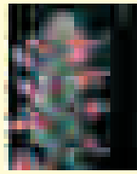
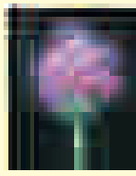
Plants

of the Natura 2000 network in the Czech Republic

SAGITTARIA

Association for Nature Conservation of Central Moravia





The authors would like to thank all the colleagues who help with the preparation of this publication for their advice and/or support.

The publication is dedicated to all endangered plants, which have survived in the Czech Republic.

Plants of the Natura 2000 network in the Czech Republic

Text: Vlastik Rybka, Romana Rybková, Renata Pohlová
Photos: Romana Rybková, Vlastik Rybka, Zbyněk Hradílek, Michal Krátký
Translation: Alice Háková, Tomáš Václavík, Shaun Baker
Typesetting and graphic layout: Jiří K. Jurečka
Published by Sagittaria - Association for Nature Conservation of Central Moravia with the financial support of the **Ministry of Environment**, **Vysočina District**, **Olomouc District**, **Foundation Veronica**, **Olomouc city**, **District of South Moravia**, **Pardubice District**

Printing: 3 000 copies

First publishing

Olomouc, Praha 2005

ISBN 80-239-6393-7

Plants
of the Natura 2000 network in the Czech Republic

Authors of text:
Vlastik Rybka,
Romana Rybková,
Renata Pohlová

Authors of photos:
Romana Rybková,
Vlastik Rybka,
Zbyněk Hradílek,
Michal Krátký

Siberian leopard plant (*Ligularia sibirica*)

Contents

Plant species of the Natura 2000 network in the Czech Republic

The aim of this publication is to introduce European protected plant species, which occur in the Czech Republic, and to explain to you why they are interesting. Also, where they grow in the world and in the Czech Republic, why they are rare and endangered, but also what we can do to protect them. Even more information is available about these and other plant species in the Red Data Book of Endangered and Rare Plant and Animal Species of the Czech and Slovak Republic, Vol. 5 Vascular Plants (Čeřovský, Feráková, Holub, Maglocký et Procházka 1999), but we have tried to focus and describe 40 species of European importance in a less scientific way for a broader audience.

Our membership in the European Union has changed not only the life of people, but also the life of plants, animals and the whole landscape. It has become part of the European nature conservation network, known as Natura 2000. A new just published book describes the aims and the objectives of the whole network. Here we will focus only on plants.

The modern conservation approach recognizes two main fields, conservation of biotopes and of species. Biotope protection is always the best practise, and is done by professional high quality management of a site where endangered plant communities grow (usually not only plants are present) and where all potential threats are monitored. Under the Natura 2000, a network of protected areas of European importance will be established.

To some extent it will help to enhance already protected areas in nature reserves, first zones of protected landscape areas and national parks. A list of endangered plant species of European importance to be compulsory protected has been compiled for every country. The Czech Republic has already adopted the protection of twelve vascular plants and four moss species from existing European Union plant lists.

Together with other candidate countries we have added a further 24 species that grow in our country during the introductory discussions. The sites of these plants became part of the Natura 2000 network and member states are responsible to secure their existence, because their decline or extinction is not only a moral and ethical question, but it could also mean perceivable sanctions from the European Union. Regular monitoring has been started, or is being prepared, for all the species. This involves a long term survey of species abundance and their populations, potentially followed by more in-depth research.

The text structure of the publication is uniform for all the species. We focus on important determination characteristics in the first paragraph, titled *"How do we recognize it?"*. Our booklet does not intend to be a determination key and only selected important characteristics are mentioned. For more detailed information we refer the reader to the Czech determination key "Key to the flora of the Czech Republic" (Kubát [red.] 2002).

Many species are easily recognized so the accompanying photos present enough information for a reliable determination of the described species. But there is also a smaller, but important group of complicated species, which have one or more very close relatives. Their determination is a task for specialists. Foremost of all is the gally feather grass, sandwort-leaved mouse-ear, Sudetic bedstraw and serpentine sandwort, but also pinks and bellflowers belong to this category.

In the second paragraph *"Something about life"* we mention information about the species life strategy, if it is an annual or a perennial, if it propagates rather by spreading (vegetative reproduction) or by seeds (generative reproduction), we also add more detailed information about flowering, seed dispersal, germination and other interesting facts. We can say that the described group of plants is very

Swamp gladiolus (*Gladiolus palustris*)

variable. The described plants also include mosses (4 species), ferns (adulterate spleenwort, killarney fern), annuals (moosgrass), species fruiting once in a life (marsh angelica, Bohemian gentian) and other perennials (many species).

Associated with the paragraph about the species distribution *"Where does it grow in the world and in our country?"* there is a map about current species distribution in the Czech Republic.

The paragraph *"What environment does it grow in?"* explains the very common problems of many endangered plant species. With many it is the need for open vegetation cover. Current endangered species have very much in common. It usually involves the loss of traditional farming practises where scattered herds of goats, sheep and cows, along with poultry would roam the landscape near villages. There are no longer farmers farming on small fields, gathering only a few logs in the forest by horse and wane for their current needs. Today's landscape has lost its diversity. There is only large-scale ploughing where large meadows are mowed in a few hours, large clearings are created during logging, and omnipresent transport brings in new alien species. We can compare disappearing plants to wrestlers, who can beat anybody on their mats but are lost in the world of firearms.

Forty described species inhabit almost all habitat types of the environment, including our most threatened habitats - salt marshes, fens and sands. Plant representatives from mountains, rocks, steppes, meadows, forest edges and springs are not missed out, and forest species are also mentioned. Bogs occurring mostly in northern Europe are the only important habitat missing from the list. Scandinavian countries did not agree adding bog species to the list, because this would mean they would have to protect large parts of their countries.

A very interesting biotope is the habitat with serpentine bedrock on which four listed species grow (adulterate spleenwort, sandwort-leaved mouse-ear, Sudetic bedstraw and serpentine sandwort). Serpentines have a high concentration of magnesium and a low content of calcium and are unique in their chemistry. Serpentines are poisonous to many plants. Only a certain community of the most

tolerant plant species can withstand this environment. As in the population of any other plant species, the selection process regarding which species can best adapt to the extreme serpentine conditions, proceeds. The whole process is accelerated by their isolation, because serpentines are solitary islands in landscapes with different bedrock.

In the paragraph *"Why is it so rare?"* we concentrate on the reasons why these plants are under threat. First we must emphasize a certain difference between a rare and endangered species. A rare species has several sites with stable abundance, so its threat is the result of its total rarity. On the other hand, an endangered species has got a distinct and considerable decreasing trend in a number of sites and/or in abundance of individual populations. It is clear that rarity and endangerment cannot really be separated, but as an overview there are more species that are rare but not endangered. Considering the causes of this rarity/endangerment we find a noticeable connection with a previous paragraph, where we describe the species suitable environment. A problem of many endangered species is their lack of competitiveness, and that is why occasional habitat disturbance, to weaken otherwise consummate dominant species, is often needed. The most obvious representatives of this category are gentians and orchids.

Some species are Czech endemic species, which means, they do not occur anywhere else outside our country (sandwort-leaved mouse-ear, Ash-mountains bellflower, Ash-mountains meadow grass, Bohemian sand pink, Moravian pink and serpentine sandwort), but might possibly be sub-endemic species with small communities in neighbouring countries (Moravian stiff monk's hood, Bohemian gentian, Bohemian bellflower, Sudetic bedstraw, Moravian long-leaved fleawort). All endemic and sub-endemic species are so-called neo-endemic, which means species form-ed after a glacial period in the Czech Republic. Amongst them are the representatives of genus allowing for quick formation of new species. Their specific characteristic is the ability to interbreed with other species of its own genus, respectively to form multiple numbers of chromosomes. This process is called polyplodization.

Lumnitzer´s pink (*Dianthus lumnitzeri*)

A very important factor during a new species origination is also the possibility of the isolation from its close relatives, to simply say, to enable a species to recede from those close relatives without any disturbance during its development. Otherwise it could be threatened by an absorption. One successful speciation process (the process when a new species originates) means many unsuccessful attempts. Newly originated species stayed isolated, especially in high mountains, which became islands of cryophilic vegetation after warming (also on serpentine bedrock, which was mentioned above).

Many described species are rare or endangered in the Czech Republic because they grow on the margins of their distribution ranges. The biggest group of these species are Pannonian (short-headed thistle, Lumnitzer´s pink) extending here from Pannonian lowlands, and pontic to pontic-pannonic species (Eastern sea-kale, sandy iris, Russian viper's bugloss) with their distribution centres being in the Black Sea region and Eastern Europe. We can also include species classified as sub-mediterranean. These are species coming from the region touching the Mediterranean, and include the Adriatic lizard orchid (species classified as sub-Atlantic are, likewise, species coming from the region touching the Atlantic). They favour a more temperate climate where sea influences cause smaller differences in temperatures and regular precipitation rates inhibiting fluctuations in weather conditions. Because western Bohemia is quite far from the sea, it is necessary to emphasize, that western and northwestern Bohemia is the absolute limit for most of these species, and even more species do not reach our country, instead settling in Germany. We can classify floating water-plantain, mossgrass and killarney fern as sub-Atlantic species.

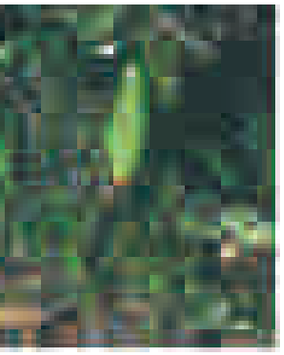
Eastern pasque flower (*Pulsatilla patens*)

Another evident group of species are the sarmat migrants coming from the north-east. Their distribution centre is in the Baltic States, possibly in Russia and across Poland and northern Germany, reaching to northwestern and central Bohemia. Eastern pasque flower, marsh angelica, bractless toadflax and Bohemian sand pink, belong to this group. Unfortunately a considerable decline in all these species has occurred during the last century.

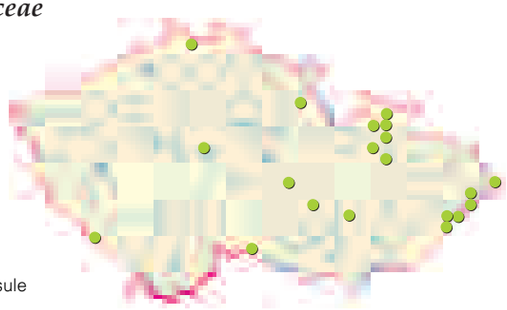
In the last paragraph *"What is being done for its survival?"* we mention various activities contributing to species conservation. At first we remark if a species grows in a protected area. According to Natura 2000 a representative network of protected areas will be designated for every described species, and also chosen populations of every species should be long-term monitored. We also pay attention to the life history of every species and which characteristics are important to be studied more closely. We mention various activities for species conservation, for example, strengthening of populations, rescue cultivations, more detailed surveys, special habitat management practices and so on.

NNR - National Nature Reserve
NNM - National Nature Monument
NR - Nature Reserve
NM - Nature Monument
PLA - Protected Landscape Area

Buxbaumia viridis (Moug. ex Lam. et DC.) Brid. ex Moug. et Nestl.



Green shield-moss
Buxbaumiaceae
family



the shape of the capsule appears provocative

How do we recognize it?

In the Czech Republic we recognize two species of the genus *Buxbaumia*, which differ in seta papillosity, colour of the capsule and by several other characteristics. Red slightly papillose seta of green shield-moss grows individually to 1 cm carrying a green lately yellow-brown, ovoid, obliquely inclined and slightly flattened 1 cm long capsule. Its surface has a lustreless wax layer (the cuticle), when ripe it splits longitudinally.

Something about life

Green shield-moss belongs to a short-living, dioecious moss family. It is impossible to recognize the "classical" green plantlet, which is formed by a stalk with leaves and holding fibres. This phase of its life cycle is considerably minute.

Male plantlets are a max. 70 – 80 µm consisting of several cells including antheridium. From 1 to 2 gametangia (archegonia) of female plantlets are packed by 3 – 4 nerveless perichaetidal leaves. Seta with capsules are around 5.5 millions where spores are formed, these develop during the autumn and will mature next year at the end of spring or at the beginning of summer. After shedding of spores capsules will decay, but old seta can be found on the locality even after several years.

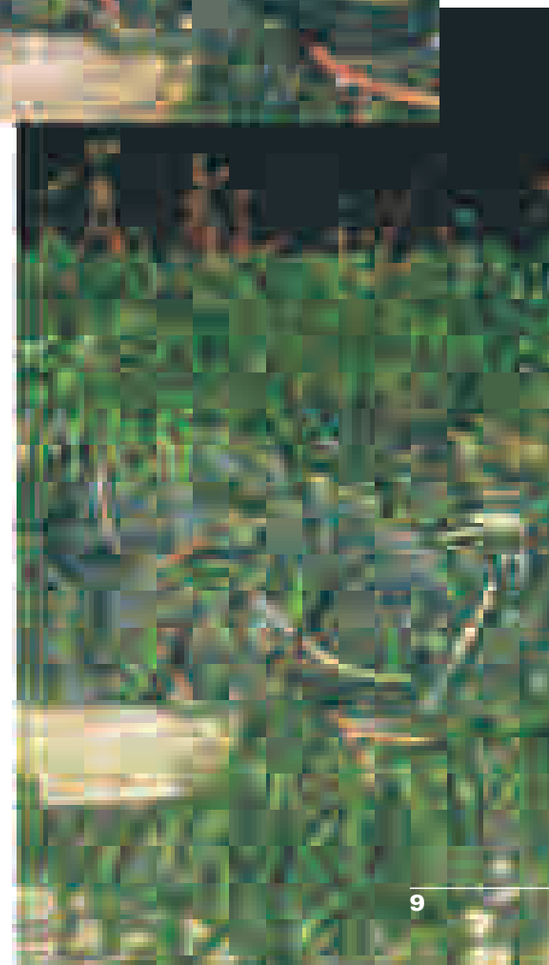
Where does it grow in the world and in our country?

Distribution of green shield-moss is known from southern, central and northern Europe (France, Belgium, Spain, Italy, Germany, Denmark, Finland, Sweden, Norway, Great Britain, Austria, Estonia, countries of former Yugoslavia, Lithuania, Poland, Switzerland, the Czech Republic, Slovakia, Hungary, Turkey, Albania, Bulgaria, Romania, European Russia (and Ukraine), from Asia (the Caucasus) and from northern America (the USA and Canada).

Green shield-moss has been found on 70 sites in the past, mostly in southern Bohemia, northern Moravia and scattered over the whole territory of the Czech Republic. During the last five years 50 sites were visited, in many cases repeatedly, and it was only recorded on 37 of the sites. These sites were situated in the Jeseníky Mountains (e.g. in the NNR Praděd, in the river valleys of Malínský, Vrchovištní and Studený Brooks), in the Beskydy Mountains (e.g. in the stream valleys of Hluchová, Hrubá Brodská and Kobylská), in the Javorníky Mountains (on the slopes of Dolní Kobylářka, in the Senice Valley), in the Macocha chasm, in the NR Štíří důl, in the Českomoravská Highlands (in the Trenckova rokle by Drahonín, in the river valley Nedvědička by Věžná), in the surrounding of Staré Hobzí, in the NR Peklo by Nové Město nad Metují, in the Městský Forest by Varndorf, by Mnichovice (the Prague -East district) and in the Šumava Mountains in the NNR Černé and Čertovo Lakes. 20 new sites have been discovered. Populations are mostly small in numbers and consist of several individuals. The exception is the site on the slopes of Dolní Kobylářka, where 160 capsules and almost 550 seta of green shield-moss were recorded on 38 monitored tree stumps in 2002.

