second attempt ever to cover the whole Carpathian ecoregion. The first list, however, dealt exclusively with vascular plants and vertebrates recorded in 17 national parks of the

Carpathians (Voloscuk ed. 1996). Moreover, species in the list are selected according to seven categories of threat (IUCN 1994); apart from Extinct (Ex), Endangered (En) and Vulnerable (Vu) species, Rare (R), Care demanding (Cd), Indeterminate (I) and Present (Pr) species are also listed. Therefore non-threatened species constitute a substantial part of that list. As a result, the number of vascular species and vertebrates in the Voloscuk list significantly exceeds that included in this list. Altogether, the Voloscuk list comprises 1,163 species and subspecies of vascular plants, 85 species of mammals, 236 species of birds, 15 species of reptiles, 17 species of amphibians and 59 species of fishes and lampreys (see Table 2 below).

Table 2. Numbers of vascular plants and vertebrates in the "Red Data Book" (Voloscuk ed. 1996) compared with those in this Carpathian List of Endangered Species. I — total number of species in Voloscuk's list; II — number of species in Voloscuk's lists, classified at least in 1 national park as EX, E(EN); or V; III — number of species in the present list (only EX, EW, CR, EN, and VU species are included in the list).

	I	II	III
Vascular Plants (taxa)	**1163**	**500**	**344**
Vertebrates	**412**	**206**	**136**
Mammals	85	59	60
Birds	236	100	29
Reptiles and Amphibians	32	26	17
Fishes and Lampreys	59	21	30

A comparison of the two lists allows for a solid conclusion if threatened species alone from the Voloscuk list are considered (table 2, column II), whereupon a significant concordance of the results becomes apparent. Differences, however, stem from two reasons. One is that the Voloscuk list of vascular plants includes subspecies, while this List is restricted almost exclusively to species; the result is that there are more vascular plant taxa in the Voloscuk list (compare columns II and III in table 2).

The other source of difference is that the Voloscuk list and this List were based on different methodologies. The Voloscuk list is restricted to flora and fauna in national parks, and does not try to determine the Pan–Carpathian status of species made in this Carpathian List of Endangered Species. Therefore, column II in Table 2 represents a total number of species which, at least in one national park (out of 17 analysed by Voloscuk), were classified as extinct, endangered or vulnerable, while column III lists only species threatened on the Pan–Carpathian level. Some of the species in the Voloscuk list were by no means threatened on the Pan–Carpathian level, and they were not included into our List. The result of differences in methodology applied in the Voloscuk list and this List is a statistical artifact implying that, generally, there are more threatened species in the Voloscuk list than in this List (see columns II and III in table 2).

Overall, our results show that there are 480 plant and animal taxa and 129 plant alliances presented in this Carpathian List of Endangered Species. Carpathian biodiversity, however, is certainly far richer. It must be remembered that fungi and lower plants are

not covered in this Carpathian List of Endangered Species. Furthermore, invertebrates — a major part of biological diversity — are undoubtedly underrepresented here.

Invertebrates

While data on vascular plants and vertebrates in this Carpathian List of Endangered Species were based upon red lists and red books published in the Carpathian countries and scientific monitoring, information on invertebrates included here should be referred to as a rough assessment rather than a comprehensive source of information.

In other red lists and red books, estimates for invertebrates vary between different taxa, ranging from less than 10% to over 40% species threatened (Głowaciński ed. 1992, Rassi, Vaisanen 1987).

Available data on other organisms in the Carpathians, such as fungi, are even more incomplete, and including them into this List would be of very little use.

The future

As the body of knowledge on biodiversity in the Carpathians is relatively large, this will almost certainly result in updated red lists to be published in some countries in the near future. This is true at least for vascular plants, vertebrates and plant communities. Such lists will contribute to filling in some of the inconsistencies evident in this Carpathian List of Endangered Species.

One possible future step to continue work on biological diversity in the Carpathians is an analysis of the list of several tens of focal species, such as large carnivores or the most valuable endemic plants and invertebrates which were selected through the biodiversity assessment of the region (Witkowski et al. 2000). Another opportunity is the development of an assessment, following the concept of a Red Book of Carpathian biodiversity which would include an in-depth analysis of population status, threats and conservation measures for focal species.

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Vascular Plants

by Lydia Tasenkevich

State of knowledge

The flora of the Carpathians have been studied by generations of Austrian, Czech, Hungarian, Polish, Romanian, Russian, Slovakian and Ukrainian botanists. These studies are summarized in a number of documents including Checklists and Keys, some of which are complete, and some of which are still in preparation (*see list below*).

List 1: Documents on the Flora of the Carpathians

- Exkursionsflora von Österreich (Adler, Oswald, Fischer 1993)
- Checklist of Non–Vascular and Vascular Plants of Slovakia (Marhold, Hindák eds. 1998)
- Flora of Romania, Vols. 1–2 (Beldie 1977–1979)
- Flora Polska (Flora Polski), Vols. 1–14 (1919–1992)
- Flora Republicae Popularis Romanicae [Flora RP (RS) Romîne], Vols. 1–13 (1952–1976)
- Flora Slovenska, Vols. 1–5 (1966–1997)
- Flora of the Ukrainian SSR [Flora Ukrains'koyi RSR], Vols. 3–12 (1950–1965)
- Key for Determination of Vascular Plants in the Ukrainian Carpathians (1977) ["Vyznachnyck roslyn Ukrains'kykh Karpat"]
- Květena Českе Republiky [Flora of the Czech Republic], Vols. 1–4 (1988–1995)
- Nová Kvìtena ÈSSR, Vols. 1–2 (Dostál 1989)
- Synopsis Systematico–Geobotanica Florae Vegetanisque Hungaricae, Vols. 1–5 (Soó 1964–1973) Vascular Plants of Poland. A Checklist (Mirek et al. 1995)

These publications, however, have been mainly concerned with the entire flora of individual countries of the Carpathian region. No data was available on the composition and quantitative structure of Carpathian flora itself, until a checklist of native vascular plant species of the Carpathians (Tasenkevich 1998) was published.

It can now be asserted that the native flora of the Carpathians is among the richest on the European continent. It is composed of 3,988 species and subspecies belonging to 131 families and 710 genera. Even if the group of inbreeding, hybrid and apomictic taxa[1] (for which their claim to the rank of species seems doubtful) are to be excluded from the count, the remaining 3,698 species and subspecies of the Carpathian native flora still make up approximately 30% of the 12,500 total for all European flora. At the same time, the ratio of the area between the Carpathians and Europe is 1:46.

The 383 species and subspecies of unquestionable taxonomic rank and 99 microspecies of genera *Alchemilla, Rubus, Sorbus* and *Hieracium* are endemic to Carpathian flora. The diversity and richness of native flora is also due to Atlantic, Central, Northern and Eastern European, Mediterranean and Asian floristic elements which meet in the Carpathians.

Red lists and red data books have been compiled in nearly all European countries with the aim of revealing the number of species in need of protection and their conservation status. In the Carpathian countries, red lists (Dihoru, Dihoru 1993, Maglocký 1983, Maglocký, Feráková 1993, Niklfeld 1999, Oltean et al. 1994, Zarzycki 1986, Zarzycki, Szeląg 1992) and Red Books (Čeřovský et al. 1999, Rakonczay 1989, Shelag–Sosonko 1996, Zarzycki, Kaźmierczakowa 1993) have also been published.

The data presented in existing red lists and red books (*see Introduction*) are concerned with the entire territories of individual countries, as are the documents listed above in List 1. An estimation of the specific threat to the flora of a specifically Carpathian area of a country has only been made in Poland (Mirek, Piękoś–Mirkowa 1992) and Ukraine (Stojko 1977, Komendar 1988).

Methods

To estimate the threat to the entire vascular flora of the Carpathians, data on the conservation status of plant species from national red lists and red books cited above and several other sources (Convention 1973, Council Directive 1992, Convention 1973) have been used in this work.

As noted in the Introduction, and according to IUCN criteria (IUCN 1994), "threatened" taxa are listed as: extinct (EX); extinct in the wild (EW); critically endangered (CR); endangered (EN); and vulnerable (VU). It should be noted that, only in the *Checklist of Slovakian Flora* (Marhold, Hindak, 1998) and in the joint *Slovak and Czech Red Book of Threatened and Rare Vascular Plants* (Čeřovský et al., 1999), were the threatened plant species evaluated according to the 1994 criteria adopted by the IUCN. In the rest of the national listings, the status category of every taxon was defined on the basis of IUCN categories introduced over 20 years ago (Lucas, Synge 1977). From those lists, only taxa listed in the extinct (EX), endangered (E) and vulnerable (V) categories have been taken into consideration in this Carpathian List of Endangered Species.

[1] This includes: 84 species of genus *Alchemilla* in the Carpathians (for which the total number of species in the Carpathians is 121); 117 species of *Rubus* from a total of 192; 22 species of *Sorbus* from a total of 33 species and subspecies; 203 species of *Hieracium* from a total of 289 species and subspecies; and 86 species of genus *Taraxacum* Weber from a total of 114 species.

It must be noted that the category of threat for a particular taxon may not be the same in different countries. In the case that a particular taxon was given a lower risk (LR), rare (R), out of danger (O) or data deficient (DD) category in a certain country's list, or even was not listed (NE) in certain countries, but was classified as EX, E (EN) or V (VU) in others, this taxon has been taken into account for inclusion in this Carpathian List of Endangered Species.

Conclusions

Of approximately 1,500 pteridophytes and flowering plants listed in national threatened and rare plant species inventories cited above, a total of 307 species and 37 subspecies have been chosen and are to be considered as threatened on the pan–Carpathian scale.

A total of 13 species have become extinct in the whole Carpathian area, and one is extinct in the wild. Among these, three taxa were Glacial relics, seven occurred only on the edge of their range in the Carpathians, two are weeds suffering in their whole range, and a further two mountain species had only one location each in the Carpathians.

The number of critically endangered (CE) taxa is very high. The 41 species and subspecies belonging to the CE category are on the verge of extinction from Carpathian flora and need particular care and urgent implementation of active protection measures in a number of cases. Most of the plants of this group have only one or a few relic sites in the Carpathians. Seven species are endemic, two are sub–endemic, 12 taxa are Glacial relics and four are older settlers in the Carpathian flora of Tertiary age. A total of 10 taxa are on the very edge of their geographical ranges, two weed species are declining archeophytes, another two are declining species of threatened wet habitats and the rest occur in xerothermic grasslands and broad–leaved forests.

A total of 135 taxa are classified as endangered (EN) and 155 species and subspecies are considered as vulnerable (VU). These alarmingly numerous groups of endangered and vulnerable species comprise, among others, 65 endemic species and subspecies, 71 relics (mainly of the Glacial period) and 76 species on the edge of their geographical range. For one species, there is insufficient data to assess their status on the regional level, so it is listed as data deficient (DD).

Altogether, amongst 344 threatened taxa of the flora of the Carpathian Mountains, 62 species and subspecies are endemic, 12 are sub-endemic, 91 are relics and 95 taxa are on the edges of their geographical range in the Carpathians (Table 3). Their eventual extinction in the Carpathians would be a great loss not only to regional Carpathian flora but also to world flora. Overall, 9.9% of native vascular plant taxa in the Carpathians are highly threatened.

This list of threatened vascular plants in the Carpathian Mountains is the first attempt to assess the conservation status of the flora of this natural geographic unit regardless of state borders. There can be no doubt that further field investigations on the populations of threatened Carpathian plants would provide new data on which to base a more specific estimation of the conservation status of threatened plant species and verify the *Carpathian Ecoregion Initiative* database.

Table 3. Groups of threatened vascular plant taxa in the Carpathians, according to criteria of their rarity and protection.

Criteria	Number of taxa
Endemics	62
Pan–Carpathian	4
West–Carpathian	28
East–Carpathian	11
South–Carpathian	6
Transsilvanian	1
Bihorian	1
West–East Carpathian	1
West–South Carpathian	2
East–Carpathian–Bihorian	1
East–South Carpathian	6
West–Carpathian–Transsilvanian	1
Sub–endemics	12
Pannonian–Carpathian	6
Alpine–Carpathian	3
Carpathian–Balcanic	3
Relics	90
Tertial	7
Glacial	71
Postglacial	12
Species on the edge of distribution	95
Bern Convention	43
Habitat Directive	13
CITES	13
Archeophytes	8
Herbal plants	2
High–montane plants	22
Hydrophytes	15
Hygrophytes	18
Xerophytes	2
Halophytes	2

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Carpathian List of Endangered Species – vascular plants (for explanations, see chapter on *How to Use This Book*)

Species	Category of Threat for Entire Carpathians	Category of Threat in Carpathian Countries							Protection in Carpathian Countries							Arctic/Alpine	Bern Convention	Carpathian hold large proportion of world population	Endemic	Habitat Directive	High Mountain Species	Relic
		A	CZ	H	PL	RO	SK	UA	A	CZ	H	PL	RO	SK	UA							
Achillea asplenifolia Vent.	EN	CR	EN	+		+	CR			PP				SP								
Achillea impatiens L.	EN					EN																+
Aconitum jacquinii Rchb.	VU					+		VU							PP				+			
Aconitum lasiocarpum (Rchb.) Gáyer	VU				+	+	EN	VU						PP	PP		+		+			
Adenophora liliifolia (L.) Besser	EN	CR		EN	+	VU	EN	VU			PP			SP								
Adonis aestivalis L.	VU	EN	EN		EN		+	VU														
Adonis flammea Jacq.	EN	CR	CR	+		+	CR						NP									
Adonis vernalis L.	VU	EN	EN				VU	EN		SP	PP		PP		E							
Aethionema saxatile (L.) R.Br.	VU					+	EN							SP								
Agrostemma githago L.	EN	CR	CR	VU	VU	+	CR	VU			PP											
Aira caryophyllea L.	EN	EN	+			+	EN															
Ajuga pyramidalis L.	EN				+	+	CR							PP								
Alchemilla plicatula Gand.	EX					EX										+						
Allium carinatum L. ssp. **pulchellum** Bonnier et Layens	VU		EN				EX				PP			SP								+
Allium zahariadii Májovský	EN					+	CR							SP					+			
Alyssum montanum L. ssp. **brymii** (Dostál) Soó	EN			VU			EN				PP			SP					+			
Alyssum montanum L. ssp. **gmelinii** (Jord.) Hegi et Em.Schmid	VU	+	+	+	+	+	EN				NP			SP								
Alyssum stribrnyi Velen.	EX					EX																
Alyssum tortuosum Will.	EN			+		VU	EN	+			NP			SP								
Anacamptis pyramidalis (L.) Rich.	EN	EN	CR	VU	EX	VU	EN	+		SP	PP			SP								
Andromeda polifolia L.	EN		+	EX	VU	+	EN	VU			NP			SP	PP	+						+
Androsace maxima L.	CR	CR	EX	VU		+	CR				PP			PP								
Androsace septentrionalis L.	EX					EX	EX															
Androsace villosa L.	VU					+	EN							SP							+	
Andryala levitomentosa (Nyár.) P.D.Sell	EN					EN											+		+			+
Anemone baldensis L.	EX					EX		+													+	
Angelica palustris (Besser) Hoffm.	VU			EN		VU					SP						+			+		+
Aphanes microcarpa (Boiss. et Reuter) Rothm.	EN		CR		EN		EX				NP											
Aquilegia transsilvanica Schur	VU					+		VU					PP		PP				+			
Arabis nova Vill.	CR						CR							SP							+	+
Arctostaphylos alpinus (L.) Spreng.	CR				+		CR							SP		+						+
Armeria maritima (Mill.) Willd. ssp. **alpina** (Willd.) P.Silva	EN				+	+	CR						SP	SP							+	
Armeria pocutica Pawl.	EN					+		EW					NP						+			
Armoracia macrocarpa (Waldst. et Kit.) Kit. ex Baumg.	EN			VU		EN					PP			SP			+					
Arnoseris minima (L.) Schweigger et Körte	EX				+	EX	EX															
Asperula neilreichii Beck	EN						EN							SP							+	
Asplenium adiantum-nigrum L.	EN	EN		VU	EX		EN	VU			PP			SP	PP							
Asplenium adulterinum Milde	VU	EN	+			+	EN	VU						SP								
Asplenium ceterach L. ssp. **bivalens** (D.E.Mey.) Greuter et Burdet	VU			VU			CR				NP			SP								
Asplenium ceterach L. ssp. **ceterach**	EX					+	EX				PP		NP									
Asplenium cuneifolium Viv.	EN	EN	+		+	+	CR	EN						SP								
Asplenium fontanum (L.) Bernh.	EX			EX			EX				PP											
Asplenium lepidum C.Presl	VU	+	+	CR		VU					PP		SP									
Astragalus alpinus L.	VU				+	+	VU							SP							+	
Astragalus australis (L.) Lam. ssp. **krajinae** Domin	VU							VU							PP				+			
Astragalus dasyanthus Pallas	VU			EN		+	+				SP											
Astragalus excapus L.	VU			VU		+	+				PP											+
Astragalus frigidus (L.) A.Gray	VU				+	+	VU							SP		+						+
Astragalus norvegicus Weber	EN				+	EX	VU							SP		+						+
Astragalus penduliflorus Lam.	VU				EN	+	EN						SP	SP							+	
Astragalus peterfii Jáv.	EN					EN							SP				+		+			
Astragalus pseudopurpureus Guşuleac	VU					VU											+		+			
Astragalus roemeri Simonk.	VU					VU							SP						+			
Astragalus vesicarius L.	EN	CR	+	VU		+	CR				PP			SP								
Aubrieta intermedia Heldr. et Orph. ex Boiss. ssp. **falcata** Ciocirlan	VU					VU															+	+
Avenula pubescens (Hudson) Dumort. ssp. **laevigata** (Schur) Holub	VU					+		VU							PP						+	
Barbarea lepuznica Nyár.	VU					VU																
Betula humilis Schrank	CR				EX	EN							SP									+
Betula nana L.	EN					VU	EX						SP									+
Botrychium lanceolatum (S.G.Gmelin) Angstr.	EX				EX											+						
Botrychium matricariifolium (Retz.) A.Braun ex W.D.J. Koch	EN	CR	+	EX	EN	+	CR	VU			PP			SP	PP		+					
Botrychium multifidum (S.G.Gmel.) Rupr.	EN		+	EN	EN	+	EN	EN			PP			SP			+					
Botrychium virginianum (L.) Swartz	EN	EN		EN		VU	EX				PP				PP							
Bromus pannonicus Kummer et Sendtner	VU	CR	+	+		+		+			PP											
Bulbocodium versicolor (Ker Gawl.) Sprengel	VU			CR		+	+				SP		SP									
Bupleurum praealtum L.	VU	CR		+		+	EN							SP								
Bupleurum rotundifolium L.	EN	CR	EN	+	EX		EN				NP			SP								
Calamagrostis stricta (Timm) Koeler	VU			EN		+					PP		PP									+
Callianthemum coriandrifolium Rchb.	VU				+	+	VU	EN					SP	SP	PP						+	
Callitriche hamulata Kütz. ex W.D.J. Koch	VU				VU																	
Camelina alyssum (Mill.) Thell.	CR				EX		EX						NP									
Campanula macrostachya Waldst. et Kit.	VU			VU		+	CR				PP			SP								
Campanula transsilvanica Schur	VU					VU												+	+			

Carpathian List Of Endangered Species

Vascular Plants

Species	Category of Threat for Entire Carpathians	Category of Threat in Carpathian Countries							Protection in Carpathian Countries							Arctic/Alpine	Bern Convention	Carpathian hold large proportion of world population	Endemic	Habitat Directive	High Mountain Species	Relic
		A	CZ	H	PL	RO	SK	UA	A	CZ	H	PL	RO	SK	UA							
Campanula xylocarpa Kovanda	EN			VU			EN				NP			SP					+			
Carex atrofusca Schkuhr	CR				+	EX	CR							SP		+						+
Carex bicolor All.	VU					+		EN							PP	+						+
Carex bohemica Schreber	VU	EN	+	EN		+	EN				PP			NP								
Carex brevicollis DC.	VU			VU		+	CR				PP			SP								
Carex buxbaumii Wahlenb.	EN	CR	CR		EN	+	EX	VU		SP	PP				SP							+
Carex chordorrhiza Ehrh.	EN	CR			VU	+	CR	VU						SP								+
Carex davalliana Sm.	VU		EN	+	VU	VU	VU	VU		SP	PP				PP							
Carex diandra Schrank	EN	CR		EN	+	+	EN	EN			PP				PP							+
Carex dioica L.	VU	EN			VU	+	EN							SP								+
Carex hallerana Asso	VU			+		+	EN				NP			SP								
Carex limosa L.	EN	CR		EX	EN	+	CR	EN			NP			SP	PP							+
Carex liparocarpos Gaudin	VU	EN	+	+		+	VU				NP			NP								
Carex parviflora Host	VU				+	+	CR							SP								
Carex pediformis C.A. Mey. ssp. **rhizodes** (Blytt.) H.Lindb.	VU	VU	+	+		+	EN	VU							PP							+
Carex praecox Schreber ssp. **curvata** (Knaf.) Kük.	VU	CR	VU		+	+	+	VU							SP							
Carex pulicaris L.	VU	CR	+																			
Carex rupestris All.	VU				+	+	CR	EN					PP	SP	SP	+						+
Carex secalina Willd. ex Wahlenb.	VU	CR	+	+		+	EN				NP						+					+
Carex stenophylla Wahlenb.	VU	EN	+	+		+	+				NP											
Carex strigosa Huds.	EN	CR	EN	VU	EN	+	VU	+			PP	PP										
Carex supina Willd. ex Wahlenb.	VU	CR	+	+		+	VU	+			NP			NP								
Centaurea badensis Tratt.	EN	VU	+	+			EN	+			NP											
Centaurium littorale (D. Turner) Gilmour	EN			+		+	CR				NP											
Cerastium uniflorum Clairv.	VU				+		VU							SP							+	+
Chimaphila umbellata (L.) W.P.C. Barton	EN		CR	EN		+	EN	EN		PP	PP			PP								+
Cicuta virosa L.	VU	CR	+	EN	VU	+	VU				PP											
Cimicifuga europaea Schipcz.	VU	EX	+	EN	+	+	+	VU			PP				SP							+
Cirsium brachycephalum Jur.	EN	CR	+	VU		VU	+				PP											
Cochlearia tatrae Borbás	VU				+		VU					SP		SP					+			
Colchicum arenarium Waldst. et Kit.	EN			VU		EN	+				SP						+		+			
Conioselinum tataricum Hoffm.	VU				+	+	VU	VU						PP	SP							+
Corispermum canescens Kit.	VU			VU		+	+				PP											
Corispermum nitidum Kit. ex Schult.	EN	CR	+	+		+	+				PP											
Coronilla emerus L.	VU			VU		+	EN				NP		SP	SP								
Corydalis capnoides (L.) Pers.	VU			+	+	+	CR	VU						SP								
Crambe tataria Sebeök	EN			EN		VU	+				SP											
Crassula aquatica (L.) Schönl.	CR				+		CR							NP								
Crepis alpestris (Jacq.) Tausch	EN				+	EX	VU	+						PP		+					+	
Crepis sibirica L.	VU					+	EN							PP								+
Crocus albiflorus Kit. ex Schult.	CR		CR	EN			+	CR		SP	PP				NP							
Crocus banaticus Gay	VU					+		CR							PP				+			
Crocus flavus Weston	VU					VU																
Cryptogramma crispa (L.) R.Br.	CR					EX	CR							SP		+						+
Cyclamen fatrense Halda et Soják	VU						VU							SP					+			+
Cyperus flavescens L.	VU		CR		+	+	EN	VU						PP								
Cypripedium calceolus L.	VU		EN	EN	VU	VU	VU	VU		SP	SP		SP	SP	SP		+			+		
Daphne arbuscula Čelak.	EN						EN							SP			+	+	+			+
Daphne cneorum L.	EN		CR	VU	+	VU	EN			SP	PP			SP	SP							+
Daphne laureola L.	VU					VU					PP		SP									
Dendranthema zawadzkii (Herb.) Tzvelev	VU				+		EN					SP		SP			+					+
Dianthus diutinus Kit.	EN			EN																		+
Dianthus nitidus Waldst. et Kit.	EN				EX												+		+			
Dianthus serotinus Waldst. et Kit.	CR	CR				EX	EN										+					
Dictamnus albus L.	VU	EN	+	+		VU	VU	VU			PP			PP								
Digitalis ferruginea L.	VU					VU																
Diphasiastrum issleri (Rouy) Holub	EN			EN	VU		EX	VU			PP										+	
Doronicum orientale Hoffm.	VU					+		VU			PP				PP						+	
Draba aizoides L.	VU		+		+	+	VU	VU				NP		PP	PP						+	
Draba dorneri Heuff.	VU					VU							SP				+		+			
Draba dubia Suter	VU				+	+	VU							PP							+	+
Draba fladnizensis Wulfen	EN				+	+	CR							SP		+						+
Draba haynaldii Stur	VU					VU																
Draba stellata Jacq. ssp. **simonkaiana** (Jáv.) Beldie	VU					VU							SP						+			
Dracocephalum austriacum L.	CR	CR	+	CR	+	+	CR				SP			SP			+			+		
Dracocephalum ruyschiana L.	EN			EN		+					SP						+					
Drosera anglica Huds.	EN			EX	EN	VU	EN				NP		SP	SP								+
Echinops ritro L. ssp. **ruthenicus** (M.Bieb.) Nyman	EN	EN	EX	VU		+	EN				PP			SP								
Elatine hydropiper L.	VU			VU	EN	+	+	+			PP											
Eleocharis austriaca Hayek	VU		VU	VU	VU	+	+	EN			NP				NP							
Eleocharis carniolica Koch	VU			EN		+	EN	VU			PP			PP	NP		+			+		
Epipactis albensis Nováková et Rydlo	EN		EN	VU			EN			PP	PP			PP				+				
Epipogium aphyllum Swartz	EN	CR	CR		+	+	CR	CR		SP	PP			PP	SP							
Erysimum hungaricum Zapał.	EN				+	EX	VU	EN						SP			+	+				
Erysimum wittmannii Zaw. ssp. **pallidiflorum** (Jáv.) Jáv.	EN			EN			EN	+			SP								+			
Erythronium dens-canis L.	VU			VU		+	CR	EN			PP			SP	SP							
Euonymus nanus M. Bieb.	EN					+		CR							SP							+
Euphorbia carpatica Woł.	VU				+	VU	+	VU							PP				+			
Euphrasia exaristata Smejkal	EN				+		EN							SP					+			
Ferula sadlerana Ledeb.	EN			CR		VU	CR				SP		SP	SP			+		+			+
Fritillaria meleagris L.	EN		EX	EN	+	VU	CR	VU			PP		PP	SP	PP		+					
Fritillaria orientalis Adams	VU					VU											+					

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		A	CZ	H	PL	RO	SK	UA	A	CZ	H	PL	RO	SK	UA							
Fumaria jankae Hausskn.	EN					EN													+			
Gagea bohemica (Zauschner) Schult. et Schult. fil.	EN		EN	VU		VU	CR			SP	PP			SP								
Gagea fistulosa (Ram. ex DC.) Ker Gawl.	VU					+		VU							NP						+	+
Galium parisiense L.	EN					+	CR							SP								
Galium transcarpaticum Stojko et Tasenk.	VU					+		VU							SP				+			
Gentiana lutea L.	EN					VU		EN					SP		SP					+	+	
Geranium bohemicum L.	EN			VU	+	EX	CR				NP		NP	NP								
Gladiolus felicis Mirek	EX				EX		+										+					+
Gladiolus palustris Gaudin	CR		CR			+	EX	+		PP	SP			SP								
Glaux maritima L.	EN			EN		EN	EN				PP			SP								
Groenlandia densa (L.) Fourr.	VU			EX		VU					PP											
Hammarbya paludosa (L.) Kuntze	EN			CR		VU		EN			SP				NP							+
Hedysarum hedysaroides (L.) Schinz et Thell.	VU				+	+	VU	EN						SP	SP	+						+
Helianthemum grandiflorum (Scop.) DC. ssp. **glaucescens** Holub	VU							VU							SP							+
Heracleum carpaticum Porcius	VU					VU		VU					SP		SP				+			+
Herminium monorchis (L.) R.Br.	EN		EX	EX			EN	EN			NP			PP	PP							
Hesperis vrabelyiana (Schur) Borbás	EN			EN							SP								+			
Himantoglossum hircinum (L.) Sprengel ssp. **caprinum** (M.Bieb.) Sunderm.	EN		EW	EN		+	CR				SP			SP			+					
Hottonia palustris L.	VU		+	VU	EN	VU	VU	VU			PP				PP							
Inula salicina L. ssp. **aspera** (Poirot) Hayek	VU			+			EN							SP								
Iris aphylla L. ssp. **hungarica** (Waldst. et Kit.) Hegi	EN			EN		+	CR				SP			SP					+			
Iris graminea L. ssp. **pseudocyperus** (Schur) Soó	VU		EN	VU	EW	+	VU	VU			PP		PP	SP	PP							
Iris humilis Georgi	VU			VU		VU	+				NP											
Iris sibirica L.	VU		VU	VU	EX	+	EW	VU			PP			SP	PP							
Iris spuria L.	EN		EX	EN		+	CR				PP			SP								
Juncus bulbosus L.	VU			VU	EN	+	EN	VU			NP			SP	PP							
Juncus castaneus Sm.	VU				+	+	CR	VU						SP	PP	+						+
Juncus sphaerocarpus Nees	CR		CR				CR			PP	NP			PP								
Juncus triglumis L.	VU				VU	+	CR	VU				PP		SP	PP	+						+
Juniperus sabina L.	VU				VU	VU	VU	VU				SP	SP	SP	SP							+
Jurinea mollis (L.) Rchb. ssp. **transsilvanica** (Sprengel) Hayek	VU	EN		VU		+					PP								+			
Kobresia myosuroides (Vill.) Fiori	EN				+	+	CR							SP		+						+
Kobresia simpliciuscula (Wahlenb.) Mackenzie	EN				+	+	CR							SP		+						+
Laserpitium siler L.	VU					VU															+	
Lathyrus pannonicus (Jacq.) Garcke	EN	CR	CR	EN		+	CR			PP	PP			SP								
Lathyrus pisiformis L.	EN			EN			CR				PP			SP								
Lathyrus transsilvanicus (Spreng.) Fritsch	EN			CR		+	EN	EN			PP			SP	NP				+			
Ledum palustre L.	EN				VU	EX	CR	VU						SP	PP							+
Leontopodium alpinum Cass.	VU				+	EN	VU	VU					SP	SP	SP						+	
Leucojum aestivum L.	VU			VU		VU	VU	VU			PP				PP							
Leucojum vernum L. ssp. **carpaticum** (Spring.) O.Schwarz	VU			VU	+	+	EN	VU			PP			SP	PP			+				
Ligularia glauca (L.) J.Hoffm.	EN					+	CR	CR					PP	SP	SP							+
Ligularia sibirica (L.) Cass.	CR			EX	EX	+	CR	+			SP		PP	SP			+			+		+
Lilium bulbiferum L.	VU		+	EN		+	VU	EN			SP			SP								
Limodorum abortivum (L.) Swartz	EN	CR	CR	VU		+	EN			SP	PP			SP								
Linaria alpina (L.) Mill.	EN				+	+	CR							SP							+	
Linaria arvensis (L.) Desv.	EX		EX	EX		EX	EX				NP											
Lindernia procumbens (Krocker) Borbás	EN	CR	CR	VU	EN	VU	EN	EN			PP			SP			+			+		
Linnaea borealis L.	CR				EN	EN	EX	CR						SP	SP							+
Linum trigynum L.	VU			+	+	VU	CR	+			NP			SP								
Liparis loeselii (L.) Rich.	EN		CR	CR		+	CR	EN		SP	SP			SP	PP		+			+		
Loiseleuria procumbens (L.) Desv.	EN				+	+	CR	EN						SP	SP	+						+
Lomatogonium carinthiacum (Wulfen) Rchb.	VU					VU							SP								+	+
Lonicera alpigena L.	VU					+	EN							SP								+
Lonicera coerulea L.	VU					+		VU							NP	+						+
Lotus borbasii Ujhelyi	EN	CR	+	+			VU				PP											
Ludwigia palustris (L.) Elliott	EN			EN		VU	EX	EN			PP				SP							
Lychnis nivalis Kit.	VU					VU							SP						+			
Lycopodiella inundata (L.) Holub	EN	CR	EN		EN	+	CR	EN		SP					SP							+
Lysimachia thyrsiflora (L.) Rchb.	EN			CR	+	+	EN				NP			SP								+
Marsilea quadrifolia L.	VU			EN		VU		VU			PP				PP		+			+		
Micromeria thymifolia (Scop.) Fritsch	CR			CR							SP											+
Microstylis monophyllos (L.) Lindley	VU			VU	VU		EN	VU			NP	PP		PP	PP		+			+		
Minuartia hirsuta (M.Bieb.) Hand.-Mazz. ssp. **frutescens** (Kit.) Hand.-Mazz.	VU			VU		+	VU				PP			SP								
Montia fontana L.	CR	CR	CR	EN	EX	+	CR				PP			SP								
Narcissus angustifolius Curt.	EN			EN		VU		EN			NP		PP		PP		+				+	
Nigritella carpatica (Zapal.) Teppner, Klein et Zagulski	VU					+		EN							PP				+			+
Nigritella nigra (L.) Rchb. ssp. **nigra**	VU					VU		+					PP								+	
Nigritella nigra (L.) Rchb. ssp. **rubra** (Wettst.) Beauverd	VU					VU							PP			+						
Onobrychis montana DC.	VU				+	+	CR					SP	PP	SP							+	
Ononis repens L.	EX					EX																
Onosma arenarium Waldst. et Kit.	EN			VU		EN	CR										+					
Onosma pseudoarenaria Schur ssp. **tuberculata** (Kit.) Rauschert	VU			VU		+	CR	+			NP			SP					+			
Onosma tornensis Jáv.	CR			CR			CR				SP			SP			+		+			+
Ophrys apifera Huds.	EN		CR	EN		+	CR			SP	SP			SP								
Ophrys fuciflora (F.W.Schmidt) Moench	EN		CR	CR		+	CR			SP	SP			SP								
Ophrys sphegodes Mill.	EN		EX	EN		+	CR				SP			SP								
Orchis pallens L.	EN		EN	EN	VU	+	EN	VU		SP	PP			SP								

