Red List of vascular plants of the Czech Republic: 3rd edition

Červený seznam cévnatých rostlin České republiky: třetí vydání

Dedicated to the centenary of the Czech Botanical Society (1912–2012)

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The knowledge of the flora of the Czech Republic has substantially improved since the second version of the national Red List was published, mainly due to large-scale field recording during the last decade and the resulting large national databases. In this paper, an updated Red List is presented and compared with the previous editions of 1979 and 2000. The complete updated Red List consists of 1720 taxa (listed in Electronic Appendix 1), accounting for more then a half (59.2%) of the native flora of the Czech Republic. Of the Red-Listed taxa, 156 (9.1% of the total number on the list) are in the A categories, which include taxa that have vanished from the flora or are not known to occur at present, 471 (27.4%) are classified as critically threatened, 357 (20.8%) as threatened and 356 (20.7%) as endangered. From 1979 to 2000 to 2012, there has been an increase in the total number of taxa included in the Red List (from 1190 to 1627 to 1720) and in most categories, mainly for the following reasons: (i) The continuing human pressure on many natural and semi-natural habitats is reflected in the increased vulnerability or level of threat to many vascular plants; some vulnerable species therefore became endangered, those endangered critically threatened, while species until recently not classified may be included in the Red List as vulnerable or even endangered. (ii) Some increase in the number of species in particular categories can be attributed to the improved knowledge of taxonomically difficult groups for which previously only incomplete species lists were available. In addition, some native species were recently discovered as new to the country's flora or described as new to science, and the status of their populations made Red-Listing necessary. (iii) Also improvements in our knowledge of the flora made the expert judgment more precise and some species were included in the list because their long-lasting vulnerability was recognized. In contrast, 23 taxa considered extinct or missing were rediscovered. This is almost one third of the number of extinct or missing taxa in the first version of the Red List published in 1979.

K e y w o r d s: Czech Republic, Red List, threatened plants, trends over time, vascular plants

Introduction

The first Red List of vascular plants in the Czech Republic was compiled in the mid-1970s. However, their compilation was preceded by international developments. Towards the end of the 1960s, the International Union for the Conservation of Nature became aware that the decline and vulnerability of species have to be evaluated before proposing effective conservation measures. The first list of endangered species published was that for Belgium (Delvolsalle et al. 1969), while the first list of endangered species named "Rote Liste", i.e. Red List, was compiled for the German federal state of Baden-Württemberg (Müller et al. 1973) and one covering the whole country the following year (Sukopp 1974). Soon after that at the 12th International Botanical Congress in 1975 in Saint-Petersburg, then

Leningrad, one of the topics addressed was the conservation of flora. On this occasion, the Red Data Book of the former USSR was published (Tachtadžjan 1975), immediately followed by a Red List for the whole of Europe (Lucas & Walters 1976).

The Czech Botanical Society soon became involved in similar studies. A workshop on declining flora and vegetation was held on 4–5 December 1976 (Štěpán 1977, Holub 1981). Among the conclusions of this workshop was a proposal to evaluate the conservation status of vascular plants in the Czech flora: as a result, the first version of the national Red List of vascular plants appeared three years later (Holub et al. 1979). This Red List generated, both among professional and hobby botanists, a lot of interest in searching for rare and declining plants at their historical sites. Within a few years, several species classified as missing or extinct were rediscovered, including *Kochia prostrata* (Tomšovic 1989) and *Adonis flammea* (Číhalík et al. 1991).

There is no doubt that Red Lists have to be updated. However, the 10 year span, as originally proposed, became substantially longer. In response to a request from the Ministry of the Environment, Josef Holub resumed activities aimed at producing a new version of the Red List in the early 1990s. A workshop was held in Olomouc, but finally only a draft version was produced and distributed among the participants and members of the Czech Botanical Society (Holub 1995). Unfortunately, Holub passed away on 23 July 1999 (see Krahulec & Pyšek 1999, Pyšek & Hrouda 2000), a few months before the Red Data Book (Čeřovský et al. 1999), which also includes the Black List of extinct and endangered species (Holub et al. 1999), was published. In order to correct some mistakes and incorporate new plant records into the species' classifications, a decision was made to resume work on the 1995 draft of the Red List. The editorial work was coordinated by František Procházka, who prepared the final version that was published in Preslia (Holub & Procházka 2000). In the same issue, dedicated to Holub's memory, a paper on vanished and extinct species of the Czech flora found among Holub's scientific manuscripts after his death was published (Holub 2000). In order to make this list more suitable for the general public, another version of the Red List was published in Czech (Procházka 2001), in which the taxonomy and nomenclature follows widely adopted concepts.