What environment does it grow in?

Green shield-moss grows, as far as we know, on fallen decomposing trunks and on tree stumps of coniferous (mostly spruce and fir), rarely on deciduous tree species and exceptionally on the forest floor, in altitudes between 330 – 1220 m. A substantial number of sites is located in altitudes between 400 – 800 m, in moist partly umbral, almost shaded stands of autochthonous mountainous mixed forests or climatic spruce forests. This moss species can be found also in artificially established spruce forests when the substrate is suitable and sufficient air moisture is present.



1 2 3

1 green shield-moss prefers very moist habitats, here it is growing in a hemmed in valley with a stable microclimate, on a fallen trunk above the water

2 several unripe capsules on the bark of a dead trunk

3 the species presence can be discovered only when capsules are formed, but it is still difficult to find it

Why is it so rare?

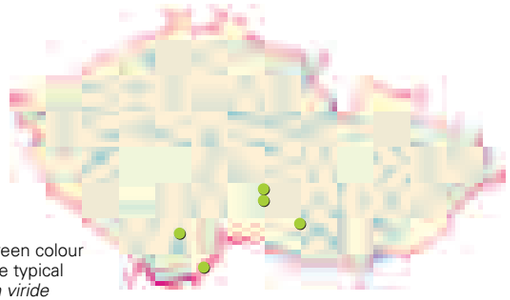
To detect green shield-moss in its natural environment is very hard. Most newly discovered sites have been found by chance; only in few cases sites were selected on the basis of the presence of a suitable substrate. So a question has arisen, is green shield-moss truly an endangered species in the Czech Republic? The loss of historical sites is probably caused by a loss of suitable substrate, which resulted from intensive utilization of the forests. Mostly from the removal of decomposing tree stumps, fallen trunks, and a decrease in autochthonous forests stands where decomposing wood matter is normally present.

What is being done for its survival?

On the sites where green shield-moss is present, the fallen tree trunks, decomposing wood and tree stumps need to be preserved. Changes in the forest composition must be minimal. Many sites are already in protected areas. In these protected areas population sizes are monitored and their changes recorded. Biology and ecology of this moss species and the discovery of new sites are the subjects of a long-term study.

Dicranum viride (Sull. et Lesq.) Lindb.

Green fork-moss
Dicranaceae
family



a conspicuous dark green colour and folded leaf tips are typical features for *Dicranum viride*

How do we recognize it?

Sixteen species of the genus *Dicranum* occur in the Czech Republic. Green fork-moss along with another four species are smaller representatives of the genus. Plants are brown tomentose with erect, entire, fragile leaves forming dense, slightly shiny, from green to dark green tufts, some even several cm^2 in size. Only an experienced professional is able to recognize green fork-moss using a magnifying glass and microscope, because it differs mostly in microscopic characteristics.

Something about life

Green fork-moss is a dioecious, 1 - 4 cm tall, long-living moss species. A small, short cylindrical, erect, symmetric, slightly inclined, light brown to brown, smooth capsule forms on a yellow left-curved 1 – 1.5 cm tall seta. The formation of neither capsules nor seta has been observed on any of our known sites. Laboratory experiments showed that green fork-moss is able to form new plants from broken off leave tips.

Where does it grow in the world and in our country?

Green fork-moss is known from the northern hemisphere. In Europe it mainly occurs in the Alps and southwestern Germany. It has also been observed in other European countries (France, Switzerland, Austria, Italy, Portugal, Ireland, Belgium, Luxemburg, Norway, Sweden, Finland, Poland, the Czech Republic, Slovakia, Hungary, Romania, Bulgaria, former Yugoslavia, Estonia, Lithuania, Latvia, the Caucasus, central part of European Russia). It also grows in eastern and southwestern Asia (central and southern China, Japan, Korea, Asian part of Russia and Turkey) and in northern America (the USA and the eastern part of Canada).
This moss species has been found on 19 sites in the Czech Republic, mainly in southern Bohemia, southern Moravia (around Brno), rarely in the Šumava Mountains (Debrník) and in the Český Wood (Čerchov), around Šumperk and the White Carpathians (Javořina). At present 6 sites in the southern Bohemia and Moravia are known (in the NM Baba, NR Karvanice, Stará obora by Hluboká nad Vltavou, and the NR Údolí Oslavy and Chvojnice, NR Zaječí skok and NNR Velký Špičák).

What environment does it grow in?

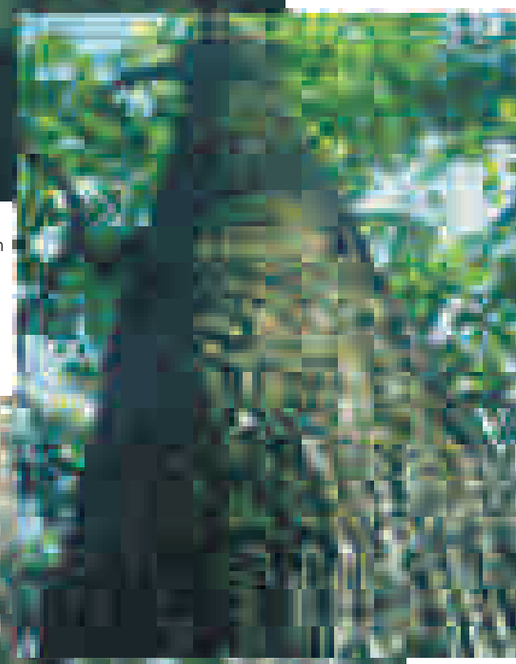
Green fork-moss belongs to the light demanding species. It grows in deciduous and mixed forests with relatively high stable air moisture. To date, on sites at altitudes between 360 – 700 m, it grows on tree trunks and on basis of deciduous trees (oaks, beech and limes). But it can also occur on tree trunks of conifers, on decomposed wood and tree roots. It is also known to grow on acidic rocks, but in this case, it is not so clear to specialists if it might be a form of *Dicranum fulvum* growing on silicate rocks. Green fork-moss prefers a substrate with a higher content of bases and nutrients.

Why is it so rare?

Green fork-moss is especially sensitive to changes of air moisture in forests stands and air pollution, which consequently causes changes in acidity and content of nutrients in substrates, which can lead to replacement of this moss species to competitively stronger species. It is very difficult to estimate real abundance and how rare green fork-moss is in the Czech Republic. Historical sites exist, but discoveries of new sites are generally results of accidental findings, which were done during ongoing investigations of bryophytes in these sites.

What is being done for its survival?

Most of its sites are situated in protected areas and populations are monitored. It is necessary to conserve present conditions with only minimal (essential) forest management to be carried out.

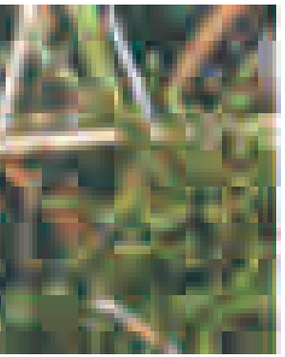


1 sessile oak in the Nature Reserve Baba in the canyon of the Vltava River hosts the largest known population of green fork-moss on its bark

2 a view of the oak's trunk with a rich moss community

3 Green fork-moss with other moss species in a community

Hamatocaulis vernicosus (Mitt.) Hedenäs



olive-coloured *Hamatocaulis vernicosus* with conspicuous curved leaves

Varnished hook-moss
Amblystegiaceae
family

How do we recognize it?

The Czech name hook-moss belongs to 15 moss species that are divided by professionals into 6 genuses. The typical feature for all of them is the presence of falcate to circinate leaves. Plants of varnished hook-moss are straight to procumbent, 10 – 15 cm tall and regularly or irregularly branched. They are yellow-green to brownish and reddish colour, and form several cm^2 big turfs. The typical feature of this species is that the leaves at the end of stems create a helmet like formation, which is some distance from other leaves on a stem. This species differs from other feather mosses by other microscopic features on leaves and on a stem, which are unfortunately for laymen hardly distinguishable and explainable.

Something about life

Varnished hook-moss is a dioecious, long-living moss, which is only very rarely fertile and forms small spores. The formation of neither seta nor capsules has been observed on any of the sites in the Czech Republic. So the distribution of plant fragments plays a very important role in its propagation.

Where does it grow in the world and in our country?

Varnished hook-moss grows primarily in the northern hemisphere, but it also occurs in mountainous areas of South and Central America. In Europe mainly in Scandinavia, but the species has been found in other countries (France, Great Britain, Ireland, Belgium, Netherlands, Germany, Austria, Switzerland, the Baltic states, European part of northern Russia, Poland, the Czech Republic, Slovakia, Hungary, Romania, Bulgaria, Croatia, Slovenia, Spain, northern Italy, Turkey and in the Georgian part of the Caucasus). But it can also be found in northern Africa, in northern America (the USA, Canada, Alaska and Greenland) and in Asia (Mongolia, Afghanistan, China and Japan).

In the past this species was present on more than 50 sites mainly in southern Bohemia (e.g. in the Třeboňsko region and around Jindřichův Hradec), in the Českomoravská Highlands (the Jihlavsko region and the Žďárské Hills), in northern Bohemia (the Českolipsko region) and in nothern Moravia (mainly in the Hrubý Jeseník Mountains and the Šumpersko region). At present there are 26 sites known in southern Bohemia (e.g. the NNR Ruda, NR Staré Lake, NR Dolejší Pond, NNR Řežabinec and Řežabinecké tůně, Odměny by the Svět pond near Třeboň), in northern Bohemia (e.g. the NR Podtrosecká Valley, NNR Novozámecký Pond, NNR Břehyně-Pecopala), in the Českomoravská Highlands (e.g. the NR V Lísovech, NR Na Oklice), in Moravia e.g. in the NR Řeka, NM Ratajské Ponds, NR Šimanovské Bogs and NR Skalské Bog. Recently 2 sites have been discovered in central and eastern Bohemia (the NR Springs of Klíčava and NR Bažiny). The population size of varnished hook-moss ranges from several tens of cm^2 to several tens of m^2.

What environment does it grow in?

Varnished hook-moss inhabits neutral to slightly acidic substrates of marshlands, peat bogs, wet meadows and still shallow waters. It prefers open or slightly shaded permanently wet habitats. The altitude of the Czech sites range from 250 to 740 m.

Why is it so rare?

Suitable conditions for the growth of varnished hook-moss have disappeared on many historical sites as a consequence of changes in their management and agricultural utilization, which was often connected to melioration and an increase in nutrient content. Varnished hook-moss is a weak competitor and that is why it cannot compete with more aggressive spreading plant species (especially reeds) and trees and shrubs on abandoned fen meadows and peat bogs. Half of today's known sites have been discovered during the last four years, many more are possibly awaiting discovery. So we do not know the exact answer to the question how rare this species is.

What is being done for its survival?

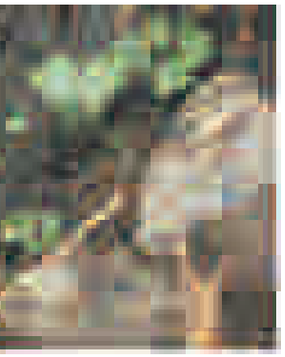
The known populations of varnished hook-moss are being monitored. Most sites are situated in protected areas. It is necessary to conserve a permanent water regime. Everywhere, where mowing and grazing was practised in the past, it is necessary to continue with these management practices. Everywhere, where there are plants or trees and shrubs encroaching, it is necessary to remove them. Today, various environmental characteristics have been studied on several sites where varnished hook-moss grows. The effects of various management practices on populations of this moss have also been monitored. We can suggest that the results obtained will help to find its specific ecological requirements and to increase the possibility of its conservation and survival.

1
2

1 a view of the Peat bog of Vidlák in the Český ráj with a tuft of varnished hook-moss at the front

2 a tuft of varnished hook-moss in mowed marshland vegetation

Mannia triandra (Scop.) Grolle



thalluses of mushroom headed-liverwort reach approx. 1 cm and are cordate

Mushroom headed-liverwort
Aytoniaceae
family

How do we recognize it?

There are two species of genus *Mannia* occurring in the Czech Republic. They are small blue-green branching or not branching lobed cordate liverworts. In comparison to *Mannia fragrans*, mushroom headed-liverwort does not give off a nice smell but is aerolated. Its size ranges from 0.5 to 1.5 cm.

Something about life

Mushroom headed-liverwort is a short-living species, synoecious, and characteristic by forming big spores, which ripen during early spring in reproductive organs within the sporangia on prolonged seta. After shedding of spores, stems mostly die, only in moist rich habitats do they live longer and even continue to grow by side protuberances.

Where does it grow in the world and in our country?

Mushroom headed-liverwort grows exclusively in the northern hemisphere. In Europe, it mainly occurs in the Alps, but the species has been found in many countries of central and southern Europe (in France, Spain, Switzerland, Germany, Italy, Austria, Hungary, Romania, Bulgaria, Croatia, Bosnia and Herzegovina, Albania, Slovenia, the Czech Republic, Slovakia, Poland and Ukraine). It grows in central and northeastern Asia (China, Japan and Russia) and in North America (Canada, Alaska and the USA) and in Greenland. In the Czech Republic it is found only on the Šumný Hill in the Hrubý Jeseník Mountains. Historically sites were known from the Giant Mountains (Rudník, Černý důl, Maršov, Horní Lánov).

What environment does it grow in?

Mushroom headed-liverwort prefers a neutral to slightly basic environment (soil pH 7 – 8) of shaded, moist crevices of mostly limestone rocks and walls, recently poached steep hill slopes and effloresced soil. It tolerates slight insulation and drier habitats. In the Czech Republic this species is known to grow in altitudes of 550 – 1070 m.

Why is it so rare?

This species reacts sensitively to habitat changes in the hydrological regime and light conditions. In the Czech Republic there are only a few possible sites where there are suitable conditions for its growth. Most of the sites (limestone or erlan rocks and arsenic slag heaps), where this species occurred in the past, were destroyed (by man) or as a consequence of succession changes (increase in herb and tree layers).

What is being done for its survival?

The site is situated in a protected area. The present population is being investigated and since the year 2000 it has been monitored regularly. Because there is not much information about the biology and ecology of this species, other environment characteristics are also monitored.

1 2 3

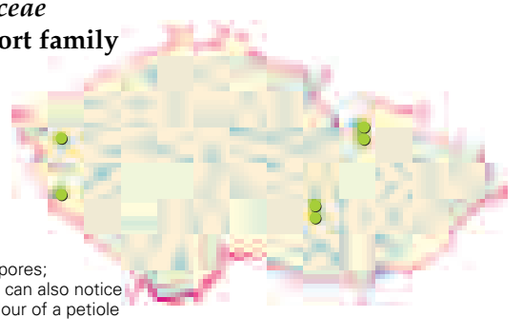
1 the Šumný Hill is rocky and is exposed to an extreme mountainous climate

2 red pencil marks the places, where mushroom headed-liverwort grows

3 mushroom headed-liverwort prefers half-shaded places among grass tufts

Asplenium adulterinum MILDE

Adulterate spleenwort
Aspleniaceae
Spleenwort family



a detail of a leaf with elongated spores; in the picture we can also notice the change in colour of a petiole

How do we recognize it?