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Orchis spitzelii Sauter ex Koch	CR						CR							PP								+
Ornithogalum sphaerocarpum A.Kern.	VU		CR	VU		+	+			SP	PP											
Orobanche picridis F.W.Schultz	EN		CR	VU	EX	+	EN			NP	NP			NP								
Oxytropis carpatica Uechtr.	VU				+	+	VU	EN							PP				+			
Paeonia mascula (L.) Mill. ssp. **triternata** (Pallas ex DC.) Stearn et P.H.Davis	VU					VU																
Paeonia tenuifolia L.	VU			VU		VU					NP		SP				+					
Papaver alpinum L. ssp. **tatricum** Nyár.	VU				+		EN							SP					+			
Pedicularis sceptrum-carolinum L.	EN				EX	VU	CR	VU					PP	SP	NP							+
Petrocallis pyrenaica (L.) R.Br.	CR				+	EX	CR							SP							+	
Pinguicula vulgaris L.	EN		+	EX	+	+	EN	EN			SP			SP	PP							
Poa margilicola Bernátová et Májovský	CR						CR							SP					+			+
Poa nobilis Skalińska	DD				+		+					PP							+		+	
Poa pannonica A.Kern. ssp. **scabra** (Asch. et Graebn.) Soó	VU			VU		+	+				NP							+				
Polycarpon tetraphyllum (L.) L. f.	EN					EN	CR							NP								
Polypodium interjectum Shivas	EN		EN	+		VU	EN							SP								
Potamogeton alpinus Balbis	EN				EN	VU	EN	EN						SP	SP							
Potamogeton compressus L.	VU				EN	+	VU				NP			SP								
Potamogeton trichoides Cham. et Schlecht.	VU			VU		+	+				NP											
Potentilla haynaldiana Janka	VU					VU															+	
Potentilla palustris (L.) Scop.	VU			EN	VU	+	VU	VU			PP			SP	SP							+
Potentilla sterilis L.	EX						EX															
Primula farinosa L.	EN			CR	EN	VU	EN	EX			SP	PP	PP	PP							+	
Primula halleri J.F.Gmel.	EN				EX	+	CR	EN						SP	PP						+	
Primula wulfeniana Schott ssp. **baumgarteniana** (Degen et Moesz) Ludi	VU					VU											+		+		+	
Pulmonaria angustifolia L.	EN		EN	EN			CR				PP			SP								
Pulsatilla halleri (All.) Willd. ssp. **slavica** (G.Reuss) Zamels	VU				VU		EN							SP			+		+			
Pulsatilla patens (L.) Mill.	EN			CR		+	EN				SP			SP			+			+		
Pulsatilla vernalis (L.) Mill.	EN				VU		CR							SP		+						+
Pulsatilla vulgaris Mill. ssp. **grandis** (Wenderoth) Zamels	VU	EN	EN	VU	+		VU	VU		SP	NP			SP	E		+					
Pyrola media Swartz	VU		CR	EX	+	+	EN	VU			PP											+
Pyrus nivalis Jacq.	VU			CR			+				PP			SP								
Ranunculus altitatrensis Paclová et Murín	CR				+		CR							SP					+			
Ranunculus glacialis L.	VU				+	VU	VU							SP		+						
Ranunculus malinovskii Jelen. et Derv.-Sok.	VU							VU							SP				+			
Ranunculus millefoliatus Vahl	EN					+	EX															
Ranunculus pygmaeus Wahlenb.	CR				+		CR							SP		+						+
Ranunculus reptans L.	EN				+		CR							PP		+						+
Ranunculus thora L.	VU				+	+	VU	VU					PP		PP						+	
Rosa glauca Pourret	VU			+		+	EN	VU						SP							+	
Rubus bertramii G.Braun	EN		EN							NP												
Rubus senticosus Köhler ex Weihe	EN		EN	VU			+			NP	NP											
Ruppia maritima L.	VU					VU																
Salix bicolor L.	VU				+	+	EN	EN						PP	SP							+
Salix helvetica Vill.	VU				+		VU							SP							+	
Salix herbacea L.	VU				+	+	EN	VU						SP	SP	+						+
Salix myrtilloides L.	CR				VU	EX	CR						PP	SP		+						+
Salix retusa L.	VU				+		EN	VU						SP							+	
Salix starkeana Willd.	EN			+		+	CR							SP						+		+
Saussurea discolor (Willd.) DC.	VU				+	+	+	EN						PP	SP				+		+	
Saussurea porcii Degen	CR					EX		CR							PP				+		+	+
Saussurea pygmaea (Jacq.) Sprengel	VU				+		VU							PP							+	
Saxifraga cernua L.	VU				+	+	CR					SP		SP		+						+
Saxifraga hirculus L.	CR				EX	VU	+				PP		SP				+			+		+
Saxifraga mutata L. ssp. **demissa** (Schott et Kotschy) D.A.Webb	VU						CR						SP	SP							+	
Saxifraga mutata L. ssp. **mutata**	CR					VU	+												+			
Saxifraga pedemontana All. ssp. **cymosa** Engler	VU					+		EN					PP		NP						+	
Saxifraga retusa Gouan	VU				+	+	EN							SP							+	
Scheuchzeria palustris L.	CR		CR		CR	VU	CR	CR						SP	SP							+
Schoenoplectus mucronatus (L.) Palla	EN				EN	+	EX															
Schoenus ferrugineus L.	EN			EX		+	EN	EN			NP			SP	NP							
Scirpus hudsonianus (Michx) Fernald	VU				VU		CR							SP								
Scorzonera humilis L.	VU		VU		VU	+	VU	VU														
Scorzonera lanata (L.) Hoffm.	VU					VU																
Scorzonera parviflora Jacq.	VU	CR	CR	+		+	EN	+						PP								
Sedum villosum L.	EW		EW		+	+	EW			SP				SP								
Selaginella helvetica (L.) Spring	EN			CR	EX		EN	EN			PP				NP							
Senecio congestus (R.Br.) DC.	VU				+	EX	+					SP										+
Senecio doria L. ssp. **umbrosus** (Waldst. et Kit.) Soó	CR		CR		VU		CR	+			NP											
Serratula lycopifolia (Vill.) A.Kern.	CR	CR	CR	EN		VU	EX			PP	PP											
Sesleria caerulea (L.) Ard.	EN					VU	CR															
Sesleria heuflerana Schur ssp. **hungarica** (Ujhelyi) Soó	VU			VU			VU				PP								+			
Sibbaldia procumbens L.	EN				+		CR									+						+
Silene zawadzkii Herbich	VU					+		VU							PP				+			
Sisymbrium austriacum Jacq.	EN						EN							SP								
Sorbus austriaca (Beck) Hedl. ssp. **hazslinszkyana** (Soó) Kárpáti	EN			CR			VU				PP			SP					+			
Sorbus chamaemespilus (L.) Crantz	VU		EX		+	+	VU	+					PP	PP							+	
Sorbus pekarovae Májovský et Bernátová	EN						EN							SP					+			
Sparganium angustifolium F. Michx	EN				+		CR	EN						SP	NP							+

Species	Category of Threat for Entire Carpathians	Category of Threat in Carpathian Countries							Protection in Carpathian Countries							Arctic/Alpine	Bern Convention	Carpathian hold large proportion of world population	Endemic	Habitat Directive	High Mountain Species	Relic
		A	CZ	H	PL	RO	SK	UA	A	CZ	H	PL	RO	SK	UA							
Spiranthes spiralis (L.) Chevall.	VU		EX	VU		+	CR	+		SP	PP			SP								
Stellaria hebecalyx Fenzl	EN					+		EN							NP							+
Sternbergia colchiciflora Waldst. et Kit.	VU			VU		+	+				PP											
Stipa danubialis Dihoru et Roman	VU					VU											+		+			
Stipa dasyphylla (Lindem.) Trautv.	VU			VU		+	+				PP											
Stipa pulcherrima K. Koch	EN	EN		+		+	EN	EN			PP			SP	SP							
Succisella inflexa (Kluk) Beck	EN			+	+	VU	CR	VU						SP	NP							
Syringa josikaea J. Jacq. ex Rchb..	EN				+	VU	+	EN							PP		+		+			+
Taraxacum arachnoideum Kirscher et Štěpánek	CR		CR				+			SP												
Taraxacum erythrocarpum Kirschner et Štěpánek	CR		+				CR							SP					+			
Taraxacum obliquum (Fries) Dahlst.	EX					EX																+
Taraxacum pieninicum Pawl.	CR				CR		+					SP							+			
Teesdalea nudicaulis (L.) R.Br.	CR			EN		EX	CR				PP			SP								
Tephroseris longifolia (Jacq.) Griseb. et Schenk ssp. **moravica** Holub	CR		CR				EN			PP	PP			PP					+			
Teucrium scorodonia L.	VU		EN	VU			VU				PP			PP								
Thesium ebracteatum Hayne	CR	CR	+			EX	EX										+			+		+
Thlaspi jankae A.Kern.	EN			VU			CR				PP			SP			+		+			
Tofieldia pusilla (Michx) Pers.	CR				+		CR							SP		+						
Trapa natans L.	EN		CR	VU		+	VU	EN			PP						+					
Trifolium lupinaster L.	EN				+	EN	CR	EN						SP	NP							+
Utricularia australis R.Br.	CR			VU	+	VU	+	VU			NP											
Utricularia bremii Heer	EN			EN		VU	EX	VU			SP			SP	NP							
Utricularia minor L.	EN			CR	EN	VU	EN				PP				PP							
Utricularia vulgaris L.	VU			EN	VU	+	VU	+			NP											
Vaccinium microcarpum (Turcz. ex Rupr.) Schmalh.	EN				EN	+	CR	VU						SP	PP							+
Vaccinium oxycoccos L.	EN		EN	EN	VU	+	CR	VU		SP	PP			PP	PP							+
Vicia sparsiflora Ten.	EN			VU		VU	EN				PP											
Viola epipsila Ledeb.	EN				+	VU	CR	+					PP	SP								+
Vulpia bromoides (L.) S.F.Gray	EN					+	CR															
Waldsteinia teppneri Májovský	EN						EN							SP					+			
Waldsteinia ternata (Stephan) Fritsch	CR						CR															+
Woodsia alpina (Bolton) S.F.Gray	EN			CR	VU	+	CR	EN			PP	SP		SP	NP	+						+
Woodsia ilvensis (L.) R.Br.	EN			EN	EN	+	+	EN			PP	NP			SP							+

Distribution of the Red Data List vascular plants in the Carpathians (for explanations, see chapter on *How to Use This Book*)

Species	Physiographic Units
Achillea asplenifolia Vent.	513.1, 514.2, 517.2-4, 526, 532.3, 541.2
Achillea impatiens L.	523.63, 541.2
Aconitum jacquinii Rchb.	522.25, 523.1
Aconitum lasiocarpum (Rchb.) Gáyer	522.12, 523.2, 523.31, 523.42, 523.46, 523.51, 531.15
Adenophora liliifolia (L.) Besser	513.65, 513.71, 514.2, 514.42-43, 514.51, 514.85, 515.26-28, 516.2, 517.1-2, 523.2, 523.52, 526.1, 541.2
Adonis aestivalis L.	513.1-2, 513.34, 513.411, 513.43-44, 513.55, 513.65, 514.31, 514.73, 514.84, 515.22, 523.51
Adonis flammea Jacq.	513.1, 513.411, 514.81, 516.2-4, 516.12, 516.14, 517, 541.1-2
Adonis vernalis L.	513.1-2, 514.31, 514.41, 514.72, 514.81, 515.26, 516.2-4, 516.11-12, 516.14, 517, 523.51
Aethionema saxatile (L.) R.Br.	514.42, 523.57, 531.36-37
Agrostemma githago L.	513.411, 513.44, 513.51, 513.65, 515.23, 515.28, 516.2, 516.11, 522.12, 523.2, 523.51-52, 523.54
Aira caryophyllea L.	513.1, 514.2, 531.37
Ajuga pyramidalis L.	514.52, 523.45, 524.2
Alchemilla plicatula Gand.	513.55, 523.31, 531.15
Allium carinatum L. ssp. **pulchellum** Bonnier et Layens	513.411, 514.42, 514.85, 517.1, 531.4, 531.32
Allium zahariadii Májovský	516.4, 541.2
Alyssum montanum L. ssp. **brymii** (Dostál) Soó	514.72, 515.29, 516.2, 516.4a, 517.1
Alyssum montanum L. ssp. **gmelinii** (Jord.) Hegi et Em.Schmid	513.1, 514.2, 514.13, 514.85, 516.2, 516.4a, 517.4, 533.3, 542.1
Alyssum stribrnyi Velen.	531.37
Alyssum tortuosum Will.	515.21, 516.2, 517.2, 517.4, 523.51, 533.3
Anacamptis pyramidalis (L.) Rich.	513.1-2, 513.31, 513.411-412, 513.43, 513.65, 514.2, 514.41-42, 514.83, 515.27, 516.2-3, 517.4, 523.2, 523.63, 523.73, 531.4, 531.37, 541.2
Andromeda polifolia L.	513.44, 513.51, 514.11, 514.14, 514.53, 522.12, 522.15, 522.25, 523.1, 523.44, 523.63, 542.1
Androsace maxima L.	514.2, 514.81, 517.1-2, 517.4-5, 531.4, 533.8, 541.2
Androsace septentrionalis L.	523.31
Androsace villosa L.	514.85, 523.45, 531.13, 531.37
Andryala levitomentosa (Nyár.) P.D.Sell	523.43
Anemone baldensis L.	523.1, 523.31, 523.62
Angelica palustris (Besser) Hoffm.	523.43, 523.63, 524.2, 531.15
Aphanes microcarpa (Boiss. et Reuter) Rothm.	513.2, 513.53
Aquilegia transsilvanica Schur	523.1, 531.11, 531.14-15, 531.22
Arabis nova Vill.	514.85
Arctostaphylos alpinus (L.) Spreng.	514.53
Armeria maritima (Mill.) Willd. ssp. **alpina** (Willd.) P.Silva	514.53, 531.11
Armeria pocutica Pawl.	523.1
Armoracia macrocarpa (Waldst. et Kit.) Kit. ex Baumg.	517.3, 526.1, 533.3, 541.2
Arnoseris minima (L.) Schweigger et Körte	513.51, 513.54, 523.73, 531.15
Asperula neilreichii Beck	514.9, 514.43, 514.51, 514.85
Asplenium adiantum-nigrum L.	513.51, 514.2, 514.53, 515.26, 516.2-4, 516.11-12, 516.14, 517, 523.51-52

Species	Physiographic Units
Asplenium adulterinum Milde	513.1, 514.9, 515.28, 531.34, 533.2
Asplenium ceterach L. ssp. **bivalens** (D.E.Mey.) Greuter et Burdet	514.2, 517.2
Asplenium ceterach L. ssp. **ceterach**	514.85, 531.17, 542.1
Asplenium cuneifolium Viv.	513.44, 514.53, 516.4, 516.4a, 523.51, 531.4, 531.15, 531.37, 541.2
Asplenium fontanum (L.) Bernh.	517.1
Asplenium lepidum C.Presl	513.1, 531.37, 533.3, 541.2, 542.1
Astragalus alpinus L.	514.43, 514.52-53, 514.85, 523.31, 523.43, 531.11, 531.15
Astragalus australis (L.) Lam. ssp. **krajinae** Domin	522.24
Astragalus dasyanthus Pallas	516.3, 517.1, 523.63, 531.26, 541.2, 542.22
Astragalus excapus L.	517.1, 517.4, 531.4, 541.2
Astragalus frigidus (L.) A.Gray	514.43, 514.52-53, 523.31, 531.11, 531.15
Astragalus norvegicus Weber	514.43, 514.52-53, 523.31
Astragalus penduliflorus Lam.	514.52-53, 514.85, 523.31, 531.11
Astragalus peterfii Jáv.	541.2
Astragalus pseudopurpureus Guşuleac	523.45
Astragalus roemeri Simonk.	523.46, 523.63, 524.3, 542.1
Astragalus vesicarius L.	513.1, 516.2, 517.4, 526.2, 541.2, 542.1
Aubrieta intermedia Heldr. et Orph. ex Boiss. ssp. **falcata** Ciocirlan	531.13
Avenula pubescens (Hudson) Dumort. ssp. l**aevigata** (Schur) Holub	523.1, 523.31, 523.46, 531.11, 531.33
Barbarea lepuznica Nyár.	531.32
Betula humilis Schrank	523.63, 526.1
Betula nana L.	523.42, 523.63
Botrychium lanceolatum (S.G.Gmelin) Angstr.	513.52
Botrychium matricariifolium (Retz.) A.Braun ex W.D.J. Koch	513.411, 513.51, 514.12-13, 514.51-53, 517.1, 522.25, 523.1, 531.25, 541.2
Botrychium multifidum (S.G.Gmel.) Rupr.	513.411, 513.44, 514.9, 514.43, 514.52-53, 514.72-73, 515.23, 515.25-26, 517.1-2, 523.1, 523.31, 523.51, 523.63, 531.4, 531.15
Botrychium virginianum (L.) Swartz	526.1, 531.4, 533.3
Bromus pannonicus Kummer et Sendtner	513.1, 517.2, 523.2
Bulbocodium versicolor (Ker Gawl.) Sprengel	517.4, 541.2
Bupleurum praealtum L.	514.2, 517.2-3, 517.5, 523.31, 531.37, 533.2, 541.2, 542.1
Bupleurum rotundifolium L.	513.1, 513.411, 513.43, 514.2, 514.82, 516.2
Calamagrostis stricta (Timm) Koeler	523.31, 523.63, 523.73
Callianthemum coriandrifolium Rchb.	514.9, 514.52-53, 522.25, 523.31, 531.13, 531.15
Callitriche hamulata Kütz. ex W.D.J. Koch	513.33, 513.53
Camelina alyssum (Mill.) Thell.	523.31, 523.42, 524.3, 532.3, 541.2, 542.1
Campanula macrostachya Waldst. et Kit.	514.83, 517.2-3, 517.5, 523.73, 531.37, 532.3, 541.2, 542.1, 542.21
Campanula transsilvanica Schur	523.31, 524.5, 531.11, 531.15, 531.32-33
Campanula xylocarpa Kovanda	514.2, 514.41, 514.73, 515.11, 515.26, 515.28, 516.2, 517.1
Carex atrofusca Schkuhr	514.53, 523.31
Carex bicolor All.	522.25, 523.31
Carex bohemica Schreber	513.1, 514.62, 514.81, 523.65, 525.1, 541.2
Carex brevicollis DC.	516.2, 517.2-5, 523.31, 531.4, 532.3, 541.2, 542.21, 542.41
Carex buxbaumii Wahlenb.	513.1, 514.2, 522.25-26, 523.1-2, 523.46, 523.62-63, 523.65, 525.1, 531.15, 531.32, 541.2, 542.1
Carex chordorrhiza Ehrh.	513.51, 514.53, 514.72, 522.25, 523.31, 523.62-63, 531.11
Carex davalliana Sm.	513.2, 513.411, 513.43, 513.55-57, 513.71, 514.2, 514.9, 514.12-13, 514.42-43, 514.51, 514.53, 514.63-64, 514.71-72, 514.85, 515.11, 515.26-27, 517.4, 522.12-14, 522.25, 523.1, 523.46, 523.63, 523.65, 526, 531.15, 541.2
Carex diandra Schrank	513.51, 514.13, 514.72, 516.3-4, 517.1, 517.4-5, 522.25, 523.1-2, 523.31, 523.73, 526.1, 531.4, 541.2
Carex dioica L.	513.51, 513.57, 514.64, 514.72, 514.83, 514.85, 515.11, 523.31, 523.46, 523.63, 531.15, 541.2
Carex hallerana Asso	514.41, 517.4-5, 531.11, 531.37
Carex limosa L.	513.57, 514.11, 514.53, 514.72, 516.4, 522.15, 522.25-26, 523.1, 523.31, 523.55, 523.62-63, 524.6, 531.11, 531.32, 533.5, 541.2, 542.1, 542.41
Carex liparocarpos Gaudin	513.1, 514.2, 517.2, 526.2, 541.2
Carex parviflora Host	514.52, 531.11, 531.15, 531.22
Carex pediformis C.A. Mey. ssp. **rhizodes** (Blytt.) H.Lindb.	513.1, 514.71, 514.73, 515.27, 515.29, 516.2, 516.4, 523.1
Carex praecox Schreber ssp. **curvata** (Knaf.) Kük.	513.2, 513.411, 514.53, 523.2, 542.32
Carex pulicaris L.	513.1-2
Carex rupestris All.	514.43, 514.52-53, 514.85, 522.22, 522.25, 523.1, 523.31, 523.45, 531.11, 531.33, 542.1
Carex secalina Willd. ex Wahlenb.	513.1, 514.64, 517.1, 523.73, 526.1, 532.3, 542.21
Carex stenophylla Wahlenb.	513.1, 514.2, 514.31, 514.81, 516.2-4, 516.12, 516.14, 517, 523.62-63, 531.4, 541.2, 542.1
Carex strigosa Huds.	513.2, 513.33, 513.63, 513.71-72, 514.2, 517.1, 517.3, 522.12, 523.51, 531.15, 541.2, 542.1
Carex supina Willd. ex Wahlenb.	513.1, 517.1, 517.4, 523.51, 541.2
Centaurea badensis Tratt.	513.1, 514.2, 514.83, 516.2, 523.51
Centaurium littorale (D. Turner) Gilmour	514.71-73, 514.85, 517.2, 517.4, 533.6, 541.2, 542.1
Cerastium uniflorum Clairv.	514.53
Chimaphila umbellata (L.) W.P.C. Barton	513.411, 513.42-43, 513.55, 513.72, 514.9, 514.85, 515.29, 516.3, 517.1-3, 522.14, 523.51, 523.63, 523.73, 526.1
Cicuta virosa L.	513.411, 514.9, 514.13, 515.28, 516.2, 517.1-2, 517.4, 523.63, 526.1, 541.2, 542.1
Cimicifuga europaea Schipcz.	513.1, 513.55, 514.9, 514.12, 514.51-53, 514.71-73, 515.26-28, 516.2, 517.2, 522.23, 523.1, 523.31, 523.42, 542.23
Cirsium brachycephalum Jur.	513.1, 517.1, 523.31, 531.15, 541.2, 542.1, 542.21
Cochlearia tatrae Borbás	514.52-53
Colchicum arenarium Waldst. et Kit.	517.4, 532.3
Conioselinum tataricum Hoffm.	513.51, 514.9, 514.12-13, 514.52-53, 514.72, 514.85, 515.23, 515.26-27, 522.12, 522.23, 523.1, 523.31, 523.45-46, 531.11, 531.13, 531.15
Corispermum canescens Kit.	517.4, 531.37
Corispermum nitidum Kit. ex Schult.	513.1, 517.4, 541.2
Coronilla emerus L.	514.2, 531.4, 533.2, 541.2
Corydalis capnoides (L.) Pers.	513.54, 514.9, 514.12-13, 514.51, 514.53, 514.71, 514.73-74, 515.23, 515.26-29, 516.2, 522.26, 523.2, 523.42, 523.56, 524.5, 541.2, 542.1
Crambe tataria Sebeök	517.1, 517.4, 526.1, 541.2
Crassula aquatica (L.) Schönl.	514.11
Crepis alpestris (Jacq.) Tausch	513.57, 514.9, 514.12, 514.42, 514.51-53, 514.71, 514.85, 515.26-27, 515.29, 522.12, 523.45
Crepis sibirica L.	514.9, 514.42-43, 514.74, 514.82, 514.85, 523.31, 523.44, 523.63, 531.11, 531.15, 541.2
Crocus albiflorus Kit. ex Schult.	513.411-412, 523.53
Crocus banaticus Gay	523.54, 523.63, 523.73, 531.4, 531.37, 533.2, 541.1-2, 542.1, 542.42
Crocus flavus Weston	531.37, 532.3, 533.2
Cryptogramma crispa (L.) R.Br.	514.9, 523.31, 531.15
Cyclamen fatrense Halda et Soják	514.9, 514.85
Cyperus flavescens L.	522.12, 523.2, 523.31, 523.65, 526.1, 531.4, 531.15, 532.3, 542.1
Cypripedium calceolus L.	513.411-412, 513.43, 514.9, 514.42, 514.51, 514.53, 514.73, 514.85, 515.14, 515.24, 515.26-27, 516.2, 517.2, 517.4, 522.16, 522.24, 523.1-2, 523.43, 523.63, 523.65, 523.73, 525.1, 526.1, 531.11, 531.15, 531.25, 531.33, 531.37, 542.1, 542.23
Daphne arbuscula Čelak.	515.25-26

Species	Physiographic Units
Daphne cneorum L.	513.2, 513.412, 513.56, 514.9, 514.12-13, 514.41-43, 514.51, 514.53, 514.71, 514.81-82, 514.85, 515.26-27, 516.2, 517.2, 523.43, 526.1, 531.15, 541.2, 542.1
Daphne laureola L.	517.5, 533.3
Dendranthema zawadzkii (Herb.) Tzvelev	514.12
Dianthus diutinus Kit.	517.4
Dianthus nitidus Waldst. et Kit.	514.9, 514.42-43, 514.51-52, 514.85
Dianthus serotinus Waldst. et Kit.	513.1, 515.22, 517.4, 541.2
Dictamnus albus L.	513.1, 513.411, 514.2, 514.41-42, 514.81, 515.28, 516.2-3, 516.11, 517.2, 517.5, 522.16, 526, 532.3, 541.2
Digitalis ferruginea L.	526, 532.3, 541.2
Diphasiastrum issleri (Rouy) Holub	513.51, 514.13, 514.52, 515.28, 517.2
Doronicum orientale Hoffm.	522.24-25, 523.1, 523.31, 523.42, 523.45, 523.57, 531.11, 531.13, 531.15, 531.22, 531.32, 531.34, 542.1
Draba aizoides L.	513.411, 514.2, 514.9, 514.42-43, 514.51-53, 514.85, 515.26, 522.24-25, 523.1, 523.31
Draba dorneri Heuff.	531.32
Draba dubia Suter	513.57, 514.52-53, 531.34
Draba fladnizensis Wulfen	514.53, 523.31, 531.11
Draba haynaldii Stur	523.45, 531.11, 531.13
Draba stellata Jacq. ssp. **simonkaiana** (Jáv.) Beldie	531.22, 531.32
Dracocephalum austriacum L.	513.1, 514.13, 514.73, 516.2, 517.2, 517.4, 523.73, 531.11, 541.2, 542.23
Dracocephalum ruyschiana L.	517.2, 523.45, 523.63, 524.3, 541.2
Drosera anglica Huds.	513.57, 514.64, 523.73
Echinops ritro L. ssp. **ruthenicus** (M.Bieb.) Nyman	513.1, 516.2, 516.12, 517.4, 531.4, 541.2, 542.1
Elatine hydropiper L.	513.65, 523.51, 523.65, 525.1
Eleocharis austriaca Hayek	513.411-412, 513.57, 514.14, 514.71, 515.21, 522.12, 523.1
Eleocharis carniolica Koch	515.15, 516.2-4, 516.13, 517.1, 517.5, 523.1-2, 523.51, 523.63, 523.65, 531.4, 541.2, 542.1, 542.21, 542.42
Epipactis albensis Nováková et Rydlo	513.2, 513.411, 514.2, 516.2, 516.12
Epipogium aphyllum Swartz	513.2, 513.42-43, 513.65, 514.9, 514.42-43, 514.52-53, 514.85, 515.11, 515.26-28, 522.23, 523.44, 523.46, 523.66, 526.2, 531.11, 533.6, 541.2
Erysimum hungaricum Zapał.	514.9, 514.12, 514.51, 514.53, 514.85, 523.1, 523.31, 523.42
Erysimum wittmannii Zaw. ssp. **pallidiflorum** (Jáv.) Jáv.	515.27, 516.2, 517.2, 517.5, 523.51
Erythronium dens-canis L.	516.2, 517.2, 517.5, 522.23, 523.1
Euonymus nanus M. Bieb.	523.63, 524.2, 525.1, 526.1
Euphorbia carpatica Wol.	522.12, 522.15, 522.24-25, 523.1
Euphrasia exaristata Smejkal	514.52
Ferula sadlerana Ledeb.	516.2, 517.2, 517.5, 541.2
Fritillaria meleagris L.	515.15, 516.2-3, 516.13, 517.2-3, 522.12, 523.51, 523.73, 526.1, 531.4, 541.2, 542.1
Fritillaria orientalis Adams	523.73, 531.4, 532.3, 533.2, 541.1-2
Fumaria jankae Hausskn.	542.1
Gagea bohemica (Zauschner) Schult. et Schult. fil.	514.2, 514.81, 517.5, 531.37
Gagea fistulosa (Ram. ex DC.) Ker Gawl.	523.1, 531.11, 531.25
Galium parisiense L.	514.81, 531.37, 533.3, 542.1
Galium transcarpaticum Stojko et Tasenk.	522.23, 523.1
Gentiana lutea L.	522.24-25, 523.1, 523.31, 523.46, 523.55, 524.5, 531.11, 531.13, 531.15, 531.24, 531.32, 542.1
Geranium bohemicum L.	514.13, 514.72, 515.27-28, 517.5, 533.2, 541.2, 542.1
Gladiolus felicis Mirek	513.51
Gladiolus palustris Gaudin	513.411, 517.3, 523.53, 523.73, 542.1, 542.21
Glaux maritima L.	514.73, 523.63, 541.2
Groenlandia densa (L.) Fourr.	523.65, 541.2
Hammarbya paludosa (L.) Kuntze	522.13, 522.15, 522.24, 523.1, 531.36, 542.1
Hedysarum hedysaroides (L.) Schinz et Thell.	514.9, 514.43, 514.52-53, 514.85, 522.24-25, 523.31, 531.15, 531.32
Helianthemum grandiflorum (Scop.) DC. ssp. **glaucescens** Holub	522.23
Heracleum carpaticum Porcius	522.25, 523.1, 523.31, 523.44
Herminium monorchis (L.) R.Br.	514.43, 515.27
Hesperis vrabelyiana (Schur) Borbás	517.2
Himantoglossum hircinum (L.) Sprengel ssp. **caprinum** (M.Bieb.) Sunderm.	517.2, 517.4, 526.2, 531.4, 531.36-37, 532.3, 533.2, 533.5, 541.2, 542.1
Hottonia palustris L.	513.2, 516.12, 517.2-3, 517.5, 523.52, 526.1, 541.2
Inula salicina L. ssp. **aspera** (Poirot) Hayek	514.41, 515.21, 516.2-4, 516.11-12, 516.14, 517
Iris aphylla L. ssp. **hungarica** (Waldst. et Kit.) Hegi	514.73, 515.27-28, 516.2-4, 516.4a, 516.14, 517.1, 517.5, 523.45, 523.65, 523.73, 526, 531.17, 532.3, 541.2, 542.21, 542.23
Iris graminea L. ssp. **pseudocyperus** (Schur) Soó	513.2, 513.411, 515.21, 516.2, 517.1-3, 517.5, 522.12, 522.23, 523.1, 523.51-53, 526, 531.4, 532.3, 541.2
Iris humilis Georgi	517.4, 541.2
Iris sibirica L.	513.411, 513.71, 515.21-23, 515.29, 516.2-3, 516.12, 517, 522.12, 523.1-2, 523.51, 526.1, 541.2
Iris spuria L.	516.3, 517.1-2, 517.4, 526.1, 541.2, 542.1, 542.23
Juncus bulbosus L.	513.51, 523.51, 541.2
Juncus castaneus Sm.	514.52-53, 522.15, 522.24-25, 523.31
Juncus sphaerocarpus Nees	513.411, 514.2
Juncus triglumis L.	514.52-53, 522.25, 523.31, 531.11, 531.15, 531.22
Juniperus sabina L.	514.12, 522.23, 523.46, 525.1, 531.17, 531.21-22, 531.37, 542.23
Jurinea mollis (L.) Rchb. ssp. **transsilvanica** (Sprengel) Hayek	516.3, 541.2
Kobresia myosuroides (Vill.) Fiori	514.53, 531.11, 531.15, 531.33
Kobresia simpliciuscula (Wahlenb.) Mackenzie	514.53, 523.31, 531.11
Laserpitium siler L.	531.21
Lathyrus pannonicus (Jacq.) Garcke	513.1, 513.411, 516.2, 517, 541.2
Lathyrus pisiformis L.	516.2, 517.1
Lathyrus transsilvanicus (Spreng.) Fritsch	515.22, 515.26, 516.13, 517.2, 523.52, 541.2
Ledum palustre L.	513.51, 514.11, 514.14, 514.53, 514.85, 522.25, 523.1, 523.52
Leontopodium alpinum Cass.	514.9, 514.12, 514.51-53, 514.85, 515.27, 522.24, 523.1, 523.31, 523.42-43, 523.45-46, 524.5, 525.1, 531.11, 531.15, 531.17, 531.21, 531.32-34, 542.1, 542.23
Leucojum aestivum L.	516.3, 517.1, 517.4, 523.54, 531.4, 532.3
Leucojum vernum L. ssp. **carpaticum** (Spring.) O.Schwarz	522.12-16, 522.21, 522.23-26, 523.51-54, 523.63, 523.65, 531.4, 541.2
Ligularia glauca (L.) J.Hoffm.	515.26, 523.1, 523.31, 523.46, 526.1, 531.11, 531.15, 531.21, 542.23
Ligularia sibirica (L.) Cass.	514.9, 514.53, 515.27, 515.29, 523.1, 531.11, 531.21, 541.2
Lilium bulbiferum L.	513.411, 513.44, 513.56, 514.9, 514.43, 514.51, 514.74, 514.85, 515.21, 515.26-27, 523.31, 523.45, 523.73, 541.2
Limodorum abortivum (L.) Swartz	513.1-2, 513.411, 514.2, 514.33, 514.41-42, 514.81, 515.14, 515.21, 515.28, 516.2, 517, 523.73, 531.36, 532.3, 533.2, 541.2
Linaria alpina (L.) Mill.	514.52, 531.11, 531.13
Linaria arvensis (L.) Desv.	513.411, 514.2, 514.81, 541.2
Lindernia procumbens (Krocker) Borbás	513.65, 514.2, 516.3, 516.12, 517.1, 517.5, 523.51, 523.56, 523.73, 531.15, 541.2, 542.1
Linnaea borealis L.	514.9, 514.52-53, 522.25, 523.62
Linum trigynum L.	515.21, 517.3, 522.12, 523.51, 531.37
Liparis loeselii (L.) Rich.	513.411, 522.25, 523.1, 523.31, 523.45, 523.63, 523.73, 531.4, 531.15, 541.2
Loiseleuria procumbens (L.) Desv.	514.9, 514.53, 522.25, 523.31, 523.46, 523.62, 531.11, 531.13-15, 531.22, 531.25, 531.32-34
Lomatogonium carinthiacum (Wulfen) Rchb.	531.11
Lonicera alpigena L.	515.26, 523.43, 523.73, 524.2, 524.6
Lonicera coerulea L.	522.25, 531.11, 531.25, 531.33-34