Apart from national Red Lists, numerous lists dealing with the flora of some parts of the country were compiled over the last three decades. They cover usually administrative units or large-scale protected areas, such as national parks and landscape protected areas. Kubát (1996) enumerated about 30 such lists. The largest and most detailed are those for southern Bohemia (Chán 1999), northern Moravia (Sedláčková & Plášek 2005) and the Šumava Mts (Procházka & Štech 2002), the latest one being that for the Krkonoše Mts (Štursa et al. 2009). Red Data books dealing with the flora of some parts of the country were also published; the most important ones are those for northern Bohemia (Kubát 1986) and the Eastern Sudetes Mts (Bureš et al. 1989).

The knowledge of this country's flora has substantially improved since the second version of the national Red List (Holub & Procházka 2000, Procházka 2001) was published. This progress was mainly due to large-scale field recording during the last decade. The purpose of the field research was the vegetation mapping in order to implement the Habitat Directive (nr. 92/43/EEC) in the Czech Republic (Härtel et al. 2009). Apart from the vegetation mapping, protected and endangered species were recorded. The Nature Conservation Agency of the Czech Republic amassed a huge number of plant records, and created a database that recently contained millions of plant records (Hošek et al. 2008). Independently,

the Czech National Phytosociological Database was established (Chytrý & Rafajová 2003) to gather data from vegetation plots, which may easily be converted into plant records. The third large database is the Flora Database of the Czech Republic (Danihelka et al. 2009 onwards). Finally, two volumes of the Flora of the Czech Republic were published during the last decade (Slavík et al. 2004, Štěpánková et al. 2010), which contain comprehensive treatments of *Hieracium* (Chrtek 2004) and *Taraxacum* (Trávníček et al. 2010), both difficult genera with apomictic species. During the last decade, two other national Red Lists were compiled and published, dealing with bryophytes (Kučera & Váňa 2005) and macromycetes (Holec & Beran 2005), the latter no more considered as plants.

More than a decade has elapsed since the 2nd version of the national Red List was compiled and published. Undoubtedly, it is time to return to this topic as there is a need for an update and it is also important that the mass of information gathered should not remain unutilized. After all, the Czech Botanical Society is particularly interested in Red-Listed species: since 2002, a series of papers have been published in the journal Zprávy České botanické společnosti (Bulletin of the Czech Botanical Society), which summarizes the records of missing, rare, scarce and vulnerable plants (Hadinec et al. 2002–2005, Hadinec & Lustyk 2006–2011; all containing references to records published elsewhere).

The progress within the Czech Republic cannot be isolated from that in neighbouring countries. The third version of the Red List of the vascular plants of Slovakia was published more than a decade ago (Feráková et al. 2001). The Red List of Austria is two years older (Niklfeld & Schratt-Ehrendorfer 1999), while the comprehensive Red List for Upper Austria is quite recent (Hohla et al. 2009). The federal Red List for Germany was published in 1997 (Jedicke 1997); it is based on methods and principles outlined by Schnittler & Ludwig (1996; see Ludwig et al. [s. a.] for the latest version). The Red List of plants and fungi in Poland was published by Zarzycki & Mirek (1996) and the Red Data Book appeared five years later (Zarzycki & Kaźmierczakowa 2001).

Classification criteria and Red List categories

The key issue of any Red List is the categorization of threat. There have been some attempts to standardize the categories. The main purpose of which is to make it possible to compare results for different areas and set priorities for practical implementation in nature conservation, for instance, when protected areas are established (Plesník 2003). An attempt to standardize the categorization was made by Čeřovský (1981), who suggested a theoretical model for the so-called "sosioecological index". However, when used to categorize species it failed and was immediately abandoned.