Adulterate spleenwort can be mistaken for two similar species – maidenhair spleenwort (*A. trichomanes*) and green spleenwort (*A. viride*). They all form dense tufts and the leaves usually do not exceed a length of 20 cm. They differ at a colour of a petiole. Which brown-red (maidenhair spleenwort), green (green spleenwort) and in case of adulterate spleenwort at the base brown and the upper part green. Adulterate spleenwort grows together with serpentine black spleenwort (*A. cuneifolium*), but is has bipinnate leaves similar to parsley.

Something about life

This perennial species survives winter by vegetative rosettes. It forms spores on the underside of leaves from July to September. Female and male green gametophytes (prothaliums) with a half set of chromozomes germinate from spores. Fertilization of an egg by sperm happens in the archegonium and the sporophyte, a green little fern then develops. This sporophyte contains a full number of chromosomes (every chromosome in a pair). During formation of spores, the number of chromosomes reduces by half (only one chromosome is left from each pair).

Where does it grow in the world and in our country?

The distribution range of this species is large. It grows scattered in Europe from the Alps and the French Massif Central to Poland. It exists in small numbers in Greece, Bosnia, Romania and in isolated sites in Scandinavia. It has recently been recorded in Canada.
The Czech Republic contains the most numerous and important populations in Europe. The centre of range lies in the Slavkovský Wood, where adulterate spleenwort inhabits all suitable habitats, in total ten thousand individuals. Two sites with several hundred plants exist in the Domažlice region (the NR Drahotínský Wood) and a similar situation occurs in south-western Moravia (Rojetín). Five sites with approximately a thousand individuals are found in the Hanušovice region (e.g. the NR Na hadci by village Raškov).

What environment does it grow in?

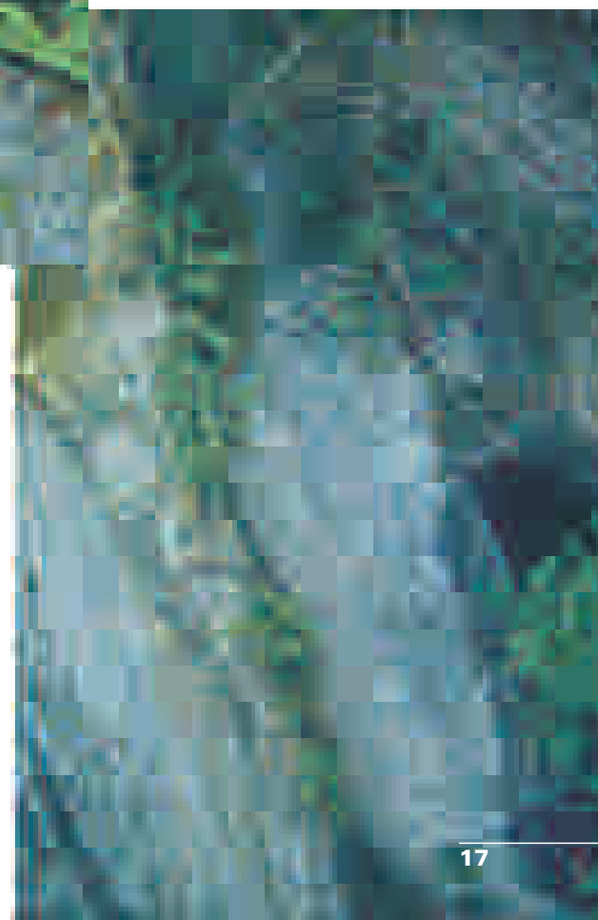
It belongs to the serpentinophytes, species growing on serpentines. Adulterate spleenwort prefers half shaded, dry rocky slits and crevices. It does not tolerate complete shadow.

Why is it so rare?

Adulterate spleenwort originated by interbreeding with maidenhair spleenwort and green spleenwort following a reduplicated number of chromosomes. It is fascinating that this process probably happened independently on many sites. So the occurrence of adulterate spleenwort is partly limited by the small probability of gametes meeting from both parental plants. Its rarity results also from the exceptionality of serpentines, which can be found only in several regions of the Czech Republic. However, adulterate spleenwort does not grow on all of them. Some localities have been damaged by serpentine mining. Adulterate spleenwort does not also tolerate trampling caused by high tourism pressure on some habitats, another threat is overshading by trees.

What is being done for its survival?

Most sites are protected and the threat of complete destruction is not probable. Sufficient management is secured at almost all sites where adulterate spleenwort grows. If there are not any global macroclimate changes and serpentine does not become a strategic mineral resource, there are not any considerable threats to adulterate spleenwort in the Czech Republic.



1 2 3

1 the NNR Křížky hosts three plant species protected under Natura 2000, adulterate spleenwort (*Asplenium adulterinum*), sandwort-leaved mouse-ear (*Cerastium alsinifolium*), Sudetic bedstraw (*Galium sudeticum*)

2 a tuft of adulterate spleenwort in a serpentine crevice

3 plants of adulterate spleenwort grow in larger numbers in a partly shaded crevice

Trichomanes speciosum WILLD.

spores of killarney fern form at the end of its leaves

Killarney fern
***Hymenophyllaceae* family**

How do we recognize it?

The Czech gametophyte populations look like a film created by some deep green algae. If we take a closer look it is possible to observe a cotton-looking structure of fibers. The sporophyte has very thin and soft leaves demonstrating its need of high air humidity.

Something about life

The alteration of gametophyte and sporophyte stages, so called alternation of generations, has been explained in the section of adulterate spleenwort. In central European conditions killarney fern is not able to form sporophyte that is what everybody calls a fern. The reasons lie in the climate imbalance, the sporophytes require an environment without frost and with permanently high air humidity. There are only gametophytes growing in our country. They reproduce by vegetative formations, which are called gems. It is an exemplary representation of a perfect strategy when a plant is able to survive unsuitable conditions in a less favourable but sufficient form.

Where does it grow in the world and in our country?

The entire range covers the area from Macaronesia (the Canary Islands, Madeira, the Azores) through southern Europe (Spain, Portugal, Italy) and England to France – at all these places it occurs also as a sporophyte. In Belgium, Luxemburg, Germany and the Czech Republic, it occurs only in the gametophyte form. Its discovery was made in the Czech Republic in 1993 by foreign researchers in the Labské Sandstones who had expected its occurrence thanks to their experience from Germany. Their discovery was quite a sensation but an even bigger one was in 2001 when a foreigner found it in the Doksy region again. After that the number of identified sites started to increase. It was documented in Kokořínsko and then in Český ráj and the Prachovské Rocks. The size of the colonies varies from several mm^2 to large covers over 1 m^2. Altogether, there are several tens of sites known in the altitudes from 130 to 420 m. Such a discovery proves what surprises we can experience even in the well-explored central European landscape while using unusual approaches.

What environment does it grow in?

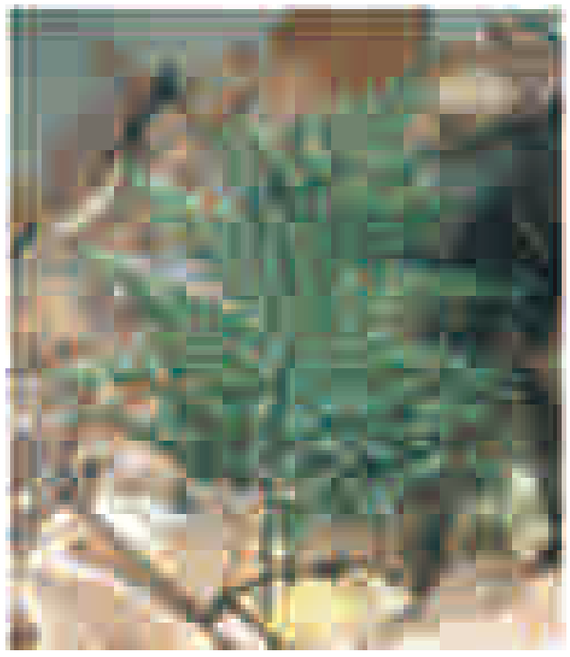
The fibrous gametophyte forms irregular colonies growing over bare sandstone in dark and humid caves, ledges, cracks, and honeycombs, where it usually does not need to compete with other species of plants. The balanced microclimate without significant oscillations, higher temperature and humidity has an important key influence.

Why is it so rare?

It is clear nowadays that it is not rare in our country but that it is rather vulnerable to a certain extent by a factor out of our control-climate. Some sites might have been destroyed by sandstone exploitation or damaged by tourists. The deforestation in the vicinity of its sites may probably have some influence as well.

What is being done for its survival?

Most of its sites are in protected areas, which should be sufficient for the species protection. On selected sites the temperature is monitored to help us with understanding its limits for survival. The future of killarney fern in our country depends solely on climate – if the temperature and the humidity increase, we will admire its beautiful leaves on sandstone rocks in the future. In the opposite case even the existing gametophytes will disappear.



1 small sandstone caves, as this one in the Kokořínsko area, have protected their secrets for a long time

2 twisted fibres form gametophytes of killarney fern growing together on a cave roof

3 the nearest location of sporophyte leaves can be found in the Bretagne region

Aconitum firmum REICHENB. subsp. *moravicum* SKALICKÝ

Moravian stiff monk´s hood
Ranunculaceae
Buttercup family

a detail of a flower shows its structure with a conspicuous helmet and numerous anthers, we can also notice flower hairs

How do we recognize it?

Everybody can recognize monk´s hoods, but the determination of species, subspecies and potential hybrids can be very complicated for even a professional botanist. Whole genus is in process of evolution newly originating monk´s hood, small habitats of species are not isolated from the habitats of other monk´s hoods and interbreeding occurs. Moravian stiff monk's hood is a stout plant with palmately divided leaves and hairy stems.

Dark blue-velvet flowers with a small helmet grow in dense inflorescence. The inflorescence of a nominated subspecies *A. firmum firmum* is without any hairs and fruits (vesicles) are always in threes, a Moravian subspecies is hairy and vesicles can be also in twos. Transitional variants grow in areas where distribution ranges of these subspecies meet. The described subspecies interbreeds with variegated monk's hood (*A. variegatum*).

Something about life

This perennial long-living species survives due to its beet-like polyheaded rhizome from which one or several stems emerge. It flowers at the end of July and in higher altitudes till the end of August. At first the main stem starts flowering, then the lateral branches. Pollinators are insects, primarily bumblebees. Seed germination takes a long time and is uncertain. Monk´s hoods contain one of the most toxic alkaloids and have been used, up until recently, to poison people.

Where does it grow in the world and in our country?

Stiff monk's hood belongs to Carpathian species, which occur in the Carpathians from Moravia, cross Slovakia, Poland and Ukraine (very rarely here) to Romania. The subspecies *A. f. moravicum* grows only in the westernmost areas of the Carpathians in Moravia, Slovakia and Poland, and the nominated subspecies *A. f. firmum* replaces it in the area from the Orava region and the Roháče Mountains further to the east.

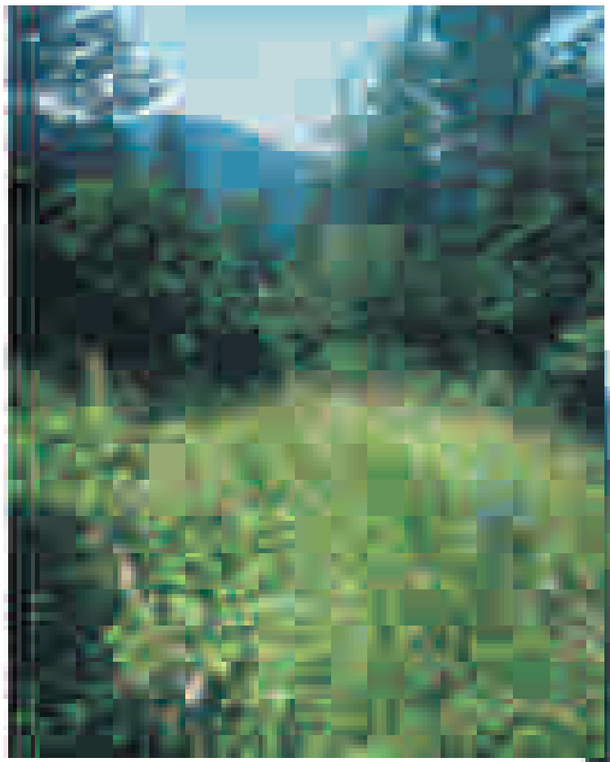
In the Czech Republic it grows exclusively in the Moravskoslezské Beskydy Mountains and the Ondřejník Massif. In Beskydy there are around 30 sites from which almost ten host numerous populations. They are situated in the region of Smrk, Kněhyně and the alluvial plain of the Čeladenka brook.

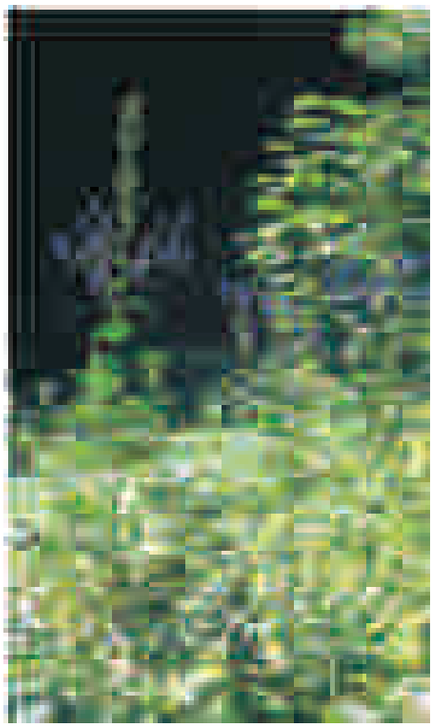
What kind of environment does it prefer?

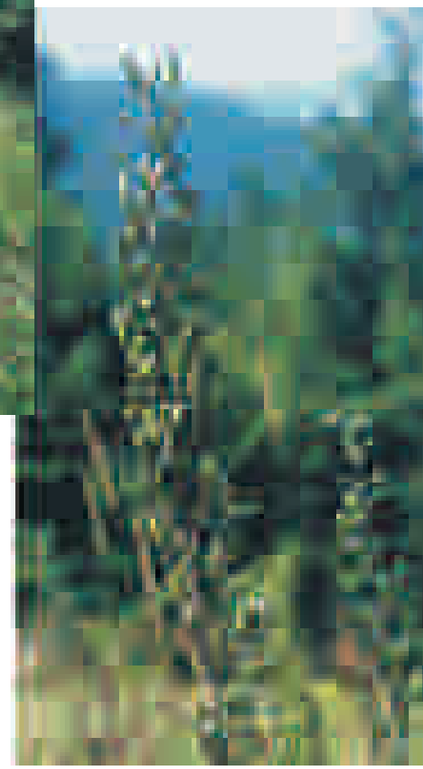
Stiff monk's hood is a typical species inhabiting permanently moist areas and marshlands. Springs are its favourite biotope but we can also find it in tall-herb fringe communities of mountainous brooks. Habitats must be at least partly insolated and with less competitive vegetation. It prefers fast running waters creating new riverbeds where it grows in their margins. In higher mountains in Slovakia and Romania it inhabits open areas formed by falling avalanches. We can also meet species in wet forests margins, possibly along traffic routes.

Why is it so rare?