Carpathian List Of Endangered Species

Vascular Plants

Species	Physiographic Units
Lotus borbasii Ujhelyi	513.1, 514.2, 517.5
Ludwigia palustris (L.) Elliott	522.22, 523.51, 531.4, 541.2, 542.1, 542.21
Lychnis nivalis Kit.	523.31
Lycopodiella inundata (L.) Holub	513.1, 513.31, 513.44, 513.51, 522.15, 523.45, 523.51, 523.55-56, 525.2
Lysimachia thyrsiflora (L.) Rchb.	513.51, 513.56, 514.34, 523.42, 523.63, 531.15, 541.2
Marsilea quadrifolia L.	523.52, 542.1
Micromeria thymifolia (Scop.) Fritsch	517.2
Microstylis monophyllos (L.) Lindley	513.411, 513.51, 513.54, 513.57, 514.9, 514.12, 514.52-53, 514.71-72, 515.11, 515.26-27, 522.12, 522.15, 522.24-25, 523.31, 523.45-46, 523.51, 523.53, 523.63, 531.14, 531.37
Minuartia hirsuta (M.Bieb.) Hand.-Mazz. ssp. **frutescens** (Kit.) Hand.-Mazz.	516.3, 517.1-3, 531.4, 531.15, 531.17, 531.37, 533.2, 542.1
Montia fontana L.	513.1, 513.44, 531.37, 541.2, 542.1
Narcissus angustifolius Curt.	522.24, 523.1, 523.31, 523.54, 526.2, 531.4, 531.15, 531.32, 532.3, 541.2
Nigritella carpatica (Zapal.) Teppner, Klein et Zagulski	523.1
Nigritella nigra (L.) Rchb. ssp. **nigra**	523.1, 525.2, 531.11, 531.33, 531.37
Nigritella nigra (L.) Rchb. ssp. **rubra** (Wettst.) Beauverd	523.31, 523.43, 523.45, 524.5, 531.11, 542.1, 542.23
Onobrychis montana DC.	514.52-53, 523.43, 531.11, 531.15, 531.32
Ononis repens L.	541.2
Onosma arenarium Waldst. et Kit.	517.4, 541.2, 542.1
Onosma pseudoarenaria Schur ssp. **tuberculata** (Kit.) Rauschert	516.2, 516.11-12, 517.1-3, 517.5, 523.51, 541.2, 542.23
Onosma tornensis Jáv.	516.2
Ophrys apifera Huds.	513.411, 514.2, 514.31, 514.41-42, 514.51, 514.81, 517.4, 526.2, 531.25, 533.2, 542.22
Ophrys fuciflora (F.W.Schmidt) Moench	513.411-412, 514.2, 514.31, 514.41-42, 514.81, 531.25, 533.6
Ophrys sphegodes Mill.	514.2, 517.2, 523.73, 531.4, 542.1, 542.22
Orchis pallens L.	513.2, 513.31-32, 513.411-412, 513.43-44, 513.51, 513.54, 514.2, 514.42, 515.14, 515.24, 515.27-28, 517.1-2, 517.5, 523.1, 523.63, 523.73, 533.6, 541.2
Orchis spitzelii Sauter ex Koch	514.43
Ornithogalum sphaerocarpum A.Kern.	513.411, 513.43, 514.2, 515.14, 515.21, 515.26, 516.2, 516.13-14, 533.6
Orobanche picridis F.W.Schultz	513.72, 514.41-42, 516.2, 516.4, 516.11, 517.2-3, 526.2, 532.3, 541.2, 542.1
Oxytropis carpatica Uechtr.	514.53, 522.24, 523.31, 523.46, 531.11
Paeonia mascula (L.) Mill. ssp. **triternata** (Pallas ex DC.) Stearn et P.H.Davis	526.2, 532.3
Paeonia tenuifolia L.	532.3, 541.2
Papaver alpinum L. ssp. **tatricum** Nyár.	514.52-53, 514.85
Pedicularis sceptrum-carolinum L.	514.52-53, 514.71-72, 522.13-14, 523.62-63, 523.73, 526.1
Petrocallis pyrenaica (L.) R.Br.	514.53
Pinguicula vulgaris L.	513.412, 513.44, 513.51-52, 513.54-57, 514.9, 514.12-13, 514.41-43, 514.51-53, 514.63-64, 514.71-72, 514.85, 515.26-28, 522.24-25, 523.1, 523.31, 523.43, 523.45, 523.63, 524.3, 531.11, 531.15
Poa margilicola Bernátová et Májovský	514.85
Poa nobilis Skalińska	514.53
Poa pannonica A.Kern. ssp. **scabra** (Asch. et Graebn.) Soó	514.72, 514.83-84, 515.15, 515.21-23, 515.28, 516.2, 516.11, 517, 523.73, 531.15, 541.2, 542.21, 542.32
Polycarpon tetraphyllum (L.) L. f.	514.2, 533.2
Polypodium interjectum Shivas	513.2, 516.2, 517.2, 517.4, 533.3
Potamogeton alpinus Balbis	522.25, 523.44, 523.63
Potamogeton compressus L.	513.65, 541.2
Potamogeton trichoides Cham. et Schlecht.	516.2, 517.4, 523.63
Potentilla haynaldiana Janka	531.22, 531.37
Potentilla palustris (L.) Scop.	513.51, 513.57, 514.9, 514.11, 514.13, 514.43, 514.53, 514.64, 514.71-72, 515.27, 522.25, 523.43, 523.63, 524.5, 531.15, 541.2
Potentilla sterilis L.	514.31
Primula farinosa L.	514.9, 514.12, 514.43, 514.51-53, 514.72, 514.85, 515.11, 515.26-27, 515.29, 516.2, 531.33, 531.36-37
Primula halleri J.F.Gmel.	514.53, 522.24-25, 523.1, 523.31, 523.42, 523.46, 531.11, 531.13, 531.15, 531.34
Primula wulfeniana Schott ssp. **baumgarteniana** (Degen et Moesz) Ludi	531.13, 531.15
Pulmonaria angustifolia L.	513.411, 514.2, 514.74, 515.26, 516.2-3, 516.13
Pulsatilla halleri (All.) Willd. ssp. **slavica** (G.Reuss) Zamels	513.412, 513.56, 514.2, 514.9, 514.31-32, 514.41, 514.43, 514.51-53, 514.62-63, 514.85, 515.14, 515.24-29, 516.2
Pulsatilla patens (L.) Mill.	514.72, 516.2, 517.1, 541.2
Pulsatilla vernalis (L.) Mill.	514.52-53
Pulsatilla vulgaris Mill. ssp. **grandis** (Wenderoth) Zamels	513.1, 513.411, 513.55, 513.72, 514.2, 514.41-42, 514.81, 515.21, 515.26, 516.2-3, 516.11, 516.14, 517, 522.12, 523.51
Pyrola media Swartz	513.51, 514.9, 514.13, 514.41, 514.51, 514.53, 514.71, 514.85, 515.26-29, 517.4-5, 522.12, 523.31, 523.45, 523.63, 523.73, 533.5, 541.2
Pyrus nivalis Jacq.	514.41-42, 514.81, 515.26, 516.11, 517.1, 517.3-4
Ranunculus altitatrensis Paclová et Murín	514.53
Ranunculus glacialis L.	514.52-53
Ranunculus malinovskii Jelen. et Derv.-Sok.	522.25
Ranunculus millefoliatus Vahl	531.37
Ranunculus pygmaeus Wahlenb.	514.53
Ranunculus reptans L.	514.53
Ranunculus thora L.	514.52-53, 522.24-25, 523.1, 523.31, 531.11, 531.15, 531.25, 531.33
Rosa glauca Pourret	514.9, 514.43, 514.51, 515.21, 515.25, 515.27, 517.1, 522.15, 531.15
Rubus bertramii G.Braun	513.31
Rubus senticosus Köhler ex Weihe	513.44, 517.3
Ruppia maritima L.	523.62, 523.66, 541.2
Salix bicolor L.	514.9, 514.52-53, 523.1, 523.31, 523.44, 523.46, 531.11, 531.22, 531.26
Salix helvetica Vill.	514.9, 514.52-53
Salix herbacea L.	513.51, 514.9, 514.43, 514.52-53, 522.25, 523.1, 523.31, 531.11, 531.15, 531.22, 531.32-34
Salix myrtilloides L.	513.51, 514.11, 531.11
Salix retusa L.	514.43, 514.52-53, 522.24-25
Salix starkeana Willd.	514.74, 515.29, 517.1, 523.63, 541.2
Saussurea discolor (Willd.) DC.	514.43, 514.53, 514.85, 522.26, 523.1, 523.44-45, 531.11, 531.15, 531.32-34
Saussurea porcii Degen	522.25, 523.1
Saussurea pygmaea (Jacq.) Sprengel	514.52-53
Saxifraga cernua L.	514.52-53, 523.31, 531.11
Saxifraga hirculus L.	514.52, 523.63, 524.5
Saxifraga mutata L. ssp. **demissa** (Schott et Kotschy) D.A.Webb	525.2, 531.11
Saxifraga mutata L. ssp. **mutata**	514.9, 523.73
Saxifraga pedemontana All. ssp. **cymosa** Engler	522.24, 523.31, 524.5, 531.15, 531.22, 531.24, 531.32-34, 531.37
Saxifraga retusa Gouan	514.52-53, 523.31, 523.43, 531.11, 531.15, 531.21
Scheuchzeria palustris L.	513.44, 514.53, 522.15, 523.2, 523.42, 523.51, 523.63, 525.2, 531.15, 542.1
Schoenoplectus mucronatus (L.) Palla	513.32, 523.65, 524.5, 531.15, 532.3, 542.21
Schoenus ferrugineus L.	514.34, 514.72, 514.85, 523.53, 523.63, 526.1
Scirpus hudsonianus (Michx) Fernald	513.51, 514.53

Species	Physiographic Units
Scorzonera humilis L.	513.411, 513.44, 513.54, 522.12-13, 522.15, 523.42, 523.46, 523.51, 523.63, 523.73, 524.2, 541.2
Scorzonera lanata (L.) Hoffm.	531.37
Scorzonera parviflora Jacq.	513.1, 514.73, 516.13, 517.4, 523.1, 523.57, 523.63, 525.1, 541.2
Sedum villosum L.	513.44, 514.53, 523.63
Selaginella helvetica (L.) Spring	514.51, 515.21, 515.26-28, 516.2, 516.14, 523.52
Senecio congestus (R.Br.) DC.	514.12, 541.2
Senecio doria L. ssp. **umbrosus** (Waldst. et Kit.) Soó	513.411, 513.57, 514.9, 514.13, 514.42, 514.51, 514.53, 514.71, 516.3, 517.2, 522.16
Serratula lycopifolia (Vill.) A.Kern.	513.1, 513.411, 517.1, 541.2
Sesleria caerulea (L.) Ard.	514.31, 514.43, 514.63, 514.85, 523.73
Sesleria heuflerana Schur ssp. **hungarica** (Ujhelyi) Soó	516.2, 517.2
Sibbaldia procumbens L.	514.52
Silene zawadzkii Herbich	523.1, 523.44, 523.46
Sisymbrium austriacum Jacq.	514.85
Sorbus austriaca (Beck) Hedl. ssp. **hazslinszkyana** (Soó) Kárpáti	515.26-28, 516.2, 517.2
Sorbus chamaemespilus (L.) Crantz	513.55, 514.9, 514.43, 514.51, 514.53, 514.85, 515.26, 522.12, 531.15, 531.32-33
Sorbus pekarovae Májovský et Bernátová	514.85
Sparganium angustifolium F. Michx	514.52, 522.24
Spiranthes spiralis (L.) Chevall.	513.44, 513.72, 517.2, 517.4, 523.2, 523.31, 523.45, 525.1, 526.2, 531.4, 531.11, 531.15, 532.3, 533.2, 533.6, 541.2, 542.1, 542.22
Stellaria hebecalyx Fenzl	523.1
Sternbergia colchiciflora Waldst. et Kit.	517.4-5, 526.1, 531.37, 533.2-3
Stipa danubialis Dihoru et Roman	531.37
Stipa dasyphylla (Lindem.) Trautv.	516.2-4, 516.12, 516.14, 517, 531.4
Stipa pulcherrima K. Koch	514.41-42, 514.51, 514.81, 516.2-4, 516.12, 516.14, 517, 523.51, 523.73, 531.4, 531.37, 541.2, 542.21
Succisella inflexa (Kluk) Beck	516.2, 517.2, 522.12, 523.2, 523.51-52, 541.2, 542.1, 542.21
Syringa josikaea J. Jacq. ex Rchb..	522.12-13, 522.21, 542.1
Taraxacum arachnoideum Kirscher et Štěpánek	513.411
Taraxacum erythrocarpum Kirschner et Štěpánek	513.411-412, 514.2, 514.42, 514.85
Taraxacum obliquum (Fries) Dahlst.	542.42
Taraxacum pieninicum Pawl.	514.12
Teesdalea nudicaulis (L.) R.Br.	516.3, 517.2-4, 524.5, 531.11, 531.15
Tephroseris longifolia (Jacq.) Griseb. et Schenk ssp. **moravica** Holub	513.411, 514.81-83
Teucrium scorodonia L.	513.44, 514.81
Thesium ebracteatum Hayne	513.1, 541.2
Thlaspi jankae A.Kern.	514.81, 516.2-3, 517.2-5
Tofieldia pusilla (Michx) Pers.	514.53
Trapa natans L.	516.13, 523.73, 531.4, 541.2
Trifolium lupinaster L.	514.52, 523.1, 523.62, 524.6
Utricularia australis R.Br.	513.56, 514.11, 514.73, 516.14, 517.4, 523.55, 523.62, 523.65
Utricularia bremii Heer	516.3, 523.2, 523.63, 523.65, 531.15, 541.2
Utricularia minor L.	514.34, 514.52, 514.64, 514.71-72, 514.85, 517.3-4, 523.44, 523.64, 541.2
Utricularia vulgaris L.	513.52, 514.52, 516.12-14, 523.2, 523.44, 523.63, 523.73, 526.1, 531.4, 532.3, 542.1
Vaccinium microcarpum (Turcz. ex Rupr.) Schmalh.	514.11, 514.52-53, 522.12, 522.15, 522.24-25, 523.1-2, 523.42, 523.55, 523.63, 526.1, 542.1
Vaccinium oxycoccos L.	513.44, 517.3, 522.12, 522.15, 522.24-25, 523.1, 523.42, 523.55, 523.63, 524.5, 541.2
Vicia sparsiflora Ten.	514.81, 515.21, 517.2-5, 531.37
Viola epipsila Ledeb.	514.53, 515.12, 523.1, 523.43, 523.63
Vulpia bromoides (L.) S.F.Gray	514.82, 531.26, 532.1, 542.1
Waldsteinia teppneri Májovský	515.21
Waldsteinia ternata (Stephan) Fritsch	515.15, 515.22-23, 515.25-26, 515.28
Woodsia alpina (Bolton) S.F.Gray	514.52-53, 517.3, 522.15, 523.1, 523.53
Woodsia ilvensis (L.) R.Br.	513.52, 514.9, 514.43, 514.52-53, 514.82, 514.84, 515.15, 515.21, 515.23, 515.25, 515.28, 516.2, 517.1-3, 517.5, 522.12, 523.1, 523.31, 523.42, 523.51, 523.62, 531.25, 541.2, 542.1

Mammals

Large Carnivores

by Henryk Okarma

Carnivores are the top consumers in a trophic web and have considerable influence on populations of large herbivores. Except for bears, which consume considerable amounts of plant food, carnivores are meat eaters. Altogether, 10 carnivore species were selected for this Carpathian List of Endangered Species including four flagship species: Brown bear *Ursus arctos*, Wolf *Canis lupus*, European lynx *Lynx lynx* and Wildcat *Felis sylvestris*.

The Brown bear is present in all Carpathian countries, although in considerably variable numbers. Official statistics for the whole Carpathian population indicate a population of about 7,000 individuals. However, many consider this figure to be slightly overestimated. The species is most numerous in Romania and Slovakia, while in Hungary and Czech Republic it has been recorded only sporadically. The general population trend in the region is either stable or slightly increasing. The conservation status of the Brown bear varies between the Carpathian countries: it is strictly protected, partially protected or hunted. However, in those countries where hunting is prohibited, it is done so on the basis of relatively accurate estimates of population numbers and can be considered as a sustainable harvest.

The Wolf is the second most numerous large carnivore in the Carpathians. Official statistics estimate the whole Carpathian population to be about 5,500 individuals. However, this number is probably considerably overestimated and scientists put the number at fewer than 4,000. The general population trend in the region is increasing or stable, with a slight decrease reported from Slovakia. The conservation status of the Wolf in the Carpathians is not satisfactory. The species is only strictly protected in countries where small or medium populations occur. In countries where the species is more numerous (Romania, Slovakia), it is intensively hunted with long hunting seasons (e.g. more than 5 months in Romania). In Ukraine, despite a relatively small population, wolves are hunted throughout the year.

Officially, statistics show the total Carpathian Lynx population to be about 3,400 individuals. However, it is probable that this is a considerable overestimate and the lat-

est scientific research indicates there to be only about 2,400 Lynx. The general population trend in the Carpathians is decreasing or stable, with an increase reported from Romania. The conservation status of the Lynx in the region generally appears to be relatively satisfactory: the species is strictly protected in four countries. Hunting is permitted only in Romania and Slovakia, however with a very long hunting season (5–6 months). Scientific assessments clearly demonstrate that the Lynx should be considered the most vulnerable large carnivore species in the region.

Knowledge about the Wildcat is very limited in the Carpathians. According to official data, the species is common in Romania and Hungary. In Slovakia and Poland it is strictly protected and its population size is estimated to be 1,200 and less than 200 individuals, respectively. There is no reliable data from Ukraine. Major threats to the wildcat include unfavourable changes in forestry (e.g. even–age monocultures), hybridisation with the domestic cat, poaching and killing by hunters (who often mistake this species for feral cats).

Recomendations for Conservation and Management

The distribution of large carnivores in the Carpathians is divided between administrations, so a national management policy would need to be coordinated at a regional level and between neighbouring countries. 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*. Monitoring of the population dynamics of large carnivores is also required. In order to achieve this, there is a need to elaborate and apply more accurate methods of estimating carnivore numbers. Essential is the development of compensation systems and their application to mitigate conflicts with local human populations. Education programmes for gaining public acceptance of various target groups (e.g. livestock owners, hunters, game managers) are also necessary.

Large Herbivores

by Kajetan Perzanowski

The three flagship species selected to represent large herbivores are the strictly herbivorous, hoofed animals which ruminate their food, including European bison *Bison bonasus*, Chamois *Rupicapra rupricapra* and Moose *Alces alces*. They occupy a range of ecological niches from concentrate selectors (i.e. species being highly selective towards the quality of their diet), through intermediate feeders to true grazers.

All of these large herbivore species are important components of a trophic web, having a pronounced influence on the composition and structure of local flora. Their foraging activity considerably affects the processes of plant succession and is therefore a potentially important modifying factor for the landscape.

The European bison has been reintroduced to the Carpathians after having been extirpated there about 200 years ago. Population numbers are estimated to be about 160

in the Bieszczady Mountains in Poland and about 220 in the Ukrainian Carpathians. Separate, isolated herds are threatened by inbreeding and further loss of genetic variability. Due to its habitat and spatial requirements, the European bison may serve as an umbrella species for other endangered animals. Its present numbers do not guarantee the survival of a self–sustainable population.

The Chamois is the only ungulate species occurring in the alpine zone of the highest part of the Carpathians — the High Tatras. Its presence in the ecoregion is limited to the Tatras, Fatra and Slovensky Raj. It is very sensitive to human–related disturbance and the loss of natural refuges. Therefore due to the absence of contact with other populations of the species, the Carpathian Chamois are highly threatened by inbreeding. Total numbers are currently estimated at about 300 individuals. The joint Polish–Slovak population has been on the decline for a number of years.

The Moose is present only sporadically on the northern slopes of the Carpathian range. Total numbers in the ecoregion probably do not exceed 100. The species is unable to form a stable breeding population due to the lack of suitable habitats. Its continued presence in the Carpathians depends on accessibility and continuity of migration routes from the core population in north–eastern Poland and Byelorussia.

Two large herbivore species, namely Aurochs *Bos primigenius* and Wild horse *Equus caballus gmelini*, became extirpated from the region several centuries ago.

Currently, the main threats for the large herbivore group include:

- habitat loss, resulting from infrastructure development encroaching up mountain valleys as well as improper practices in forestry, including clear cuts and artificial rejuvenation of forests with spruce mono–cultures;
- habitat fragmentation due to the increasing density and development of the road and railway network;
- poaching (locally intensive); and
- population fragmentation and inbreeding.

Recomendations for Conservation and Management

The most important and urgent needs regarding the protection and sustainable management of these ungulate species are improved information exchange and the development of a monitoring system common to all countries of the region. This could provide the basis for a joint conservation action plan, which among other aspects, would unify the legal status of particular species and impose the same approach to their protection and management over the whole home range of a population, regardless of administrative borders.

Small Mammals

by Kajetan Perzanowski

For this Carpathian List of Endangered Species, insectivores, bats and rodents were combined together under the single category of *Small Mammals*. This group is fairly well

studied in the Carpathians. So far, several lists of threatened species (Głowaciński 2001, Okołów 1998, Voloscuk ed. 1996) and monographs of Carpathian fauna have been published (Wołoszyn, Bashta 2001). The respective categories of threat for particular species applied in this Carpathian List of Endangered Species follow earlier red lists.

The majority of species named in this Carpathian List of Endangered Species occur in small isolated populations, seriously threatened by habitat loss or alterations. Other threats include probable high inbreeding in local populations which is further increased by low reproduction rates and, in the case of marmot and beaver, poaching.

Due to their requirements for highly specific environmental conditions, including their sensitivity to human pressure, small mammals serve as important indicators of environment quality.

Recommendations for Conservation and Management

The status of the species belonging to this group is in general not sufficiently assessed. Therefore, it is necessary to introduce the monitoring of their population parameters (numbers, trends and distribution) on an eco–regional scale. Effective conservation depends on the ability to protect their crucial habitats as well as on the introduction of a consistent legal status of the species in the region.

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Carpathian List of Endangered Species – mammals (for explanations, see chapter on How to Use This Book)

Species	Category of Threat for Entire Carpathians	Category of Threat in Carpathian Countries							Protection in Carpathian Countries							Arctic/Alpine	Bern Convention	Carpathian hold large proportion of world population	Endemic	Habitat Directive	High Mountain Species	Relic
		A	CZ	H	PL	RO	SK	UA	A	CZ	H	PL	RO	SK	UA							
Large Carnivores																						
Canis lupus Linnaeus, 1758	VU	EX	CR	CR	VU	VU	VU	VU		SP	SP	SP	PP	PP	E		+	+		+		
Felis sylvestris Schreber, 1777	EN		CR	VU	CR	VU	VU	VU			PP	SP		SP			+	+		+		
Lutra lutra (Linnaeus, 1758)	VU		CR	EN	VU	VU	VU	VU		SP	SP	SP	SP	SP	SP		+	+				
Lynx lynx Linnaeus, 1758	EN	EX	CR	CR	EN	VU	VU	EN	NP	SP	SP	SP	PP	SP	SP		+	+		+		
Ursus arctos Linnaeus, 1758	EN		CR	+	EN	+	+	VU		PP	SP	SP	PP	PP	PP	+		+		+		
Large Herbivores																						
Alces alces (Linnaeus, 1758)	VU				VU		+	+			NP	E			E		+					
Bison bonasus (Linnaeus, 1758)	EN	EW	EW	EW	VU	EW	EW	EN			NP	SP			PP		+	+				
Bos primigenius Bojanus, 1827	EX																					
Equus caballus gmelini Antonius, 1912	EX																					
Rupicapra rupicapra (Linnaeus, 1758)	EN				EN		EN	EW			PP	SP	E		PP			+	+	+	+	
Small Mammals																						
Barbastella barbastellus (Schreber, 1774)	VU		VU	CR	VU	VU	VU	VU			SP	SP					+			+		
Castor fiber Linnaeus, 1758	VU			EX	VU		+	+			PP	SP					+			+		
Crocidura leucodon (Hermann, 1780)	VU				+		VU	VU			PP	SP					+					
Crocidura sauveolens (Pallas, 1811)	VU				+		EN	VU			PP	SP					+					
Dryomys nitedula Pallas, 1778)	VU			EN	VU		VU	VU			PP	SP					+			+		
Eliomys quercinus (Linnaeus, 1766)	VU				VU		EN				PP	SP					+					
Eptesicus nilssonii (Keyserling & Blasius, 1839)	EN	EN	EN	VU	VU		VU	VU			PP	SP					+			+		
Eptesicus serotinus (Schreber, 1774)	VU		VU	VU	VU	VU	VU	VU			PP	SP					+			+		
Erinaceus concolor Martin, 1838	VU				VU		VU				PP	SP					+			+		
Erinaceus europaeus Linnaeus, 1758	VU	+	+	+	VU	VU	+	+			NP	SP					+					
Glis glis (Linnaeus, 1766)	VU			EN	VU		VU	+			PP	SP					+					
Marmota marmota (Linnaeus, 1758)	EN				CR	+	EN	EW			NP	SP					+					
Microtus nivalis (Martins, 1842)	VU				VU		VU	VU			NP	SP					+				+	
Miniopterus schrebersi (Kuhl, 1817)	EN		EN	EN	EN	VU	VU	EN			SP	SP					+					
Muscardinus avellanarius (Linnaeus, 1758)	VU	+	+	EN	VU	+	+	+			PP	SP					+			+		
Mustela eversmanni Lesson, 1827	VU				VU						PP	SP					+					

Species	Category of Threat for Entire Carpathians	Category of Threat in Carpathian Countries							Protection in Carpathian Countries							Arctic/Alpine	Bern Convention	Carpathian hold large proportion of world population	Endemic	Habitat Directive	High Mountain Species	Relic
		A	CZ	H	PL	RO	SK	UA	A	CZ	H	PL	RO	SK	UA							
Mustela lutreola (Linnaeus, 1758)	CR			CR	EX		EX	EN			PP	SP					+			+		
Mustela nivalis Linnaeus, 1766	VU	+	+	VU	VU	+	+	+			NP	SP					+					
Myotis bechsteini (Kuhl, 1818)	VU		VU	CR	VU	VU	VU	VU			SP	SP					+			+		
Myotis blythi (Tomes, 1857)	VU		VU	VU	VU	VU	VU	VU			PP	SP					+					
Myotis brandtii (Eversmann, 1845)	VU		VU	VU	VU	VU	VU	VU			PP	SP					+			+		
Myotis capaccinii (Bonaparte, 1837)	VU					VU											+			+		
Myotis dasycneme (Boie, 1825)	EN		VU	VU	VU	EN	VU	VU			SP	SP					+			+		
Myotis daubentonii (Kuhl, 1817)	VU		VU	VU	VU	VU	VU	VU			PP	SP					+			+		
Myotis emarginatus (Geoffroy, 1806)	CR		VU	CR	EN	VU	VU	VU			SP	SP					+			+		
Myotis myotis (Borkhausen, 1797)	VU			+	VU		+				PP	SP					+			+		
Myotis mystacinus (Kuhl, 1817)	VU		VU	VU	VU	VU	VU	VU			PP	SP					+			+		
Myotis nattereri (Kuhl, 1817)	VU		VU	VU	VU	VU	VU	VU			PP	SP					+			+		
Nannospalax leucodon Nordmann, 1840	VU			CR				VU			SP						+					
Neomys anomalus Cabrera, 1907	VU	+	+	+	VU	+	+	+			PP	SP					+					+
Neomys fodiens (Pennant, 1771)	VU	+	+	+	+	+	VU	+			PP	SP					+					
Nyctalus lasiopterus (Schreber, 1780)	VU			+	VU	VU	+				SP	SP					+			+		
Nyctalus leisleri (Kuhl, 1817)	VU		VU	EN	VU	VU	VU	VU			PP	SP					+			+		
Nyctalus noctula (Schreber, 1774)	VU		VU	VU	VU	VU	VU	VU			PP	SP					+			+		
Pipistrellus kuhlii (Kuhl, 1817)	VU	VU	+			VU											+			+		
Pipistrellus nathusii (Keyserling & Blasius, 1839)	VU		VU	VU	VU	VU	VU	VU			PP	SP					+			+		
Pipistrellus pipistrellus (Schreber, 1774)	VU		VU	VU	VU	VU	VU	VU			PP	SP					+			+		
Pitymys tatricus Kratochvil, 1952	VU				VU	+	+	+			NP	SP						+	+			
Plecotus auritus (Linnaeus, 1758)	VU		VU	VU	VU	VU	VU	VU			PP	SP					+			+		
Plecotus austriacus (Fischer, 1829)	VU		VU	VU	VU	VU	VU	VU			PP	SP					+			+		
Rhinolophus blasii (Peters, 1866)	VU					VU											+			+		
Rhinolophus euryale Blasius, 1853	VU			EN		VU	VU				SP						+					
Rhinolophus ferrumequinum (Schreber, 1774)	VU			+		+	+	+			PP	SP					+			+		
Rhinolophus hipposideros (Bechstein, 1800)	EN			+	EN		+	+			PP	SP					+			+		
Rhinolophus mehelyi (Matschie, 1901)	VU				+	VU											+			+		
Sciurus vulgaris Linnaeus, 1758	VU	+	+	+	VU	+	+	+			PP	SP					+					
Sicista betulina (Pallas, 1778)	EN				EN		EN	VU			PP	SP					+			+		
Sorex alpinus Schinz, 1837	VU				VU		+	+			PP	SP					+				+	
Spermophilus citellus (Linnaeus, 1766)	EN			+	EN		+				PP	SP					+					
Vespertilio murinus Linnaeus, 1758	VU		VU	VU	VU	VU	VU	VU			PP	SP					+			+		

Distribution of the Red Data List mammals in the Carpathians (for explanations, see chapter on *How to Use This Book*)

Species	Physiographic Units
Large Carnivores	
Canis lupus Linnaeus, 1758	513.412, 513.43-45, 513.48-49, 513.51-52, 513.54-57, 513.65, 513.71-72, 514.9, 514.11-12, 514.14, 514.33-34, 514.43, 514.51-53, 514.62-64, 514.71-74, 514.84-85, 515.11-14, 515.23-29, 516.2, 516.4a, 517.1, 522, 523.1-2, 523.31, 523.41-42, 523.44-47, 523.51-54, 523.56, 523.61-66, 523.71-73, 524.1-2, 524.4-6, 525, 526, 531.4, 531.11-17, 531.21-25, 531.31-33, 531.35-37, 532.1-2, 533, 541.1, 541.3-4, 542.1, 542.21-22, 542.31-34, 542.41, 542.43
Felis sylvestris Schreber, 1777	513.412, 513.55-57, 513.64-65, 513.72, 514.9, 514.14, 514.33-34, 514.42-43, 514.51-53, 514.62-64, 514.71-74, 514.81-85, 515, 516, 517, 522, 523, 524, 525, 526, 531, 532, 533, 541, 542
Lutra lutra (Linnaeus, 1758)	513.31, 513.34, 513.411-412, 513.45-49, 513.51-57, 513.61-65, 513.67-69, 513.71-72, 514, 515, 516, 517, 522, 523, 524, 525, 526, 531, 532, 533, 541, 542
Lynx lynx Linnaeus, 1758	513.31, 513.412, 513.42-44, 513.47, 513.51-57, 513.65, 513.71-72, 514.9, 514.11-14, 514.32-34, 514.42-43, 514.51-53, 514.62-64, 514.71-74, 514.82-85, 515, 516.2, 516.4a, 517.1, 522, 523.1-2, 523.31, 523.41-47, 523.51, 523.53-54, 523.57, 523.61-66, 523.71-73, 524, 525, 526, 531, 532.2, 533.2, 533.4-7, 533.8, 541.3, 542.1, 542.21-23, 542.31, 542.33, 542.42
Ursus arctos Linnaeus, 1758	513.42, 513.44-45, 513.51-52, 513.54-57, 513.71, 514.9, 514.11-12, 514.14, 514.32-34, 514.42-43, 514.51-53, 514.62-64, 514.71-74, 514.82-85, 515.11-15, 515.23-29, 522, 523.1-2, 523.31, 523.41-42, 523.44-47, 523.52-53, 523.56-57, 523.61-66, 523.71-73, 524, 525, 526, 531, 532.1-2, 533.1-5, 541.3-4, 542.1, 542.23, 542.31, 542.33
Large Herbivores	
Alces alces (Linnaeus, 1758)	513.64-65, 513.67, 513.71, 522.12
Bison bonasus (Linnaeus, 1758)	522.12-13, 522.15
Rupicapra rupicapra (Linnaeus, 1758)	514.52-53
Small Mammals	
Barbastella barbastellus (Schreber, 1774)	514.12, 514.52-53
Castor fiber Linnaeus 1758	513.53, 513.63, 513.71, 522.12
Crocidura leucodon (Hermann, 1780)	514.9, 514.12, 522.15, 522.25
Crocidura sauveolens (Pallas, 1811)	514.12, 514.43, 514.52-53, 522.15, 522.25
Dryomys nitedula Pallas, 1778)	513.51, 513.54, 513.65, 513.71, 514.52-53, 522.12
Eliomys quercinus (Linnaeus, 1766)	513.51, 514.12, 515.27
Eptesicus nilssonii (Keyserling & Blasius, 1839)	513.52, 514.12, 514.52-53, 522.12

Carpathian List Of Endangered Species

Mammals

Species	Physiographic Units
Eptesicus serotinus (Schreber, 1774)	514.12, 514.52-53, 522.12
Erinaceus concolor Martin, 1838	514.9, 514.12, 514.43, 514.52-53, 515.27
Erinaceus europaeus Linnaeus, 1758	513, 514, 515, 516, 517, 522, 523, 524, 525, 526, 531, 532, 533, 541, 542
Glis glis (Linnaeus, 1766)	513.45, 513.51-52, 513.65, 514.9, 514.12, 514.43, 514.52-53, 515.27, 522.12
Marmota marmota (Linnaeus, 1758)	514.9, 514.52-53, 531.32
Microtus nivalis (Martins, 1842)	514.9, 514.53, 522.15, 522.25
Miniopterus schrebersi (Kuhl, 1817)	514.12, 517.2, 522.15, 522.25
Muscardinus avellanarius (Linnaeus, 1758)	513, 514, 515, 516, 517, 522, 523, 524, 525, 526, 531.4, 531.11-17, 531.21-26, 531.31, 531.33-37, 532, 533, 541, 542
Mustela lutreola (Linnaeus, 1758)	522.15, 522.25
Mustela nivalis Linnaeus, 1766	513, 514, 515, 516, 517, 522, 523, 524, 525, 526, 531.4, 531.11-17, 531.21-26, 531.31, 531.33-37, 532, 533, 541, 542
Myotis bechsteini (Kuhl, 1818)	514.9, 514.12, 514.43, 514.52-53, 516.2, 517.2
Myotis blythi (Tomes, 1857)	514.9, 514.12, 514.52-53, 515.27, 516.2
Myotis brandtii (Eversmann, 1845)	513.52, 514.52-53, 515.27, 517.2
Myotis capaccinii (Bonaparte, 1837)	531.4, 531.32, 533, 542.1, 542.21-23
Myotis dasycneme (Boie, 1825)	514.12, 514.43, 515.27, 517.2, 522.15, 522.25
Myotis daubentonii (Kuhl, 1817)	513.52, 514.9, 514.12, 514.43, 516.2
Myotis emarginatus (Geoffroy, 1806)	513.51, 514.12, 516.2, 517.2, 522.12, 522.15, 522.25
Myotis myotis (Borkhausen, 1797)	513.52, 514.12, 514.52-53, 515.27, 516.2
Myotis mystacinus (Kuhl, 1817)	513.51-52, 514.9, 514.12, 514.43, 514.52-53, 515.27, 516.2, 517.2, 522.12
Myotis nattereri (Kuhl, 1817)	513.51, 514.9, 514.12, 514.43, 514.52-53, 515.27, 516.2, 517.2
Nannospalax leucodon Nordmann, 1840	522.15, 522.25
Neomys anomalus Cabrera, 1907	513, 514, 515, 516, 517, 522, 523, 524, 525, 526, 531, 532, 533, 541, 542
Neomys fodiens (Pennant, 1771)	513, 514, 515, 516, 517, 522, 523, 524, 525, 526, 531, 532, 533, 541, 542
Nyctalus lasiopterus (Schreber, 1780)	516.2, 517.2
Nyctalus leisleri (Kuhl, 1817)	514.52-53, 516.2, 517.2
Nyctalus noctula (Schreber, 1774)	514.9, 514.12, 514.43, 516.2, 522.12
Pipistrellus kuhlii (Kuhl, 1817)	513.1, 531.4, 531.32, 533, 542.1
Pipistrellus nathusii (Keyserling & Blasius, 1839)	513.52
Pipistrellus pipistrellus (Schreber, 1774)	514.9, 514.12, 516.2, 522.12, 531.32
Pitymys tatricus Kratochvil, 1952	513.51, 514.9, 514.43, 514.52-53, 514.71, 514.84, 522.15, 522.25, 531.32
Plecotus auritus (Linnaeus, 1758)	513.51-52, 514.12, 514.43, 514.52-53, 515.27, 516.2
Plecotus austriacus (Fischer, 1829)	514.9, 514.12, 516.2
Rhinolophus blasii (Peters, 1866)	533
Rhinolophus euryale Blasius, 1853	516.2, 517.2
Rhinolophus ferrumequinum (Schreber, 1774)	516.2, 522.25, 523.1
Rhinolophus hipposideros (Bechstein, 1800)	513.45, 513.51-52, 514.9, 514.12, 514.52-53, 516.2, 522.15, 522.25
Rhinolophus mehelyi (Matschie, 1901)	513.34, 526, 531.4, 531.32, 532, 533.3, 533.5, 542.1
Sciurus vulgaris Linnaeus, 1758	513, 514, 515, 516, 517, 522, 523, 524, 525, 526, 531, 532, 533, 541, 542
Sicista betulina (Pallas, 1778)	514.9, 514.12, 514.43, 514.52-53, 515.27, 522.12, 522.15, 522.25
Sorex alpinus Schinz, 1837	513.51, 514.9, 514.12, 514.43, 514.52-53, 515.27, 522.12, 522.15, 522.25
Spermophilus citellus (Linnaeus, 1766)	514.9, 515.27, 516.2, 517.2
Vespertilio murinus Linnaeus, 1758	513.52, 513.54, 513.71, 514.9, 514.12, 514.52-53, 522.12

Birds

by Tomas Ruzicka

A total of 29 birds were selected for this Carpathian List of Endangered Species. Altogether, 7 species are considered critically endangered, 11 endangered and 11 vulnerable. Characteristic species were defined as those species where a significant area of their range falls into the Carpathians, or those for which the Carpathians represent an important refuge in Europe.