The International Union for the Conservation of Nature worked during the 1980s and 1990s on a unified classification of species' endangerment; the version that is at present in use was published in 2001 (IUCN 2001). The primary purpose of this classification is to evaluate the endangerment of all living organisms throughout their entire distribution ranges and for this reason, many methodical difficulties had to be addressed, in particular that of migratory animals. The Czech scientific community had detailed discussions on these issues during the compilation of the Red Lists of different vertebrate groups (Anděra & Červený 2003, Šťastný & Bejček 2003, Zavadil & Moravec 2003). Main discrepancies between the regional and range-wide attitudes were analysed by Gärdenfors et al. (2001).

Assigning criteria is the most difficult phase of the evaluation process. In plants, even some key criteria are difficult to evaluate, starting with the question what is an individual and, consequently, how many individuals constitute a population. Further, the IUCN classification deals with trends within populations during the last 10 years (IUCN 2001). The use of this criterion for vascular plants is rather difficult. For many taxa, decline is well documented for a longer time span; populations of some species declined during the whole of the 20th century, some even during the 19th century (Grulich 1990, 1992, Grulich & Procházka in Čeřovský et al. 1999) but no clear trend can be seen if only data for particular decades are considered. Other difficulties are associated with species with a specific biology, including survival in long-term seed banks, sometimes for decades; such species may not be found at a site for long time but then suddenly appear in copious stands and regenerate if environmental conditions become favourable. This applies frequently to species growing on exposed bottoms of drained fishponds and other water reservoirs. Another method is the evaluation of population trends over a period of three generations. However, even in bryophytes where generation time may be estimated and generation turnover observed more easily than in vascular plants, Kučera & Váňa (2005) were not able to apply this approach.

The Czech Red List has always used categories based on an empirical evaluation of a particular species. Taking into account the variation in the biology of the evaluated taxa, this process may be described as classifying numerous individual stories in a limited number of formal categories. The first version of the Red List (Holub et al. 1979) used seven threat categories (A1–3 and C1–4), while the second version (Procházka 2001) had eight threat categories (group C4 was divided into C4a and C4b). The same classification was used in earlier versions of the Slovak Red List (Maglocký 1983, Maglocký & Feráková 1993); the recent version uses more or less the same categories, only their formal labels correspond to those used by the IUCN (2001). Very similar classifications are used in the Red Lists of vascular plants for Austria (Niklfeld & Schratt-Ehrendorfer 1999) and Germany (Jedicke 1997). Both lists have one category of extinct and missing taxa and four categories of endangered taxa. In addition, Jedicke (1997) has category R (rare) for species with very few but stable populations. All the classifications are based on expert judgment and, consequently, the lists can be compared.

The practical application of the Red List in nature conservation requires a simple structure consisting of a limited number of categories that can be used when priorities in nature conservation are set. As already stated, many different cases or stories are assigned to a few categories. As in previous versions, we applied the method of classification based on expert judgments. The invited experts, including specialists in difficult groups and local botanists, easily accepted this method of classification; hence the discussions were mostly about balancing local and national points of view.

Taxa evaluated and categories used in the present Red List

This Red List is based on the taxonomy and nomenclature used in the checklist of vascular plants of the Czech Republic (Danihelka et al. 2012). For the first time it is clearly stated from which particular "species pool" the choice was made. In general, all native taxa and naturalized archaeophytes, but not neophytes (following the classification in Pyšek et al.

2012), were evaluated. Of hybrids, only those forming a population independent of assumed parents and frequently found elsewhere (e.g. *Circaea* ×*intermedia*) were included. Also recent secondary occurrences of otherwise evaluated taxa (e.g. *Spergularia marina* along motorways) were not considered (this is indicated in the entries concerned).

We applied a conservative classification based in general on both earlier versions of the Red List (Holub et al. 1979, Holub & Procházka 2000). The main reason for adopting this approach was the lack of exact data on most of the taxa evaluated, which makes it impossible to apply the IUCN criteria. The second reason is to prevent any confusion caused by the application of the same "labels" for categories defined using different methodical approaches. The third reason is continuity, because the categories used in previous versions of the Red List are widely used in nature conservation. Therefore, the following categories are distinguished in the present paper.