Moravian stiff monk's hood formed on the species distribution edge with a contact with other monk's hood species. It has not spread further inland from the Beskydy Mountains, so our country hosts marginal and from a scientific point of view, very valuable populations. Some habitats were destroyed by unsuitable torrent control measurements and river regulation and also by the construction of forest roads. These activities still remain a threat. Species fertility at some sites has decreased by hybridisation with variegated monk's hood. The consequence of this hybridisation for species survival has not been studied until now.







1 the mountainous spring under Hubertka in the Smrk Massif hosts a numerous population of Moravian stiff monk's hood

2 fruiting plants form vesicles, most often in threes

3 a Moravian stiff monk's hood by the end of flowering; fruits form at the main axis of an inflorescence but the lateral branches are in a full bloom

What is being done for its survival?

Some sites are located in protected areas (e.g. the NNR Radhošť and the NNR Kněhyně-Čertův mlýn). Mapping of distribution and monitoring of its abundance is being carried out. Species protection from e.g. unsuitable building and river regulation activities is secured in the Beskydy Landscape Protected Area. The species is cultivated only by the NGO ČSOP Myricaria in Dobrá. But seeds are not stored in any seed bank and nobody has investigated species biology. Besides these problems Moravian stiff monk's hood has good conditions for its future survival.

Adenophora liliifolia (L.) A. DC.

Ladybells
Campanulaceae
Bellflower family

a conspicuous stigma projecting from flowers of ladybells

How do we recognize it?

Ladybells is the only representative of this genus, which contains sixty species, growing in the Czech Republic. It can be distinguish from other bluebells by conspicuous stigma projecting from blue-white flowers. A flowering plant can reach almost one meter in height when good conditions occur. Leaves are arranged in a rosette and are petioleted and cordate to round crenated.

Something about life

It is a perennial long-living species surviving by a strong beet-like root. Variable living conditions caused it to form two life strategies – awaiting and searching for new growth possibilities. During unfavourable conditions, like light deterioration, adults will not bloom for a longer period. When there are good conditions, they produce many flowers and their rounded seeds are spread by wind to a wide surrounding area enabling them to colonize other suitable habitats. It flowers from the end of June till August and flowers are pollinated by insects.

Where does it grow in the world and in our country?

The distribution area of ladybells extends from eastern Asia to Central Europe, where there are some gaps. It remains quite common in Poland and the Carpathians, but occurs infrequently in Switzerland, northern Italy and in former Yugoslavia.

In the Czech Republic there are five sites known at present. Past records exist from the Rožďalovice region. It also occurred in the Drahanská Highlands and in the Opava region, but the evidence from herbariums is missing. Today, approximately three hundred specimens grow on the Babinské Meadows in the České Středohoří. Several plants can be found in Džbán in the Bílíchovské Valley. A better situation is in the NNR Karlštejn and the NR Karlické Valley in the Český kras region, where several tens of ladybells occur. A new locality with more than a hundred plants has been confirmed from the forest Vražba in the Jaroměř region. In the Rožďalovice and Jaroměř regions, we suspect, there may be hidden some more populations.

What environment does it grow in?

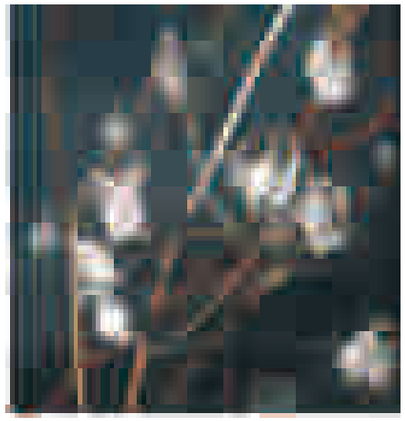
Ladybells is a demanding and selective species. Although it grows on meadows and in forests, it prefers slightlyshaded habitats, potentially wandering shadow with several hours of sunshine. Soils must be deep and nutritious, quite moist, not dry, but not wet.

Why is it so rare?

The Czech Republic is situated on the margin of its distribution range, where fewer sites are found. Ladybells has been damaged by forest management practices because it prefers former grazed or coppice woods, open with continuous wood removing. It does not favour today's dark tall-trunk forests with complete canopy closure. It mostly occupies forest path edges where it struggles to compete in an un-equal fight with blackberries and nettles. Furthermore, roe deer likes eating it. Nowadays populations are few and isolated, genetic variability is lost, and once the process of extinction has started, it is very difficult to stop it.

What is being done for its survival?

All the sites are, or will be, protected. However, it is more difficult to arrange a suitable type of a forest structure. In Karlštejn it grows in a regularly mown fenced enclosure, which is only a short-term measure. In the future it will be necessary to support rich populations in larger forest stands. The Babinské Meadows have finally started to be mowed and the number of individuals has increased. A rescue plan is being prepared. The seeds from the population in the Český kras are being cultivated in the Prague Botanical Garden. It is easy, and reintroduction has already taken place. The conservation of ladybells is one of the most complicated of all the Natura 2000 plant species, and the species survival will take a lot of effort.



1 2
3

1 seeds become ripe in capsules with a thin wall, in which slits are formed in autumn

2 ladybells on the Babinské Meadows has a low growth and has deep blue-violet coloured flowers

3 our most numerous population of ladybells grows on the Babinské Meadows

Angelica palustris (BESSER) HOFM.

Marsh angelica
Apiaceae
Carrot family

a detail of a small umbel; two stigmas project from flowers; we can also notice a stylophodium excreting nectar

How do we recognize it?

For the most people it seems to be an ordinary 0.8-1.5m tall "carrot". It is similar to the more common species wild angelica. Marsh angelica has light green leaves, slightly shiny and recurved. During flowering a stem with ridges can be noticed and sepals are formed. In an inflorescence there are bracteoles and several caducous bracts. The achenes are important for determination within umbellifers (see the photo).

Something about life

A biennial, rarely a longer living plant, flowering once in its life from June to September, most often in July. Different species of pollinating insects feed on the nectar of the white composite umbels. The whole plant withers during the maturing of thousands of achenes, which are distributed by the wind.

Where does it grow in the world and in our country?

Marsh angelica represents a continental species of a temperate climate; the main species range is between 40 – 60 northern altitudes, from Poland to western Siberia where it probably originated. It rarely occurs in Germany, Hungary and Romania, with only one site found in Slovakia, in the Záhoří region.

In Bohemia it was last recorded near Všetaty in 1902. In Moravia its existence has been recorded on 5 sites, but all of them disappeared at the beginning of the second half of the 20th century. The most numerous populations could be found on the Černovírské slatiniště near Olomouc and also near Čelčice, Čejč, Vacenovice and Vracov. In the 70's the fens near Hrdibořice village was the last discovered site. Today, the locality is protected as the National Nature Reserve Hrdibořické Ponds, but marsh angelica struggles to survive.

What environment does it grow in?

Marsh angelica can be found in open grasslands. It demands soils with high organic content and a good supply of nutrients. In the Czech Republic it grows in marshlands, but in eastern Europe on black soils. It is hydrophilous but certainly not a paludal species. It prefers lowlands, and only rarely in the south of its range does it extend to the lower slopes of the mountains.

Why is it so rare?

In the Czech Republic marsh angelica inhabits the margin of its distribution range and has always been considered to be a very rare species by all botanists. More over it occured on fertile lands near villages and in areas with high quality drinking water. Its sites were destroyed by the disturbance of the water regime due to melioration or drawing of drinking water. Some sites were ploughed; near Černovír a big part of the site was converted to a train station. The meadows near Hrdibořice were also ploughed but marsh angelica survived along the route in a small ditch.

What is being done for its survival?

Marsh angelica is the first plant species with its own rescue plan in the Czech Republic. The programme is being carried out by the NGO Sagittaria. Population strengthening and reintroduction is done by seeding and planting in Hrdibořice and the Černovírské slatiniště. This activity also requires the improvement of habitat conditions. In Hrdibořice there has started a revitalization project bringing water from the River Blata. The flood in 1997 helped to increase the water level also in the Černovírské slatiniště. The management activities on meadows have been improved (in Hrdibořice

1 2 3

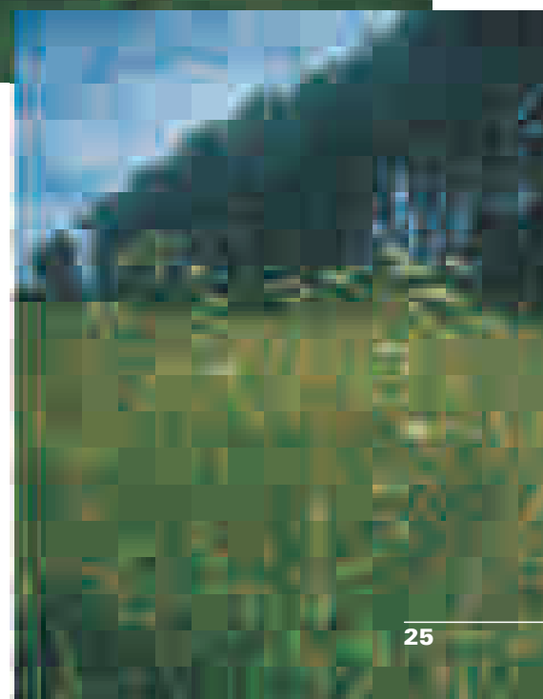
1 a main composite umbel is much bigger than later blooming lateral umbels

2 the National Nature Reserve Hrdibořické Ponds; a view of Raška Pond across meadows, where marsh angelica is being re-introduced

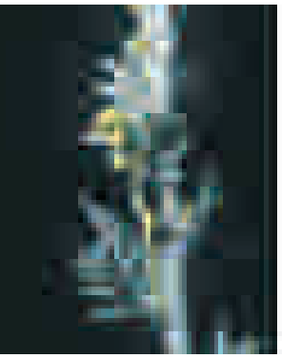
3 flowering plants of marsh angelica in the Hrdibořické Ponds in 2003; until now this was the highest number of flowering plants in the last 25 years

the meadows needed to be re-established). The meadows are regularly maintained, twice a year. The first mowing carried out before the beginning of June does not affect marsh angelica, but it is better to postpone the second mowing till the end of August after the achenes have ripened. When done earlier, the flowering plants need to be left un-mown.

This species is grown in Olomouc and in Průhonice, almost 1 kg of achenes is deposited in the seed bank. Sagittaria also considers the possibility of marsh angelica being reintroduced to south Moravia. An information board has been erected and a booklet published about the Hrdibořice Ponds. In the Czech Republic the species survival depends on its intensive care.



Artemisia pancicii (JANKA) RONN.



a detail of close flower heads. The sericeous appearance of the plant is clearly visible.

Pancic´s mugwort
Asteraceae
Daisy family

How do we recognize it?

There are six species of mugworts growing in the Czech Republic. Even though amateurs can consider the species very similar, good determination characteristics exist. Pancic's mugwort forms low growing tough brown stems. Two pinnatisect leaves with wide sericeous lobes emerge from each stem. It flowers with narrow small flower heads.

Something about life

This perennial plant species grows by rhizomes forming dense or open vegetation cover, at first sight individual plants are difficult to distinguish. Flowering is very rare and occurs from the middle of August until September. Flower heads of mugworts are not decorated compared to other daisies and rely more on pollination by wind. In the Czech Republic formation of achenes is not known as well as the presence of seedlings on the sites.

Where does it grow in the world and in our country?

Pancic´s mugwort is a Pannonian endemic species of a small area, and the number of sites where it is present can be counted on two hands. Its most southern occurrence is in Vojvodina in the Banat region in the sand area Deliblat. In Austria it can be found in Burgenland by Nesideur Lake near the village of Parndorf and in lower Austria near Vienna (Hainburger Berg and Bisamberg).

In the Czech Republic it occurs only in the Pannonian region in southern Moravia where it reaches the north-western margin of its distribution range. Six sites have been recorded but on three of them this species has probably become extinct (Výhon by village Židlochovice – the most northern site, Zázmoníky by Bořetice and Valy by Mutěnice). It still occurs on the Pouzdřanská Steppe, Špidlák by Čejč and Liščí Hill in the Dunajovické Hills. The number of plants is not very high with the most numerous population spread on Liščí Hill.

What environment does it grow in?

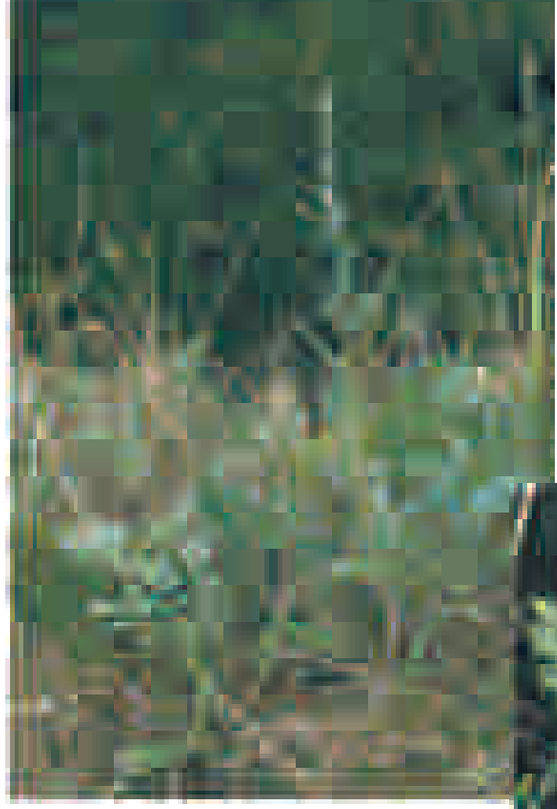
It is a thermophylic species growing on dry, deep and most frequently loess soils, which are rich in nutrients. It is never found in the most exposed and warmest areas, it usually grows in partly shaded areas.

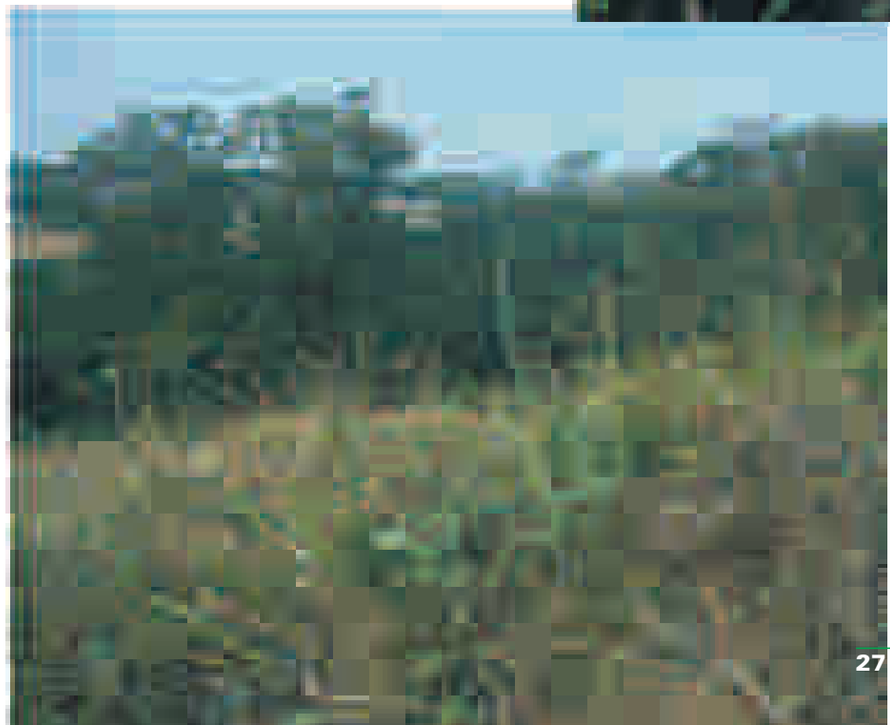
Why is it so rare?