According to the 2000 IUCN Red Data List, a total of 1,183 bird species in the world are considered to be vulnerable, endangered or critically endangered. Only two species nesting in the Carpathians are considered to be globally threatened or conservation dependant: the Imperial eagle *Aquila heliaca* and the Corncrake *Crex crex* (IUCN Red Data List 2000, Tucker and Heath 1994).

Eight bird species were identified as flagship species for the Carpathians:

- Imperial eagle *Aquila heliaca*
- Lesser spotted eagle *Aquila pomarina*
- Corncrake *Crex crex*
- White-backed woodpecker *Dendrocopos leucotos*
- Rock thrush *Monticola saxatilis*
- Ural owl *Strix uralensis*
- Capercaillie *Tetrao urogallus*
- Wallcreeper *Tichodroma muraria*

State of Knowledge

In the Czech Republic, Hungary, Poland and Slovakia, knowledge about the distribution of most species is fairly good. In these countries national censuses have been carried out and detailed research undertaken for different species (e.g. birds of prey, Corncrake). The situation in the Ukraine and Romania is different. The relatively small group of qualified ornithologists and the inaccessibility of the mountains contribute to the fact that the precise distribution and density of most bird species is not known; this applies particularly to birds of prey, owls and grouse. However, the Romanian Red List of birds is due to be published in 2003.

Red lists on birds of the Czech Republic date back to 1988, covering the former Czechoslovakia. Similarly, in Hungary the red list was published in 1989. The latest ver-

sion of the Slovakian Red List was published in 1998. New red lists for the Czech Republic, Slovakia and Romania are due to be published in 2003. The Red book for the Ukraine was published in 1994. The latest version of the Polish Red Data Book was recently published (Głowaciński 2001).

The Carpathians are a refuge for nesting species such as the Lesser spotted eagle and the globally threatened Imperial eagle. The region represents a real stronghold for these species, hosting nearly 28–40% (1,500–2,700 pairs) and 20% to 45% (85 pairs) of their European populations, respectively. The dense deciduous and mixed forests provide a home for species such as the White–backed woodpecker and the Ural owl. The population of the White-backed woodpecker in the Carpathians is estimated to include up to 30% (11,400 pairs) of its entire European population. The number of pairs of the Ural owl living in the Carpathians represents nearly 20% (2,285 pairs) of the entire European population (excluding Russia).

It is very difficult to estimate the total Carpathian population of Capercaillie, mainly because of a lack of precise data from Romania and the Ukraine. Nevertheless, the Carpathians, particularly Romania, undoubtedly represent a very important region for the species in Europe. Other noteworthy species of the Carpathian forests include the Black stork *Ciconia nigra*, Grey–headed woodpecker *Picus canus*, Black woodpecker *Dryocopus martius*, Three–toed woodpecker *Picoides tridactylus*, Tengmalm's owl *Aegolius funereus* and Red–breasted flycatcher *Ficedula parva*.

Typical mountain species, such as the Rock thrush and Wallcreeper, also find a valuable habitat in the Carpathians, reaching the northern limit of their range here. Other valuable mountain species include the Water pipit *Anthus spinoletta* (20% of the European population) and the Alpine accentor *Prunella collaris*.

It is not only the forests and mountains which provide a valuable habitat for birds. The globally threatened Corncrake, a species which has been in steep and continuing population decline in Western Europe for the last 20 years, is found in the Carpathian meadows. The Carpathians represent a very important refuge for this species in Europe thanks to extensive agricultural practices.

Interestingly, the Carpathians are an important European stronghold for the steppe species Saker *Falco cherrug* (15% to 25% of the European population, or 80 to 85 pairs, nest in lower ranges and depressions in the Carpathians).

Quite a unique migrating population of a few pairs of Horned Lark (Eremophila alpestris balcanica) nest in the Romanian mountains of Munti Cindrel, Bucegi and Parâng (Munteanu and Szabó 2001). It is an isolated and northern most nesting location of this sub–species.

Main Threats to Birds in the Carpathians

Most birds are not dependent on small–sized habitats and can easily move to other similar habitats when their original one changes. Nevertheless, habitat alteration, fragmentation and destruction have been identified as the worst threats, especially for birds of prey, woodpeckers, grouses and Corncrakes. Destruction of old growth forests, which constitute important nesting habitats for most birds of prey, owls and woodpeckers, has particu-

larly adverse effects. On the European scale, extensive beech and fir forests are the most valuable nesting habitats for White–backed, Black and Three-toed woodpeckers, and also for some passerines such as Red–breasted Flycatcher.

The very specific habitat requirements of the Capercaillie — coniferous forests with open areas and undergrowth of Bilberry *Vaccinium myrtillus* — together with intensive forest management practices, pollution by DDT and hunting, has made this species almost extinct in most of the Carpathian countries, and virtually extinct in Hungary. Only in Romania is the Capercaillie still fairly common and hunted.

In addition to habitat destruction, bird crime is also a serious threat, especially for rare birds of prey. Egg collection, stealing chicks for falconry and shooting birds for taxidermy can play a significant role in the decrease of populations of rare birds of prey. Bird crime has been monitored in Slovakia since 1965. Nests of some birds of prey (e.g. Golden eagle *Aquila chrysaetos*, Lesser spotted eagle, Saker) have been guarded there since 1990 resulting in lower numbers of robbed nests, at times a 70% decrease, and the occasional prosecution of robbers. Although data on bird crime from other countries is absent, it is probable that the possible may significantly affect bird of prey populations also in the Ukraine and Romania.

Top predators, such as birds of prey and owls, are especially vulnerable to pollution. Larger bird species are also threatened by collisions, usually fatal, with overhead wires and poorly designed electric poles.

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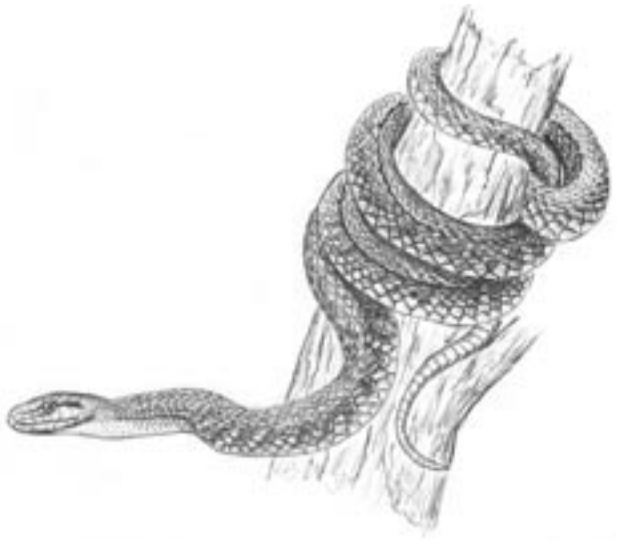
Carpathian List of Endangered Species – birds (for explanations, see chapter on *How to Use This Book*)

Species	Category of Threat for Entire Carpathians	Category of Threat in Carpathian Countries							Protection in Carpathian Countries							Arctic/Alpine	Bern Convention	Bird Directive	Carpathian hold large proportion of world population	Endemic	Habitat Directive	High Mountain Species	Relic
		A	CZ	H	PL	RO	SK	UA	A	CZ	H	PL	RO	SK	UA								
Aegolius funereus (Linnaeus, 1758)	VU		VU		VU	+	VU	CR		SP	PP	SP	SP	SP	SP		+	+					+
Anthus spinoletta (Linnaeus, 1758)	VU		CR		+	+	VU	+		SP	PP	SP	SP	SP	PP		+					+	
Aquila chrysaetos (Linnaeus, 1758)	EN		EW	VU	EN	VU	CR	CR		SP	SP	SP	SP	SP	SP		+	+					
Aquila heliaca Saviigny, 1809	CR			CR		CR	CR	+		PP	SP	SP	SP	SP	SP		+	+	+				
Aquila pomarina Brehm, 1831	EN		EW	CR	VU	EN	EN	CR		SP	SP	SP	SP	SP	SP		+	+	+				
Bonasa bonasia (Linnaeus, 1758)	VU		VU	CR	+	+	EN	+		SP	SP	PP	E	PP	PP		+	+					
Caprimulgus europaeus Linnaeus, 1758	VU		CR	+	+	VU	VU	+		SP	PP	SP	SP	SP	PP		+	+					
Charadrius morinellus (Linnaeus, 1758)	CR				CR	CR	+			SP	NP	SP	SP	SP	PP	+	+	+					+
Ciconia nigra (Linnaeus, 1758)	EN		VU	CR	+	EN	EN	+		SP	SP	SP	SP	SP	SP		+	+					
Crex crex (Linnaeus, 1758)	EN		EN	EN	+	VU	CR	CR		SP	SP	SP	SP	SP	SP		+	+					
Dendrocopos leucotos (Bechstein, 1803)	EN		EN	EN	VU	EN	EN	VU		SP	SP	SP	SP	SP	PP		+	+					
Emberiza cia Linnaeus, 1766	EN			EN		+	EN			PP	PP	SP	SP	SP			+						
Eremophila alpestris (Linnaeus, 1758)	CR					CR							SP				+					+	
Falco cherrug Gray, 1834	CR	+	CR	CR		CR	CR	CR		SP	SP	SP	SP	SP	SP		+						
Falco peregrinus Tunstall, 1771	CR		EW	+	CR	EN	CR	CR		SP	SP	SP	SP	SP	SP		+	+					
Ficedula parva (Bechstein, 1794)	VU		VU	+	+	VU	VU	+		SP	PP	SP	SP	SP	PP		+	+					
Glaucidium passerinum (Linnaeus, 1758)	VU		EN	+	VU	+	VU	CR		SP	PP	SP	SP	SP	SP		+	+					
Hieraaetus pennatus (Gmelin, 1788)	CR			CR		EN	CR	CR			SP	SP	SP	SP			+	+					
Lullula arborea (Linnaeus, 1758)	VU	+	EN	+	+	EN	VU	+		SP	PP	SP	SP	SP	PP		+	+					
Monticola saxatilis (Linnaeus, 1766)	CR		EW	EN	+	EN	CR	CR		SP	SP	SP	SP	SP	SP		+						
Otus scops (Linnaeus, 1758)	VU		CR	EN		+	CR	VU		SP	PP	SP	SP	SP	PP		+						
Picoides tridactylus (Linnaeus, 1758)	VU		EN		VU	VU	EN	VU		SP	NP	SP	SP	SP	PP		+	+					+
Picus canus Gmelin, 1758	VU		+	+	+	VU	VU	VU		PP	PP	SP	SP	SP	PP		+	+					
Prunella collaris (Scopoli, 1769)	EN		EW		CR	+	EN	CR		SP		SP	SP	SP	SP		+					+	
Scolopax rusticola Linnaeus, 1758	VU		VU	+	+	VU	VU	VU		PP	E	PP	E	PP	PP		+	+					
Strix uralensis Pallas, 1771	EN		CR	EN	VU	VU	EN	CR		SP	SP	SP	SP	SP	SP		+						
Tetrao tetrix Linnaeus, 1758	EN		EW	EW	+	EN	EN			SP	NP	SP	SP	SP			+	+					
Tetrao urogallus Linnaeus, 1758	EN		CR	EW	EN	+	EN	CR		SP	NP	SP	E	SP	SP		+	+					
Tichodroma muraria (Linnaeus, 1766)	EN				CR	VU	EN			SP	PP	SP	SP	SP			+						

Distribution of the Red Data List birds in the Carpathians (for explanations, see chapter on *How to Use This Book*)

Species	Physiographic Units
Aegolius funereus (Linnaeus, 1758)	513.2, 513.412, 513.43-44, 513.51-52, 513.55-57, 513.71, 514.9, 514.11, 514.13-14, 514.42-43, 514.51-53, 514.62, 514.64, 514.71-74, 514.85, 515.11-14, 515.23-28, 516.2, 516.4a, 522, 523.1-2, 523.51-55
Anthus spinoletta (Linnaeus, 1758)	513.44-46, 513.51-52, 513.55, 513.71, 514.9, 514.14, 514.42-43, 514.51-53, 514.63, 514.74, 514.84-85, 515.26-29, 522, 523.1-2, 523.31, 523.42-47, 523.51-57, 523.61-63, 523.66, 523.71-73, 524.2-3, 524.5, 525.3, 531.4, 531.11-15, 531.21-22, 531.25-26, 531.31-36, 533.2-3, 533.5, 542.1, 542.21-23, 542.32, 542.34, 542.42
Aquila chrysaetos (Linnaeus, 1758)	513.55, 513.71, 514.9, 514.11-13, 514.42-43, 514.51-53, 514.63-64, 514.74, 514.84-85, 515.25-29, 516.2, 516.4a, 517.1-2, 522, 523.1-2, 523.31, 523.45-47, 523.51-56, 523.62-64, 523.71-73, 524.3, 524.5-6, 531.4, 531.11, 531.13, 531.15, 531.17, 531.22, 531.25-26, 531.31-36, 533.1, 533.6-7, 541.1-2, 542.1, 542.21-23, 542.31-34, 542.42
Aquila heliaca Saviigny, 1809	513.411, 514.2, 514.41-42, 514.81, 514.83, 515.21, 515.28, 516.2, 516.4, 517.1-2, 523.41, 523.51, 523.63-65, 523.71, 523.73, 531.24, 531.32, 541.2-4
Aquila pomarina Brehm, 1831	513.411, 513.51, 513.55-57, 513.64-65, 513.71-72, 514.9, 514.11-14, 514.34, 514.41-43, 514.51-53, 514.62-63, 514.71-74, 514.82-85, 515.12-15, 515.21-29, 516.2, 516.4, 516.4a, 516.11, 517.1-2, 522, 523.1-2, 523.31, 523.41, 523.44-47, 523.51-57, 523.62-66, 523.71-73, 524.5-6, 525.1-2, 526.1, 531.4, 531.11-12, 531.16-17, 531.21-26, 531.31-37, 532.1, 532.3, 533.1, 533.3, 533.5-7, 541, 542.1, 542.21-23, 542.31-33, 542.42-43
Bonasa bonasia (Linnaeus, 1758)	513.31-34, 513.411-412, 513.43-49, 513.51-57, 513.61-65, 513.67-69, 513.71-72, 514.9, 514.11-14, 514.33-34, 514.43, 514.51-53, 514.62-63, 514.71-72, 514.74, 514.82, 514.84-85, 515.11-15, 515.21, 515.23-26, 515.28-29, 516.2, 516.4a, 517.1, 522, 523.1-2, 523.31, 523.42-47, 523.51-57, 523.61-64, 523.66, 524.1-3, 524.5-6, 525.1, 525.3, 526, 531.4, 531.11, 531.13-15, 531.17, 531.21-22, 531.24-26, 531.31-37, 532.3, 533.1-3, 533.5-6, 533.8, 542.1, 542.21-23, 542.31-34, 542.41-42
Caprimulgus europaeus Linnaeus, 1758	513.411, 513.44, 513.54, 513.71-72, 514.2, 514.9, 514.11, 514.13, 514.41, 514.43, 514.51-53, 514.71-74, 514.81, 514.85, 515.21-23, 515.25-27, 515.29, 516.2-4, 516.11-14, 517.1-2, 517.4-5, 522.12, 523.51
Charadrius morinellus (Linnaeus, 1758)	514.12, 514.52-53, 531.25
Ciconia nigra (Linnaeus, 1758)	513.2, 513.32-34, 513.411-412, 513.43-49, 513.51-57, 513.61-65, 513.67-69, 513.71-72, 514.2, 514.9, 514.11-14, 514.31, 514.33-34, 514.41-43, 514.51-53, 514.62-64, 514.71-74, 514.81-85, 515.12-15, 515.17, 515.21-29, 516, 517.1-2, 517.4-5, 522.11-12, 523.1-2, 523.31, 523.41, 523.44, 523.46, 523.51, 523.62-65, 523.71-73, 524.5-6, 525.2, 526.2, 531.17, 531.22, 531.24-26, 531.32, 531.35, 531.37, 532.1, 532.3, 533.1, 533.3, 541, 542.1, 542.21-23, 542.32-34, 542.42
Crex crex (Linnaeus, 1758)	513.2, 513.31-34, 513.411-412, 513.43-49, 513.51-57, 513.61-65, 513.67-69, 513.71-72, 514, 515, 516, 517.1, 517.4-5, 522.11-12, 522.24, 523.2, 523.31, 523.41-42, 523.45, 523.51, 523.63-65, 523.71-73, 524.1, 524.5-6, 525.2, 526, 531.16-17, 531.23-26, 531.31-32, 531.35, 531.37, 532.1, 532.3, 533.1, 533.4, 533.7, 533.7a, 541, 542.21, 542.23, 542.32, 542.42-43
Dendrocopos leucotos (Bechstein, 1803)	513.2, 513.31, 513.411-412, 513.43-44, 513.49, 513.51-52, 513.55-57, 513.61, 513.71-72, 514.2, 514.9, 514.13-14, 514.32-34, 514.41-43, 514.51-52, 514.62-64, 514.71, 514.73-74, 514.81-85, 515.11-15, 515.21-28, 516.2, 516.4, 516.4a, 516.14, 517.1-2, 517.4-5, 522, 523.1-2, 523.31, 523.42, 523.44-46, 523.51-55, 523.57, 523.62-64, 523.71-72, 524.3, 524.6, 525.1, 531.15, 531.24-26, 531.31-33, 541.3-4, 542.1, 542.22-23, 542.33, 542.42
Emberiza cia Linnaeus, 1766	514.2, 514.51, 515.26, 515.28, 516.2, 517.1, 517.4-5, 523.31, 523.42, 523.45, 523.47, 523.51, 523.62, 523.66, 524.3, 524.5, 531.11, 531.13-15, 531.17, 531.22, 531.25-26, 531.32-33, 531.35-36, 533.1, 533.6-7, 542.1, 542.21-23, 542.41-42
Eremophila alpestris (Linnaeus, 1785)	513.11, 531.22, 531.25
Falco cherrug Gray, 1834	513.1, 514.2, 514.41-42, 514.81, 515.26, 515.28, 516.2-4, 517.1-2, 517.4-5, 531.37, 533.1, 542.21
Falco peregrinus Tunstall, 1771	514.2, 514.9, 514.12, 514.42-43, 514.51-53, 514.63, 514.82, 514.85, 515.26, 516.2, 517.1-2, 517.4-5, 522, 523.1-2, 523.31, 523.45-46, 523.51-55, 523.62-63, 523.71, 524.3, 531.22, 531.31-32, 532.3, 533.1, 541.4, 542.1, 542.22-23, 542.33, 542.42
Ficedula parva (Bechstein, 1794)	513.2, 513.32-34, 513.411-412, 513.42-49, 513.51-57, 513.61-65, 513.67-69, 513.71-72, 514.2, 514.11-14, 514.32-34, 514.41, 514.43, 514.52-53, 514.63-64, 514.71, 514.74, 514.84-85, 515.12-15, 515.23, 515.25-28, 516.2, 516.4, 516.4a, 516.11-12, 516.14, 517.1-2, 517.5, 522, 523.1-2, 523.31, 523.42-43, 523.45-46, 523.51-57, 523.61, 523.64, 523.71-73, 524.1, 524.3, 525, 526.2, 531.4, 531.11, 531.13, 531.16-17, 531.24-26, 531.32, 531.34-35, 531.37, 532.1, 532.3, 533.2-3, 533.6-7, 533.8, 541.1, 541.3-4, 542.1, 542.21, 542.23, 542.32-33, 542.42-43
Glaucidium passerinum (Linnaeus, 1758)	513.32-34, 513.412, 513.43-49, 513.51-57, 513.61-65, 513.67-69, 513.71, 514.9, 514.11-14, 514.33-34, 514.43, 514.51-53, 514.62-64, 514.71-74, 514.82, 514.84-85, 515.11-15, 515.23-29, 516.2, 516.4, 516.4a, 522, 523.1-2, 523.51-55
Hieraaetus pennatus (Gmelin, 1788)	517.1, 522.13-16, 522.21-25, 523.51
Lullula arborea (Linnaeus, 1758)	513.1, 513.52, 513.55-56, 513.71-72, 514.2, 514.9, 514.41-42, 514.51, 514.62, 514.64, 514.73, 514.81, 514.83-85, 515.11-12, 515.14, 515.21-26, 515.28-29, 516, 517.1-2, 517.4-5, 522, 523.1-2, 523.51-55
Monticola saxatilis (Linnaeus, 1766)	514.2, 514.41-43, 514.52, 514.63, 514.85, 515.25-26, 515.28, 516.2, 517.2, 517.5, 522.12, 522.24-25, 523.51, 523.66, 524.2-3, 531.12-13, 531.17, 531.22, 531.24, 531.31-33, 531.35, 531.37, 532.3, 533.1, 533.6-7, 541.1, 542.1, 542.21-23, 542.31, 542.33, 542.42
Otus scops (Linnaeus, 1758)	513.411, 515.25, 516.2-4, 516.12, 516.14, 517.1, 517.4-5, 522, 523.1-2, 523.51-55
Picoides tridactylus (Linnaeus, 1758)	513.32-34, 513.412, 513.43-49, 513.51-57, 513.61-65, 513.67-69, 513.71, 514.9, 514.11-14, 514.42-43, 514.51-53, 514.62-64, 514.71-74, 514.84-85, 515.11-15, 515.23-28, 516.2, 516.4, 522, 523.1-2, 523.31, 523.42-47, 523.51-57, 523.61-66, 523.71-72, 524.1-3, 524.5-6, 525.1, 525.3, 531.4, 531.13-17, 531.21, 531.23-26, 531.31-34, 531.36-37, 533.3, 533.5, 541.1, 541.4, 542.1, 542.21-23, 542.31, 542.33-34, 542.41-42
Picus canus Gmelin, 1758	513.2, 513.31-34, 513.411-412, 513.43-45, 513.47-49, 513.51-52, 513.54-57, 513.61-65, 513.68-69, 513.71-72, 514, 515.11-14, 515.17, 515.21-29, 516, 517.1-2, 517.4-5, 522, 523.1-2, 523.31, 523.41-42, 523.45-46, 523.51-57, 523.61-66, 523.71-73, 524, 525, 526, 531.4, 531.11-13, 531.16-17, 531.21-26, 531.31-37, 532.1, 532.3, 533, 541, 542.1, 542.21-23, 542.31-33, 542.41-43
Prunella collaris (Scopoli, 1769)	513.51, 513.56-57, 514.9, 514.13, 514.43, 514.51-53, 514.63, 514.71-72, 514.84-85, 515.26, 522.12, 522.15, 522.24-25, 523.1, 523.31, 523.42, 523.45, 523.56, 523.62, 524.3, 524.5, 525.3, 531.11, 531.13-15, 531.22, 531.25, 531.32-34, 542.1, 542.23
Scolopax rusticola Linnaeus, 1758	513.2, 513.31-34, 513.411-412, 513.42-49, 513.51-57, 513.61-65, 513.67-69, 513.71-72, 514.2, 514.9, 514.12, 514.14, 514.32-34, 514.41-43, 514.51-53, 514.62-64, 514.71-74, 514.81-85, 515.12-15, 515.17, 515.21-26, 515.28-29, 516.2-4, 516.4a, 516.11-13, 517.1, 517.5, 522, 523.1-2, 523.51-55
Strix uralensis Pallas, 1771	513.32-34, 513.44-49, 513.51-55, 513.57, 513.61-65, 513.67-69, 513.71-72, 514.9, 514.11-14, 514.43, 514.51-53, 514.62, 514.64, 514.71-72, 514.85, 515.11-13, 515.23-29, 516.2, 516.4, 516.4a, 517.1-2, 522, 523.1-2, 523.31, 523.42, 523.45-47, 523.51-55, 523.57, 523.62-66, 523.71-73, 524.1, 524.3, 524.5-6, 525.1-2, 531.4, 531.11-14, 531.17, 531.21-22, 531.24-26, 531.31-34, 531.36-37, 532.1, 532.3, 533.6-7, 541.1, 541.3-4, 542.1, 542.21-23, 542.33, 542.42
Tetrao tetrix Linnaeus, 1758	513.45-46, 513.49, 513.51-52, 513.54-55, 514.9, 514.11, 514.13, 514.42-43, 514.51-53, 514.72-74, 514.84-85, 515.25-29, 516.4a
Tetrao urogallus Linnaeus, 1758	513.412, 513.44, 513.51, 513.56-57, 514.9, 514.11, 514.13-14, 514.42-43, 514.51-53, 514.63-64, 514.71-74, 514.82, 514.84-85, 515.11-13, 515.23-24, 515.26-28, 522.13, 522.15-16, 522.24-25, 523.1-2, 523.31, 523.42-47, 523.56-57, 523.61-66, 523.72, 524.1-3, 524.5-6, 525.1, 525.3, 526.2, 531.4, 531.11, 531.13-15, 531.17, 531.21-22, 531.24-26, 531.32-37, 532.1, 532.3, 533.2-3, 533.5-6, 533.8, 542.1, 542.21-23, 542.31, 542.33-34, 542.41-42
Tichodroma muraria (Linnaeus, 1766)	513.52, 513.54, 514.9, 514.12, 514.14, 514.42-43, 514.51-53, 514.63, 514.84-85, 516.2, 523.31, 523.45, 523.47, 523.56, 523.66, 524.3, 531.11, 531.13, 531.15, 531.21-22, 531.24-26, 531.32-37, 533.5-6, 542.1, 542.21, 542.23, 542.42



Reptiles and Amphibians

by Mojmir Vlašín

Detailed knowledge about the distribution of most species of reptiles and amphibians is not very good. In most countries, national censuses have not been carried out. However, red lists are available in all countries. New red lists for some countries are due to be published.

Out of a total of 31 reptile and amphibian species recorded in the Carpathians, 17 species have been recognized as endangered and/or characteristic for the region. Only one reptile and one amphibian species were selected as flagship species.

The Aesculapian snake *Elaphe longissima* is the longest Carpathian snake reaching up to 2m. The body is relatively slender, smooth, and in old specimens, slightly keeled. Although mostly terrestrial, it is a good climber. It hibernates in rocky crevices, in rodent burrows, manure and in the cellars of ruins. In most states in the Carpathian region it is classified as a critically endangered species. It is protected within the EU *Habitat Directive* (Annex 4) and the *Bern Convention* (Annex 2).

The Carpathian newt *Triturus montandoni* is a small newt reaching a maximum length of 10 cm (although it is usually smaller). The head is relatively flat and wide with 3 grooves. The back is sand–yellow to dark brown and sometimes greenish. The belly is always uniformly yellow to orange. The tail has pale streaks on the sides and its lower edge is orange with black spots. This newt is endemic to the Carpathians and inhabits humid, shaded slopes in deciduous forests. Although it mostly lives under stones, woods and leaves, the species reproduces in small water bodies near springs on wet meadows. Due to its endemism in the Capathian region and environs, it is not mentioned in the EU's *Habitat Directive* but it is protected by the Bern Convention (Annex 2). In most Carpathian states it is protected as an endangered species.

The following reptiles and amphibians, found in the Carpathians, can be selected as species of particular interest: Green lizard *Lacerta viridis*, Moor frog *Rana arvalis*, Fire-bellied toad *Bombina variegata*, European tree frog *Hyla arborea* and Swamp turtle *Emys orbicularis*.

Main Threats for Reptiles and Amphibians

The main threat for reptiles is the deterioration of habitats including clear-cutting, drainage and habitat fragmentation in general. Similar factors pose the greatest threats for

amphibians. Most reptiles and amphibians are dependent on small–size habitats and cannot move to other similar habitats if their own habitat changes. Additionally, very small and isolated populations, for instance of the Aesculapian snake, can be destroyed by collectors, natural succession and habitat destruction.