A Extinct, vanished or missing taxa

Taxa classified in any of the categories within this group are not currently known to occur in the Czech Republic. Despite that, it is useful to distinguish three subcategories (Holub et al. 1979), traditionally referred to as A1 (exctinct), A2 (missing) and A3 (uncertain cases of extinct or missing taxa).

A1 Extinct or vanished taxa (EX) are those not found in this country for more than 25–50 years. The inclusion in this category means that is very unlikely they will be rediscovered in the future. For species that were last recorded 25–50 years ago, the situation at the last known place of occurrence is considered. If the site was completely destroyed or changed by irreversible vegetational succession and there are no suitable habitats close by, 25 years was the applied threshold value. If a taxon vanished but its former places of occurrence remained more or less unchanged or if it occurred at numerous sites in the past, there is some hope that the species might have survived elsewhere but not recorded, 50 years was the applied threshold value.

A2 Missing taxa (?EX) are those that were not found in this country for a shorter time than stated in the definition of the previous group, i.e. for the last 10–30 years.

A3 Uncertain cases of extinct, vanished or missing taxa (?EX?) is a category including several taxa that are currently not known to occur in the Czech Republic. They are discussed in detail by Holub (2000). The doubts concern the reliability of their identification, or the information on their locality or residence status (native or archaeophytic vs neophytic) or are taxa of disputed taxonomic value.

C Endangered taxa

C1 Critically threatened taxa (CR). As defined by Holub et al. (1979), this category consists of two different groups of taxa. The first group includes taxa that are very rare in this country and occur only at 1–5 localities. The other group includes strongly declining species in that, if recent and past recorded occurrences are compared, at least 90% of the populations have become extinct, and new localities are only seldom colonized. Each species in the C1 category was given an index indicating the reason why it was classified as critically threatened. There may be three formal reasons, derived from the criteria given above and from their possible combinations (in this classification **t** was given more weight than **b,** and **b** more weight than **r**):

- **t** – Taxon meets the condition of decline, at least 90% of all the populations ever recorded have become extinct and extant populations are usually clearly declining.
- **b** – Taxon meets or approaches the condition of rarity (recently at 1–5 localities), with its populations declining: either some populations have become extinct or at least some of the extant populations are clearly declining.
- **r** – Taxon meets the condition of rarity. It occurs at 1–5 localities and two or one population is known to have become extinct, and the extant populations are not clearly declining.

C2 Endangered taxa (EN). In the first version of the Red List (Holub et al. 1979), this category was defined in a way similar to C1, i.e. species could be classified in this category in two different ways. It therefore includes species that occur only at 5–20 localities in this country or those that disappeared from 50–90% of the localities where previously recorded. In both cases new sites are only rarely colonized. Application of these criteria and of their combination resulted in three different situations, all justifying classification in this category (as in C1, **t** was given more weight than **b,** and **b** more weight than **r**):

t – Taxon meets the condition of decline, i.e. currently at least 50–90% of all populations ever recorded are extinct and extant populations are clearly declining.

b – Taxon meets or approaches the condition of rarity (recently recorded at only 6–20 localities) and is declining in abundance: either it no longer occurs in some of the localities where it was recorded in the past or at least some of the extant populations are clearly declining.

r – Taxon meets the condition of rarity. It occurs at 6–20 localities and only a few populations have become extinct, and the extant populations are not clearly declining.

C3 Vulnerable taxa (VU). Vulnerable species are no longer present at 20–50% of all localities recorded in the past (Holub et al. 1979). They may often have been locally common in the past, which still may be the case in some parts of the country; however, they have strongly declined or become extinct in other parts. No detailed classification is necessary for this category. Colonization events may occur but only to a limited extent.

C4a Lower risk – near threatened (NT). This is a group of potentially vulnerable species, which should be monitored, because they are in danger as they are declining in abundance. They may be threatened by new management practices in agriculture or forestry but were not affected by previous practices and techniques. Another threatening factor is the spread of expansive or invasive organisms into the habitats of these species. In this category are species declining in some parts of the country and colonizing new localities in other parts. This recent spread to new sites should be spontaneous but it may often follow human interventions that resulted in habitat changes.