Sometimes after the end of the ice-age southern Siberian steppe species started spreading to Europe and one of them was the ancestor of Pancic´s mugwort, which has probably interbred with other related mugworts. Individual populations became isolated and gradually evolved into different species after climate warming. Today, they survive in small areas where the climate is not favorable to them. Pancic´s mugwort is close to extinction. Its sites are isolated from each other, the species does not usually flower and it reproduces only vegetatively. The worse situation would be if each population was one clone, which would mean a very low genetic variation thus reducing the ability of its reaction to changing environmental conditions. We must also mention the threat from the establishment of vineyards and terraces, and chemicals used in past agricultural practises. A very serious problem also is the succession of *Robinia*.

What is being done for its survival?

All three sites exist in strict protected areas with good management practices. Pancic´s mugwort population is monitored and its occurrence recorded. Long-term monitoring has started. The management practices include, if necessary, mowing (usually from July to August), plants are left un-mown. Little is known about the biology of the species, including the reason why it doesn't flower. Pancic´s mugwort has not been cultivated. Its rarity together with the fact that the sites in the Czech Republic are an important part of the world population, requires that we are committed to apply specific conservation measures because the risk of species extinction is likely high.





1 a view of a flowering plant does not happen every year

2 a basal rosette usually consists of 2 - 3 leaves

3 the population of Pancic´s mugwort on Liščí Hill in the Dunajovické Hills is the most numerous in the Czech Republic

Campanula bohemica HRUBY

detail of a flowering stalk

Bohemian bellflower
Campanulaceae
Bellflower family

How do we recognize it?

Bohemian bellflower belongs to a group of smaller bluebells with narrow leaves and fine stems. In the Czech Republic *Campanula rotundifolia* and the rare species *C. gentilis*, *Campanula moravica* and *Campanula gelida* are similar species of this bellflower group. Bohemian bellflower grows individually, not in tufts with basal leaves that die off before blooming. It has from 20 – 40 cm regularly and sparsely leaved stems and membranous capsules (not leathery or lignificating). In the natural environment it occurs as a companion of *C. rotundifolia* from which it differs by distinct angular stems and bigger flowers. Differences to *C. gelida* are described in the text relating to this species.

Something about life

This charming mountainous perennial species survives by its rhizome from which basal leaves sprout at the beginning of the season. Stems grow individually or only several stems at the most. The inflorescence is represented by a raceme of 2 – 5 flowers pollinated by insect. It blooms from June to the end of July. A fruit is a capsule. Small seeds shed only locally. We lack precise information about germination in its natural environment. We assume it is good enough to sustain the species population. It rarely interbreeds with *C. rotundifolia* whose hybrids are called *C.* x *pilousii*.

Where does it grow in the world and in our country?

Bohemian bellflower is an endemic species of the Giant Mountains and grows on many sites in the Czech and also Polish parts of the mountains, often in great numbers. It colours the meadows in blue from near Pec pod Sněžkou to the Luční Challet, it is also abundant around Svatý Petr. It occurs at altitudes from 800 m to the peak of Sněžka (1.602 m).

What environment does it grow in?

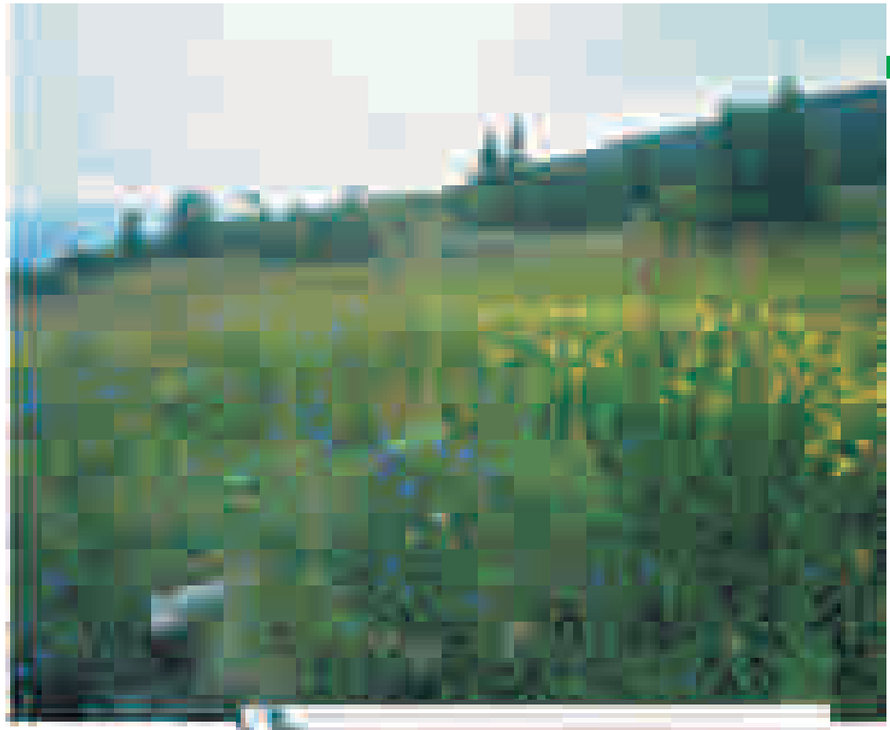
It prefers sunny areas on rich wet mountainous meadows with a sufficient supply of nutrients, often growing at the edges of dwarf pine stands.

Why is it so rare?

Its uniqueness relates to its interesting origin. The alpine bluebell species *C. scheuchzeri* is its ancestor. At the end of the glacial period it reached the High Sudeten, and in the Giant Mountains this independent bluebell Bohemian bellflower gradually developed in isolation. Rarity is, in this case, a relative term and results mainly from the fact that this species grows only in the Giant Mountains. It is still abundant but it can be threaten by changes in meadow management and abandonment of traditional meadow management practices, which have been used in the Giant Mountains for centuries. Long-term management caused the establishment of valuable and diverse meadow communities, which are suitable for Bohemian bellflower. If anybody started mulching up meadows, bluebell will have serious problems trying to survive. A particular threat is the presence of *C. rotundifolia*, which together with people penetrates still higher altitudes of the Giant Mountains. The former pure population of Bohemian bellflower could be threatened by more frequent interbreeding of these two species. In the Giant Mountains there is a similar problem with a new colonizing *Viola tricolor*, which almost genetically overrun a beautiful big flowering *Viola sudetica*.

What is being done for its survival?

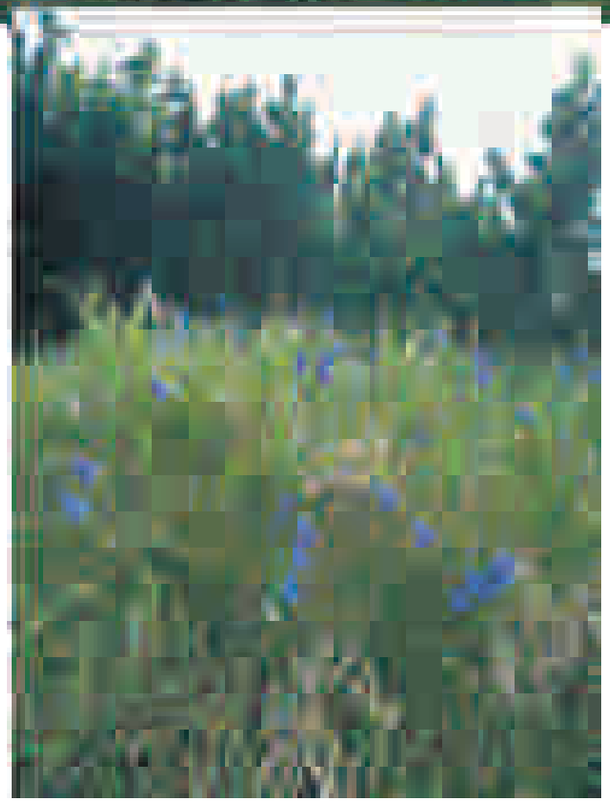
Almost all the sites are situated within the Giant Mountains National Park, in many cases



1
2

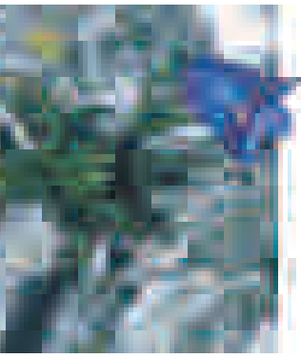
1 extensive stand of Bohemian bellflower in species rich short grassland

2 Bohemian bellflower is still very numerous in Giant Mountains



in its core first zone, which provides the highest level of protection. Meadows, with the exception of meadows at the highest altitudes, are mown once a year, which suits the Bohemian bellflower. As long as apricot orchards are not established in Pec pod Sněžkou as a consequence of global warming, this species will not be in any great danger of extinction.

Campanula gelida KOVANDA



a detail of an individual plant of Ash-mountains bellflower

Ash-mountains bellflower
Campanulaceae
Bellflower family

How do we recognize it?

This species takes very much after the previous Bohemian bellflower. The species classification has got an interesting background. It was first described in 1968 then the same author reclassified it as a subspecies of Bohemian bellflower. Today, most taxonomists think about this species as independent. It differs in the formation of tufts; it has also smaller flowers and capsules. Flowers grow individually or in a four-flowered raceme, stems do not exceed 20 cm in height. Basal rosette leaves last until the end of flowering period, (you can see this in the photo).

Something about life

Ash-mountains bellflower is a perennial species, capable of forming a large ground cover. Besides formation of tufts it propagates by seeds but the rooting of seedlings in hostile mountainous environments is difficult. At first pollen releases from anthers of flowers pollinated by insect (similarly in other bellflower species) and then the formation of a stigma follows. This phenomenon prevents self-pollination.

Where does it grow in the world and in our country?

It is endemic to one site - the Petrovy Stones in the Jeseníky Mountains. It grows scattered on a small rock and in the immediate vicinity of the rock in approximately 50 tufts.

What environment does it grow in?

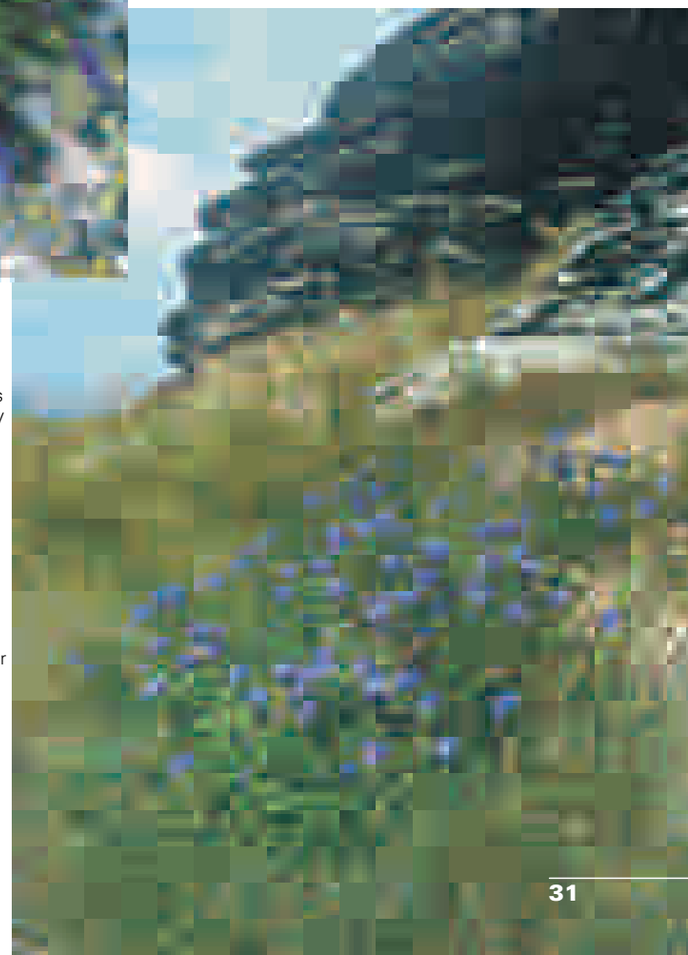
It withstands an extreme mountainous climate with frequent winds, low temperatures and snow falls. Most plants grow in light or in full view of the sun, several tufts hide in a deep shadow of rocky crevices. It grows to low *Festuca* grasslands at the foot of rocks, where it spreads widely and the detection of individual plants is difficult.

Why is it so rare?

Its rarity results in the existence of one site in the world with only approximately 50 tufts. The species origin, like the Bohemian bellflower, comes from the alpine bellflower *C. scheuchzeri*. Isolated from the alpine plant but also from the plants occurring in the Giant Mountains, this original Ash-mountains bellflower developed in the Jeseníky Mountains. The reason there is such a small number of individuals is due to insufficient site protection, which allowed visitors to indiscriminately trample this unique plant. The author also experienced a school group picture at the top of the Petrovy Stones. This attractive bellflower is also easy prey for thieving alpine plant collectors.

What is being done for its survival?

The Petrovy Stones are now part of a strictly protected zone of the Protected Landscape Area Jeseníky, in the National Nature Reserve Praděd. Although not many people like it, entry on to the Petrovy Stones is forbidden. This peaceful situation is convenient for this bellflower and the species has started spreading again. It is also important to solve the problem of operational ski lifts during winter, when the Petrovy Stones are again threatened. Employees from the PLA Jeseníky put out selectively spreading raspberry bushes at the foot of the rocks to help protect the plants. The Ash-mountain bellflower population is mapped, and the long-term monitoring of its development has started. We are familiar with basic information about the biology of Ash-mountain bellflower and its cultivation is possible.



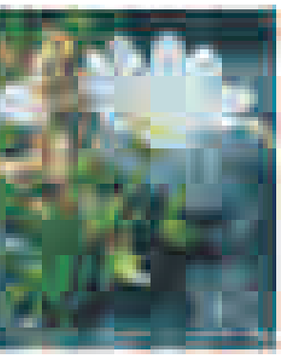
1 2 3

1 the Petrovy Stones represent the only site in the world of Ash-mountains bellflower; it grows not only on the rock but also on the grassland at the foot of the rocks

2 the smaller plant of Ash-mountains bellflower growing in a rock crevice, in the picture the quite wide calyx lobes are noticeable

3 one of the largest tufts of Ash-mountains bellflower flowering at the foot of the rocks

Cerastium alsinifolium TAUSCH



a detail of a flower and a fruit, quite rounded green leaves are noticeable

Sandwort-leaved mouse-ear
Caryophyllaceae
Pink family

How do we recognize it?

Sandwort-leaved mouse-ear is a small, from tufted to cushioned white flowering plant. We determine genus *Cerastium* by five styles in a flower compared to genus *Stellaria*. As early as in 1828 F. I. Tausch differentiated it from the closely related wild chickweed (*C. arvense*) by its light green to yellow colour, more orbiculate leaves, shorter calyx and bracts without scarious tips.

Something about life

We know little about how long this species lives, but we know for certain that it is a perennial and flowers repeatedly. Bigger tufts are formed by side shoots. Plants over winter vegetatively. They flower from April to June, some also later in the summer. Flowers are pollinated by insects. It forms many seeds but knowledge about germination and seedling development is missing. It probably interbreeds with wild chickweed but we do not have enough information about the extent of this potential interbreeding and its influence on the population of sandwort-leaved mouse-ear.