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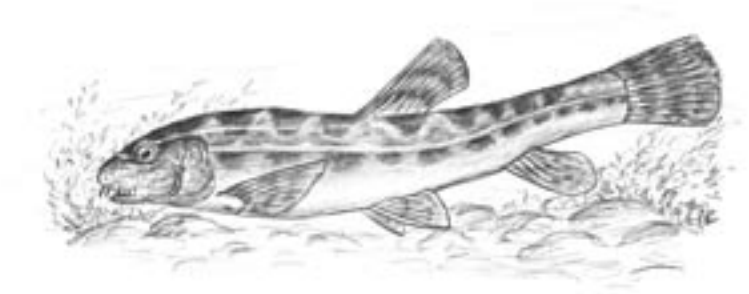
Carpathian List of Endangered Species – reptiles and amphibians (for explanations, see chapter on *How to Use This Book*)

Species	Category of Threat for Entire Carpathians	Category of Threat in Carpathian Countries							Protection in Carpathian Countries							Arctic/Alpine	Bern Convention	Carpathian hold large proportion of world population	Endemic	Habitat Directive	High Mountain Species	Relic
		A	CZ	H	PL	RO	SK	UA	A	CZ	H	PL	RO	SK	UA							
Reptiles																						
Coronella austriaca Laurenti, 1768	VU	+	VU	EN	+	+	EN	VU		SP	PP	SP		SP	SP		+			+		
Elaphe longissima (Laurenti, 1768)	EN		CR	EN	+	+	CR	EN		SP	PP	SP		SP	SP		+	+		+		
Emys orbicularis (Linnaeus, 1758)	CR		CR	CR		+	CR	+		SP	PP	SP		SP	NP		+			+		
Lacerta viridis (Laurenti, 1768)	EN	+	CR	VU		+	CR	+		SP	NP			SP			+			+		
Natrix tessellata (Laurenti, 1768)	DD		EN	+		+	EN	+		SP	PP			PP	NP		+			+		
Podarcis muralis (Laurenti, 1768)	VU		CR	+	+	+	CR	+		NP	PP			SP			+	+		+		
Vipera ammodytes (Linnaeus, 1758)	VU					+					PP						+			+		
Vipera berus (Linnaeus, 1758)	VU		EN	+	+	+	CR	+		SP	PP			SP	NP		+					
Zootoca vivipara (Jacquin, 1787)	DD		VU	+	+	+	VU	+		SP	PP	SP		SP			+					

Species	Category of Threat for Entire Carpathians	Category of Threat in Carpathian Countries							Protection in Carpathian Countries							Arctic/Alpine	Bern Convention	Carpathian hold large proportion of world population	Endemic	Habitat Directive	High Mountain Species	Relic
		A	CZ	H	PL	RO	SK	UA	A	CZ	H	PL	RO	SK	UA							
Amphibians																						
Bombina bombina (Linnaeus, 1761)	EN	+	CR	VU	+	+	CR	VU		SP	PP	SP		SP	NP		+			+		
Bombina variegata (Linnaeus, 1758)	EN		CR	EN	+	+	EN	+		SP	PP	SP		SP	NP		+			+		
Rana dalmatina Bonaparte, 1840	VU	+	VU	+	+	+	+	EN	SP	SP	PP	NP			SP		+			+		
Salamandra salamandra (Linnaeus, 1758)	DD		CR	EN	+	+	EN	VU		SP	PP	SP		SP	SP		+					
Triturus alpestris (Laurenti, 1768)	VU		EN	CR	+	+	CR	EN		SP	PP	SP		SP	SP		+					
Triturus cristatus (Laurenti, 1768)	EN		CR	EN	+	+	EN	+		SP	PP	SP		SP	NP		+			+		
Triturus dobrogicus (Kiritzescu, 1903)	VU		CR	EN	+	+	CR	VU		NP	PP			SP	NP		+					
Triturus montandoni (Boulenger, 1880)	EN		CR	?	+	+	CR	EN		SP	PP	SP		PP	SP		+	+	+			

Distribution of the Red Data List reptiles and amphibians in the Carpathians (for explanations, see chapter on *How to Use This Book*)

Species	Physiographic Units
Reptiles	
Coronella austriaca Laurenti, 1768	513.1-2, 513.31, 513.33-34, 513.411, 513.42-43, 513.45, 513.52-54, 513.61, 513.63, 513.65, 513.67, 513.71-72, 514.2, 514.9, 514.11-13, 514.31-34, 514.41-43, 514.51, 514.62, 514.64, 514.71-74, 514.81-85, 515.14-15, 515.21-23, 515.25-26, 515.28, 516.2-4, 516.11-14, 517, 522.11-12, 522.15-16, 522.21-26, 523, 524, 525, 526, 531, 532.1, 532.3, 533, 541, 542
Elaphe longissima (Laurenti, 1768)	513.411, 513.54, 513.72, 514.2, 514.31, 514.41-42, 514.62, 514.81-82, 515.15, 515.17, 515.21-23, 515.25-28, 516, 517, 522.12-16, 522.21-26, 523.1-2, 523.51-55
Emys orbicularis (Linnaeus, 1758)	517.3, 523.2, 523.51-55
Lacerta viridis (Laurenti, 1768)	513.1, 513.411, 514.2, 514.31, 514.41-42, 514.62, 514.81, 514.83, 515.15, 515.17, 515.21, 515.26, 516.2-4, 516.11-14, 517, 523.2, 523.51-55
Natrix tessellata (Laurenti, 1768)	513.411, 513.72, 514.2, 514.31, 514.62, 514.73, 514.83, 515.15, 515.25-26, 515.28, 516.3-4, 516.4a, 516.13-14, 517.1, 517.5, 522.21-24, 523.1-2, 523.51-55
Podarcis muralis (Laurenti, 1768)	513.411, 513.43, 513.45, 513.56, 513.72, 514.2, 514.9, 514.11, 514.31-33, 514.41-43, 514.51, 514.62, 514.64, 514.71, 514.73, 514.81-82, 514.84-85, 515.14-15, 515.21-24, 515.26-28, 516, 517, 522.16, 523.1, 523.31, 523.42-47, 523.51, 523.56-57, 523.61-66, 523.71, 524, 525, 526.1, 531.4, 531.11-15, 531.17, 531.21-26, 531.31-37, 532.1, 533.1-3, 533.5-7, 533.8, 541.1-2, 541.4, 542.1, 542.21-23, 542.31-34, 542.41-42
Vipera ammodytes (Linnaeus, 1758)	523.66, 526.2, 531.17, 531.31-33, 531.35, 531.37, 533.1, 533.6-7, 542.21-22, 542.42
Vipera berus (Linnaeus, 1758)	513.2, 513.32-34, 513.411-412, 513.43-49, 513.51-52, 513.54-57, 513.61, 513.64-65, 513.67-68, 513.71-72, 514.9, 514.11-14, 514.31, 514.41-43, 514.51-53, 514.63-64, 514.71-74, 514.82, 514.84-85, 515.11-15, 515.21, 515.23-29, 516.4a, 517.1, 522, 523.1-2, 523.31, 523.41-47, 523.51-57, 523.61-64, 523.66, 523.71-72, 524.2-6, 525, 526, 531, 532.1, 533.2-7, 533.8, 541.3-4, 542.1, 542.21-23, 542.31-34, 542.41-42
Zootoca vivipara (Jacquin, 1787)	513.32, 513.411-412, 513.43-47, 513.49, 513.51-52, 513.54-57, 513.61, 513.65, 513.67-68, 513.71-72, 514.9, 514.11-14, 514.42-43, 514.51-53, 514.63, 514.71-74, 514.81-82, 514.84-85, 515.11-14, 515.17, 515.21-29, 516.4a, 516.11, 517.1, 522, 523.1-2, 523.31, 523.42-47, 523.51-57, 523.61-66, 523.71-72, 524, 525, 531.4, 531.11-15, 531.17, 531.21-26, 531.31-37, 533.1, 533.3, 533.5-6, 533.8, 541.1-2, 541.4, 542.1, 542.21-23, 542.31, 542.33-34, 542.41-43
Amphibians	
Bombina bombina (Linnaeus, 1761)	513.1-2, 513.31, 513.42, 513.45-49, 513.51-54, 513.61-65, 513.67-68, 513.71, 514.2, 514.11-13, 514.52-53, 515.26, 516.2-4, 516.11-14, 517, 522.11-12, 522.16, 523.1-2, 523.31, 523.41-47, 523.51-54, 523.56-57, 523.61-66, 523.71-73, 524, 525, 526, 531, 532, 533, 541, 542
Bombina variegata (Linnaeus, 1758)	513.2, 513.31, 513.411-412, 513.42, 513.44-45, 513.51, 513.54-57, 513.71-72, 514.2, 514.9, 514.11-14, 514.31-34, 514.42-43, 514.51-53, 514.62-64, 514.71-74, 514.81-85, 515, 516.2, 516.4, 516.11, 517.1-3, 522, 523.1-2, 523.51-55
Rana dalmatina Bonaparte, 1840	513.1, 513.411, 513.45, 513.64-65, 514.2, 514.31-34, 514.41-42, 514.62, 514.81-84, 515.15, 515.17, 515.21-23, 515.26, 515.28, 516, 517, 522.11-12, 522.15-16, 522.21-25, 523.1-2, 523.31, 523.41-47, 523.51-52, 523.54-57, 523.61-66, 523.71-73, 524, 525, 526.2, 531, 532.1, 533, 541.1, 541.3-4, 542
Salamandra salamandra (Linnaeus, 1758)	513.2, 513.31-32, 513.411-412, 513.42-49, 513.51-57, 513.61-65, 513.68, 513.71-72, 514.2, 514.9, 514.11-14, 514.31-33, 514.42-43, 514.51-53, 514.62-64, 514.71, 514.73-74, 514.81-85, 515.11-15, 515.17, 515.21-22, 515.24-29, 516, 517, 522, 523, 524, 525, 526, 531, 532.1, 532.3, 533, 541, 542
Triturus alpestris (Laurenti, 1768)	513.2, 513.31, 513.411-412, 513.42-43, 513.45, 513.47-49, 513.51-52, 513.54-57, 513.67, 513.71-72, 514.9, 514.11-14, 514.42-43, 514.51-53, 514.62-64, 514.71-74, 514.84-85, 515.11-15, 515.22-29, 517.1-3, 522, 523.1-2, 523.31, 523.42-47, 523.51-57, 523.61-64, 523.66, 523.71-73, 524, 525, 526, 531.4, 531.11, 531.13-15, 531.21-26, 531.31-37, 532.1, 532.3, 533.1-3, 533.5-7, 533.8, 541.1, 541.4, 542.1, 542.21-23, 542.31, 542.33-34, 542.41-42
Triturus cristatus (Laurenti, 1768)	513.2, 513.31, 513.411-412, 513.42-43, 513.45, 516.2-4, 516.12, 516.14, 522, 523.1-2, 523.51-55
Triturus dobrogicus (Kiritzescu, 1903)	514.31, 515.26, 516.4, 516.14, 517.4-5, 522.12, 522.21-23, 523.1-2, 523.51-54, 531.4, 531.35, 531.37, 533.1, 533.6-7, 533.7a, 541.1, 542.1, 542.21-22, 542.33-34, 542.42-43
Triturus montandoni (Boulenger, 1880)	513.32, 513.42-49, 513.51-57, 513.61-65, 513.67-68, 513.71-72, 514.9, 514.11-14, 514.43, 514.51-53, 514.71, 514.73-74, 514.84-85, 515.11, 515.22-29, 522, 523.1-2, 523.31, 523.41-47, 523.51-57, 523.61-65, 523.71-72, 524.1, 524.5-6, 525.1, 541.3



Fishes and Lampreys

by Krzysztof Kukuła and Judit Sandor

The waters of the Carpathians are mainly fast–flowing mountain rivers and streams with a bedrock bottom. River slope ranges between less than 10‰ to over 100‰. The occurrence of macrophytes is rather restricted, due in part to fast currents and considerable changes in water level. Such hydrological conditions determine fish composition, with the dominant share of rheophilous species. Fish preferring a bedrock bottom are a characteristic group.

State of knowledge

For the past several decades, studies on the Carpathian ichtyofauna have been carried out with varying intensity. Relatively extensive data is available from the Polish (eg. Rolik 1971; Bieniarz, Epler 1972; Skóra, Włodek 1988, 1989, 1991; Starmach et al. 1988; Kukuła 1999; Włodek, Skóra 1999), Czech and Slovakian parts of the range (Weisz, Kux 1959; Kux, Weisz 1964; Holčik 1966, 1996; Holčik, Hensel 1972; Kirka et al. 1976, 1981; Baruš et al. 1981; Koščo, Košuth 1995a, 1995b).

Threats for Fishes and Lampreys

The impact of anthropogenic changes on ichtyofauna is evident in a number of river catchment basins of the Carpathians. Data gathered in the 1980s and 1990s points to increasing threats including: pollution, changes in river beds caused by hydrotechnical constructions (dams), poaching, extensive angling pressure and introduction of alien fish species (Lelek 1987; Witkowski 1992, 1996; Schiemer, Waidbacher 1992; Banarescu 1993; Lusk 1996; Sych 1996; Starmach 1998; Amirowicz 2001; Kukuła 2001). In the 1990s, comprehensive research into fish conservation began in the region. Red lists for most threatened species were also drawn up (Głowaciński 1992, 2001; Witkowski 1995, 2001; Holčik 1996; Lusk, Hanel 1996; Witkowski et al. 1999).

The greatest numbers of threatened fish species belong to Cyprinids *Cypriniformes*. Particularly alarming is a strong decrease in those fish that were once dominant species in the Carpathian rivers, for instance, Common barbel *Barbus barbus* and Nase *Chondrostoma nasus*. The population of anadromic Vimba *Vimba vimba* has also decreased markedly.

Migratory fish are particularly affected by anthropogenic alternations of the environment. Hydrotechnical constructions isolate them from their spawning grounds which in many cases are additionally degraded by pollution. For these reasons, Atlantic sturgeon *Acipenser sturio*, Atlantic salmon *Salmo salar* and probably also Sea trout *Salmo trutta* m. *trutta* can be classified in this list as extinct species in the Carpathians.

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Dr A. Amirowicz, Institute of Freshwater Biology Polish Academy of Sciences, helped in determining the category of threat of some species in the Polish Carpathians.

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Carpathian List of Endangered Species – fishes and lampreys (for explanations, see chapter on *How to Use This Book*)

Species	Category of Threat for Entire Carpathians	Category of Threat in Carpathian Countries							Protection in Carpathian Countries							Arctic/Alpine	Bern Convention	Carpathian hold large proportion of world population	Endemic	Habitat Directive	High Mountain Species	Relic
		A	CZ	H	PL	RO	SK	UA	A	CZ	H	PL	RO	SK	UA							
Fishes																						
Acipenser ruthenus Linnaeus, 1758	VU			+		VU	+	VU					PP		SP		+					
Acipenser sturio Linnaeus, 1758	EX		EX		EX																	
Alburnoides bipunctatus Bloch, 1782	CR		VU	+	CR	+	VU	+		PP	PP	SP		SP	PP		+					
Barbus barbus Linnaeus, 1758	VU		VU	+	VU	+	+	+		PP	PP	PP								+		
Barbus peloponnesius Valenciennes, 1842	VU			CR	VU	+	VU	+			PP	PP		SP			+					
Chondrostoma nasus Linnaeus, 1758	EN		CR	+	VU	+	+	+		PP		PP		SP	PP		+					
Cobitis taenia Linnaeus, 1758	EN		EN	+	VU	+	CR	+			PP	SP		SP	PP		+					
Cottus gobio Linnaeus, 1758	VU		VU	+	VU	+	+	+		PP	PP	NP								+		
Cottus poecilopus Heckel, 1836	VU		VU	+	EN	+	+	+		PP	PP	SP		SP	PP		+					
Gobio kessleri Dybowski, 1862	EN		CR	+	+	+	CR	+			PP	SP		SP			+					
Gobio uranoscopus Agassiz, 1828	EN		+	+		+	CR	+			PP			SP	SP		+					
Gymnocephalus baloni Holcik & Hensel, 1974	EN			+			EN							SP			+					
Gymnocephalus schraetzer Linnaeus, 1758	EN		CR	+		EN	EN	VU			PP		PP	SP	SP		+		+			
Hucho hucho Linnaeus, 1758	CR		EX	+	EW	EN	CR	EN			SP	PP	PP	PP	SP		+					
Leuciscus souffia Risso, 1826	VU			+		+	+	VU			PP				SP		+					
Lota lota Linnaeus, 1758	VU		VU	+	VU	+	+	+		PP		PP										
Phoxinus phoxinus Linnaeus, 1758	VU		VU	+	VU	+	VU	+		PP	PP	SP										
Proterorhinus marmoratus Pallas, 1814	VU			+			VU							SP			+					
Rhodeus sericeus (Pallas, 1776)	EN			+	EN	+	+	+				SP					+					
Romanichthys valsanicola Dumitrescu et Banarescu & Stoica, 1957	EN					EN							PP						+			
Sabanejewia aurata (Filippi, 1865)	EN		CR	+	EN	+	EN	+		PP	PP	SP		SP	PP		+			+		
Sabanejewia romanica Bacescu, 1943	VU					+													+			
Salmo salar Linnaeus, 1758	EX		EX		EX							PP					+					
Thymallus thymallus Linnaeus, 1758	VU		+	+	VU	+	+	VU		PP	PP	PP		SP	SP		+			+		
Vimba vimba Linnaeus, 1758	CR		EN	+	CR	+	+	+				PP		SP	PP		+					
Zingel streber Siebold, 1863	EN		EX	+		EN	CR	+			PP		PP	SP	SP		+					
Zingel zingel Linnaeus, 1758	EN			+		EN	+	+			PP		PP	SP	SP		+					
Lampreys																						
Eudontomyzon danfordi Regan, 1911	EN			+	+	+	CR	+			SP			SP	SP				+			
Eudontomyzon mariae Berg, 1931	EN		CR	+	EN	+	+	+			SP	SP			SP		+					
Lampetra planeri Bloch, 1784	EN		EN		VU		CR	+				SP		SP			+					

Distribution of the Red Data List fishes and lampreys in the Carpathians (for explanations, see chapter on *How to Use This Book*)

Species	Physiographic Units
Fishes	
Acipenser ruthenus Linnaeus, 1758	516.4, 517.1, 517.5, 523.51-52, 523.54, 541, 542.34
Alburnoides bipunctatus Bloch, 1782	513.33-34, 513.411-412, 513.43-44, 513.46-49, 513.51-52, 513.54-57, 513.61-65, 513.67-69, 513.71-72, 514.2, 514.9, 514.12-13, 514.32-34, 514.43, 514.62, 514.64, 514.71-74, 514.81-82, 514.84-85, 515.11-15, 515.17, 515.21-23, 515.25-29, 516, 517, 522.11-12, 522.21-23, 523.2, 523.41, 523.51-53, 523.61, 523.65, 523.71-73, 524.4, 526.1, 531.4, 531.12, 531.16-17, 531.23, 531.31, 531.35, 532.1-2, 533.1, 533.4, 533.7, 533.7a, 541, 542.1, 542.32, 542.34, 542.43
Barbus barbus Linnaeus, 1758	513.32-34, 513.411-412, 513.43-44, 513.46-47, 513.53-57, 513.61-65, 513.67, 513.71-72, 514.2, 514.9, 514.11-13, 514.31-34, 514.41-43, 514.62, 514.71-74, 514.81-85, 515.11-15, 515.17, 515.21-22, 515.26, 515.28-29, 516, 517, 522.12, 523.2, 523.31, 523.41, 523.43, 523.46, 523.51, 523.56, 523.61-66, 523.71-73, 524.1, 524.4-6, 525.1-2, 526, 531.4, 531.11-13, 531.16-17, 531.21-26, 531.31-33, 531.35-37, 532, 533.1-7, 533.7a, 541, 542
Barbus peloponnesius Valenciennes, 1842	513.32-34, 513.45-49, 513.51-55, 513.61-65, 513.67-69, 513.71-72, 514.9, 514.12-13, 514.72-74, 514.84-85, 515.12-15, 515.17, 515.21, 515.25-29, 516, 517, 522.11-12, 523.2, 523.31, 523.41, 523.43, 523.46, 523.51, 523.56, 523.61-66, 523.71-73, 524.1, 524.4-6, 525.1-2, 526.1, 531.4, 531.11-13, 531.16-17, 531.21-26, 531.31-33, 531.35-37, 532.1-2, 533.1-7, 533.7a, 541, 542
Chondrostoma nasus Linnaeus, 1758	513.32-34, 513.411-412, 513.44, 513.46-49, 513.52-57, 513.61-65, 513.67-68, 513.71-72, 514.2, 514.9, 514.11-12, 514.31-34, 514.42-43, 514.62, 514.64, 514.71-74, 514.82, 514.85, 515.12-15, 515.17, 515.21-22, 515.25-28, 516.2-4, 516.11-14, 517, 522.11-12, 522.21-25, 523.1-2, 523.31, 523.41, 523.43, 523.46, 523.51-53, 523.56, 523.61-66, 523.71-73, 524.1, 524.4-6, 525.1-2, 526.1, 531.4, 531.11-13, 531.16-17, 531.21-26, 531.31-33, 531.35-37, 532.1-2, 533.1-7, 533.7a, 541, 542
Cobitis taenia Linnaeus, 1758	513.32-34, 513.411-412, 513.46, 513.55, 513.61-62, 513.64-65, 513.71-72, 514.11, 514.62, 514.64, 514.72-74, 514.85, 515.15, 515.25-26, 515.28, 516.2-4, 516.12-14, 517.1-2, 517.4, 522.11-12, 522.21-23, 523.51-53, 526.2, 531.17, 531.35, 531.37, 533.1, 533.6, 533.7a
Cottus gobio Linnaeus, 1758	513.32-34, 513.411-412, 513.44-49, 513.51-57, 513.61-65, 513.67-69, 513.71-72, 514.2, 514.9, 514.11-13, 514.32-34, 514.42-43, 514.62, 514.64, 514.71-74, 514.82, 514.85, 515.11-14, 515.25-29, 516.4, 516.4a, 516.13, 517.5, 522.11-12, 523.1-2, 523.31, 523.41-43, 523.45-47, 523.51, 523.55-57, 523.61-66, 523.71-73, 524, 525, 526.1, 531, 532.1, 533.1-3, 533.5-7, 533.7a, 533.8, 541, 542.1, 542.21-23, 542.31-34, 542.41-42

Species	Physiographic Units
Cottus poecilopus Heckel, 1836	513.411-412, 513.44-49, 513.51-52, 513.54-57, 513.67-69, 513.71-72, 514.2, 514.9, 514.11-13, 514.32-34, 514.41-43, 514.51-53, 514.62-64, 514.71-74, 514.82, 514.84-85, 515.11-15, 515.17, 515.23-29, 516.2, 516.4, 516.4a, 516.12, 516.14, 517.1, 517.3, 522.11-13, 522.15, 522.23-25, 523.1-2, 523.31, 523.41-43, 523.45-47, 523.51, 523.55-57, 523.61-66, 523.71-73, 524, 525, 526.1, 531, 532.1, 533.1-3, 533.5-7, 533.7a, 533.8, 541, 542.1, 542.21-23, 542.31-34, 542.41-42
Gobio kessleri Dybowski, 1862	513.33, 513.44, 513.55, 513.64-65, 513.72, 514.11, 515.12-14, 516.2-4, 516.12-14, 522.11-12, 523.51, 523.73, 526.1, 532.1, 533.7, 541, 542.34, 542.43
Gobio uranoscopus Agassiz, 1828	513.411, 513.55, 513.57, 513.72, 514.32, 514.72, 514.74, 514.85, 516.2-4, 517.5, 522.23, 523.1-2, 523.31, 523.41-43, 523.45-47, 523.51, 523.53, 523.55-57, 523.61-66, 523.71-73, 524, 525, 526.1, 531, 532.1, 533.1-3, 533.5-7, 533.7a, 533.8, 541, 542.1, 542.21-23, 542.31-34, 542.41-42
Gymnocephalus baloni Holcik & Hensel, 1974	516.12-13
Gymnocephalus schraetzer Linnaeus, 1758	514.31, 514.64, 515.15, 515.21, 516.2-3, 516.12-13, 517.5, 522.22, 523.53, 523.73, 541, 542.43
Hucho hucho Linnaeus, 1758	513.411-412, 513.54-57, 513.64-65, 514.9, 514.11-13, 514.31-34, 514.43, 514.51, 514.62, 514.64, 514.71-72, 514.74, 514.85, 515.12-15, 515.22, 515.25-26, 515.28, 517.1, 517.5, 522.23-25, 523.1-2, 523.43, 523.46-47, 523.57, 523.61-62, 523.71-72, 524.1, 524.3, 524.5, 526.1, 531.14, 531.24, 541, 542.33-34
Leuciscus souffia Risso, 1826	517.1, 522.22-23, 523.1-2, 523.31, 523.43, 523.52-53, 523.55, 523.57, 523.61, 524.1, 541.1, 542.42
Lota lota Linnaeus, 1758	513.32-34, 513.411, 513.43, 513.46-47, 513.51, 513.53, 513.55, 513.57, 513.61-65, 513.71-72, 514.2, 514.11, 514.64, 514.71, 515.12, 515.14-15, 515.25-26, 516.2-4, 516.12-14, 517, 522.12, 523.51, 523.73, 541, 542.43
Phoxinus phoxinus Linnaeus, 1758	513.32-34, 513.411-412, 513.43-49, 513.51-57, 513.61-65, 513.67-69, 513.71-72, 514.2, 514.9, 514.11-13, 514.31-34, 514.41-43, 514.51, 514.53, 514.62-64, 514.71-74, 514.82, 514.85, 515.11-15, 515.17, 515.21-22, 515.24-29, 516, 517, 522.11-12, 523.51, 523.73, 541, 542.43
Proterorhinus marmoratus Pallas, 1814	516.12-13, 517.1, 517.5
Rhodeus sericeus (Pallas, 1776)	513.32, 513.46, 513.55, 513.63-65, 513.67-68, 513.71-72, 514.62, 515.15, 516.2-4, 516.11-14, 517.1-2, 517.5, 523.51, 523.73, 541, 542.43
Romanichthys valsanicola Dumitrescu et Banarescu & Stoica, 1957	532.1
Sabanejewia aurata (Filippi, 1865)	513.411-412, 513.44, 513.55-56, 513.61, 513.71-72, 514.11, 514.13, 514.32, 514.34, 514.72-74, 515.15, 516.2-3, 516.12-14, 517, 522.11-12, 522.22-23, 522.25, 523.1-2, 523.31, 523.41-43, 523.45-47, 523.51-53, 523.55-57, 523.61-66, 523.71-73, 524, 525, 526.1, 531, 532.1, 533.1-3, 533.5-7, 533.7a, 533.8, 541, 542
Sabanejewia romanica Bacescu, 1943	523.66, 531.16-17, 531.22-24, 531.26, 531.32, 531.34-37, 533.1, 533.6, 533.7a, 541.3, 542.21-22, 542.41-42
Thymallus thymallus Linnaeus, 1758	513.32, 513.411-412, 513.43-45, 513.47-49, 513.51-52, 513.54-57, 513.64-65, 513.68, 513.71-72, 514.2, 514.9, 514.11-13, 514.34, 514.42-43, 514.51-52, 514.62-64, 514.71-74, 514.85, 515.11-15, 515.23-29, 516.2, 516.4, 516.4a, 516.12, 517.1, 522.11-13, 522.21, 522.23, 523.1-2, 523.31, 523.41-47, 523.51, 523.53, 523.55-57, 523.61-66, 523.71-73, 524, 525, 526.1, 531, 532.1, 533.1-3, 533.5-7, 533.7a, 533.8, 541, 542.1, 542.21-23, 542.31-34, 542.41-42
Vimba vimba Linnaeus, 1758	513.411-412, 513.51, 513.53-57, 513.61, 513.63-65, 513.71-72, 514.11, 514.31-34, 514.43, 514.62, 514.64, 514.71, 514.85, 515.12, 515.15, 515.17, 515.21, 515.24, 515.28, 516.2-4, 516.11-12, 516.14, 517, 522.22, 523.51-53, 523.73, 541, 542.43
Zingel streber Siebold, 1863	513.412, 513.55-57, 513.72, 514.31-32, 514.43, 514.62, 514.64, 514.85, 515.15, 516.2-4, 516.12-14, 517.1-2, 517.5, 522.22, 523.51, 523.53, 523.73, 541, 542.43
Zingel zingel Linnaeus, 1758	513.55, 513.72, 516.4, 516.12, 516.14, 517.1, 517.3, 517.5, 522.22-23, 523.51, 523.53, 523.73, 541, 542.43
Lampreys	
Eudontomyzon danfordi Regan, 1911	513.55, 513.72, 514.72-74, 515.25-26, 515.28-29, 516.2-4, 516.4a, 516.13-14, 517.1-2, 517.5, 522.12, 522.23-24, 523.1-2, 523.31, 523.41-43, 523.45-47, 523.51, 523.55-57, 523.61-66, 523.71-73, 524, 525, 526.1, 531, 532.1, 533.1-3, 533.5-7, 533.7a, 533.8, 541, 542.1, 542.21-23, 542.31-34, 542.41-42
Eudontomyzon mariae Berg, 1931	513.32-33, 513.47-48, 514.11, 517.5, 522.11, 522.13, 531.17, 531.31, 531.35-37, 532.1, 533.1, 533.6, 533.7a
Lampetra planeri Bloch, 1784	513.32-34, 513.45-49, 513.51, 513.54-55, 513.61-65, 513.67, 513.71, 514.9, 514.12-13, 514.72, 514.74, 522.11-12

Invertebrates

by Jerzy Pawłowski

In order to develop a Carpathian List of Endangered Species, former classification concerning Carpathian species in the previously published national red data books or lists were transformed into new IUCN categories of threat (Table 4). However, only species classified as E or V (according to the earlier classifiation of IUCN) were selected from national red lists, and only species classified as E were selected from regional (provincial) red lists according to evaluations on the country scale. Moreover, some new species were introduced by the author.

Table 4. Approximated relation between threat categories in different Carpathian countries (after national or regional red data books or red lists: CSRB'92 = (Škapec ed. 1992), PLRB'92 = (Głowaciński ed.1992), PLRL'92 = (Głowaciński ed. 1992), SURB'84 = (Borodin ed. 1984), UArB'94 = (Shcherbak ed. 1994),

New–WCU status	**Old–IUCN status accepted in CSRB '92, PLRB '92, PLRL '92**	**Categories accepted for Ukraine**	
		SURB '84	UARB '94
EX + EW	EX (also EXP)		O
CR	E	I	I
EN / VU	V	II	II
LR (NT)	R	III	III
	I	IV	IV / V
LR (CD)	O	V	VI

The systematic nomenclature accepted in the present Carpathian List of Endangered Species was based mainly on the "Checklist of Animals of Poland" vol. I–V (Razowski 1990–1997), apart from *Lepidoptera* which were arranged according to "The Lepidoptera of Europe. A distributional checklist" (Karsholt, Razowski 1996). Higher taxa (classes) are presented in systematic order, while lower taxa (genera, species) are presented in alphabetical order.

The large number of invertebrate species requires well–trained experts in each Carpathian country. As the number of invertebrate experts is still limited, the data col-

lected for this list is dramatically insufficient. It is particularly evident when data collected by the author is compared in different countries. Lack of knowledge of Carpathian invertebrate fauna is not an exception — this problem can be found all over the world. The invertebrate fauna of the Carpathians, divided among seven countries, still needs a fundamental inventory in order to draw any solid conclusions about the list of species, their distribution and threats. Any conclusions based on the initial material presented here could be misleading.

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Carpathian List of Endangered Species – invertebrates; + species recorded from the country, but hitherto not protected (or not threatened); ? – species hitherto not found in the country, but its presence is probable (for explanations, see Table 4 and chapter on How to Use This Book)

Class	Ordo	Species	Category of Threat for Entire Carpathians	Category of Threat in Carpathian Countries						Protection in Carpathian Countries			Bern Convention	Endemic	Relic	Alpine
				CZ	H	PL	RO	SK	UA	CZ	PL	SK				
Gastropoda		**Abida secale** (Draparnaud, 1801)	CR					CR								
Gastropoda		**Alopia clathrata** (Rossmässler, 1857)	CR				+	CR						+		
Gastropoda		**Argna bielzi** (Rossmässler, 1859)	EN			VU		CR	+							
Gastropoda		**Balea perversa** (Linnaeus, 1758)	CR	+		CR		+	+							
Gastropoda		**Bielzia coerulans** (M.Bielz, 1851)	VU	+	+	+	+	+	+					+		
Gastropoda		**Candidula unifasciata** (Poiret, 1801)	EN	+		VU										
Gastropoda		**Causa holosericum** (Studer, 1820)	VU	+		VU		+								
Gastropoda		**Chilostoma rossmaessleri** (L.Pfeiffer, 1842)	EN			VU		+								
Gastropoda		**Chondrina clienta** (Westerlund, 1883)	VU			VU	+	+	+							
Gastropoda		**Clausilia cruciata** (Studer, 1820)	EN	+		VU	+	+	+							
Gastropoda		**Cochlicopa nitens** (Gallenstein, 1848)	CR	CR				CR							+	
Gastropoda		**Cochlodina fimbriata remota** Ložek, 1952	CR					CR						+		
Gastropoda		**Deroceras moldavicum** (Grossu & Lupu, 1961)	EN			VU	+	+	+					+		
Gastropoda		**Drobacia banaticum** (Rossmässler, 1838)	CR	Ex	+	Ex	+	Ex	II					+		
Gastropoda		**Gonyodiscus perspectivus** (Megerle v. Mühlfeld, 1818)	VU	+		VU	+	+	+							
Gastropoda		**Granaria frumentum** (Draparnaud, 1801)	CR			CR			I							
Gastropoda		**Helix lutescens** Rossmässler, 1837	CR		+	CR	+	+	+							
Gastropoda		**Hygromia transsylvanica** (Westerlund, 1876)	EN				+	VU						+		
Gastropoda		**Lehmannia macroflagellata** Grossu & Lupu, 1962	VU	+		VU	+	+	+							
Gastropoda		**Lehmannia nyctelia** (Bourguignat, 1861)	EN			VU	+	+								
Gastropoda		**Macrogastra latestriata** (A.Schmidt, 1857)	VU	+		VU	+	+	+							
Gastropoda		**Nesovitrea petronella** (L.Pfeiffer, 1853)	CR	CR		VU	+	CR								
Gastropoda		**Oxychilus inopinatus** (Uličný, 1887)	VU	+	+	VU	+	+	+							
Gastropoda		**Pagodulina pagodula** (Desmoulins, 1830)	CR	VU		CR		VU							+	
Gastropoda		**Perforatella dibothrion** (M.Kimakowicz, 1884)	EN			VU	+	+	+					+		
Gastropoda		**Prostenomphalia carpathica** Baidaschnikov, 1985	EN				?		II					+		
Gastropoda		**Pseudalinda fallax** (Rossmässler, 1836)	VU			VU	+	+	+							
Gastropoda		**Pseudalinda stabilis** (L.Pfeiffer, 1847)	VU			VU	+	+	+					+		
Gastropoda		**Pseudofusculus varians** (C.Pfeiffer, 1828)	CR	CR				CR								
Gastropoda		**Pupilla alpicola** (Charpentier, 1837)	CR					CR							+	
Gastropoda		**Pupilla sterri** (Voith, 1840)	CR			VU		+	+							
Gastropoda		**Pupilla triplicata** (Studer, 1820)	VU			VU	+	+								
Gastropoda		**Semilimax kotulae** (Westerlund, 1883)	EN	+		VU		+	+							
Gastropoda		**Serrulina serrulata** (L.Pfeiffer, 1874)	CR						I						+	
Gastropoda		**Trichia bakowskii** (Poliński, 1924)	VU			VU		+	+							
Gastropoda		**Trichia bielzi** (E.A.Bielz)	VU			VU	+	+	+					+		
Gastropoda		**Trichia filicina** (L.Pfeiffer, 1841)	EN					VU								
Gastropoda		**Trichia lubomirskii** (Ślósarski, 1881)	EN	+		VU		+	+					+		
Gastropoda		**Trichia villosula** (Rossmässler, 1838)	VU			+		+	+							
Gastropoda		**Truncatellina costulata** (Nilsson, 1822)	EN			+		VU							+	
Gastropoda		**Vertigo angustior** Jeffreys, 1830	VU			VU		+					+			
Gastropoda		**Vertigo geyeri** Lindholm, 1925	CR	CR		+		CR								
Gastropoda		**Vertigo modesta** (Say, 1824)	VU			VU		+	+							
Gastropoda		**Vertigo moulinsiana** (Dupuy, 1849)	CR	CR		CR		CR							+	
Gastropoda		**Vestia elata** (Rossmässler, 1836)	CR			CR	+	+						+		
Gastropoda		**Vestia ranojevici** moravica (Brabenec, 1952)	CR	CR				CR								
Oligochaeta		**Allolobophora carpathica** Cognetti, 1927	VU			+	?	+	+					+		
Oligochaeta		**Fitzingeria platyura** (Fitzinger, 1833)	VU	+	+	+	+	+	+							
Oligochaeta		**Helodrilus cernosvitovianus** (Zicsi, 1967)	VU		+	+	+	+	+					+		
Hirudinea		**Trocheta bykowskii** Gedroyć, 1913	VU		+	+		?	+							
Crustacea		**Astacus astacus** (Linnaeus, 1758)	VU	+	+	VU	+	+	+							
Crustacea		**Astacus torrentium** (Schrank, 1803)	EN	CR	?		+	CR								