C4b Lower risk – data deficient (DD). In this category are mainly taxa from difficult groups, often those with unresolved taxonomies, including apomictic microspecies. In many cases, detailed knowledge of their current distribution and frequency is lacking, usually because they can be identified only by specialists. However, based on the information available, some degree of vulnerability or threat may be assumed.

Results and discussion

The complete list of taxa included in the Red List is given in Electronic Appendix 1, and the numbers in the above categories in Table 1. In total 1720 taxa are listed, which is more than half (59.2%) of the recently updated total number of taxa in the native flora of the Czech Republic (Danihelka et al. 2012, Kaplan 2012). Of the Red-Listed taxa, 156 (9.1% of the total number listed) are in A categories as they are now extinct or are not known to occur at present in the Czech Republic, 471 (27.4%) are critically threatened, 357 (20.8%) threatened and 356 (20.7%) endangered.

The stability of categories used in the present and past versions of the Red List makes it possible to identify trends in the occurrence in the Czech Republic of threatened and endangered taxa over time, although these changes in the numbers in particular categories are sometimes difficult to interpret.

Taxa classified as extinct, vanished or missing

Most of the species classified as extinct, vanished or missing may be considered as regionally extinct (RE). However, some species are extinct in their entire range, such as *Euphrasia corcontica* (Smejkal 1963, Dvořáková 1999, Smejkal & Dvořáková 2000, Krahulec 2006), *Hieracium callimorphoides*, *H. chamaedenium*, *H. pseudocalodon*, *H. purkynei* and *H. tephrophyton* (Chrtek 2004, Kaplan 2012). The first and second version of the Red List (Holub et al. 1979, Holub & Procházka 2000) included 37 and 69 extinct taxa, while the corresponding numbers of missing taxa were 39 and 49, respectively (Table 1). In the present version, 74 taxa are classified as extinct/vanished and 53 as missing. Shifts between categories are partly due to the fact that some species classified as missing or extinct in the first version of the Red List were rediscovered. Of 114 taxa classified in the first and second version of the Red List as extinct, missing or doubtful cases of extinct/missing 23 (20.2%) and 18 (15.8%), respectively, were rediscovered.

Table 1. – The numbers of taxa in particular categories in the present Red List and comparison of the current state with that recorded in previous Red Lists. See text for description of categories and classification criteria.

Code	Category	Qualifier	Present study	Holub & Procházka (2000)	Holub et al. (1979)
A1	Extinct or vanished taxa (Ex)		74	69	37
A2	Missing taxa (?EX)		53	49	39
A3	Uncertain cases of extinct, vanished or missing taxa (?EX?)		29	80	38
C1	Critically threatened taxa (CR)	t: declining	203		
		b: approaching rarity	101		
		r: rare	167		
		C1 total	471	473	267
C2	Endangered taxa (EN)	t: declining	74		
		b: approaching rarity	163		
		r: rare	120		
		C2 total	357	352	240
C3	Vulnerable taxa (VU)		356	326	239
C4a	Lower risk – near threatened (NT)		233	199	
C4b	Lower risk – data deficient (DD)		147	78	
		C4 total	380	278	330
Total taxa			1720	1627	1190

Species classified as extinct or missing and rediscovered at their former localities or nearby include *Hammarbya paludosa* (Procházka et al. in Čeřovský et al. 1999) and *Lactuca saligna* (Grulich in Hadinec & Lustyk 2007). Other species, in contrast, were found at different localities, often also in different parts of the country; this applies also to taxa rediscovered after a very long time: *Pilularia globulifera* was found 68 years (Ekrtová et al. 2008) and *Cystopteris sudetica* 61 years (Kočí in Hadinec & Lustyk 2012) after the last record. On the other hand, some taxa had to be classified in this group as they, in spite of repeated attempts, could not be found at their last known locality. *Salicornia prostrata*, for instance, was last recorded in the Czech Republic in 1976 (Grulich 1987).