Where does it grow in the world and in our country?

This species is an endemic of a very small area in the PLA Slavkovský Wood near Mariánské lázně. The total number of sites is approximatelly 13. The sites with the most concentrated number of plants are the NNR Pluhův bor, NNM Křížky, NNM Upolínová Meadow, NR Planý Hill, NR Vlček and NM Dominova skalka.

What environment does it grow in?

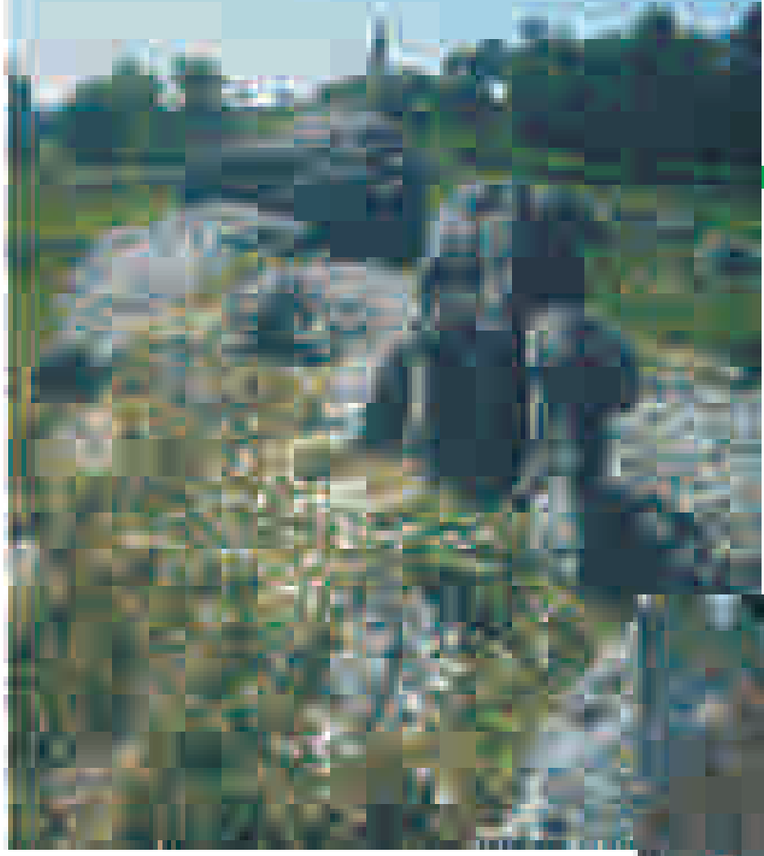
It is an obligatory serpentinophyte growing only on serpentines. The specific characteristics of serpentine with a surplus of magnesium exclude the presence of many species. Open vegetation is most important for this small sandwort-leaved mouse-ear because this small plant cannot compete with more robust plant species. So we can imagine that the ancestor of this mouse-ear developed and adapted to this extreme bedrock in isolation after the end of a glacial period, while elsewhere was excluded by competitors. The sandwort-leaved mouse-ear belongs to the species, which are called S-strategists meaning the plants withstanding stress - unfavourable environment conditions. Except for the bedrock it is not too selective, it is found most often in rock crevices and in shallow soils, but also in open forests or even near springs.

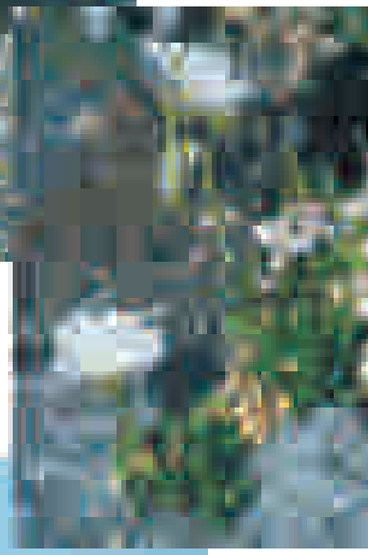
Why is it so rare?

It occurs quite frequently in its small distribution range. Its rarity is due to the limit of this range. It does not grow in other serpentine areas. It is threatened by overgrowing on non-forested sites by self-seeding trees and *Rubus* species as a result of the disappearance of goat and sheep grazing. This type of grazing provided suitable poached areas for mouse-ear to grow due to disturbance from the animal's hoofs. It is under threat also by large-scale forest management. It would prefer former continuous logged open forests. Another threat is the interest of collectors on some well visited sites.

What is being done for its survival?

Most of its sites are strictly protected. The aim of the management on its sites is to create open vegetation cover done by grazing and cutting of self-seeding trees and bushes. Its biology and the above mentioned influence of interbreeding with wild chickweed have not been sufficiently studied.





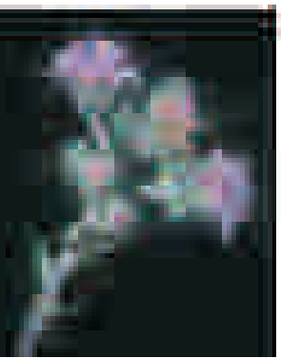
1
2
3

1 the extensive stand of sandwort-leaved mouse-ear on the serpentine rock in Křížky

2 big flowers often exceed leave rosettes; leaves, which did not survive winter, are decomposing and are also visible

3 plants grow in small crevices in serpentine rocks, but can also grow off the rocks

Cirsium brachycephalum JURATZKA



a detail of short-peduncled, almost sessile flower heads

Short-headed thistle
Asteraceae
Daisy family

How do we recognize it?

As a real thistle, it has many spiny teeth on its leaves and winged stems. It grows up to 2 meters high. The whole plant is light-green and of slender appearance with many small and short-peduncled flower heads concentrated at the top of a stem. Leaves are erect in acute-angle. Lower leaves are entire and oblong-lanceolate.

Something about life

It is a biennial/short perennial species with a taproot. It is capable of forming side leave rosettes. It flowers from June till September; flowers are pollinated by butterflies and other hymenopteran and also dipteran insects. The life strategy of short-headed thistle is to form a great number of achenes. It is not a great competitor and by forming many achenes, with good germination and wind dispersal, it can colonize suitable open habitats. It survives in these habitats for a short time and expands until more aggressive plant species colonize the site. It does not make any hybrids, as do other thistles.

Where does it grow in the world and in our country?

It is a typical pannonian endemic. The centre of its distribution is the salt steppes in Hungary and from here it spreads north-west towards Slovakia, south Moravia and Austria. It grows also in Vojvodina and northern parts of Romania.

In southern Moravia this thistle was rare in the past and it occurred certainly only on several sites around Rakvice and on marshy meadows near Moravský Písek. Today, several hundred plants grow on two sites near Trkmanský Dvůr.

What environment does it grow in?

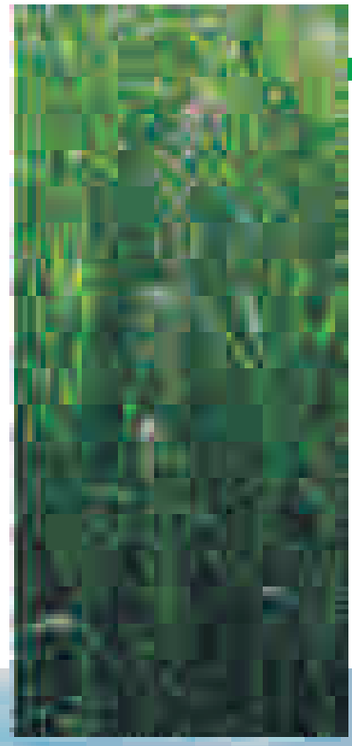
Short-headed thistle is a species of lowlands, the altitude of its sites do not exceed 200 m. It inhabits heavy soils rich in salts, which are for at least a part of the year flooded or considerably wet. Saline soils form in areas where evaporation exceeds precipitation, where salts rise up in nutrient rich soils. To some extent it requires disturbed habitats, most often open edges of reed-beds, salt meadow communities or more often grazed meadows, edges of ditches and so on. Both Moravian sites are very much affected by human activities. Near Trkmanský Dvůr it grows on a pile of soil formed after dredging out the banks of a water reservoir. Towards Rakvice behind a motorway, we can find hundreds of individuals on a wet field, which is only occasionally ploughed and overgrown by sparse reed beds. The human/animal disturbance or flooding of a habitat is essential for this species existence.

Why is it so rare?

This pannonian species has always been on the margin of its distribution range in the Czech Republic. It favours salt habitats, which have been almost destroyed by landscape meliorati-on and ploughing of meadows in southern Moravia.

What is being done for its survival?

Both sites are situated outside existing protected areas, but their designation is being prepared. We expect that in the future it will be necessary to disturb its habitats, the best would be by a disk harrow, possibly by ploughing small areas. The localities must not overgrow by dense reed beds, which would out-compete the thistle. Both populations are monitored and a complete rescue plan is being prepa-red. The species is cultivated in the botanical garden at the Faculty of Science Masaryk University in Brno. To understand the needs of the thistle, it will be necessary to study conditi-ons on sites in Hungary and other countries.



1 2
4 3

1 a detail of winged spiny stem, it belongs to less spiny thistles, one of characteristics is its light green colour

2 tall plants appear to be slim due to short lateral branches, many flower heads are formed

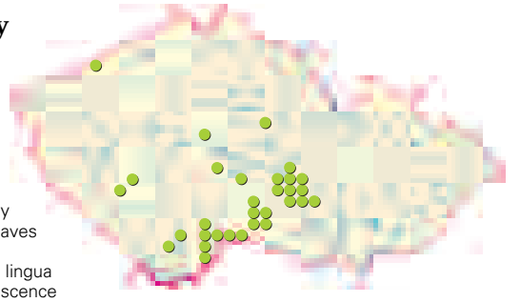
3 the site Trkmanský dvůr, where short-headed thistle grows on a pile of soil formed after dredging out the banks of a pond

4 fruiting flower heads of plumous achenes

Coleanthus subtilis (TRATT.) SEIDL

when looked at closely
the grooved curved leaves
become visible,
also the membranous lingua
and compound inflorescence

Mossgrass
Poaceae
Grass family



How do we recognize it?

Mossgrass is a small tufted grass species, characterised by distinct inflated sheaths and a short widely pyramidal panicle with cylinder spikelets. There are no close relatives in the world and taxonomists consider it as a real rarity.

Something about life

It is an extremely short-living annual surviving two months at most, often even less. It needs initially to be fully submerged then to germinate the water level must fall to allow the substrate to be warmed. Seedlings mature very fast. Pollen is carried by the wind between the flowers, fruits (caryopsis) form in large numbers, and after flooding fall down to the substrate. The fruits are often distributed by waterfowl. They can survive immersed in the mud for several years. If water level drops gradually in a dry summer, mossgrass forms several generations.

Where does it grow in the world and in our country?

Mossgrass has very atypical, wide and sporadic sub-oceanic range - it is dependent on a more oceanic climate with even precipitation and temperatures. In the past in Europe it has been known from Norway, Italy and Germany. Today, the European sites are only located in the Breton area and in Austria, these sites are connected with the Czech. It is missing from the European part of Russia, but bigger populations are found in the river basins of the lower Ob and Irtysh and on the lower Amur. It occurs rarely in western USA in Oregon and Washington, and in Canada in British Colombia.

In the Czech Republic it prefers to inhabit the highlands of the Bohemian Massif. The centre of its occurrence is in the South Bohemian basins and in the Českomoravská Highlands. It has also been found in the Rokycany region, Podbrdsko, Krušné Mountains, Chrudimsko and Pardubicko regions. 140 sites have been detected in the Czech Republic but only approximately a hundred has been verified during last 10 years.

What environment does it grow in?

Mossgrass is an exceptionally selective species with regards to suitable habitats. It requires moist environments, which include bare sandy mud to margins of ponds without the presence of other plant species. In the Czech Republic exposed bottoms of ponds are suitable habitats, elsewhere in the world bare riverbanks during decreased water levels also prove suitable.

Why is it so rare?

The Czech Republic is one of the main centres of the world's distribution, although it could seem that with hundreds of thousands of mossgrass present at hundreds of sites this species must be common. However, every year it only grows on the ponds where it has suitable living conditions. It is rare, more precisely threatened, due its specific habitat requirements. Ponds must not be fertilized or limed and never dredged. Summer drying of ponds must be repeated about every four years. If the interval is shorter, weeds reproduce excessively and overgrow mossgrass. A longer interval results in lower germination rate and weakened populations. The old traditional system of pond management was suitable and during this time its populations expanded to a greater extent, which was documented in the last century.

What is being done for its survival?

Mossgrass is protected only on several ponds and a model example can be found at the NNR Velký and Malý Tisý in the Třeboň area, where its habitat requirements are incorporated into the management plan. But most sites are not protected. Species cultivation is possible without any major difficulties and mossgrass is grown in the Hydrobotanical department of the Institute of Botany, Academy of Sciences of the Czech Republic in Třeboň. We have a good level of knowledge about the distribution of mossgrass and its biological characteristics. An imaginary key for mossgrass survival is in hands of pond managers.

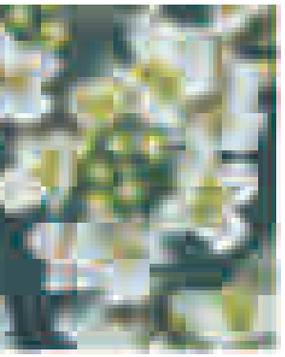
1 2 3

1 a numerous population of mossgrass and also a critically endangered yellow floating heart on the exposed bottom of Maňovický Pond near Nepomuk

2 the vegetation cover of mossgrass in good condition on the moist mud substrate

3 two European protected species discussing a happy future

Crambe tataria SEBEÓK



Eastern sea-kale
Brassicaceae
Mustard family

a detail of a tetradynamous flower, because of this feature the former name for *Brassicaceae* was *Cruciferae*

How do we recognize it?

We cannot confuse a flowering eastern sea-kale, plants are stout (up to 1 metre) white balls and its sites look like hillsides with lots of grazing sheep when eastern sea-kale is in bloom. The appearance of its leaves is shown in the photo.

Something about life

This perennial plant survives the winter season by having deep strong roots with an apical bud. It propagates only generatively by seeds. A single seed is enclosed in a special fruit - an achene (achenes are found rarely in Mustard family). A typical fruit is a silicula and a little silicula. Eastern sea-kale flowers from April till June and flowers are pollinated by various insect species. It has an interesting dispersal technique, which involves the whole dry upper part of a fruiting ball-like plant to be disconnected and blown by the wind into surrounding areas, where the seeds then become detached. Hence, why these species are called steppe runners.

Where does it grow in the world and in our country?

Eastern sea-kale has a Euro-Asian distribution range in un-forested areas, spreading from south western Siberia, Russia and Ukraine to Romania, northern Bulgaria, Serbia, Hungary, Slovakia and Austria.

In the Czech Republic it grows at the north-western edge of its distribution range in the pannonian region of southern Moravia. It occurs near Újezd by Brno (the NM Špice), Krumvíře (the NR Meadows under Kumstát), Hovorany (the NR Hovoranské Meadows), Čejč and Čejkovice (the NR Špidláky), Velké Bílovice (Zimarky), Pouzdřany (the NNR Pouzdřanská Steppe - Kolby) and in the NNM Dunajovické Hills.

What environment does it grow in?