Class	Ordo	Species	Category of Threat for Entire Carpathians	Category of Threat in Carpathian Countries						Protection in Carpathian Countries			Bern Convention	Endemic	Relic	Alpine
				CZ	H	PL	RO	SK	UA	CZ	PL	SK				
Crustacea		**Bathynella natans** Vejdovsky, 1882	EN	+		VU										
Crustacea		**Branchinecta paludosa** (Müller, 1788)	CR			I		CR							+	
Crustacea		**Chirocephalus slovacicus** Brtek, 1971	CR					?							+	
Crustacea		**Holopedium gibberum** Zaddach, 1855	EN	CR		+		CR							+	
Crustacea		**Imnadia yeyetta** Hertzog, 1935	CR					CR							+	
Crustacea		**Niphargus leopoliensis** Jaworowski, 1893	VU			VU			+							
Crustacea		**Niphargus tatrensis** Wrześniowski, 1888	VU			VU		+								
Scorpionida		**Euscorpius carpathicus** (Linnaeus, 1767)	VU	VU	+		+									
Araneae		**Acantholycosa lignaria** (Clerck, 1758)	EN	CR	+	+	+	CR	+						+	
Araneae		**Arctosa cinerea** (Fabricius, 1777)	EN	CR	+	+	+	CR	+							
Araneae		**Arctosa maculata** (Hahn, 1822)	EN	CR	+	+	+	CR	+							
Araneae		**Argiope bruennichi** (Scopoli, 1772)	VU	+	+	+	+	CR	+							
Araneae		**Argyroneta aquatica** (Clerck, 1758)	CR	CR	+	+	+	CR	+							
Araneae		**Atypus muralis** Bertkau, 1890	EN	CR	+	+		CR	?							
Araneae		**Clubiona alpicola** Kulczyński, 1881	EN	VU		+		VU								
Araneae		**Dolomedes fimbriatus** (Clerck, 1758)	VU	CR	?	+	+	CR	+							
Araneae		**Eresus niger** (Petagna, 1787)	EN	CR	+	+	+	CR	+							
Araneae		**Gnaphosa microps** Holm, 1939	EN	CR/VU		+		CR/VU								
Araneae		**Micaria formicaria** (Sundeval, 1832)	EN	CR	?	+	?	CR	?							
Araneae		**Nesticus fodinarum** Kulczyński, 1915	VU				+							+		
Araneae		**Pardosa ferruginea** (L.Koch, 1870)	EN	CR		+	+	CR	?						+	
Araneae		**Pardosa morosa** (L.Koch, 1870)	VU	VU	+	+	+	VU	+							
Araneae		**Troglohyphantes kulczynskii** Fage	VU				+							+		
Araneae		**Uloborus valckenaerius** Latreille, 1806	EN		?		?	CR								
Araneae		**Zelotes puritanus** Chamberlin, 1922	EN	CR	?	+	?	CR	?							
Opiliones		**Egaenus convexus** (C.L.Koch, 1839)	EN	+	+	CR	+	+	+							
Opiliones		**Ischyropsalis manicata** L.Koch, 1869	EN			CR	+	+	+							
Opiliones		**Siro carpathicus** Rafalski, 1956	VU			+	?	?	?							
Pseudoscorpionidea		**Neobisium brevidigitatum** (Beier, 1928)	VU			+	+	?	+					+		
Chilopoda		**Dicellophilus carniolensis** (C.L.Koch, 1847)	VU		+	+	+	+								
Chilopoda		**Harpatolithobius anodus** (Latzel, 1880)	EN			+	?	+	+							
Chilopoda		**Lithobius biungulatus** Loksa, 1947	EN		+	+	+	+	+					+		
Chilopoda		**Lithobius burzenlandicus** Verhoeff, 1931	VU			+	+	+	+							
Chilopoda		**Lithobius erythrocephalus schuleri** Verhoeff, 1925	VU			+	+	+	+							
Chilopoda		**Lithobius silvivagus** Verhoeff, 1925	VU			+	+	+	+					+		
Chilopoda		**Strigamia pusilla perkeo** (Verhoeff, 1935)	EN			+		+						+		
Diplopoda		**Beskidia jankowskii** (Jawłowski, 1938)	VU			+	?	+	+					+		
Diplopoda		**Mastigophorophyllon serrulatum apiculatum** Jawłowski, 1928	VU			+	?	?	+					+		
Diplopoda		**Polydesmus komareki** Gulička, 1962	VU			+		+						+		
Diplopoda		**Polydesmus tatranus** Latzel, 1882	VU			+		+	?					+		
Insecta	Ephemeroptera	**Ametropus fragilis** Albarda, 1878	CR	CR		CR		CR								
Insecta	Ephemeroptera	**Arthroplea congener** Bengtsson, 1909	VU	CR/VU		I		CR/VU								
Insecta	Ephemeroptera	**Baetis beskidensis** Sowa, 1972	VU			+		+								
Insecta	Ephemeroptera	**Choroterpes picteti** (Eaton, 1871)	VU	+	+	+	+	+	+							
Insecta	Ephemeroptera	**Ecdyonurus aurantiacus** (Burmeister,1839)	VU	+	+	VU	+	+	+							
Insecta	Ephemeroptera	**Ephemera glaucops** Pictet, 1843	EN	+	+		+	+	?							
Insecta	Ephemeroptera	**Ephoron virgo** (Olivier, 1791)	VU		+	+	+		+							
Insecta	Ephemeroptera	**Isonychia ignota** (Walker, 1835)	EN	+		CR		+								
Insecta	Ephemeroptera	**Oligoneuriella polonica** Mol, 1984	VU			VU										
Insecta	Ephemeroptera	**Palingenia longicauda** (Olivier, 1791)	CR	CR		Ex		CR								
Insecta	Ephemeroptera	**Rhitrogena alpestris** Eaton, 1871	CR				+		+							
Insecta	Ephemeroptera	**Rhitrogena germanica** Eaton, 1885	VU	+	+	VU	+	+	+							
Insecta	Odonata	**Aeschna subarctica** Walker, 1908	EN	CR		VU		CR					+			
Insecta	Odonata	**Calopteryx splendens** (Harris, 1782)	VU	CR	+	+	+	CR	+							
Insecta	Odonata	**Calopteryx virgo** (Linnaeus, 1758)	VU	+	+	I	+	+	+							
Insecta	Odonata	**Cordulegaster bidentatus** Sélys, 1839	EN			+										
Insecta	Odonata	**Cordulegaster boltonii** (Donovan, 1807)	EN	CR	+	I	+	CR	+							
Insecta	Odonata	**Leucorrhinia albifrons** (Burmeister, 1839)	CR			+					+					
Insecta	Odonata	**Leucorrhinia pectoralis** (Charpentier	VU	CR	+	I	+	CR	+							
Insecta	Odonata	**Ophiogomphus cecilia** (Fourcroy, 1785)	EN			+					+					
Insecta	Odonata	**Orthetrum coerulescens** (Fabricius, 1798)	EN			+										
Insecta	Odonata	**Sympecma braueri** Bianchi, 1905	CR			+					+					
Insecta	Plecoptera	**Brachyptera braueri** (Klapálek, 1900)	CR	Ex?	Ex?	CR		CR								
Insecta	Plecoptera	**Capnopsis schilleri** (Rostock, 1892)	EN	CR		VU		CR								
Insecta	Plecoptera	**Isogenus nubecula** Newman, 1833	EN	CR		CR		CR								
Insecta	Plecoptera	**Isoperla grammatica** (Poda, 1761)	EN			VU										
Insecta	Plecoptera	**Isoperla obscura** (Zetterstedt, 1840)	CR/EN			CR		CR	+							
Insecta	Plecoptera	**Nemoura dubitans** Morton, 1894	EN			VU										
Insecta	Plecoptera	**Perla burmeisteriana** Claasen, 1936	EN			VU										
Insecta	Plecoptera	**Perla maxima** Scopoli, 1763	CR/EN			Ex			II							
Insecta	Plecoptera	**Xanthoperla apicalis** (Newman, 1836)	CR	Ex?		VU	+	CR								

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Insecta	Orthoptera	**Acrida hungarica** (Herbst, 1786)	EN	Ex?	+		+	CR								
Insecta	Orthoptera	**Aiolopus thalassinus** (Fabricius, 1781)	VU	+	+	VU	+	+	+							
Insecta	Orthoptera	**Homocoryphus nitidulus** (Scopoli, 1786)	EN	CR	+		+	CR								
Insecta	Orthoptera	**Platycleis grisea** (Fabricius, 1781)	EN	+	+	CR	+	+	+							
Insecta	Orthoptera	**Poecilimon fussi matisi** Mařan, 1952	EN		+		+	CR								
Insecta	Orthoptera	**Saga pedo** (Pallas, 1771)	EN	CR	+		+	CR	II							
Insecta	Mantodea	**Mantis religiosa** (Linnaeus, 1758)	EN	VU	+	CR	+	VU	+							
Insecta	Heteroptera	**Aphelocheirus aestivalis** (Fabricius, 1803)	CR	CR	+	+	+	CR	+							
Insecta	Homoptera	**Achorotile albosignata** (Dahlbom, 1850)	EN/VU			+		VU								
Insecta	Homoptera	**Javesella salina** (Haupt, 1924)	EN	CR		+		CR								
Insecta	Homoptera	**Porphyrophora polonica** (Linnaeus, 1758)	VU	+		+		+	+							
Insecta	Homoptera	**Tibicina haematodes** (Scopoli, 1763)	CR	Ex?	+		?	CR	+							
Insecta	Neuroptera	**Ascalaphus macaronius** (Scopoli, 1763)	VU		+		+	+	II							
Insecta	Neuroptera	**Dendroleon pantherinus** (Fabricius, 1878)	EN	CR		+		CR								
Insecta	Neuroptera	**Mantispa styriaca** (Poda, 1761)	CR	Ex?				CR								
Insecta	Coleoptera	**Akimerus schaefferi** (Laicharting, 1784)	CR	+		CR	?	+	?						+	
Insecta	Coleoptera	**Aplocnemus tarsalis** (C.R.Sahlberg, 1822)	EN	+	+	CR	+	+	+							
Insecta	Coleoptera	**Aromia moschata** (Linnaeus, 1758)	VU	+	+	+	+	+	+							
Insecta	Coleoptera	**Baris cuprirostris** (Fabricius, 1787)	EN	+	+	CR	+	+	+							
Insecta	Coleoptera	**Betarmon bisbimaculatus** (Fabricius, 1803)	CR	+	+	CR	+	+	+							
Insecta	Coleoptera	**Callimellum angulatum** (Schrank, 1789)	CR	+	?	CR	?	?	?							
Insecta	Coleoptera	**Calosoma sycophanta** (Linnaeus, 1758)	VU	VU	+	+	+	VU	II	+	+	+				
Insecta	Coleoptera	**Cantharis pulicaria** Fabricius, 1781	EN	+	?	CR	?	+	+							
Insecta	Coleoptera	**Carabus fabricii** Duftschmidt, 1812	CR/EN	Ex?		CR	+	+	+		+					+
Insecta	Coleoptera	**Carabus hampei** Küster, 1846	EN				+		+					+		
Insecta	Coleoptera	**Carabus menetriesi** Hummel, 1827	CR	VU		+		VU	+		+	+				
Insecta	Coleoptera	**Carabus montivagus** Palliardi, 1825	EN		+		+	CR	+			+				
Insecta	Coleoptera	**Carabus planicollis** Küster, 1846	CR/EN				+									
Insecta	Coleoptera	**Carilia excellens** (Brancsik, 1874)	CR			CR	+	CR	+		+	+		+		
Insecta	Coleoptera	**Carpathobyrrhulus tatricus** Mroczkowski, 1957	VU			+		+						+		
Insecta	Coleoptera	**Carpathobyrrhulus transsylvanicus** Miller, 1859	VU				+		+					+		
Insecta	Coleoptera	**Cerambyx cerdo** Linnaeus, 1758	VU	+	+	VU	+	+	II		+		+			
Insecta	Coleoptera	**Cerambyx scopolii** (Fuesslin, 1775)	VU	+	+	VU	+	+	+		+					
Insecta	Coleoptera	**Ceruchus chrysomelinus** (Hochenwarth, 1785)	EN/VU	+		VU	+	+	+		+					
Insecta	Coleoptera	**Chlorophorus sartor** (O.F.Müller, 1766)	EN	+	+	CR	+	+	+							
Insecta	Coleoptera	**Chrysolina fuliginosa** (Olivier, 1807)	CR	+		CR		?								
Insecta	Coleoptera	**Cornumutila quadrivittata** (Gebler, 1841)	CR			CR		+	+							
Insecta	Coleoptera	**Curimus decorus** (Steffahny, 1843)	CR			CR	+	?	+							
Insecta	Coleoptera	**Deltomerus carpathicus** (Miller, 1868)	VU			+	+	+	+					+		
Insecta	Coleoptera	**Deltomerus tatricus** (Miller, 1859)	VU			+		+						+		
Insecta	Coleoptera	**Dictyoptera fiedleri** (Reitter, 1907)	EN	?	?	CR	?	?								
Insecta	Coleoptera	**Duvalius bokori** (Csiki, 1910)	EN		+			CR						+		
Insecta	Coleoptera	**Duvalius microphthalmus** (Miller, 1859)	CR			Ex?		CR						+		
Insecta	Coleoptera	**Duvalius subterraneus** (Miller, 1868)	VU			+	+	+	+					+		
Insecta	Coleoptera	**Dytiscus latissimus** Linnaeus, 1758	EN	CR		+		CR					+			
Insecta	Coleoptera	**Emus hirtus** (Linnaeus, 1758)	VU	+	+	+	+	+	+							
Insecta	Coleoptera	**Eurythyrea austriaca** (Linnaeus, 1767)	EN	CR	+	CR	+	CR	+							
Insecta	Coleoptera	**Hydrous piceus** (Linnaeus, 1758)	EN	CR	+	VU	+	CR	+							
Insecta	Coleoptera	**Lacon fasciatus** (Linnaeus, 1758)	VU	+		CR	+	+	+							
Insecta	Coleoptera	**Lacon lepidopterus** (Panzer, 1801)	EN			CR		+								
Insecta	Coleoptera	**Leistus montanus** Stephens, 1827	VU	+		CR	?	+	+							+
Insecta	Coleoptera	**Leistus ucrainicus** Lazorko, 1950	CR						+					+		
Insecta	Coleoptera	**Leptura thoracica** (Creutzer, 1799)	CR				+	CR	?							
Insecta	Coleoptera	**Limoniscus violaceus** (Ph.W.Müller, 1821)	CR	CR	?	+	+	CR	?				+			
Insecta	Coleoptera	**Lucanus cervus** (Linnaeus, 1758)	EN	VU	+	CR	+	VU	II	+	+	+	+			
Insecta	Coleoptera	**Malthodes lobatus** Kiesenwetter, 1852	EN	+	+	CR	+	+	?							
Insecta	Coleoptera	**Meloe variegatus** Donovan, 1793	EN	CR	+	+	+	CR	+							
Insecta	Coleoptera	**Nanophyes gracilis** L.Redtenbacher, 1849	EN	+	+	CR	+	+	+							
Insecta	Coleoptera	**Nebria heegeri** Dejean, 1826	VU				+		+							
Insecta	Coleoptera	**Nebria reitteri** Rybiński, 1902	VU				?		+							
Insecta	Coleoptera	**Nebria tatrica** Miller, 1859	VU	+		+								+		
Insecta	Coleoptera	**Nebria transsylvanica** Germar, 1824	VU				+		+					+		
Insecta	Coleoptera	**Netocia lugubris** (Herbst, 1786)	VU	+	+	+	+	+	+				+			
Insecta	Coleoptera	**Ocypus biharicus** (J.Müller, 1926)	VU			+	+		+					+		
Insecta	Coleoptera	**Ocypus olens** (O.F.Müller, 1764)	VU	+	+	+	+	+	II							
Insecta	Coleoptera	**Osmoderma eremita** (Scopoli, 1763)	EN	CR	+	CR	+	CR	II		+		+			
Insecta	Coleoptera	**Otiorhynchus perdix** (Olivier, 1807)	CR			VU	+	+	+							
Insecta	Coleoptera	**Pachyta lamed** (Linnaeus, 1758)	EN	CR		+	+	CR	?							
Insecta	Coleoptera	**Patrobus quadricollis** Miller, 1868	VU						+					+		
Insecta	Coleoptera	**Peltis grossa** (Linnaeus, 1758)	EN			VU	+		+							
Insecta	Coleoptera	**Phloiophilus edwardsii** Stephens, 1830	CR	?		CR		?								
Insecta	Coleoptera	**Phloiotrya subtilis** (Reitter, 1897)	CR	+		CR										

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Insecta	Coleoptera	**Phryganophilus auritus** Motschulsky, 1845	CR	+		CR										
Insecta	Coleoptera	**Phryganophilus ruficollis** (Fabricius, 1798)	CR	+	?	CR	+	?	?							
Insecta	Coleoptera	**Pterostichus tatricus** Kult, 1947	CR			CR		+						+		
Insecta	Coleoptera	**Purpuricenus kaechleri** (Linnaeus, 1758)	VU	+	+	+	+	+	+							
Insecta	Coleoptera	**Rosalia alpina** (Linnaeus, 1758)	EN	CR	+	CR	+	CR	+	+	+	+	+			
Insecta	Coleoptera	**Sclerophaedon orbicularis** (Suffrian, 1851)	EN	+	+	CR	+	+	+							
Insecta	Coleoptera	**Selatosomus depressus** (Germar, 1822)	VU	?	?	+	?	?	+							
Insecta	Coleoptera	**Semiadalia alpina** (A.Villa & J.B.Villa, 1835)	VU			+	+	+	+							
Insecta	Coleoptera	**Sphenoptera antiqua** (Illiger, 1803)	CR	CR	+		+	CR	+							
Insecta	Coleoptera	**Teredus opacus** Habelmann, 1854	CR	+		CR	+	+								
Insecta	Coleoptera	**Trechus amplicollis** Fairmaire, 1859	VU	+		VU		+								
Insecta	Coleoptera	**Trechus insolitus** K.Daniel, 1906	CR				+									
Insecta	Coleoptera	**Trechus matejkai** Všetečka, 1938	EN			?		+								+
Insecta	Coleoptera	**Trechus montanellus** Gemminger & Harold, 1868	CR	+		Ex/CR		Ex?						+		
Insecta	Coleoptera	**Velleius dilatatus** (Fabricius, 1787)	EN	CR	+	+	+	CR	+							
Insecta	Coleoptera	**Xyleborus pfeili** (Ratzeburg, 1837)	EN	CR	?	+	?	CR	+							
Insecta	Hymenoptera	**Agapetus delicatulus** McLachlan, 1884	VU			VU										
Insecta	Hymenoptera	**Agapetus laniger** (Pictet, 1834)	VU			VU										
Insecta	Hymenoptera	**Agapetus ochripes** Curtis, 1834	VU			VU										
Insecta	Hymenoptera	**Allogamus starmachi** (Szczęsny, 1967)	VU			+		+								
Insecta	Hymenoptera	**Andrena intermedia** Thomson, 1870	VU			VU										
Insecta	Hymenoptera	**Andrena paucisquama** Noskiewicz, 1924	VU			VU										
Insecta	Hymenoptera	**Andrena synadelpha** Perkins, 1914	CR			Ex/CR										
Insecta	Hymenoptera	**Anthidium montanum** Morawitz, 1864	EN			+	+	CR	+							
Insecta	Hymenoptera	**Apatania fimbriata** (Pictet, 1834)	VU			VU										
Insecta	Hymenoptera	**Batozonellus lacerticida** (Pallas, 1771)	EN	CR	+	+	?	CR	+							
Insecta	Hymenoptera	**Bombus confusus** Schenck, 1859	VU	+	+	VU	+	+	+		+					
Insecta	Hymenoptera	**Bombus distinguendus** F.Morawitz, 1869	VU	+	+	VU	+	+	+		+					
Insecta	Hymenoptera	**Bombus humilis** Illiger, 1806	VU	+	+	VU	+	+	+		+					
Insecta	Hymenoptera	**Bombus jonellus** (Kirby, 1802)	VU	+		VU	+	+	+		+					
Insecta	Hymenoptera	**Bombus mesomelas** Gerstaecker, 1869	VU	+		I	+	+	+		+				+	
Insecta	Hymenoptera	**Bombus pomorum** (Panzer, 1805)	VU	+	+	VU	+	+	II		+					
Insecta	Hymenoptera	**Bombus pyrenaeus** (Perez 1879)	EN			+	+	+	+		+					
Insecta	Hymenoptera	**Bombus ruderatus** (Fabricius, 1775)	VU	+	+	VU	+	+	II		+					+
Insecta	Hymenoptera	**Bombus soroensis** (Fabricius, 1776)	VU	+	+	VU	+	+	+		+					
Insecta	Hymenoptera	**Bombus subterraneus** (Linnaeus, 1758)	VU	+	+	VU	+	+	+		+					
Insecta	Hymenoptera	**Bombus veteranus** (Fabricius, 1793)	VU	+	+	VU	+	+	+		+					
Insecta	Hymenoptera	**Bombus wurfleini** (Radoszkowski, 1859) [= **B. mastrucatus** (Gerstaecker, 1868)]	VU			+		+	II		+					
Insecta	Hymenoptera	**Camponotus vagus** (Scopoli, 1763)	VU			VU										
Insecta	Hymenoptera	**Chelostoma ventrale** (Schletter, 1889)	VU			VU										
Insecta	Hymenoptera	**Chimarra marginata** (Linnaeus, 1767)	CR	Ex?		Ex?		Ex?	?							
Insecta	Hymenoptera	**Harpagoxenus sublaevis** (Nylander, 1849)	VU			VU										
Insecta	Hymenoptera	**Hoplitis andrenoides** (Spinola, 1808)	VU			VU										
Insecta	Hymenoptera	**Hydroptila occulata** (Eaton, 1873)	VU			VU										
Insecta	Hymenoptera	**Hylaeus rinki** (Gorski, 1852)	VU			VU										
Insecta	Hymenoptera	**Liometopum microcephalum** (Panzer, 1798)	VU		?		?		+							
Insecta	Hymenoptera	**Megachile rotundata** (Fabricius, 1787)	VU	+	+	+	+	+	II							
Insecta	Hymenoptera	**Megascolia flavifrons** (Fabricius, 1787)	EN		+		+	CR	+							
Insecta	Hymenoptera	**Melliturga clavicornis** (Latreille, 1806)	VU	?	+	+	+	+	II							
Insecta	Hymenoptera	**Micrasema setiferum** (Pictet, 1834)	VU			VU										
Insecta	Hymenoptera	**Oligopectrum maculatum** (Fourcroy, 1785)	VU			VU										
Insecta	Hymenoptera	**Polycentropus schmidi** Nowak & Botoşăneanu, 1965	VU			VU										
Insecta	Hymenoptera	**Rhadicoleptus alpestris sylvanocarpathicus** Botoşăneanu & Riedel, 1965	VU			VU		+	+							
Insecta	Hymenoptera	**Rophitoides canus** (Eversmann, 1852)	VU			+			II							
Insecta	Hymenoptera	**Scolia hirta** Schrank, 1781	EN		+	+	+	+	II							
Insecta	Hymenoptera	**Scolia maculata** Drury, 1773	VU		+		+		II							
Insecta	Hymenoptera	**Xylocopa valga** Gerstaecker, 1872	EN	+	+	CR	+	+	II							
Insecta	Hymenoptera	**Xylocopa violacea** (Linnaeus, 1758)	EN	?	+	CR	+	+	II							
Insecta	Lepidoptera	**Acherontia atropos** (Linnaeus, 1758)	VU	+	+	I	+	+	+							
Insecta	Lepidoptera	**Apatura ilia** (Denis & Schiffermüller, 1775)	VU	VU	+	CR/VU	I	+	+		+					
Insecta	Lepidoptera	**Apatura iris** (Linnaeus, 1758)	VU	VU	+	+	I	+	II		+					
Insecta	Lepidoptera	**Arctia festiva** (Hufnagel, 1776)	VU	+	+	VU	+	+	+							
Insecta	Lepidoptera	**Boloria eunomia** (Freyer, 1797)	EN/VU	+		VU		?	?							
Insecta	Lepidoptera	**Brenthis daphne** (Denis & Schiffermüller, 1775)	EN	+	+	VU/CR	+	VU	+							
Insecta	Lepidoptera	**Callimorpha dominula** (Linnaeus, 1758)	VU	+	+	+	+	+	II							
Insecta	Lepidoptera	**Catocala fraxini** (Linnaeus, 1758)	VU	+	+	+	+	+	II							+
Insecta	Lepidoptera	**Catocala sponsa** (Linnaeus, 1767)	VU	+	+	+	+	+	II							+
Insecta	Lepidoptera	**Chamaesphecia maseriformis** (Ochsenheimer, 1808)	CR	CR	+		+	CR								
Insecta	Lepidoptera	**Chazara briseis** (Linnaeus, 1764)	EN	CR	+	CR	+	CR	+							

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Insecta	Lepidoptera	**Coeonympha tullia** (Müller, 1764)	CR	CR	Ex	VU	CR	VU	I							
Insecta	Lepidoptera	**Colias myrmidone** (Esper, 1780)	EN	CR	VU	VU	+	CR	+							
Insecta	Lepidoptera	**Colias palaeno** (Linnaeus, 1761)	CR	CR	+	VU/CR	?	CR	I							
Insecta	Lepidoptera	**Cryphia fraudactricula** (Hübner, 1803)	VU	+	+	VU	+	+	?							
Insecta	Lepidoptera	**Daphnis nerii** (Linnaeus, 1758)	VU	+	+	I	+	+	+							
Insecta	Lepidoptera	**Drymonia querna** (Denis & Schiffermüller, 1775)	VU	+	+	VU	+	+	?							+
Insecta	Lepidoptera	**Elophos operaria** (Hübner, 1813)	VU	+		+	+	+	+							
Insecta	Lepidoptera	**Erebia pharte** (Hübner, 1804)	VU			+	+	CR/VU								
Insecta	Lepidoptera	**Erebia pronoë** (Esper, 1780)	CR			+/CR	VU	VU	Ex							
Insecta	Lepidoptera	**Erebia sudetica** Staudinger, 1861	CR	+		Ex?	+									
Insecta	Lepidoptera	**Eriogaster catax** (Linnaeus, 1758)	VU	+	+	VU	+	+	?							
Insecta	Lepidoptera	**Euphydryas aurinia** (Rottemburg, 1775)	EN/VU	VU	+	CR/VU	+	CR	+							
Insecta	Lepidoptera	**Euphydryas maturna** (Linnaeus, 1758)	EN/VU	CR	+	VU	VU	CR	+							
Insecta	Lepidoptera	**Eupithecia undata** (Freyer, 1840)	EN			VU	+	+								
Insecta	Lepidoptera	**Euplagia quadripunctaria** (Poda, 1761)	EN	+	+	CR	+	+	II							
Insecta	Lepidoptera	**Glacies canaliculata schwingenschussi** (Wehrli, 1919)	VU			+	+	+								
Insecta	Lepidoptera	**Glacies noricana** (Wagner, 1898)	EN				+	VU								
Insecta	Lepidoptera	**Gynaephora selenitica** (Esper, 1783)	EN			VU	+	+								
Insecta	Lepidoptera	**Hamaeris lucina** (Linnaeus, 1758)	VU	+	+	+	+	+	II							
Insecta	Lepidoptera	**Hemaris fuciformis** (Linnaeus, 1758)	EN	+	+	CR	+	+	?							
Insecta	Lepidoptera	**Hemaris tityus** (Linnaeus, 1758)	EN/VU	+	+	VU	+	+	?							
Insecta	Lepidoptera	**Hipparchia fagi** (Scopoli, 1763)	VU	+	+	VU	+	+	I							
Insecta	Lepidoptera	**Hipparchia statilinus** (Hufnagel, 1766)	EN	CR	+	VU	I	CR	+							
Insecta	Lepidoptera	**Iphiclides podalirius** (Linnaeus, 1758)	EN	+	+	CR/VU	+	VU	II		+					
Insecta	Lepidoptera	**Jordanita globulariae** (Hübner, 1793)	EN	+	+	CR	+	+	+							
Insecta	Lepidoptera	**Lamellocossus tenebra** (Denis & Schiffermüller, 1755)	VU		+	VU	+	+								
Insecta	Lepidoptera	**Limenitis populi** (Linnaeus, 1758)	EN/VU	I	+	CR/VU	VU	VU	II							+
Insecta	Lepidoptera	**Lopinga achine** (Scopoli, 1763)	EN	CR	+	+	+	CR	+							
Insecta	Lepidoptera	**Lycaena dispar** (Haworth, 1803)	EN	CR	+	VU	VU	VU/CR	+							
Insecta	Lepidoptera	**Maculinea alcon** (Denis & Schiffermüller, 1775)	EN	CR	+	CR/VU	VU	I	CR						+	
Insecta	Lepidoptera	**Maculinea arion** (Linnaeus, 1758)	EN	CR	+	VU	VU	VU/CR	+							+
Insecta	Lepidoptera	**Marumba quercus** (Denis & Schiffermüller, 1775)	EN	VU	+		+	VU	?							
Insecta	Lepidoptera	**Melitaea diamina** (Lang, 1789)	EN/VU	CR	+	VU	K	VU	+							
Insecta	Lepidoptera	**Minois dryas** (Scopoli, 1763)	EN	VU	+	CR	+	+	+							
Insecta	Lepidoptera	**Neptis rivularis** (Scopoli, 1763)	EN	VU	+	VU/CR	+	VU	+							
Insecta	Lepidoptera	**Neptis sappho** (Pallas, 1771)	EN	+	+	CR	+	+	?							
Insecta	Lepidoptera	**Nymphalis vaualbum** (Denis & Schiffermüller, 1775)	VU	+	+	+	+	+	+							
Insecta	Lepidoptera	**Nymphalis xanthomelas** (Esper, 1780)	VU	Ex	+	+	I	+	+							
Insecta	Lepidoptera	**Papilio machaon** Linnaeus, 1758	VU	+	+	VU	+	+	II		+					
Insecta	Lepidoptera	**Parnassius apollo** (Linnaeus, 1758)	CR	Ex	+	CR	CR	CR	CR/II	+	+	+	+			
Insecta	Lepidoptera	**Parnassius mnemosyne** (Linnaeus, 1758)	EN	CR/VU	+	CR/VU	VU	VU	II	+	+	+				
Insecta	Lepidoptera	**Parocneria detrita** (Esper, 1785)	VU	+		VU	+	+	?							
Insecta	Lepidoptera	**Penthophera morio** (Linnaeus, 1767)	VU	+	+	VU	+	+	?							
Insecta	Lepidoptera	**Pericalia matronula** (Linnaeus, 1758)	VU	+	+	VU	+	+	+							
Insecta	Lepidoptera	**Pharmacis carna** (Denis & Schiffermüller, 1755)	VU		+	+	+	VU								
Insecta	Lepidoptera	**Phyllodesma tremulifolia** (Hübner, 1810)	VU	+	+	VU	+	+	?							
Insecta	Lepidoptera	**Pieris bryoniae** (Hübner, 1806)	VU	+	+	VU	I	+	+							
Insecta	Lepidoptera	**Plebeius optilete** (Knoch, 1781)	EN	CR		CR/VU		CR	+							
Insecta	Lepidoptera	**Polyommatus bellargus** (Rottemburg, 1775)	VU	VU	+	VU	I	VU	+							
Insecta	Lepidoptera	**Polyommatus daphnis** (Denis & Schiffermüller, 1775)	VU	+	+	+	I	VU	II							
Insecta	Lepidoptera	**Proserpinus proserpina** (Pallas, 1772)	EN/VU	+	+	CR	+	+	?							
Insecta	Lepidoptera	**Pyrrhia purpurina** (Denis & Schiffermüller, 1775)	CR	CR	+		+	CR								
Insecta	Lepidoptera	**Saturnia pavonia** (Linnaeus, 1761)	EN	+	+	+	+	+	II							
Insecta	Lepidoptera	**Saturnia pyri** (Denis & Schiffermüller, 1775)	CR	+	+	ExP	+	+	?							
Insecta	Lepidoptera	**Satyrium w-album** (Knoch, 1782)	EN	VU/CR	+	+	+	VU/CR	+							
Insecta	Lepidoptera	**Scolitantides orion** (Pallas, 1771)	EN	VU	+	CR	VU	VU	+							
Insecta	Lepidoptera	**Sesia melanocephala** Dalman, 1816	VU	+		VU	+	+								
Insecta	Lepidoptera	**Syngrapha microgamma** (Hübner, 1821)	CR			+	+	CR								
Insecta	Lepidoptera	**Thyris fenestrella** (Scopoli, 1763)	VU	+	+	VU	+	+	?							
Insecta	Lepidoptera	**Tyria jacobaeae** (Linnaeus, 1758)	VU	+	+	VU	+	+	?							
Insecta	Lepidoptera	**Utetheisa pulchella** (Linnaeus, 1758)	VU	+	+	+	+	+	+							
Insecta	Lepidoptera	**Xestia rhaetica** (Staudinger, 1871)	EN	VU		+	+	VU								
Insecta	Lepidoptera	**Zerynthia polyxena** (Denis & Schiffermüller, 1775)	CR	VU	+	ExP	CR	VU	II							
Insecta	Lepidoptera	**Zygaena angelicae** Ochsenheimer, 1808	EN/VU	+	+	VU	+	+	?							
Insecta	Lepidoptera	**Zygaena cynarae** (Esper, 1789)	VU	+	+	VU		+	+							
Insecta	Lepidoptera	**Zygaena laeta** (Hübner, 1790)	CR	CR	+		+	CR	+							
Insecta	Lepidoptera	**Zygaena osterodensis** Reiss, 1921	CR	+	+	CR	+	+	?							
Insecta	Lepidoptera	**Zygaena purpuralis** (Brünnich, 1763)	EN	+	+	VU	+	+	?							
Insecta	Lepidoptera	**Zygaena trifolii** (Esper, 1783)	CR	+		CR		+								

Class	Ordo	Species	Category of Threat for Entire Carpathians	Category of Threat in Carpathian Countries						Protection in Carpathian Countries			Bern Convention	Endemic	Relic	Alpine
				CZ	H	PL	RO	SK	UA	CZ	PL	SK				
Insecta	Mecoptera	**Bittacus italicus** (Müller, 1766)	CR	CR				CR								
Insecta	Diptera	**Atherix ibis** (Fabricius, 1798)	EN	CR		+		CR								
Insecta	Diptera	**Dasypogon diadema** (Fabricius, 1781)	EN	Ex?	+	+	+	CR	+							
Insecta	Diptera	**Gonia foersteri** Meigen, 1838	EN	CR		+		CR								
Insecta	Diptera	**Oxycera pardalina** Meigen, 1822	EN	CR		+		CR								
Insecta	Diptera	**Stratiomys chamaeleon** (Linnaeus, 1758)	EN	CR		+		CR								
Insecta	Diptera	**Xylomya maculata** (Meigen, 1804)	EN	CR		+		CR								

Plant Alliances

by Viera Stanova

Vegetation encompasses a very broad scale of synecologically and structurally distinct types — grasslands, forests, aquatic vegetation, alpine vegetation etc. An attempt was made to compile a list of all available Carpathian plant communities on the level of alliances (syntaxon in the terminology of the Braun–Blanquet approach), which have appeared in the literature of focal Carpathian countries — Slovak Republic, Czech Republic, Hungary, Poland, Ukraine and Romania. Since Austria holds only a small fraction of the Carpathians, it was excluded.

Methodology

It was decided to gather data on the level of alliance, because this phytosociological unit has a very good ecological characteristic. Selecting a more detailed phytosociological level (association) would make the data gathering process unrealistic within the time span. The following information was collected: name of the alliance (with class and order), distribution and threat.

Experts within focal countries collected the data and country databases were sent to a Carpathian Ecoregion Initiative sectoral coordinator. The names were checked for nomenclature and a common database was designed.

The second step was to collect data on the geographical distribution of Carpathian endemic plants (selected by Lydia Tasenkevich), in alliances, in order to obtain Carpathian communities in which the proportion of endemic species is significant. The following information was collected: species name, distribution, type of community on the basis of alliance in which a species occurs, threats and management (information whether a given community requires any management to protect it effectively or not).

On the basis of national data, a database was developed and used for the final evaluation. The list of top 20 alliances was created on the basis of occurrence of the endemic plants within alliances or endemic character of communities.

Evaluation and results

The total number of alliances provided by the countries was 190. Ruderal plant communities were excluded due to an uneven level of information between the countries and due

to the fact that these communities are not important for evaluation of biodiveristy value. Communities with marginal occurrence in the Carpathians were likewise excluded, giving a final number of 129 plant alliances.

In the countries concerned, there is a difference in the levels of knowledge about communities studied using the Braun–Blanquet approach. There is a long history of such research in Western Carpathian countries, while in Eastern and Southern Carpathian countries it has a shorter tradition. This is particulrly true of Ukraine, where a different scientific approach was used; here the Braun–Blanquet approach is quite new and additional communities may exist and even be described within different orographical units.

List of Carpathian plant alliances and their distribution in Carpathian countries.