Critically threatened taxa

There are 267 taxa in this category in the first version of the Red List (Holub et al. 1979) and 473 in the second version (Holub & Procházka 2000). Now 471 taxa are classified as critically threatened. The increase, compared to the 1979 version, in the number of taxa so classified was due to a more detailed classification of large apomictic genera (*Hieracium*, *Rubus*, *Taraxacum*), which resulted from a substantial improvement in the level of knowledge during the last decade, which also revealed that there was a greater diversity of vascular plants in this country. Another reason for this was accumulation of new information on species' biology, population status and trends. Based on this information all of the species in *Taraxacum* sect. *Palustria* are now classified as critically threatened. Since the publication of the first version of the Red List, most of their habitats were irreversibly destroyed and this also

affected those species that were known from dozens of localities, such as *T. paucilobum*, *T. subdolum* and *T. vindobonense* (Kirschner & Štěpánek 1988, Kirschner 2010).

Rare species that occur only at a few localities in the Czech Republic but whose populations have remained stable over a long period of time, are for instance, *Arenaria grandiflora* (Čeřovský & Grulich in Čeřovský et al. 1999) and *Notholaena marantae*. Until recently, the latter species was only known to occur on serpentine rocks near the town of Mohelno in south-western Moravia (Čeřovský in Čeřovský et al. 1999), where there is a population of about 800 individuals and then it was found at another site in the Bohemian Karst in central Bohemia about 10 years ago (Špryňar 2004). These two species are in subgroup C1r. Subgroup C1t, in contrast, is represented by species like *Agrostemma githago*, which in the past was almost omnipresent and occurred in every cereal field (Čeřovský in Čeřovský et al. 1999) but for which there are only a few recent records, all from ruderal sites and probably garden escapes (Lepší et al. 2005). It is now grown as an ornamental plant in the open air museum in Rožnov pod Radhoštěm, northern Moravia, or sown by small-scale farmers in the White Carpathians (I. Jongepierová, pers. comm.). However, these two subgroups cannot be completely separated as some of the populations of rare species are declining, such as the species in subgroup C1b. For instance, *Minuartia smejkalii*, a stenoendemic species, was known to occur on three or four islands of serpentine rocks in the Bohemian-Moravian highlands (Dvořáková 1988, 1990, Kolář & Vít 2008, Kaplan 2012). One or two of these populations disappeared, one probably during the 1960s. At another unprotected site there are still a few individual plants but they are currently endangered by natural succession. Only the fourth group, which consists of a few populations scattered over an area of several square kilometres, does not seem to be immediately endangered as at least some of the populations are stable (Procházka & Klaudisová in Čeřovský et al. 1999). *Sorbus sudetica*, endemic to the Krkonoše Mts, is a shrub with a long life span. Unfortunately, there is almost no natural regeneration of this species and the populations in the Polish part of the mountains have vanished and there are only two localities with a total of 135 individuals on the Czech side (Procházka in Čeřovský et al. 1999, Štursa et al. 2009).

Endangered, vulnerable and lower-risk taxa

Holub et al. (1979) included 240 taxa in this category, Holub & Procházka (2000) 352 taxa, while in the present version, 357 taxa are classified as endangered. There is a variety of reasons for these changes. Some of the taxa previously classified here were moved to categories C1 (e.g. *Ajuga chamaepitys*) or C3 (e.g. *Potamogeton trichoides*, cf. Kaplan 2002), while other rare species with more than five stable populations, formerly classified as C1 (e.g. *Iris arenaria*), were moved here. In contrast, also some taxa previously classified as C3, had to be reclassified as C2, the reasons being either underestimation of threat in earlier versions of the Red List or (e.g. *Crepis conyzifolia*) a decline recently recorded in some parts of this country (e.g. *Anthemis cotula*).

Iris arenaria is classified as endangered on the account of its rarity, and is therefore in subgroup C2r. Recently there are eight populations in the Czech Republic. Based on historical information, only two or three of the 11 populations were destroyed in the past (Grulich & Čeřovský in Čeřovský et al. 1999, Hrouda & Grulich 2010). The extant populations differ in size but, apart from one, are situated in nature reserves. Their status is

being monitored and, if necessary, plants are protected from succession by management measures. In contrast, *Helichrysum arenarium* (Štech 2004) and *Ranunculus lingua* (Rybka 2004) are declining species (C2t). *Pulsatilla grandis*, however, is both rare and declining and therefore classified as C2b. There is a fairly large number of populations of this species in this country, some of which are stable, while others, usually consisting of a few individuals, are clearly declining.