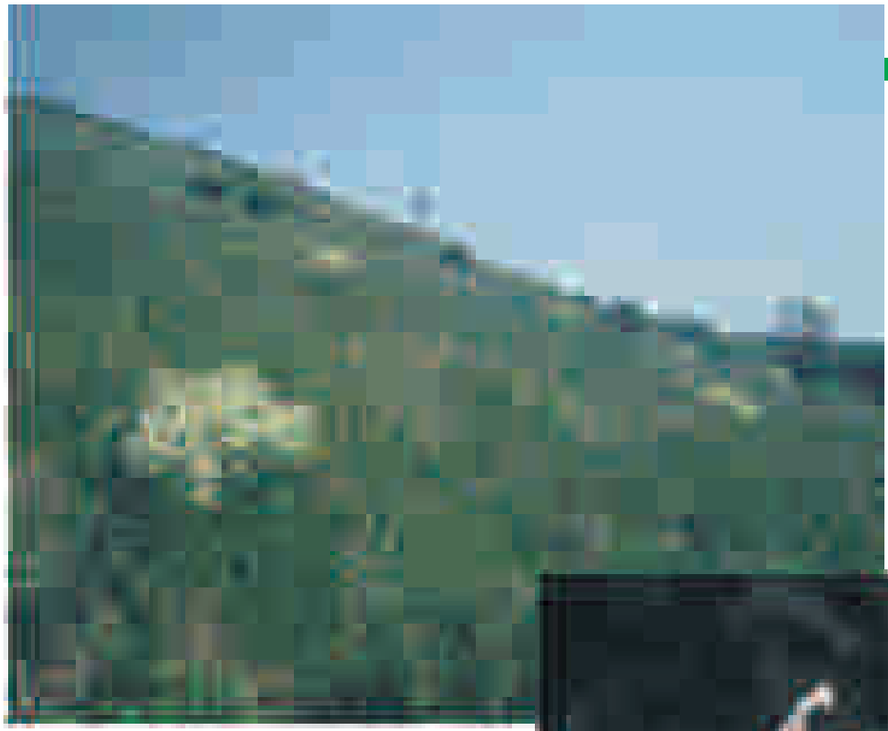
It is a typical species of the steppes requiring light, dry, open areas on deep and nutrient rich loess soils. In Moravia it is often found on south-oriented steep slopes but outside the Czech Republic it grows also on the plains. It requires a certain type of soil cover and disturbance. It inhabits rabbit burrows and it can spread to wastelands and to garden margins. It can also tolerate fire damage.

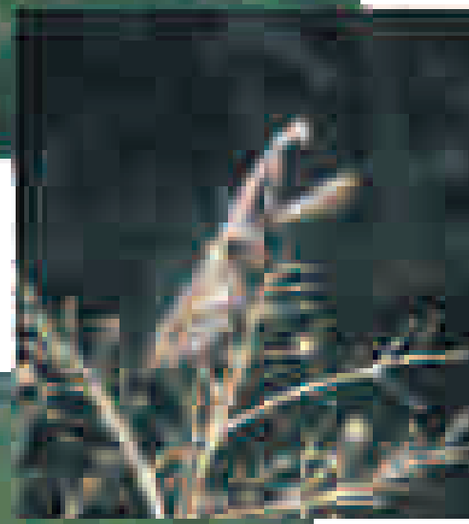
Why is it so rare?

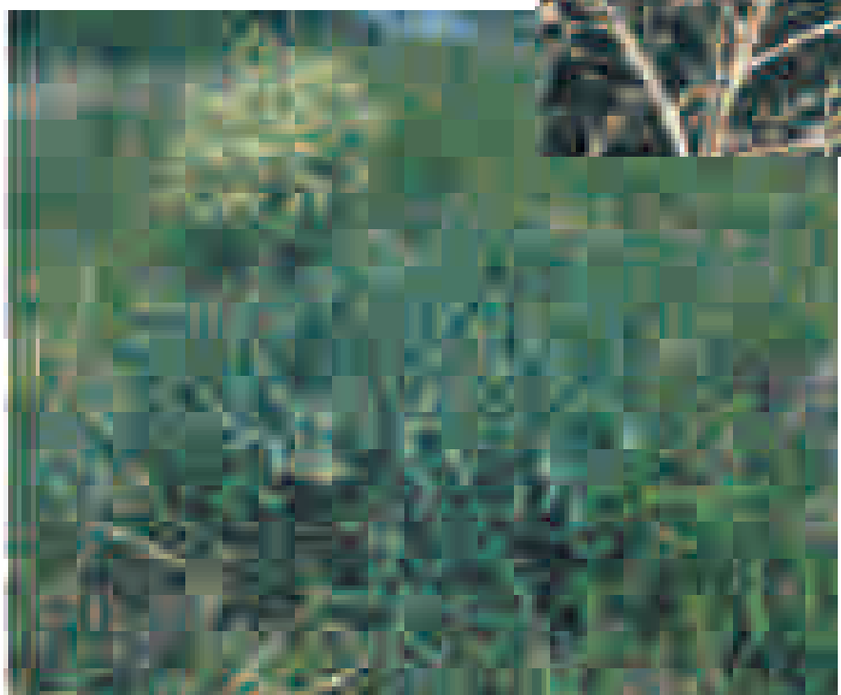
Its rarity is caused mainly by its marginal distribution range. Otherwise it is relatively adaptable; it grows in large numbers and has the ability to spread. In the past it grew also in many of today's vineyards. The spreading of *Robinia* plantations has also destroyed some of its habitats.

What is being done for its survival?

Almost all of its sites are situated in protected areas where mowing and removal of over-grown shrubs is secured and the sites are not in danger. We have very little information about its biology. It would be useful to use our rich populations for studying. Eastern sea-kale is a quite non-problematic species and we do not need to be worried about its existence in Moravia.







1 2 3

1 the Pouzdřanská Steppe with flowering eastern sea-kale

2 a fruiting eastern sea-kale with capsules, and a prominent visitor praying for its important fertility

3 a sterile individual with distinct partite greyish leaves

Cypripedium calceolus L.

Lady´s slipper
Orchidaceae
Orchid family

lady's slipper due to its unusualness and rarity represents one of nature's conservation symbols

How do we recognize it?

A flowering lady's slipper cannot really be mistaken by anybody and it is a famous icon of nature conservation. When not in flower, its leaves are conspicuously wide, ovate and warped along the venation.

Something about life

Lady's slipper is a perennial and long-living species; there are records of even one hundred years old plants. In spring new stems sprout from rhizomes. On average it branches every five years and large tufts are often formed. When they break off, vegetative reproduction occurs. But it can propagate also by seed. One to three deceptive flowers grow on a stalk; it means they do not provide any reward for pollinators, which are mainly solitary bee species. It flowers from the middle of May to June and a flower can last more than ten days. Fruits (capsules) are formed from only every third to tenth flower, and open during September and October. Small seeds are released gradually and distributed by the wind. An embryo germinates from a seed and in the soil cooperates with symbiotic fungi in a relationship called mycorrhiza. A plant usually flowers for the first time when it is around ten years old.

Where does it grow in the world and in our country?

The distribution range of lady's slipper covers a large part of Europe, from England in the north-west and Scandinavia in the north, to the south, rarely to the Mediterranean mountains, in the east across the whole Siberia to Japan, with isolated occurrences in the Caucasus. In Switzerland it reaches high altitudes of up to 2.700 meters.

In the Czech Republic it grows in most lowland and highland areas, but not in the Moravskoslezský, Plzeň and Karlovy Vary districts. We know of 76 sites in total. The number of individuals in populations ranges from several plants to tens of individuals, and to hundreds in the richest populations.

What environment does it grow in?

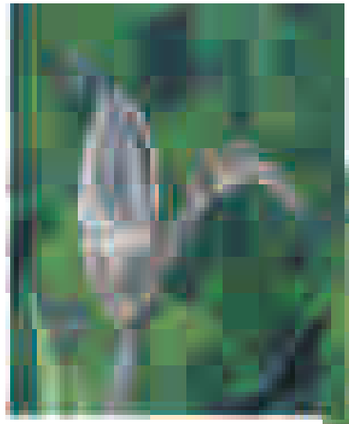
It is a species of open grasslands to open forests, but it prefers half-shaded habitats. We find it most often in hornbeam and beech forests, less often in ravine forests. Its grasslands sites also differ, from slightly moist hillsides to *Molinia* grasslands. But it is very selective about soil requirements. It grows on nutrient rich soils with neutral to basic soil reaction. Very often also on limestone, on so called "white hillsides" with heavy clay plaener soils or on the Whitecarpathian flysh.

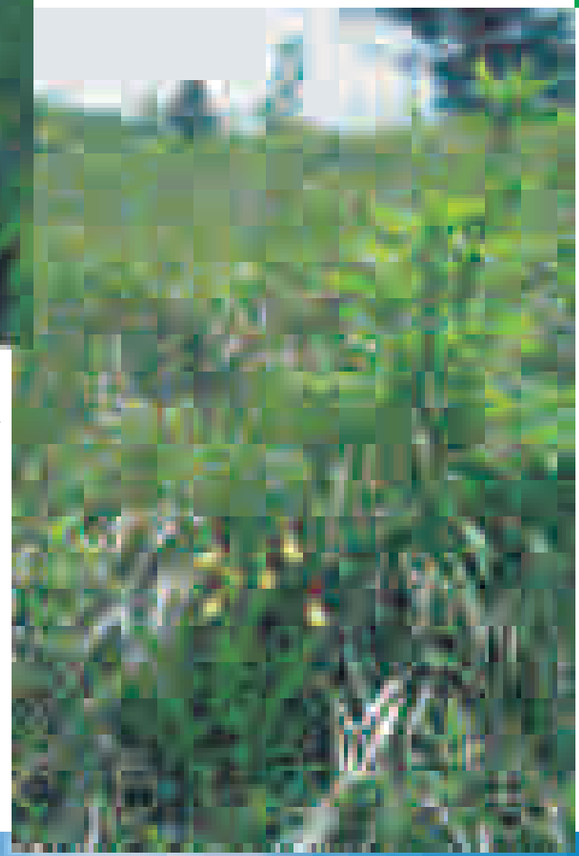
Why is it so rare?

It is a bit problematic to talk about its rarity in the Czech Republic, if there are over seventy existing sites. Lady's slipper was added to the endangered list by western countries where it is very rare. We are aware of the main threats such as unsuitable forests management practices, for example the transformation of deciduous forests to spruce monocultures. Some un-forested localities have been destroyed by ploughing or fertilization. Today, the up rooting of attractive plants for gardening represents the main threat and ends up usually in extinction of lady's slipper on a site.

What is being done for its survival?

Many sites are situated in protected areas. The species is being monitored on many sites so long-term time data about species abundance exist. Forest stand management plans have been modified on many sites and unsuitable spruces are being cut. The most non-forested sites have been regularly mown or at least shrubs removed. The species is easy to cultivate in a laboratory so it is accessible commercially for gardeners and they do not need to destroy it in its natural environment.





1 2 3

1 seeds in capsules ripen in autumn and sometimes a stem with a capsule survives till the next flowering

2 one of the more numerous populations of lady's slipper found in the Bílé stráně by Pokratice

3 lady's slipper can form dense tufts when shooting from rhizomes

Dianthus arenarius L. subsp. *bohemicus* (NOVÁK) O. SCHWARZ

a flower detail

Bohemian sand pink
Caryophyllaceae
Pink family

How do we recognize it?

Bohemian sand pink is a glaucous green, densely caespitose species. White flowers have conspicuous deeply laciniate corolla laminas. The hybrid with *D. carthusianorum* (*D.* x *lucae*) have less laciniated pinkish flowers. It differs from other subspecies by glaucous colouring, epicalyx-scales are pointed and smaller, usually solitary flowered stalks. None of these characteristics is exclusive for the Czech subspecies and can be discovered in other populations as well.

Something about life

It is a perennial, probably long-living species whose older tufts can break off to produce more individuals. It propagates by rhizomes and seeds. Flowers are pollinated particularly by various hymenopterous insect species. It flowers gradually from June to September. A young plant flowers for the first time usually during its second year.

Where does it grow in the world and in our country?

The afore mentioned subspecies is an endemic of a small area of the Roudnice sands. Other subspecies grow in Germany and across Poland to the Baltic States and Ukraine. A nominated subspecies *Dianthus arenarius arenarius* is found in Sweden.

In the Czech Republic 200 individuals grow only on one hillside above the village of Kleneč. In the past it occurred also close to Vražkov. In 1987 the species was introduced on the opposite side of the river Elbe by the village of Kyškovice, but only several planted tufts have survived here.

What environment does it grow in?

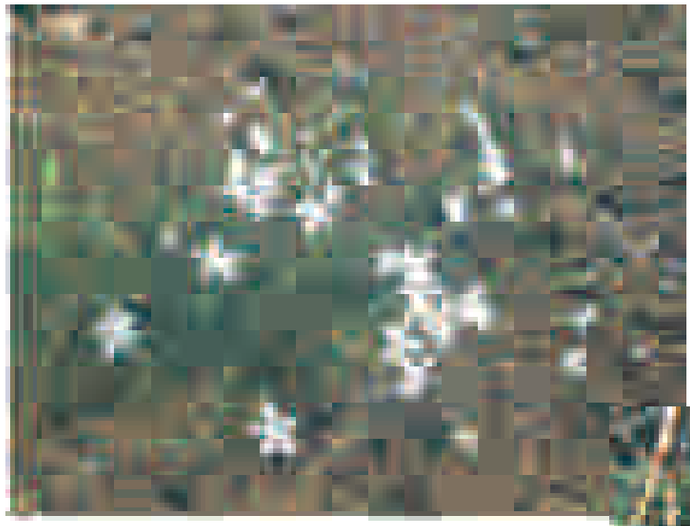
It is an exclusive inhabitant of sands - a psamophyte. It grows and germinates only on open uncovered ground. Old tufts can survive also in tree shadows and in more close vegetation cover.

Why is it so rare?

The isolated existence of the Czech subspecies is remarkable and emphasizes its rarity. Sands belong to the most endangered habitat types in the Czech Republic. Their old management practices of pasture and fire, which kept vegetation cover open, has disappeared. Many sites became overgrown or were actively forested and cultivated, etc. The sites by Roudnice have not been grazed for a long time and have become overgrown by *Robinia*, and on some sites sand has been quarried. Today, in the Czech Republic the sites with active sand replacement by the wind do not exist. The future of this vegetation depends very much on suitable human practices. During the last decades one of the biggest threats to nature conservation - *Calamagrostis epigejos* - has started to spread at the sites and it is able to form continuous vegetation cover, destroying this species habitat. Buds of the sand pink also taste good to weevil species *Hypera arator*, who's feeding activities causes a decrease in seed formation and also in possible colonization of new individuals. The successful survival of Bohemian sand pink is threatened by interbreeding with carthusian pink. The importance of this process does not perhaps need urgently addressing, but should not be overlooked for long.

What is being done for its survival?

Bohemian sand pink has got the most detailed methods of species conservation prepared of all of our endangered plants. The species habitat is protected and the intensive management is in progress - mowing, reduction of shrubs but also very radical turf removal on a big area is practised. On this area there are then suitable conditions for young plant colonization. The population is being monitored in detail at permanent sites. Introduction of the species to different sites, as mentioned above, is being carried out. The species is cultivated and reproduction *in vitro* has been managed, but because new plants spontaneously reproduce from seeds on the locality, there will be no need to use the artificial reproduction methods in the future. The conservation of Bohemian sand pink will certainly depend on human effort in the future, but if there are not any unexpected events, its existence should be secured provided habitat conditions remain good.