Alliances	CZ	SK	RO	HU	PL	UA
Abietion albae Březina et Hadač in Hadač 1962		+			+	
Aceri tatarici–Quercion Zólyomi & Jakucs 1957		+		+		+
Adenostylion Br.–Bl. 1926	+	+	+		+	+
Achnatherion calamagrostis Br.–Bl. 1918			+			
Alnion glutinosae Malcuit 1929	+	+	+	+	+	+
Alnion incanae Pawlowski in Pawlowski, Sokolowski et Walisch 1928	+	+	+	+	+	+
Alopecurion Passarge 1964	+	+				+
Androsacion alpinae Br.–Bl. in Br.–Bl. et Jenny 1926		+			+	
Androsacion vandelii Br.–Bl. in Br.–Bl. et Jenny 1926 corr. Br.–Bl. 1948		+	+			
Arabidion alpinae Beguin 1972		+			+	
Arabidopsidion thalianae Passarge 1964		+		+		
Arrhenatherion Koch 1926	+	+	+	+	+	+
Asplenio–Festucion glaucae Zólyomi 1936		+		+		
Asplenion septentrionalis Oberd. 1938		+	+	+	+	
Athyrio alpestris–Piceion Sýkora 1971	+	+				+
Berberidion Br.–Bl. 1950	+			+	+	
Bromion erecti W. Koch 1926	+	+		+		
Calamagrostion arundinaceae (Luquet 1926) Jeník 1961		+			+	+
Calamagrostion villosae Pawl. et al. 1928	+	+	+		+	+
Calthion R. Tx. 1937 em. Bal.–Tul. 1978	+	+	+	+	+	+
Cardaminion amarae Maas 1959		+				+
Cardamino–Montion Br.–Bl. 1926	+	+	+	+	+	+
Caricion curvulae Br.–Bl. 1925			+		+	+
Caricion davallianae Klika 1934	+	+	+	+	+	
Caricion firmae Gams. 1926		+				
Caricion fuscae Koch 1926 em. Klika 1934	+	+	+	+	+	+
Caricion gracilis Neuhausl 1959 em. Balátová–Tuláčková 1963	+					
Caricion lasiocarpae Vanden Berghen ap. Lebrun & al. 1949		+	+	+		+
Caricion remotae Kastner 1941	+	+		+		+
Caricion rostratae Balátová–Tuláčková 1963	+					+
Carpinion Issler 1931	+	+		+	+	+
Ceratophyllion Den Hartog et Segal 1964			+	+		+
Cirsio–Brachypodion pinnati Hadač et Klika 1944	+	+		+	+	
Cratoneurion commutati Koch 1928		+	+	+	+	+
Cratoneuro filicini–Calthion laetae Hadač 1983	+	+				+
Cymbalario–Asplenion Segal 1969 em. Mucina 1993		+	+	+		
Cynosurion R. Tx. 1947	+	+	+	+	+	+
Cystopteridion Richard 1972	+	+	+	+	+	+
Dicrano–Pinion (Libbert 1933) Matuszk. 1962		+	+		+	
Drapanocladion exannulati Krajina 1933		+				
Eriophoro–Pinion sylvestris Pass. et Hoffm. 1968			+			
Erysimo–Hackelion deflexae Bernátová et Obuch 1991		+				
Fagion Luquet 1926	+	+		+	+	+
Festucion carpaticae Bělohlávková et Fišerová 1989		+			+	+
Festucion pictae Kraj. 1933		+	+			
Festucion pseudovinae Soó 1933			+			
Festucion rupicolae Soó 1940 corr. 1964				+		
Festucion vaginatae Soo 1929			+			
Festucion vallesiaceae Klika 1931	+	+				+
Festucion versicoloris Krajina 1933		+				
Festuco saxatilis–Seslerion bielzii (Pawl. Et Walas 1949) Coldea 1984			+			+
Genistion pilosae Duvigneaud 1942			+	+		
Genisto germanicae–Quercion Neuhäusl & Neuhäuslová–Novotná 1967	+	+	+	+	+	
Geranion sanguinei R. Tx. in Th. Muller 1961	+	+		+		
Glycerio–Sparganion Br.–Bl. et Sissingh in Boer 1942	+		+	+	+	+
Gypsophilion petraeae Borhidi et Pocs 1957			+			
Hyperico perforato–Scleranthion perennis Moravec 1967			+			
Hypno–Polypodion vulgaris Mucina 1993		+		+		
Chrysanthemion rotundifolii Kraj. 1933		+				+
Juncion trifidi Krajina 1933		+			+	+
Juniperion nana Br.–Bl. et al. 1939						+
Koelerio–Phleion phleoidis Korneck 1974		+				
Lathyro–Carpinion Boşcaiu 1974			+			
Lemnion minoris de Bolós et Masclans 1955	+	+		+	+	+
Lemno–Salvinion natantis Slavnic 1956			+			

Loiseleurio–Vaccinion Br.–Bl. 1926		+	+			+
Luzulo–Fagion Lohm. et R. Tx. in R. Tx. 1954	+	+		+	+	
Lycopodio–Cratoneurion commutati Hadač 1983	+					
Magnocaricion elatae W. Koch 1926		+	+	+	+	+
Micromerion pulegii Boşcaiu (1971) 1979			+			
Molinion coerulae Koch 1926	+	+	+	+	+	+
Nanocyperion Koch ex Libbert 1932				+	+	
Nardion strictae Br.–Bl. 1926		+			+	+
Nardo–Agrostion tenuis Sillinger 1933	+	+				+
Nymphaeion albae Oberd. 1957	+	+	+	+	+	
Oenanthion aquaticae Hejný ex neuhausl 1959	+		+	+		
Orno–Cotinion Soó 1960			+	+		
Oxycocco–Empetrion hermaphroditi Nordh. 1936		+				+
Oxytropido–Elynion Br.–Bl. 1949			+			+
Papaverion tatrici Pawlowski 1928 corr. Valachovič 1995		+			+	
Papavero–Thymion pulcherrimi I. Pop 1968			+			+
Petasition officinalis Sillinger 1933 em. Kopecký 1969	+			+		
Phragmition communis Koch 1926	+		+	+	+	
Piceion excelsae Pawlovski in Pawlovski et al. 1928	+	+	+		+	
Pinion mugi Pawl. 1928		+	+			+
Pino–Quercion Kozl. 1925 em. Mat. et Pol. 1955					+	
Poion alpinae Oberd. 1950		+				
Poion violaceae Horv. 1937			+			
Polygono–Trisetion Br.–Bl. et R. Tx. ex Marshall 1947		+			+	
Potamion lucentis Rivas–Martínez 1973	+			+		
Potamion pusilii Hejný 1978	+	+		+		
Potentillion caulescentis Br.–Bl. in Br.–Bl. et Jenny 1926 em. Sutter 1969	+	+			+	
Potentillo albae–Quercion petreae Jakucs in Zólyomi et al. 1967		+		+		
Potentillo–Nardion Simon 1957			+			+
Prunion spinosae Soó 1947	+	+		+		+
Pulsatillo slavicae–Pinion Fajmonová 1978		+			+	
Quercion petrae Zólyomi et Jakucs ex Jakucs 1960	+	+				
Quercion pubescenti–petrae Br.–Bl. 1932	+	+				
Rhododendro–Vaccinion Br.–Bl. 1926					+	+
Rhynchosporion albae Koch 1926		+	+		+	+
Rumicion alpini Rubel ex Klika in Klika et Hadač 1944		+	+		+	+
Salicion albae Soó 1930	+			+	+	
Salicion cinereae Th. Müll. & Görs ex Passarge 1961	+	+	+	+		
Salicion eleagno–daphnoidis (Moor 1958) Grass in Mucina et al. 1993	+	+	+		+	
Salicion herbaceae Br.–Bl. in Br.–Bl. et Jenny 1926		+	+		+	+
Salicion incanae Aichinger 1933		+			+	+
Salicion retusae Horv. 1949		+	+		+	+
Salicion silesiacae Rejmánek, Sýkora et Štursa 1971		+				+
Salicion triandrae Th. Muller et Gors. 1958	+	+				
Senecion fluviatilis R.Tx. 1950				+	+	
Seslerio rigidae–Pinion Coldea 1991			+			
Seslerio–Asterion Hadač ex Hadač et al. 1969		+			+	
Seslerio–Festucion pallentis Klika 1931 corr. Zólyomi 1966	+	+	+	+	+	
Seslerion rigidae Zoly. 1939			+			
Seslerion tatrae Hadač ex Hadač et al. 1969		+			+	
Silenion lerchenfeldianae Simon 1957			+			
Sphagnion magellanici Kastner et Flossner 1933			+		+	+
Sphagnion medii Kästner & Flössner 1933	+	+		+		
Sphagno recurvi–Caricion canescentis Passarge 1964	+	+			+	
Sphagno warnstorfiani–Tomenthypnion Dahl 1957	+	+			+	
Sphagno–Utricularion Th. Muller et Gors. 1960		+		+	+	
Spiraeion mediae Borhidi & Varga Z. 1998				+		
Stipion calamagrostis Jenny–Lips ex Br.–Bl. Et al. 1952	+	+			+	
Symphyto–Fagion Vida 1959			+			+
Syringo–Carpinion orientalis Jakucs 1960			+			
Thero–Airion Tx. ex Oberd. 1957		+		+		
Tilio–Acerion Klika 1955	+	+	+	+	+	+
Trifolion medii Th. Muller 1962	+	+		+	+	
Trisetion fusci Krajina 1933		+				
Utricularion vulgaris Passarge 1964			+	+		+
Vaccinion Bocher 1943	+				+	
Veronicion baumgartenii Coldea 1991			+			
Violion caninae Schwickerath 1944	+			+	+	

Endemic plant species

Originally, 455 endemic plant species were selected by Lydia Tasenkevich. National experts commented on the original list, adding new species on the basis of the most recent data. Altogether, the final list includes 486 endemic plants recorded within the alliances.

List of endemic plant species recorded within Carpathian alliances.

Acinos alpinus (L.) Moench ssp. baumgartenii (Simonk.) S. Pawlowska
Aconitum anthora L. ssp. jacquinii (Rchb.)Domin
Aconitum lasiocarpum (Rchb.) Gayer
Aconitum lycoctonum L. ssp. moldavicum (Hacq.) Jalas
Aconitum moldavicum ssp. hosteanum (Schur) Asch. et Graeb.
Aconitum napellus L. ssp. firmum (Rchb.) Gayer
Aconitum napellus ssp. moravicum (Skalicky) Tasen.
Achillea oxyloba (DC.) Schultz Bip. ssp. schurii (Schultz Bip.) Heimerl
Achillea tuzsonii Ujh.
Alchemilla acrostegia Plocek
Alchemilla aequidens Pawł..
Alchemilla amauroptera Plocek
Alchemilla amblyodes Plocek
Alchemilla amicorum Pawl.
Alchemilla anceps Plocek
Alchemilla animosa Plocek
Alchemilla aspera Plocek
Alchemilla babiogorensis Pawl.
Alchemilla bogumilii Pawlus
Alchemilla boleslai Pawł..
Alchemilla brachycodon Plocek
Alchemilla braun-blanquetii Pawl.
Alchemilla bucovinensis Sytschak
Alchemilla contractilis (Plocek) S.Fröhner
Alchemilla crassa (Plocek) Plocek
Alchemilla curtischista Plocek
Alchemilla czywczynensis Pawl.
Alchemilla decurrens Plocek
Alchemilla delitescens Plocek
Alchemilla dostalii Plocek
Alchemilla echinoglobosa Plocek
Alchemilla eugenii Pawl.
Alchemilla exaperta Plocek
Alchemilla fusoidea Plocek
Alchemilla giewontica Pawl.
Alchemilla gorcensis Pawl.
Alchemilla grandiceps Plocek
Alchemilla gruneica Plocek
Alchemilla gymnopoda Plocek
Alchemilla hyperptycha Plocek
Alchemilla chalarodesma Plocek
Alchemilla chilitricha Plocek
Alchemilla intermedia Haller ssp. sooi Palitz
Alchemilla isodonta Plocek
Alchemilla jasiewiczii Pawł..
Alchemilla kornasiana Pawł..
Alchemilla kosiarensis Plocek
Alchemilla kulczynskii Pawł.
Alchemilla ladislai Pawł..
Alchemilla laevipes Plocek
Alchemilla laxa Plocek
Alchemilla longidens Plocek
Alchemilla lorata Plocek
Alchemilla loxotropa Plocek
Alchemilla ludovitiana Plocek
Alchemilla marginata Plocek
Alchemilla megalodonta Plocek
Alchemilla microsphaerica S.Fröhner
Alchemilla mollifolia Plocek et Zlinska
Alchemilla moncophila Plocek
Alchemilla multiloba Plocek
Alchemilla obesa Plocek
Alchemilla oculimarina Pawł..
Alchemilla patens Plocek
Alchemilla polonica Pawł..
Alchemilla pseudincisa Pawł..
Alchemilla pseudothmari Pawł..
Alchemilla pungentiflora (Plocek) Plocek
Alchemilla reversantha Plocek
Alchemilla rhodobasis Plocek
Alchemilla rhodocycla Plocek
Alchemilla sejuncta Plocek
Alchemilla sericoneuroides Pawł..
Alchemilla smaragdina Plocek
Alchemilla smytniensis
Alchemilla sojakii Plocek
Alchemilla sokolowskii Pawł..
Alchemilla stanislae Pawł..
Alchemilla stenoleuca Plocek
Alchemilla suavis Plocek
Alchemilla subconnivens Pawł..
Alchemilla subsessilis Plocek
Alchemilla subtatrica Pawł..
Alchemilla superata Plocek
Alchemilla szaferi Pawł..
Alchemilla tacikii Plocek
Alchemilla tatricola Pawł..
Alchemilla thaumasia Plocek
Alchemilla turculensis Pawł..
Alchemilla versipiloides Pawł..
Alchemilla virginea Plocek
Alchemilla walasii Pawł..
Alchemilla wallischii Pawł..
Alchemilla zapalowiczii Pawł..
Alchemilla zmudae Pawł..
Alopecurus pratensis L.ssp. laguriformis (Schur) Tzvelev
Alyssum montanum L.ssp. brymii (Dostál) Soó
Alyssum repens Baumg. ssp. repens
Androsace villosa L. ssp. arachnoidea (Schott, Nyman et Kotschy) Knuth
Andryala levitomentosa (Nyár.) P.D.Sell
Antennaria carpatica (Wahlenb.) Bluff et Fingerh. ssp. carpatica
Anthemis carpatica Kit. ssp. pyrethriformis (Schur) Beldie
Anthemis tinctoria L.ssp. fussii (Griseb.) Beldie
Aquilegia nigricans Baumg.ssp. subscaposa (Borbás) Soó
Aquilegia transsilvanica Schur
Arenaria ciliata L. ssp. tatrensis (Zapal.) Favarger
Armeria maritima (Mill.) Willd. ssp. barcensis (Simonk.) P.Silva
Armeria pocutica Pawł..
Armoracia macrocarpa (W. et K.) Baumg.
Artemisia absinthium L. var. calcigena Rehman
Asperula carpatica Morariu
Astragalus australis (L.) Lam.ssp. krajinae Domin
Astragalus peterfii Jav.
Astragalus pseudopurpureus Gusul.
Astragalus roemeri Simonk.
Athamanta turbith (L.) Broth. ssp. hungarica (Borbás) Tutin
Aubrieta intermedia Heldr. et Orph. ex Boiss. ssp. falcata Ciocârlan
Barbarea lepuznica Nyár.
Biscutella laevigata ssp. hungarica Soó
Bromus pannonicus Kummer et Sendtner ssp. monocladus (Domin) P.M.Sm.
Bupleurum falcatum L. ssp. dilatatum Schur
Bupleurum longifolium L.ssp. vapincense (Vill.)Todor
Campanula carpatica Jacq.
Campanula crassipes Heuff.
Campanula kladniana (Schur) Witasek
Campanula rotundifolia L. ssp. polymorpha (Witasek) Tacik

Campanula serrata (Kit.) Hendrych
Campanula subcapitata Popov
Campanula tatrae Borbás
Campanula xylocarpa Kovanda
Cardaminopsis halleri (L.) Hayek ssp. tatrica (Pawł..) Dostál
Cardaminopsis neglecta (Schultes) Hayek
Carduus collinus W. et K.
Carduus kerneri Simonk. ssp. kerneri
Carduus kerneri ssp. lobulatiformis (Csuros et Nyár.) Soó
Carduus lobulatus Borbás
Carex sempervirens Vill. ssp. tatrorum (Zapal.) Pawł..
Centaurea coziensis Nyár.
Centaurea globurensis Nyár.
Centaurea maramarosiensis (Jav.) Czerep.
Centaurea phrygia L. ssp. carpatica (Porc.) Dostál
Centaurea phrygia ssp. melanocalathia (Borbás) Dostál
Centaurea phrygia ssp. nigriceps (Dobrocz.) Dostál
Centaurea phrygia ssp. rarauensis (Prodan) Dostál
Centaurea phrygia ssp. retezatensis (Prodan) Dostál
Centaurea pinnatifida Schur ssp. sooana (Borhidi) Soó
Centaurea reichenbachii DC.
Centaurea sadleriana Janka
Centaurea trichocephala Bieb. ex Willd. ssp. simonkaiana (Hayek) Dostal
Centaurea triumfettii All. ssp. dominii Dostál
Cephalaria radiata Griseb. et Schenk
Cerastium arvense L. ssp. glandulosum (Kit.) Soó
Cerastium arvense ssp. lerchenfeldianum (Schur) Asch. et Graeb.
Cerastium transsilvanicum Schur
Cerinthe glabra Mill subsp. tatrica Hadač
Cirsium boujartii (Piller et Mitterp.) Schultz. Bip ssp. boujartii
Cirsium brachycephalum Juratzka
Cirsium decussatum Janka
Cirsium furiens Griseb. et Schenk
Cirsium grecescui Rouy
Cochlearia tatrae Borbás
Cotoneaster matrensis Domokos
Crocus scepusiensis (Rehmann et Wol.) Borbás
Cyclamen fatrense Halda et Soják
Dactylorhiza fuchsii (Druce) Soó ssp. sooana (Borsos) Borsos
Dactylorhiza maculata (L.) Soó ssp. schurii (Klinge) Soó
Daphne arbuscula Celak.
Delphinium oxysepalum Borbás et Pax
Delphinium simonkaianum Pawł..
Dendranthema zawadzkii (Herbich) Tzvelev
Dentaria glandulosa W. et K.
Dianthus callizonus Schott et Kotschy
Dianthus carthusianorum L. ssp. saxigenus (Shur) Jav.
Dianthus giganteus D'Urv. ssp. banaticus (Heuffel) Tutin
Dianthus glacialis Haenke ssp. gelidus (Schott, Nyman et Kotschy) Tutin
Dianthus henteri Heuffel ex Griseb.
Dianthus lumnitzeri Wiesb.
Dianthus nitidus Waldst. et Kit.
Dianthus plumarius ssp. praecox (Kit.) Pawł..
Dianthus spiculifolius Schur
Dianthus tenuifolius Schur
Doronicum carpaticum (Griseb. et Schenk) Nyman
Draba aizoides L. ssp. zmudae Zapal.
Draba dorneri Heuffel
Draba haynaldii Stur
Draba kotschyi Stur
Draba lasiocarpa Rochel ssp. klasterskyi (Chrtek) Chrtek
Draba stellata Jacq. ssp. simonkaiana (Jav.) Beldie
Erigeron nanus Schur
Eritrichium nanum (All.) Schrad. ssp. jankae (Simonk.) Jav.
Erysimum pieninicum (Zapal.) Pawł..
Erysimum wahlenbergii (Asch. et Engl.) Borbás
Erysimum witmannii Zawadzki ssp. pallidiflorum (Jav.) Jav.
Erysimum witmannii ssp. transsilvanicum (Schur) P.W.Ball
Erysimum witmannii ssp. vagicum (Holub et Tomsovic) Dostál
Erysimum witmannii ssp. witmannii
Euphorbia carpatica Wol.
Euphrasia exaristata Smejkal
Euphrasia slovaca (Yeo) Holub ssp. slovaca
Euphrasia stipitata Smejkal
Euphrasia tatrae Wettst.
Ferula sadlerana Ledeb.
Festuca bucegiensis Markgr.-Dannenb.
Festuca carpatica F.G.Dietr
Festuca nitida Kit. ssp. flaccida (Schur) Markgr.-Dannenb.
Festuca pachyphylla Degen ex Nyár.
Festuca porcii Hackel
Festuca rupicola Heuff. ssp. saxatilis (Schur) Rauschert
Festuca scoparia (A.Kern. et Hackel) ssp. lutea K.Richter
Festuca tatrae (Czako) Degen
Festuca versicolor Tausch ssp. dominii Krajina
Galium abaujense Borbás
Galium anisophyllon Vill. ssp. fatrense Ehrend. et Šipošova
Galium baillonii Brandza
Galium pawlowskii Kucowa
Galium transcarpaticum Stoyko et Tasen.
Genista tinctoria L. ssp. oligosperma (Andrae) Prodan
Gentiana cruciata L. ssp. phlogifolia (Schott et Kotschy) Tutin
Gentianella amarella (L.) Börn. ssp. reussii (Tocl) Holub
Gentianella austriaca (A. et J.Kern.) ssp. fatrae A. et D.Löve
Gentianella lutescens (Velen.) ssp. tatrae (Ronniger) Holub
Gypsophila petraea (Baumg.) Rchb.
Helictotrichon decorum (Janka) Henrard
Hepatica transsilvanica Fuss
Heracleum carpaticum Porc.
Heracleum sphondylium L. ssp. trachycarpum (Soják) Holub
Heracleum sphondylium ssp. transsilvanicum (Schur) Brummitt
Hesperis matronalis L. ssp. moniliformis (Schur) Borza
Hesperis matronalis ssp. vrabelyiana (Schur) Soó
Hesperis nivea Baumg
Hesperis oblongifolia Schur
Hesperis slovaca (F.Dvorak) F.Dvorak
Hieracium amoenanthes Nyár.et Zahn
Hieracium atrellum (Zahn) Juxip
Hieracium biharianum Prodan
Hieracium bohatschianum Zahn
Hieracium borzae Nyár.et Zahn
Hieracium breazense Nyár.
Hieracium bucuranum Nyár .
Hieracium buianum Prodan
Hieracium caesiogenum Wol. et Zahn
Hieracium carpaticum Besser
Hieracium catenatum Sennik.
Hieracium crassipedipilium (Pawł.. et Zahn) Chrtek jr.
Hieracium czeremoszense Wol. et Zahn
Hieracium dacicum Uechtr.
Hieracium filarszkyi Jav.
Hieracium fritzeiforme Zahn
Hieracium goemorense Borbás
Hieracium grabowskianum Naegeli et Peter
Hieracium grecescui Nyár. et Zahn
Hieracium grofae Wol.
Hieracium chlorobracteum Degen et Zahn
Hieracium jankae Uechtr.
Hieracium krasanii Wol.
Hieracium lomnicense Wol.
Hieracium longifoliosum Nyár.
Hieracium melananthum (Naegeli et Peter) P.D.Sell et C.West

Hieracium mukacevense Juxip
Hieracium muscelii Prodan
Hieracium napaeum Zahn
Hieracium negoiense (Ravarut et Nyár.) Soó
Hieracium nyaradyanum Zahn
Hieracium occidentale Nyár.
Hieracium paltinae jav. Et zahn
Hieracium pawlowskianum Nyár.
Hieracium paxianum Nyár.et Zahn
Hieracium pelagae Degen et Zahn
Hieracium pelesii Grecesc.
Hieracium perfoliosum Nyár.
Hieracium peterfii Nyár.et Zahn
Hieracium phaedrocheilon Zahn
Hieracium pinetophilum (Degen et Zahn) Chrtek jr.
Hieracium pisaturense Nyár.
Hieracium pocuticum Wol.
Hieracium pojoritense Wol.
Hieracium praebiharicum Boros
Hieracium prodanianum Nyár.et Zahn
Hieracium pseudeffusum (Naegeli et Peter) Nyár.
Hieracium pseudocaesiiforme Nyár.et Zahn
Hieracium pseudocaesium Degen et Zahn
Hieracium pseudonigritum Pax
Hieracium pseudopaltinae Nyár.et Zahn
Hieracium pseudoratezatense Nyár.et Zahn
Hieracium pseudotranssilvanicum (Zahn) Zahn
Hieracium pseudovagneri Zahn
Hieracium rapunculoidiforme Wol. et Zahn
Hieracium riumarense Nyar.
Hieracium scitulum Wol.
Hieracium simonkaianum (Zahn) P.D.Sell et C.West
Hieracium slovacum Chrtek jr.
Hieracium speciosum Willd. ex Hornem
Hieracium stenodontophyllum Nyár.et Zahn
Hieracium subpojoritense Prodan
Hieracium subserratosinuatum Zahn
Hieracium tajanum K.Maly et Zahn
Hieracium telekianum Boros et Lengyel
Hieracium tephroglaucum Naegely et Peter
Hieracium tomiasae Nyár.et Zahn
Hieracium tomiasaeforme Nyár.
Hieracium trischistum Nyár.et Zahn
Hieracium virgicaule Naegely et Peter
Hieracium vladeasae Prodan
Hieracium vurtopicum Zahn
Hylotelephium argutum (Haw.) Holub
Chenopodium wolffii Simonk.
Chrysosplenium alpinum Schur
Jovibarba globifera ssp. preissiana (Domin) Holub
Jurinea mollis ssp. transsilvanica (Sprengel) Hayek
Knautia dipsacifolia Kreutzer ssp. lancifolia (Heuffel) Ehrend.
Knautia dipsacifolia ssp. pocutica (Szabo) Ehrend.
Knautia dipsacifolia ssp. turocensis (Borbás) Jav. ex Kiss
Knautia kitaibelii (Schultes) Borbás
Knautia slovaca Stepanek
Koeleria macrantha (Ledeb.) Schultes ssp. transsilvanica (Schur) Beldie
Koeleria tristis Domin
Lathyrus transsilvanicus (Sprengel) Fritsch
Leontodon pseudotaraxaci Schur
Leontodon repens Schur
Leucanthemopsis alpina (L.) Heywood ssp. tatrae (Vierh.)Holub
Leucanthemum waldsteinii (Schultz Bip.) Pouzar
Leucojum vernum L. ssp. carpaticum (Spring) O.Schwarz
Linum uninerve (Rochel) Jav.
Luzula alpinopilosa (Chaix) Breistr. ssp. obscura Frohner
Lychnis nivalis Kit.
Melampyrum ambiguum Soó
Melampyrum herbichii Wol.
Melampyrum saxosum Baumg.
Micromeria pulegium (Rochel) Bentham
Minuartia frutescens (Kit.) Tuzson
Minuartia setacea (Thuill.) Hayek var. pienina (Zapal.) Pawł..
Minuartia verna (L.) Hiern. ssp. oxypetala (Wol.) Halliday
Molinia horanszky Milkovits
Molinia hungarica Milkovits
Molinia ujhelyii Milkovits
Myosotis transsilvanica Porcius
Nigritella carpatica (Zapal.) Teppner, Klein et Zagulski
Onobrychis montana DC. ssp. transsilvanica (Simonk.) Jav.
Onosma pseudarenaria Schur
Onosma tornensis Jav.
Ophrys holubyana Andras.
Ornithogalum orthophyllum Ten.ssp. acuminatum (Schur) Zahar.
Oxytropis carpatica Uechtr.
Papaver alpinum L. ssp. corona-sancti-stephani (Zapal.) Borza
Papaver alpinum ssp. tatricum Nyár.
Pedicularis baumgartenii Simonk.
Peucedanum rochelianum Heuffel
Phyteuma tetramerum Schur
Phyteuma vagneri A.Kern.
Pilosella alpicola (Schleich. ex Gaudin) F. W. Schultz et Schultz Bip. subsp. ullepitschii (Blocki) Zahn
Pinus nigra Arnold ssp. banatica (Borbás) Novak
Plantago atrata Hoppe subsp. carpathica (Soó) Soó
Poa granitica Br.-Bl. ssp. disparilis (Nyár.) Nyár.
Poa granitica ssp. granitica
Poa laxa Haenke ssp. pruinosa Nyár.
Poa margilicola Bernátová et Májovský
Poa molinerii Balbis ssp. glacialis Beldie
Poa nemoralis L. ssp. carpatica Jirasek
Poa nobilis Skalinska
Poa pannonica A.Kern. ssp. scabra (Asch. et Graeb.) Soó
Poa rehmannii (Asch. et Graeb.) Wol.
Poa sejuncta Bernatova, Majovsky, Obuch
Prangos ferulacea (L.) Lindley ssp. carinata (Griseb. ex Degen) Dihoru
Primula auricula L. ssp. hungarica (Borbás) Soó
Primula auricula ssp. serratifolia (Rochel) Jav.
Primula elatior (L.) Hill. ssp. carpatica (Fuss) W.W.Sm. et Forrest
Primula elatior ssp. leucophylla (Pax) H.-Harrison ex W.W.Sm. et Fletcher
Primula elatior ssp. poloninensis (Domin) Dostál
Primula wulfeniana Schott ssp. baumgarteniana (Degen et Moesz) Ludi
Pulmonaria filarszkyana Jav.
Pulsatilla halleri (All.) Willd. ssp. slavica (G.Reuss) Zamels
Pulsatilla subslavica Futák ex Goliášová
Pyrola carpatica Holub et Krisa
Ranunculus altitatrensis Paclova et Murin
Ranunculus auricomus L. ssp. binatus Jasiewicz
Ranunculus carpaticus Herbich
Ranunculus malinovskii Jelen. et Derv.-Sokol.
Rosa heterostyla Chrshan.
Rubus banaticus Nyár.
Rubus bicolorispinosus Nyár.
Rubus cirlioare Nyár.
Rubus crispomarginatus Holub
Rubus cuiedensis Nyár.
Rubus doftanensis Nyár.
Rubus exornatus Nyár.
Rubus fagetanus Nyár.
Rubus grandiflorus Nyár.
Rubus henrici-egonis Holub
Rubus chloroclados Sabr.

Rubus laetecoloratus Nyár.
Rubus lipovensis Nyár.
Rubus longebracteatus Nyár.
Rubus magurensis Nyár.
Rubus margaritae Gayer
Rubus moestus Holuby
Rubus neopyramidalis Nyár.
Rubus niveoserpens Nyár.
Rubus ocnensis Nyár.
Rubus opiparus Nyár.
Rubus perrobustus
Rubus persanimontis Nyár.
Rubus petnicensis Nyár.
Rubus pseudodoftanensis Nyár.
Rubus romanicus Nyár.
Rubus rubristamineus Nyár.
Rubus saxosus Nyár.
Rubus seciurensis Nyár.
Rubus severinensis Nyár.
Rubus slatinensis Nyár.
Rubus subcoriaceus Nyár.
Rubus subvillicaulis Nyár.
Rubus tenuispinosus Nyár.
Rubus teregovensis Nyár.
Rubus vaccarum Nyár.
Rumex arifolius All. ssp. carpaticus (Zapal.) Pawł..
Salix kitaibeliana Willd.
Salvia transsilvanica (Schur ex Griseb.) Schur
Saussurea porcii Degen
Saxifraga carpatica Sternb.
Saxifraga moschata Wulf. ssp. dominii Soó
Saxifraga moschata ssp. kotulae S.Pawlowska
Saxifraga moschata ssp. transsilvanica S.Pawlowska
Saxifraga mutata L. ssp. demissa (Schott et Kotschy) D.A.Webb
Saxifraga wahlenbergii Ball
Scabiosa columbaria L. ssp. pseudobanatica (Schur) Jav. et Csapody
Scabiosa lucida Vill. ssp. barbata Nyár.
Scabiosa lucida ssp. pseudobanatica (Schur) Chrtek
Scilla bifolia L. ssp. subtriphylla (Schur) Domin
Sedum krajinae Domin
Sempervivum wettsteinii Letz ssp. heterophyllum (Hazsl.) Letz
Sempervivum wettsteinii ssp. wettsteinii
Seseli gracile Waldst. et Kit.
Sesleria heuflerana Schur ssp. hungarica (Ujhelyi) Deyl
Sesleria heufleriana ssp. heufleriana
Sesleria sadlerana Janka ssp. tatrae (Degen) Deyl
Silene dinarica Sprengel
Silene nutans L. ssp. dubia (Herbich) Zapal.
Silene zawadzkii Herbich
Soldanella carpatica Vierh.
Soldanella hungarica Simonk. subsp. hungarica
Soldanella hungarica ssp. major (Neilr.) S.Pawlowska
Soldanella pseudomontana F.K.Mey
Sorbus austriaca (Beck) Hedl. ssp. hazslinszkyana Soó
Sorbus borbasii Jav.
Sorbus buekkensis Soó
Sorbus dacica Borbás
Sorbus javorkae (Soó) Karpaty
Sorbus margittaiana (Jav.) Karpati
Sorbus paxiana Jav.
Sorbus pekarovae Majovsky et Bernatova
Sorbus scepusiensis Kovanda
Sorbus sooi (Mathe) Karpati
Sorbus umbellata (Desf.) Fritsch ssp. banatica (Jav.) Karpati
Stipa crassiculmis P.Smirnow ssp. heterotricha Dihoru et Roman
Stipa danubialis Dihoru et Roman
Symphytum cordatum Waldst. et Kit.
Syringa josikaea Jacq. fil. ex Rchb.
Taraxacum erythrocarpum Kirschner et Stepanek
Taraxacum nigricans (Kit.) Rchb.
Taraxacum pawlowskii Van Soest
Taraxacum pieninicum Pawł..
Tephroseris longifolia (Jacq.) Griseb. et Schenk ssp. moravica Holub
Thalictrum minus L. ssp. carpaticum (Kotula) Osvacilova
Thalictrum minus ssp. pseudominus (Borbás) Soó
Thesium kernerianum Simonk.
Thlaspi caerulescens J. et C. Presl ssp. tatrense (Zapal.) Dvorakova
Thlaspi dacicum Heuffel ssp. banaticum (Uechtr.) Jav.
Thlaspi dacicum ssp. dacicum
Thlaspi jankae A.Kern.
Thlaspi kovatsii Heuffel ssp. schudichii Soó
Thymus alternans Klokov
Thymus bihoriensis Jalas
Thymus comosus Heuffel ex Griseb.
Thymus pulcherrimus Schur ssp. pulcherrimus
Thymus pulcherrimus ssp. sudeticus (Lyka) P.A.Schmidt
Tithymalus sojakii (Chrtek et Křísa) Holub
Trifolium medium L. ssp. banaticum (Heuffel) Hendrych
Trifolium medium ssp. sarosiense (Hazsl.) Simonk.
Trifolium pratense L. ssp. kotulae (Pawł..) Soják
Trisetum flavescens (L.) Beauv. ssp. tatricum Chrtek
Trisetum fuscum (Kit. ex Schultes) Schultes
Trisetum macrotrichum Hackel
Trollius altissimus Crantz ssp. tatrae (Borbás) Pocs et Balogh
Tulipa hungarica Borbás
Viola declinata Waldst. et Kit.et Kit.

Top alliances

On the basis of the occurrence of endemic plants, the following 20 alliances were selected as the most valuable in the Carpathians.