Vulnerable taxa, defined as those for which 20–50% of the populations ever recorded have been lost (Holub et al. 1979) were in most cases at least locally common. They have declined dramatically but despite that, there are still a sufficient number of populations. Holub et al. (1979) classified 239 taxa as vulnerable, while Holub & Procházka (2000) listed 326 such taxa. At present, 356 taxa are classified as vulnerable. Here no distinction is made between rarity and trends because most rare taxa are also declining at least at some of their localities.

The subset of the lower-risk category labelled as data-deficient includes mainly representatives of taxonomically difficult groups such as apomictic microspecies and other taxa not easy to identify (e.g. *Rubus*, *Rosa*, *Crataegus* and *Taraxacum*). Their identification usually requires long experience, and most botanists only determine them to the aggregate or section level. As there are only a few specialists capable of reliable identifications, the knowledge on their distribution, vulnerability trends in or threat to their populations is still largely insufficient. Yet, our knowledge is now substantially better than it was 12 years ago or in the late 1970s due to intensive recent research addressing these groups (e.g. Krahulcová & Rotreklová 2010, Štěpánek et al. 2011, Trávníček & Žíla 2011), with the genus *Hieracium* in particular being a good example (e.g. Křišťálová et al. 2010, Krahulec et al. 2011). In contrast, virtually nothing is known about the apomictic species of the *Ranunculus auricomus* agg.

Trends over the last 30 years

The three Red Lists published since the end of 1970s make it possible to assess overall trends and dynamics of endangered taxa in the Czech Republic (Table 1). The greater increase in the number of taxa included on the list occurred between the first and second version, i.e. over the last two decades of the 20th century. This increase occurred in most categories (Table 1) and can be attributed to a better knowledge of the respective taxa and also to a more detailed classification of taxonomically difficult groups elaborated over this period. The opposite trend occurred in C4, due to the moving of many taxa to more endangered categories. It needs to be also kept in mind that the period between the first and second Red List was twice as long as that between 2000 and the current version, which might have also contributed to the more profound changes between the first two Red Lists. Overall, the number of Red-Listed taxa increased from 1190 in 1979 to 1627 in 2000 to 1720 at present (Table 1). Changes in proportional representation of particular categories are shown in Fig. 1.

The increase in the number of taxa between 2000 and present is much less dramatic, with five and four taxa added to the A1 and A2 categories, respectively, minor decrease of two taxa in the number of taxa classified as C1 and a minor increase of five taxa in C2. Overall, the number of taxa in less-threatened categories increased, such as C3 (30 taxa) and C4 (103 taxa). The marked decrease in both the number (51 taxa) and percentage (Fig. 1) of uncertain taxa in A3 is due to the improved knowledge of their status, which resulted in them

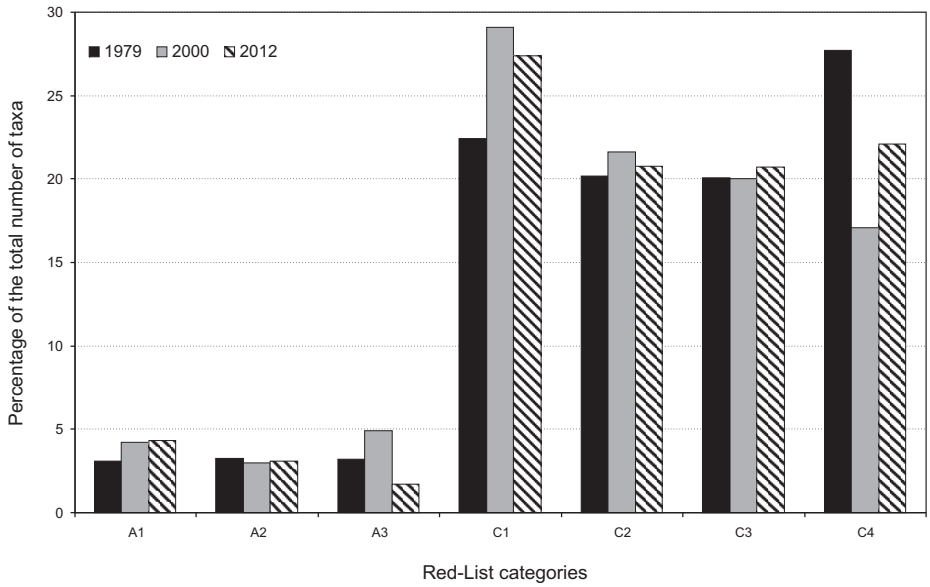

Fig. 1. – Percentage of taxa classified in particular categories in the three Red-Lists published in the Czech Republic over the last three decades. Data from Holub et al. (1979), Holub & Procházka (2000) and present study (2012).