1 *Festuco saxatilis–Seslerion bielzii* (Pawł. et Walas 1949) Coldea 1984 — Eastern Carpathian cushion sedge carpets

Aconitum anthora ssp. *jacquinii*, *Aconitum moldavicum* ssp. *hosteanum*, *Achillea oxyloba* ssp. *schurii*, *Alchemilla szaferi*, *Alyssum repens* ssp. *repens*, *Androsace villosa* ssp. *arachnoidea*, *Campanula rotundifolia* ssp. *polymorpha*, *Campanula serrata*, *Carduus kerneri* ssp. *kerneri*, *Carduus kerneri* ssp. *lobulatiformis*, *Centaurea pinnatifida*, *Cerastium arvense* ssp. *lerchenfeldianum*, *Cerastium transsilvanicum*, *Dianthus callizonus*, *Dianthus glacialis* ssp. *gelidus*, *Dianthus spiculifolius*, *Dianthus tenuifolius*, *Doronicum carpaticum*, *Draba haynaldii*, *Festuca carpatica*, *Festuca nitida* ssp. *flaccida*, *Festuca pachyphylla*, *Festuca rupicola* ssp. *saxatilis*, *Festuca versicolor* ssp. *dominii*, *Genista tinctoria* ssp. *oligosperma*, *Gentiana cruciata* ssp. *phlogifolia*, *Gypsophila petraea*, *Heracleum carpaticum*, *Koeleria macrantha* ssp. *transsilvanica*, *Leontodon pseudotaraxaci*, *Leontodon repens*, *Minuartia verna* ssp. *oxypetala*, *Nigritella carpatica*, *Onobrychis montana* ssp. *transsilvanica*, *Oxytropis carpatica*, *Poa granitica* ssp. *disparilis*, *Poa rehmannii*, *Primula elatior* ssp. *poloninensis*, *Primula wulfeniana* ssp. *baumgarteniana*, *Saxifraga mutata* ssp. *demissa*, *Scabiosa lucida* ssp. *barbata*, *Sesleria heuflerana*, *Silene nutans* ssp. *dubia*, *Soldanella hungarica* ssp. *major*, *Thesium kernerianum*, *Thlaspi dacicum* ssp. *banaticum*, *Thlaspi dacicum* ssp. *dacicum*, *Thymus comosus*, *Thymus pulcherrimus pulcherrimus*, *Trisetum fuscum*

2 *Calamagrostion villosae* Pawł. et al. 1928 — Wooly small–reed tall grass communities

Aconitum moldavicum ssp. *hosteanum*, *Aconitum napellus* ssp. *firmum*, *Alchemilla czywczynensis*, *Alchemilla decurrens*, *Alchemilla gorcensis*, *Alchemilla lorata*, *Alchemilla multiloba*, *Alchemilla obesa*, *Alchemilla sericoneuroides*, *Alchemilla stanislae*, *Alchemilla subtatrica*, *Alchemilla tatricola*, *Alopecurus pratensis* ssp. *laguriformis*, *Campanula rotundifolia* ssp. *polymorpha*, *Campanula serrata*, *Campanula tatrae*, *Cardaminopsis halleri* ssp. *tatrica*, *Dianthus spiculifolius*, *Festuca carpatica*, *Festuca porcii*, *Heracleum carpaticum*, *Heracleum sphondylium* ssp. *transsilvanicum*, *Hesperis matronalis* ssp. *moniliformis*, *Knautia dipsacifolia* ssp. *pocutica*, *Leucanthemum waldsteinii*, *Leucojum vernum* ssp. *carpaticum*, *Melampyrum saxosum*, *Phyteuma vagneri*, *Poa granitica* ssp. *disparilis*, *Primula elatior* ssp. *carpatica*, *Primula elatior* ssp. *poloninensis*, *Pulmonaria filarszkyana*, *Ranunculus carpaticus*, *Rumex arifolius* ssp. *carpaticus*, *Scabiosa columbaria* ssp. *pseudobanatica*, *Silene nutans* ssp. *dubia*, *Soldanella hungarica* ssp. *major*, *Thymus alternans*, *Thymus pulcherrimus* ssp. *pulcherrimus*, *Trifolium pratense* ssp. *kotulae*, *Trisetum flavescens* ssp. *tatricum*, *Trisetum fuscum*, *Trollius europaeus* ssp. *tatrae*, *Viola declinata*, *Gentianella lutescens* ssp. *tatrae*

3 *Seslerion tatrae* Hadač 1962 — West Carpathian alpine calciphilous grasslands

Alchemilla braun-blanquetii, *Alchemilla pseudothmari*, *Alchemilla smytniensis*, *Alchemilla subconnivens*, *Alchemilla tatricola*, *Antennaria carpatica* ssp. *carpatica*, *Arenaria ciliata* ssp. *tatrensis*, *Artemisia absinthium* var. *calcigena*, *Campanula rotundifolia* ssp. *polymorpha*, *Campanula tatrae*, *Cardaminopsis halleri* ssp. *tatrica*, *Carex sempervirens* ssp. *tatrorum*, *Dendranthema zawadzkii*, *Dianthus nitidus*, *Dianthus plumarius* ssp. *praecox*, *Draba aizoides* ssp. *zmudae*, *Erigeron nanus*, *Erysimum pieninicum*, *Erysimum wahlenbergii*, *Erysimum witmannii* ssp. *witmannii*, *Festuca tatrae*, *Festuca versicolor* ssp. *dominii*, *Hieracium carpaticum*, *Hieracium melananthum*, *Hieracium*

virgicaule, *Jovibarba globifera* ssp. *preissiana*, *Knautia kitaibelii*, *Oxytropis carpatica*, *Plantago atrata* ssp. *carpatica*, *Poa molinerii* ssp. *glacialis*, *Poa nemoralis* ssp. *carpatica*, *Primula auricula* ssp. *hungarica*, *Pulsatilla halleri* ssp. *slavica*, *Pyrola carpatica*, *Saxifraga moschata* ssp. *dominii*, *Sesleria sadlerana* ssp. *tatrae*, *Soldanella carpatica*, *Taraxacum pieninicum*, *Thalictrum minus* ssp. *carpaticum*, *Thymus pulcherrimus* ssp. *pulcherrimus*, *Thymus pulcherrimus* ssp. *sudeticus*, *Trifolium pratense* ssp. *kotulae*

4 *Adenostylion alliariae* Br. — Bl. 1926 — Carpathian tall herb communities
Aconitum lasiocarpum, *Aconitum lycoctonum* ssp. *moldavicum*, *Aconitum napellus* ssp. *firmum*, *Alchemilla babiogorensis*, *Alchemilla czywczynensis*, *Campanula rotundifolia* ssp. *polymorpha*, *Cardaminopsis halleri* ssp. *tatrica*, *Centaurea maramarosiensis*, *Centaurea phrygia* ssp. *nigriceps*, *Cerinthe glabra* ssp. *tatrica*, *Delphinium oxysepalum*, *Euphorbia carpatica*, *Festuca carpatica*, *Heracleum carpaticum*, *Heracleum sphondylium* ssp. *transsilvanicum*, *Hesperis matronalis* ssp. *moniliformis*, *Hesperis nivea*, *Hesperis oblongifolia*, *Chrysosplenium alpinum*, *Knautia dipsacifolia* ssp. *pocutica*, *Leucanthemum waldsteinii*, *Phyteuma vagneri*, *Poa granitica* ssp. *disparilis*, *Primula elatior* ssp. *carpatica*, *Pulmonaria filarszkyana*, *Ranunculus carpaticus*, *Soldanella hungarica* ssp. *major*

5 *Seslerion rigidae* Zoly. 1939 — East Carpathian [Sesleria rigida] grasslands
Achillea oxyloba ssp. *schurii*, *Alyssum repens* ssp. *repens*, *Anthemis tinctoria* ssp. *fussii*, *Aquilegia nigricans* ssp. *subscaposa*, *Aquilegia transsilvanica*, *Asperula carpatica*, *Astragalus pseudopurpureus*, *Astragalus roemeri*, *Athamanta turbith* ssp. *hungarica*, *Campanula kladniana*, *Carduus kerneri* ssp. *lobulatiformis*, *Centaurea reichenbachii*, *Cephalaria radiata*, *Dianthus spiculifolius*, *Dianthus tenuifolius*, *Helictotrichon decorum*, *Linum uninerve*, *Melampyrum herbichii*, *Melampyrum saxosum*, *Pedicularis baumgartenii*, *Primula auricula* ssp. *serratifolia*, *Primula elatior* ssp. *leucophylla*, *Scabiosa columbaria* ssp. *pseudobanatica*, *Silene nutans* ssp. *dubia*, *Thymus comosus*, *Trisetum macrotrichum*

6 *Cystopteridion* Richard 1972 — Middle–European calcareous fern cliffs
Acinos alpinus ssp. *baumgartenii*, *Aconitum moldavicum* ssp. *hosteanum*, *Achillea oxyloba* ssp. *schurii*, *Alopecurus pratensis* ssp. *laguriformis*, *Bupleurum longifolium* ssp. *vapincense*, *Campanula carpatica*, *Campanula rotundifolia* ssp. *polymorpha*, *Dianthus carthusianorum* ssp. *saxigenus*, *Festuca carpatica*, *Festuca rupicola* ssp. *saxatilis*, *Galium pawlowskii*, *Galium transcarpaticum*, *Hieracium caesiogenum*, *Knautia dipsacifolia* ssp. *pocutica*, *Leontodon pseudotaraxaci*, *Poa granitica* ssp. *disparilis*, *Poa rehmannii*, *Poa sejuncta*, *Scabiosa lucida* ssp. *pseudobanatica*, *Sempervivum wettsteinii* ssp. *wettsteinii*, *Silene nutans* ssp. *dubia*, *Silene zawadzkii*, *Thymus alternans*

7 *Fagion* Luquet 1926 — Medio–European acidophilous beech forest
Aconitum lasiocarpum, *Aconitum moldavicum* ssp. *hosteanum*, *Aquilegia transsilvanica*, *Centaurea maramarosiensis*, *Cyclamen fatrense*, *Dentaria glandulosa*, *Erysimum witmannii* ssp. *witmannii*, *Gentianella austriaca* ssp. *fatrae*, *Hesperis matronalis* ssp. *vrabelyiana*, *Hesperis nivea*, *Hieracium mukacevense*, *Hieracium pocuticum*, *Hylotelephium argutum*, *Molinia ujhelyii*, *Leucojum vernum* ssp. *carpaticum*, *Pulsatilla halleri* ssp. *slavica*, *Pulsatilla subslavica*, *Ranunculus carpaticus*, *Rubus crispomarginatus*, *Rumex arifolius* ssp. *carpaticus*, *Scilla bifolia* ssp. *subtriphylla*, *Sorbus pekarovae*, *Symphytum cordatum*

8 *Seslerio–Festucion pallentis* Klika 1931 corr. Zólyomi 1966 — Dealpine calciphile pale fescue grasslands

Anthemis tinctoria ssp. *fussii*, *Biscutella laevigata* ssp. *hungarica*, *Bupleurum falcatum* ssp. *dilatatum*, *Centaurea phrygia* ssp. *retezatensis*, *Centaurea reichenbachii*, *Cotoneaster matrensis*, *Daphne arbuscula*, *Dianthus lumnitzeri*, *Draba lasiocarpa* ssp. *klasterskyi*, *Ferula sadlerana*, *Ornithogalum orthophyllum* ssp. *acuminatum*, *Prangos ferulacea* ssp. *carinata*, *Primula auricula* ssp. *hungarica*, *Pulsatilla halleri* ssp. *slavica*, *Pulsatilla subslavica*, *Seseli gracile*, *Silene nutans* ssp. *dubia*, *Stipa crassiculmis* ssp. *heterotricha*, *Sesleria heufleriana*, *Thalictrum minus* ssp. *pseudominus*, *Thlaspi jankae*

9 *Papavero–Thymion pulcherrimi* I. Pop 1968 — Alpine screes of Eastern Carpathians

Alyssum repens ssp. *repens*, *Aubrieta intermedia* ssp. *falcate*, *Campanula kladniana*, *Cardaminopsis neglecta*, *Carduus kerneri* ssp. *kerneri*, *Cerastium arvense* ssp. *lerchenfeldianum*, *Dianthus glacialis* ssp. *gelidus*, *Doronicum carpaticum*, *Erysimum witmannii* ssp. *transsilvanicum*, *Festuca carpatica*, *Festuca nitida* ssp. *flaccida*, *Jovibarba globifera* ssp. *preissiana*, *Papaver alpinum* ssp. *corona–sancti–stephani*, *Poa granitica* ssp. *disparilis*, *Primula elatior* ssp. *poloninensis*, *Silene nutans* ssp. *dubia*, *Silene zawadzkii*, *Thlaspi dacicum* ssp. *dacicum*, *Thymus bihoriensis*, *Thymus pulcherrimus*

10 *Salicion herbaceae* Br.–Bl. in Br.–Bl. et Jenny 1926 – snow-bed communities of siliceous substrates

Achillea oxyloba ssp. *schurii*, *Alchemilla stanislae*, *Alchemilla szaferi*, *Alchemilla tatricola*, *Alchemilla versipiloides*, *Alchemilla wallischii*, *Alchemilla zapalowiczii*, *Dianthus spiculifolius*, *Festuca carpatica*, *Chrysosplenium alpinum*, *Leucanthemopsis alpina* ssp. *tatrae*, *Luzula alpinopilosa* ssp. *obscura*, *Poa granitica* ssp. *granitica*, *Poa granitica* ssp. *disparilis*, *Poa nobilis*, *Primula elatior* ssp. *poloninensis*, *Rumex arifolius* ssp. *carpaticus*, *Soldanella hungarica* ssp. *major*, *Taraxacum pawlowskii*

11 *Potentillo–Nardion* Simon 1957 — Carpathian mat–grass swards

Bupleurum longifolium ssp. *vapincense*, *Campanula rotundifolia* ssp. *polymorpha*, *Centaurea phrygia* ssp. *carpatica*, *Centaurea phrygia* ssp. *melanocalathia*, *Genista tinctoria* ssp. *oligosperma*, *Hesperis nivea*, *Hieracium krasanii*, *Hieracium lomnicense*, *Hieracium mukacevense*, *Leucanthemum waldsteinii*, *Luzula alpinopilosa* ssp. *obscura*, *Phyteuma tetramerum*, *Phyteuma vagneri*, *Rumex arifolius* ssp. *carpaticus*, *Scabiosa lucida* ssp. *barbata*, *Soldanella hungarica* ssp. *major*, *Trifolium pratense* ssp. *kotulae*, *Viola declinata*

12 *Seslerio–Asterion* Hadač 1962 — West Carpathian subalpine calciphilous grasslands

Biscutella laevigata ssp. *hungarica*, *Bromus pannonicus* ssp. *monocladus*, *Campanula carpatica*, *Campanula rotundifolia* ssp. *polymorpha*, *Campanula tatrae*, *Carex sempervirens* ssp. *tatrorum*, *Daphne arbuscula*, *Dendranthema zawadzkii*, *Dianthus plumarius* ssp. *praecox*, *Knautia kitaibelii*, *Oxytropis carpatica*, *Poa margilicola*, *Poa sejuncta*, *Primula auricula* ssp. *hungarica*, *Pulsatilla halleri* ssp. *slavica*, *Thalictrum minus* ssp. *carpaticum*, *Thalictrum minus* ssp. *pseudominus*

13 *Cardamino–Montion* Br. — Bl. 1926 — Montane soft water springs

Aconitum napellus ssp. *moravicum*, *Alchemilla aequidens*, *Alchemilla gorcensis*, *Alchemilla stanislae*, *Alchemilla subtatrica*, *Alchemilla tatricola*, *Alchemilla zmudae*, *Armeria pocutica*, *Barbarea*

lepuznica, *Cardaminopsis neglecta*, *Festuca porcii*, *Chrysosplenium alpinum*, *Leucanthemum waldsteinii*, *Poa granitica* ssp. *disparilis*, *Pulmonaria filarszkyana*, *Saussurea porcii*

14 *Pulsatillo slavicae–Pinion* Fajmonová 1978 — Western Carpathian calcicolous Scots pine forests

Biscutella laevigata ssp. *hungarica*, *Daphne arbuscula*, *Dendranthema zawadzkii*, *Dianthus nitidus*, *Erysimum witmannii* ssp. *witmannii*, *Gentianella austriaca* ssp. *fatrae*, *Knautia slovaca*, *Koeleria tristis*, *Pulsatilla halleri* ssp. *slavica*, *Sorbus pekarovae*, *Dianthus plumarius* ssp. *praecox*, *Festuca tatrae*, *Soldanella carpatica*, *Campanula carpatica*, *Campanula serrata*, *Thymus pulcherrimus* ssp. *sudeticus*

15 *Gypsophilion petraeae* Borhidi et Pocs 1957 — Eastern Carpathian calcareous cliff xero–heliophile communities

Achillea oxyloba ssp. *schurii*, *Androsace villosa* ssp. *arachnoidea*, *Andryala levitomentosa*, *Campanula carpatica*, *Campanula kladniana*, *Dianthus spiculifolius*, *Dianthus tenuifolius*, Draba *kotschyi*, *Eritrichium nanum* ssp. *jankae*, *Festuca nitida* ssp. *flaccida*, *Festuca rupicola* ssp. *saxatilis*, *Gypsophila petraea*, *Saxifraga mutata* ssp. *demissa*, *Silene nutans* ssp. *dubia*, *Silene zawadzkii*, *Thesium kernerianum*

16 *Trisetion fusci* Krajina 1933 — Carpathian tall–herb meadows

Alchemilla subtatrica, *Leucanthemopsis alpina* ssp. *tatrae*, *Ranunculus altitatrensis*, *Trisetum fuscum*, *Campanula serrata*, *Cochlearia tatrae*, *Cerastium arvense* ssp. *glandulosum* (*Cerastium tatrae*), *Delphinium oxysepalum*, *Soldanella carpatica*, *Trollius altissimus* ssp. *tatrae*, *Sesleria sadlerana* ssp. *tatrae*, *Saxifraga carpatica*

17 *Papaverion tatrici* Pawł. et al. 1928 corr. Valachovič 1995 — West Carpathian calcareous screes

Arenaria ciliata ssp. *tatrensis*, *Cerastium arvense* ssp. *glandulosum*, *Delphinium oxysepalum*, *Papaver alpinum* ssp. *tatricum*, *Sesleria sadlerana* ssp. *tatrae*, *Saxifraga moschata* ssp. *dominii*, *Saxifraga wahlenbergii*, *Carex sempervirens* ssp. *tatrorum*, *Festuca carpatica*, *Thymus pulcherrimus* ssp. *pulcherrimus*, *Campanula tatrae*

18 *Symphyto–Fagion* Vida 1959 — Trans–Carpathian beech forest

Aconitum lycoctonum ssp. *moldavicum*, *Centaurea maramarosiensis*, *Galium baillonii*, *Hepatica transsilvanica*, *Leucanthemum waldsteinii*, *Phyteuma tetramerum*, *Primula auricula* ssp. *serratifolia*, *Ranunculus carpaticus*, *Symphytum cordatum*

19 *Festucion versicoloris* Krajina 1933 — West Carpathian garland grasslands

Antennaria carpatica ssp. *carpatica*, *Arenaria ciliata* ssp. *tatrensis*, *Campanula rotundifolia* ssp. *polymorpha*, *Campanula tatrae*, *Pyrola carpatica*, *Soldanella hungarica* ssp. *hungarica*, *Gentianella lutescens* ssp. *tatrae*

20 *Festucion carpaticae* Bělohlávková et Fišerová 1989 — Carpathian fescue tall grass communities

Carex sempervirens ssp. *tatrorum*, *Festuca carpatica*, *Pulsatilla halleri* ssp. *slavica*, *Trisetum flavescens* ssp. *tatricum*

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WWF International Danube–Carpathian Programme and the Carpathian Ecoregion Inititiative

About the WWF International Danube–Carpathian Programme

WWF recognizes both the Carpathian Mountains and Danube as Global 200 Ecoregions. These are the priority ecoregions identified by WWF as the most valuable, and sometimes most vulnerable, ecoregions in the world which best represent the breadth of biodiversity and ecological processes.

Before the Carpathians and Danube became Global 200 ecoregions, WWF recognised its duty to create its own trans–boundary protection programme to protect the Danube and its threatened wetlands and floodplains. The opportunity arose over a decade ago with the fall of the Iron Curtain, allowing WWF to become more active in the Central and Eastern European countries. In 1992, WWF projects and political activities in the Danube River Basin began with 5 model projects located in natural areas critical for the survival of the river.

In 1998, WWF work in the region was expanded to include an additional focus on the Carpathian Mountains and ecologically sustainable forestry. That same year, the *WWF International Danube-Carpathian Programme* was officially established to co-ordinate WWF activities in the Carpathian Mountains and Danube River Basin.

Today, the mission of the WWF International Danube-Carpathian Programme is to support the conservation, restoration and sustainable management of nature, primarily of freshwater and forest resources, in the Danube River Basin and Carpathian Mountains. This is achieved through an ecoregion planning approach based on model projects, influencing policy, communications, networking, capacity building and crisis response.

About the Carpathian Ecoregion Initiative

The Carpathian Ecoregion Initiative (CEI) was launched in 1999 in response to increasing threats to the unique and valuable Carpathian Mountains ecoregion — an area of

global importance stretching across seven countries and forming a mountainous link between the forests of northern, southern, eastern and western Europe.

The unique character of the Carpathians is also tied to its heritage values, cultural richness and diversity. Maintaining this diversity while sustainably using the natural capital of the region requires the adoption of an inclusive, holistic approach to development planning involving all stakeholders.

Today the CEI is a unique international partnership achieving conservation of nature in the globally important Carpathian region and, at the same time, supporting local economy and culture for the lasting benefit of the people living in the heart of Europe.

Facilitated by WWF, the CEI is an alliance of governmental, non-governmental, funding, scientific and academic organisations, both national and international, seeking to influence the development of the region over the next 50 years. The CEI approach is new, large-scale, long-term and in partnership with local people. It is the first time a project of this magnitude has ever been attempted in the Carpathian region and the first time its conservation has been planned on a 'natural scale' across political boundaries.

As a result of an intensive two-year process, including a major data gathering exercise, it is now possible to demonstrate the true value of the Carpathians for the first time and to prepare this *Carpathian Red List* of threatened species and ecosystems.

- The CEI has a number of achievements since its launch. Key ones include:
- Agreed *Carpathian Vision* outlining long-term goals for conservation and sustainable development with a specific vision for a protected areas network.
- Detailed *Status of the Carpathians* report and mini–GIS CD–ROM summarising the results of the Initiative's detailed assessments and GIS analysis, as well as key issues affecting biodiversity and sustainable development in the Carpathians — the first ever overall view of the Carpathians.
- 30 *Priority Areas* for Biodiversity identified across the region.
- The *Declaration on Environment and Sustainable Development* signed by 14 Heads of State or their representatives through co–hosting the Summit on Environment and Sustainable Development in the Danube and Carpathian Region (April 2001).
- Major progress towards the development of a legal structure for the region — working with UNEP on the drafting of a Carpathian Convention.
- Agreement on basic themes for a *Conservation and Action Plan* for the region.
- Commitment from major international donors to discuss the development of funding mechanisms for the region.
- Four Model Project Areas identified, demonstrating the benefits of combining sustainable development and conservation on a local scale.
- Small local sustainable development projects funded in the Czech Republic, Hungary, Poland, Romania, Slovakia and Ukraine, according to criteria developed by the CEI.
- Carpathian carnivore reports published, in preparation for the creation of a *Pan–Carpathian Large Carnivore Conservation and Management Plan*.
- A report on the results of an independent NGO evaluation of the European Union's SAPARD plans and processes.

- A comprehensive range of communication materials to bring international attention to the importance, vulnerability and opportunities in the region (including a comprehensive website: www.carpathians.org).
- A 2.5 year, comprehensive programme of workshops on Carpathians issues, facilitating cross border co-operation and highlighting the region internationally.

Future activities

The next stage of the Initiative will focus on the agreement and implementation of the Conservation and Action Plan, to feed into the developing Carpathian Convention. The work of the Initiative will fall into 7 categories:

- Biodiversity conservation: protected areas network, effective management of protected areas, large carnivore conservation and management strategy.
- Sustainable economic and social development: market mechanisms for sustainable production, nature & culture based tourism strategy, pilot projects demonstrating economic benefits
- Sustainable forestry (including certification)
- Sustainable agriculture
- Integrated river basin management
- Institutional development: strengthening legislation, promoting flexible co–operation, enhancing community participation, capacity building
- Financial mechanisms: develop co–ordinated investment programme e.g. “Green Carpathian Fund”, together with international donor agencies and national governments

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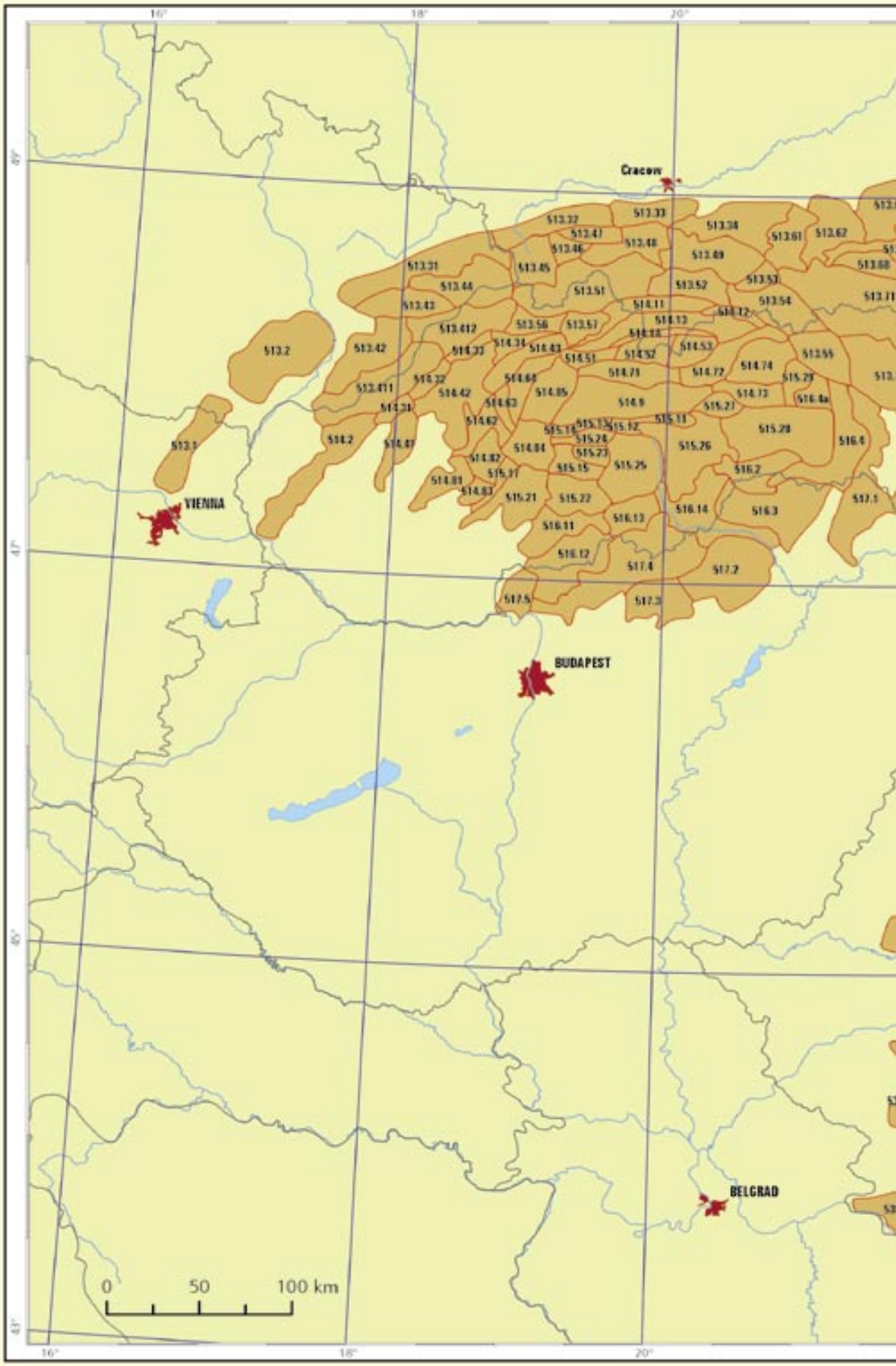
Cracow
VIENNA
BUDAPEST
BELGRAD
0
50
100 km

Division of the Carpathians into mesoregions according to Kondracki

List of mesoregions and their codes is given on the back of the map

List of mesoregions ordered by codes

513.1 Rakusko-Jihomoravke Karpaty
513.2 Stredomoravske Karpaty
513.31 Podbeskydska pahorkatina
513.32 Pogorze Slaskie
513.33 Pogorze Wielickie
513.34 Pogorze Wisnickie
513.411 Bile a Biele Karpaty
513.412 Javorniky
513.42 Vizovicka vrchovina
513.43 Hostynsko-Vsetynska hornatina
513.44 Moravsko-Sliezke Beskydy
513.45 Beskid Slaski
513.46 Kotlina Zywiecka
513.47 Beskid Maly
513.48 Beskid Makowski
513.49 Beskid Wyspowy
513.51 Beskid Zywiecki
513.52 Gorce
513.53 Kotlina Sadecka
513.54 Beskid Sadecki
513.55 Cergov
513.56 Kysucka vrchovina
513.57 Oravska Magura
513.61 Pogorze Roznowskie
513.62 Pogorze Ciezkowickie
513.63 Pogorze Strzyzowskie
513.64 Pogorze Dynowskie
513.65 Pogorze Przemyskie
513.67 Kotlina Jasielsko-Krosnienska
513.68 Pogorze Jasieskie
513.69 Pogorze Bukowskie
513.71 Beskid Niski
513.72 Ondavska vrchovina
514.2 Male Karpaty
514.9 Nizke Tatry
514.11 Kotlina Orawsko-Nowotarska
514.12 Pieniny
514.13 Pogorze Spisko-Gubalowskie
514.14 Podtatranska brazda
514.31 Trencianska kotlina
514.32 Ilavska kotlina
514.33 Bytcianska kotlina
514.34 Zilinska kotlina
514.41 Povazsky Inovec
514.42 Strazovske vrchy
514.43 Mala Fatra
514.51 Chocske vrchy
514.52 Zapadne Tatry
514.53 Vysoke a Belianske Tatry
514.62 Hornonitrianska kotlina
514.63 Ziar
514.64 Turcianska kotlina
514.71 Liptovska kotlina
514.72 Popradska kotlina
514.73 Hornadska kotlina
514.74 Levocske vrchy
514.81 Tribec
514.82 Vtacnik
514.83 Pohronsky Inovec
514.84 Kremnicke vrchy
514.85 Velka Fatra
515.11 Helpianska kotlina
515.12 Breznianska kotlina
515.13 Lopejska kotlina
515.14 Bystricke podolie
515.15 Zvolenska kotlina
515.17 Ziarska kotlina
515.21 Stiavnicke vrchy
515.22 Javorie
515.23 Polana
515.24 Bystricka vrchovina
515.25 Veporske vrchy
515.26 Stolice vrchy
515.27 Slovensky Raj
515.28 Volovske vrchy
515.29 Branisko a Bachure
516.2 Slovensky kras
516.3 Cserehati dombsag
516.4 Kosicka kotlina
516.4a Sarisska vrchovina
516.11 Krupinska planina
516.12 Ipelska kotlina
516.13 Lucenecka kotlina
516.14 Rimavska kotlina
517.1 Slanske vrchy
517.2 Bukk
517.3 Matra
517.4 Cserhat-hegyseg
517.5 Borzsony a Burda
522.11 Grzbiety Sanocko-Turczanskie
522.12 Bieszczady Zachodnie
522.13 Skolivski Beskidy
522.14 Verchno-Dnistrivski Beskydy
522.15 Gorgany
522.16 Pokutsko-Bukovynski Karpaty
522.21 Polonyna Rivna
522.22 Polonyna Borzava
522.23 Polonyna Krasna
522.24 Svydovec
522.25 Czarnohora
522.26 Hyrnjavski hory
523.1 Muntii Maramuresului
523.2 Depresiunea Maramuresului
523.31 Muntii Rodnei
523.41 Mestecanis
523.42 Muntii Giumalaul-Raraul
523.43 Pietros
523.44 Budacu
523.45 Ceahlau
523.46 Muntii Giurgeului
523.47 Muntii Hasmas
523.51 Vihorlat
523.52 Makovycja
523.53 Buzora
523.54 Tupyj
523.55 Muntii Oasului
523.56 Muntii Gutiiului
523.57 Muntii Tiblesului
523.61 Muntii Birgaului
523.62 Muntii Calimani
523.63 Muntii Harghita
523.64 Muntii Baraolt
523.65 Bodoc
523.66 Muntii Persani
523.71 Depresiunea Giurgeului
523.72 Depresiunea Ciucului
523.73 Depresiunea Brasov
524.1 Obcinele
524.2 Muntii Stinisoarei
524.3 Muntii Tarcaului
524.4 Dolina Trotuszu i Kotlina Darmanesti
524.5 Muntii Ciucului
524.6 Muntii Nemira
525.1 Muntii Vrancei
525.2 Muntii Buzaului
525.3 Muntii Girbova
526.1 Subcarpatii Moldovei
526.2 Subcarpatii Munteniei
531.4 Poiana Rusca
531.11 Muntii Bucegi
531.12 Leaota
531.13 Piatra Craiului
531.14 Muntii Iezer
531.15 Muntii Fagarusului
531.16 Depresiunea Lovistei
531.17 Cozia
531.21 Muntii Capatini
531.22 Muntii Paringului
531.23 Depresiunea Lotrului
531.24 Muntii Lotrului
531.25 Muntii Cindrel
531.26 Muntii Sureanu
531.31 Depresiunea Petrosani
531.32 Muntii Retezatului
531.33 Muntii Godeanu
531.34 Muntii Tarcu
531.35 Culoarul Cerna
531.36 Muntii Vilcanului
531.37 Muntii Mehedinti
532.1 Subcarpatii Ardzeszu
532.2 Subcarpatii Aluty
532.3 Subcarpatii Oltenskie
533.1 Culoarul Timis-Cerna
533.2 Muntii Almajului
533.3 Muntii Locvei
533.4 Depresiunea Almajului
533.5 Muntii Semenic
533.6 Muntii Aninei
533.7 Depresiunea Caras-Resita
533.7a Dealurile Carasului
533.8 Muntii Dognecei
541.1 Podisul Somesan
541.2 Podisul Transilvan
541.3 Depresiunea Mures-Turda
541.4 Podisul Tirnavelor
542.1 Muntii Bihorului
542.21 Muntii Zarandului
542.22 Muntii Metaliferi
542.23 Muntii Trascaului
542.31 Muntii Codrului
542.32 Depresiunea Beiusului
542.33 Padurea Craiului
542.34 Depresiunea Vad
542.41 Muntii Muntele Ses
542.42 Muntii Mesesului
542.43 Depresiunea Simleu