being reclassified. For some, their taxonomic value was not confirmed, others were found not to occur in the Czech Republic, or their native status was reassessed and they are now considered to be neophytes.

The above numbers result from rather profound differences in their current status compared to that in previous version (Holub & Procházka 2000). Of the taxa that were on the list in 2000, 168 were removed, representing 10.1% of the total number. On the other hand, 278 taxa were added, and for the same number the category of threat has changed. Considerably more taxa were moved to categories of higher endangerment: 20 taxa (1.4% of the total number) were added to A categories, and the degree of endangerment increased for 130 taxa (8.3%): 40, 52 and 38 were reclassified from lower categories to C1, C2 and C3, respectively. The opposite is true for 141 taxa that are now evaluated as less endangered than in 2000; 54 taxa were moved from C1 to lower-endangerment categories and 24 deleted from the list, the respective figures for C2 being 58 and 10 taxa, and for C3 29 and 9 taxa, respectively.

In comparisons like this it is difficult to separate reasons for classifying species within Red-List categories, namely those attributed to improved knowledge of taxonomically difficult groups, better information on species status and changes in the definitions of the different categories, from those reflecting the real dynamics of populations of threatened taxa in the territory under study. Nevertheless, the rather high numbers of taxa that are currently in the higher-endangerment categories should be a matter of concern for nature conservation authorities.

See http://www.preslia.cz for Electronic Appendix 1

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Souhrn

Práce přináší aktualizovaný červený seznam cévnatých rostlin květeny České republiky. Stav poznání se od vydání poslední verze červeného seznamu opět značně posunul. Nové poznatky se týkají téměř všech aspektů ohroženosti flóry cévnatých rostlin, neboť uplynulé desetiletí bylo v České republice ve znamení intenzivního terénního výzkumu, který přinesl mnoho údajů o výskytu chráněných a ohrožených druhů. Aktualizovaný červený seznam zahrnuje 1720 taxonů (jejich přehled viz Electronic Appendix 1), což představuje více než polovinu (59,2 %) původních druhů české flóry. Z tohoto celkového počtu je 156 taxonů (9,1 %) řazeno do kategorie A, tedy mezi druhy vyhynulé, vymizelé nebo nezvěstné, 471 (27,4 %) patří mezi kriticky ohrožené (C1), 357 (20,8 %) mezi silně ohrožené (C2) a 356 (20,7 %) mezi ohrožené (C3). Srovnáme-li celkový počet taxonů zahrnutých do červeného seznamu s oběma předchozími verzemi (Holub et al. 1979, Holub & Procházka 2000), zjistíme, že se jejich počet zvýšil z 1190 v roce 1979 přes 1627 v roce 2000 až na současných 1720, přičemž nárůst nastal ve většině kategorií. Tento trend má několik příčin. (i) Rostoucí antropický tlak vede k silnějšímu ohrožení mnoha taxonů dosud kategorizovaných nižším stupněm ohrožení a k zařazení taxonů dosud nekategorizovaných. (ii) Určitý nárůst je způsoben lepším poznáním taxonomicky komplikovaných okruhů; menším dílem byly nově nalezeny taxony původní flóry, které dosud unikaly pozornosti a které bylo třeba z hlediska ohrožení flóry klasifikovat. (iii) Zlepšující se znalost květeny umožňuje objektivnější klasifikaci ohrožení. Na druhé straně byly – v některých případech i velmi překvapivě – nalezeny taxony považované za nezvěstné nebo dokonce vyhynulé. Těchto případů bylo zaznamenáno celkem 23, což je téměř třetina počtu vyhynulých a nezvěstných druhů v první verzi červeného seznamu (Holub et al. 1979).

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