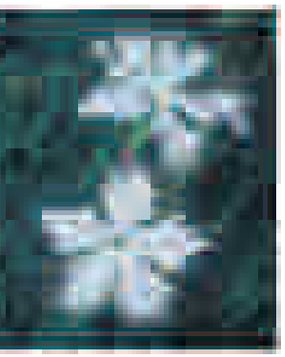
1
2
3

1 rich flowering tufts on places where turfs have been removed previously

2 an open capsule

3 the site of Bohemian sand pink under Říp hill is the only one in the world

Dianthus lumnitzeri WIESB.



in the detail we can notice very laciniate margins of the petals, the colour of flower can be pinkish, but white is more typical

Lumnitzer´s pink
Caryophyllaceae
Pink family

How do we recognize it?

Lumnitzer´s pink is a tufted, glaucous species, flowering with white, rarely pink, peduncle, laciniate flowers. In the Pálava population there are plants with very wide petals, which are at the base pink and bearded. They have been described as a form of *palaviensis* NOVÁK.

Something about life

Lumnitzer´s pink is a perennial species with a strong taproot, which penetrates rock crevices. It spreads to large tufts, which can separate into several individuals when older. Propagation is mainly by seeds. It flowers once and richly from May to June and during three weeks flowering ends. Various insects, especially hymenopterans, pollinate flowers. Seeds gradually shed from the four toothed capsules with most of them ending up within the immediate vicinity of the parent plant. There is nothing known about how seedlings root, but we can suggest, that only minute fragments will continue growing in this extreme rock habitat.

Where does it grow in the world and in our country?

The species is an endemic of quite a small area in the northwest Pannonian region, but its sites extend to four countries. In western Slovakia it grows in Děvín, the Small Carpathians, the Čachtické and Tematínské Hills, in lower Austria in the Hainburg Hills and in northern Hungary in the Pilis Hills.

In the Czech Republic we can come across it only in Pálava, where several sites are known (Děvín, Soutěska, Kotelná, the Růžový Hill and Stolová).

What environment does it grow in?

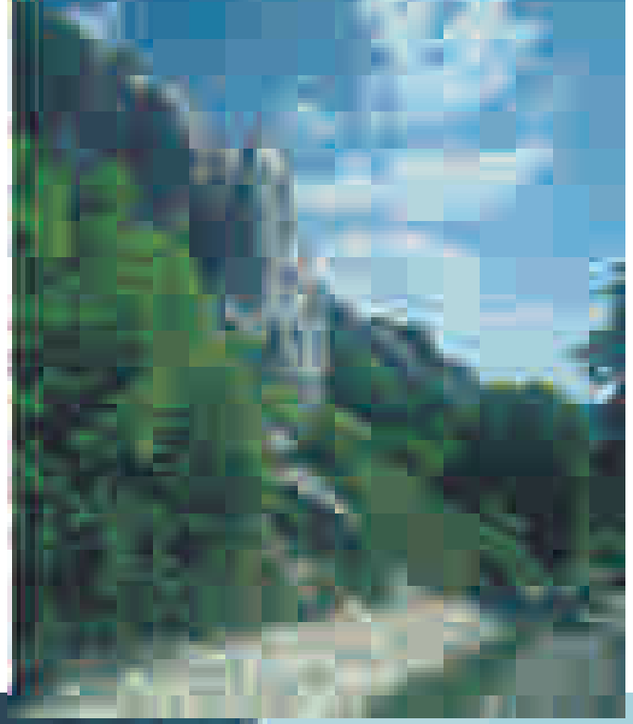
It grows exclusively on limestone bedrock in rock crevices (so called chasmophyte) or on rocky slopes and flat ground. It does not prefer any point of the compass. It requires light not shaded habitats.

Why is it so rare?

In our country it grows at the northern margin of its distribution range. Because it is exclusively dedicated to limestone bedrock, it does not have suitable habitats anywhere else than in southern Moravia in the Pálava region. It probably has not colonized limestones in the Moravský kras. But in Pálava it is found often. There is a risk from collection of plants for rock gardens, but fortunately many sites are hard to access.

What is being done for its survival?

All its localities are situated in strictly protected areas in the Biosphere Reserve Pálava. We know little about the biology of this species. It is easy to cultivate and everybody can buy this pink species on a market. If Pálava does not become a rocket base against attacks from the south, does not get overgrown by communication towers or eager miners do not grind the limestone to cement, the future of this pink will not be threatened.

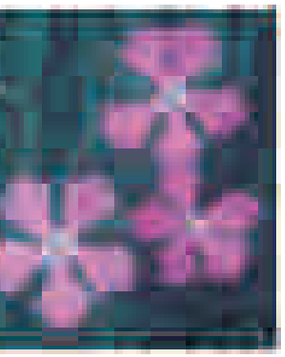


1
2

1 limestone rocks and their edges represent the only sites of Lumnitzer´s pink in the Czech Republic

2 a flowering tuft on a flat shelf of a limestone rock

Dianthus moravicus KOVANDA



a flower detail
with typical
deeply laciniate petals

Moravian pink
Caryophyllaceae
Pink family

How do we recognize it?

This glaucous Moravian pink forms dense tufts and flowers with deep pink to red, fragrant flowers, with acuminate toothed-laminas of petals. It was separated from its close relative and very similar species *D. gratianopolitanus* in 1982. It especially differs from it by a longer calyx; the capsule is the same length as the calyx with herbal bracteoles without scarious margins situated below a calyx.

Something about life

It forms similar large tufts as previous pinks, which can break down into more individuals when older. A strong taproot penetrates deeply into rock crevices. It blooms from May to June; rarely do we see solitary flowering plants in September. Flowers are pollinated by various insect species. Seed production on the sites is partly reduced by the influence of flower pests and a periodical drying of soil cover reduces germination. Perhaps the most effective reproduction method seems to be spreading of tufts, possibly enrooting of broken stalks.

Where does it grow in the world and in our country?

Moravian pink is an endemic species of a small area in the southwest of Moravia. We know of seven existing sites and two extinct sites in the river valleys of Dyje (the Růžový Hill by Chvalatice), Želetavka (the NR Suché Rocks by Lubnice), Rokytná (Florián, Buben and Křížová Mountain † by Moravský Krumlov, Tábor by Rokytná and Baba by Budkovice †) and Jihlava (the NM Pekárka and Červená Rock by Moravské Bránice). We cannot rule out its possible discovery in a neighbouring area in northern Austria.

What environment does it grow in?

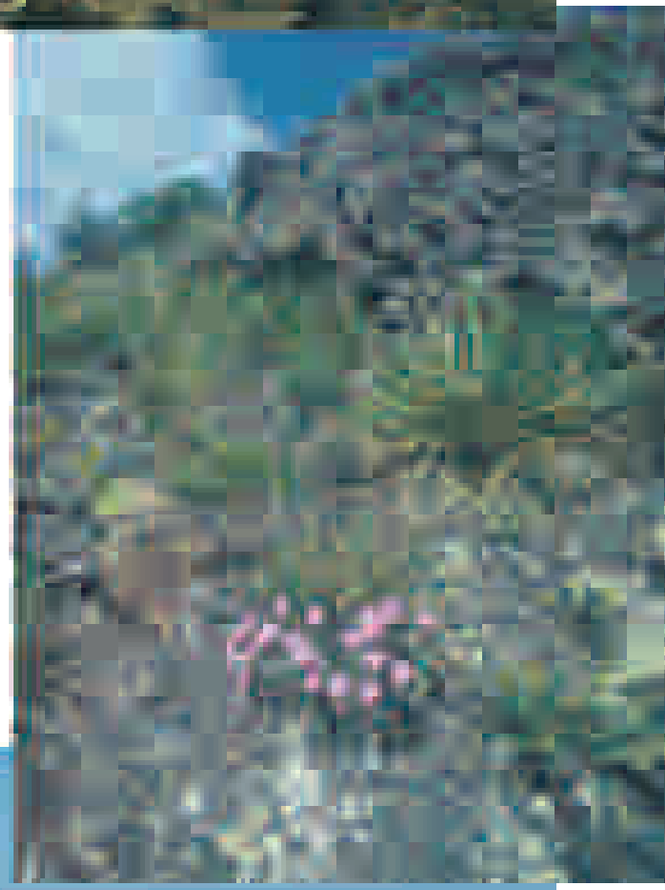
We find it growing on rocks and rock slopes of deep river valleys. It inhabits various geological substrates - calcic pudding stones, granodiorites, granulites and gneiss. Habitats are always half shaded. It prefers slightly northern exposures.

Why is it so rare?

Its origin and evolution stay unclear, but it is distinctly isolated from its close related pinks and its distribution range covers a smaller area within suitable steep river valleys. Insect pests affect seed dispersal. A possible threat is excessive overgrowth of sites by shrubs or *Robinia* trees and potentially stone mining. Attractive plants are also of interest for rock gardeners, who collect the plants and can destroy the sites.

What is being done for its survival?

Two sites are situated in protected areas and others are being prepared for their designation. We have enough information about the ecobiology of this species and generative and vegetative multiplication is easy. Some sites of Moravian pink are very difficult to access and this is the best situation for its conservation. If a cascade of dams is not built in deep river valleys in southwestern Moravia, its existence should not be threatened.

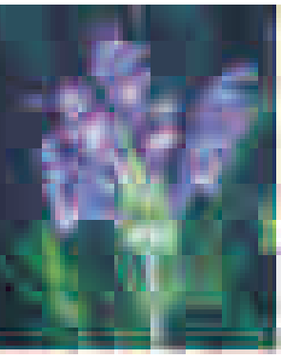


1
2
3

1, 2 a flowering tuft situated on a steep pudding stone rock with open vegetation cover

3 St. Florián looms high over Moravský Krumlov and Rokytná River; a numerous population of Moravian pink, which has been scientifically monitored, grows on its steep slopes

Dracocephalum austriacum L.



Austrian dragonhead
Lamiaceae
Mint family

when we examine closely the flowers of Austrian dragonhead, we understand its Latin and English names

How do we recognize it?

Austrian dragonhead is an unmistakable plant with pinnatipartite leaves formed into narrow acicular segments. It reaches 40 cm in height. Flowers are big and blue-violet.

Something about life

It is a long-living perennial herb or shrub slowly growing in tufts. It blooms in May and finishes flowering in the first half of June. Flowers are pollinated by hymenopterans with a long proboscis, most often by bumblebees. Four fruits (nucula) are formed. Seeds germinate well, but successful rooting of new seedlings is quite low.

Where does it grow in the world and in our country?

Its distribution is very scattered and isolated in Europe. It grows in the eastern Pyrenees, France, Italy, Switzerland, Austria, Slovakia (6 sites), Hungary, Romania and Ukraine. Eastwards it reaches the foothills of the Caucasus. Nowhere it is a common species.

The Czech sites form the northern margin of its distribution range. The distribution centre of the dragonhead is situated in the PLA Český kras, where it grows on eight sites, approximately five hundred plants. In the NNR Karlštejn we find it on Haknovec, Velká Hill and in the Kozelské Valley, in the NNR Koda in Císařská rokle and on Kodská stěna. It also occurs in the NR Karlické Valley and Na Vacenovicích. It extends to the Prague area where at present it grows only in the Radotínské Valley. But in the past it was recorded in the Prokopské Valley. An introduced population was planted in the area of Koněpruské Caves. It became extinct on Deblík in the České Středohoří, where the last plant was recorded in 1996. Two tufts grow isolated in Moravia on the site Zázmoníky by Bořetice.

What environment does it grow in?

The dragonhead is a thermophilic species of calorific habitats. It prefers exclusively fully sunned areas in open vegetation cover. The bedrock can vary, but it is usually nutrient rich. It often grows on limestones, but in Moravia it also occurs on loess.

In the Český kras we find it almost always on flat ledges in rock walls.

Why is it so rare?

It is a good example of a so-called relict species. It means, it has not survived on many suitable sites. It is under threat by overgrowing shrubs, which is happening on some sites in the Český kras. However, the biggest threat to this species is from stone quarrying. Because of its attractiveness it is also threatened by plant collectors and again for use in rock gardens. It has become extinct on several sites due to a combination of the above-mentioned damages in the last century. It is an ignominy of respectable Czech nature conservation that allowed the irretrievable extinction of the dragonhead on its most northern locality on Deblík.

What is being done for its survival?

All its sites are protected at present. Cutting of shrubs is practised on some sites in the Český kras. Its cultivation from seeds or cuttings has been well managed. The dragonhead is grown in the Prague Botanical Garden and a rescue programme is being prepared. Its aim is to strengthen the weak populations by propagating the remained plants. All the populations are being monitored in detail and research of species propagation is being carried out. If we succeed in our effort, we can see the future of dragonhead in quite bright colours.

1
2 3

1 dragonhead growing in its typical habitat on steep slopes of open rocky steppes, usually near to a top edge

2 dry fruiting stems stay visible for a long time

3 a flowering plant on a limestone rock; in the picture there is visible last year's stem and also dead leaves of a dragonhead in the lower right corner of the picture

Echium maculatum L.

anthers and stigmas extend from united corollas of Russian viper's bugloss; when the flowers begin to fade they turn blue

Russian viper´s bugloss
Boraginaceae
Borage family

How do we recognize it?

Russian viper's bugloss cannot be mistaken, in spite of the fact that many other species of this genus have the same red colour of flowers. Russian viper's bugloss reaches 60 cm in height, rarely almost 1 m. In the Czech Republic there is one more species of bugloss growing common viper´s bugloss, but it flowers in blue, has broader leaves and its styliform hairs extend from verrucose protuberances.

Something about life

It is a biennial to shortly perennial species, but there is no information about how old it can get and how many times it can flower. It propagates by seeds but some tufts can form several stems. A flowering stem with numerous flowers in cymes (scorpioid cymes) emerges from an over wintering rosette in spring. It blooms during June with some plants ending flowering at the beginning of July. Insects do pollination but self-pollination can occur. Four fruits (nucula) can form from each flower and ripen during July. Seed germinability is high; then natural selection excludes seedlings from germinating on unsuitable habitats. Seeds can possibly survive longer periods in a soil seed bank.

Where does it grow in the world and in our country?

Russian viper's bugloss is an east-european species extending to central Europe. Its distribution centre is in Ukraine and Russia. Eastern Austria, Moravia and Slovakia form its west boundary, where it is absent in a bigger part of the Pannonian lowland. Several sites are situated in eastern Poland. In southern Europe it grows in Macedonia and southwestern Bulgaria. It exceeds from the Caucasus to Turkey and Iran, it occurs in isolation in Turkmenistan.

In the Czech Republic we find it exclusively in the Pannonian region in southern Moravia. Historically it has been known from Znojmo, Brno, Vyškov, Hustopeče, Ždánicko and Čejč regions and from the southwestern part of the White Carpathians. Today, it has been recorded at fourteen sites with a total number of seven hundred individuals. Most sites are situated in the area among Hustopeče, Kyjov and the edge of the Hodonínská doubrava Forest. The richest population is in the NR Horky by Milotice. It grows also on the Hádecká planinka above Brno and very rarely occurs at its northern limit in the Větrníky by Dražovice in the Vyškov region. Recently, after a long period, it has been recorded again from the White Carpathians from three sites nearby Hluk.

What environment does it grow in?

This steppe species prefers open dry and warm habitats, often on steep hill slopes. In our country it almost exclusively grows on deep loess soils, but in Slovakia we find it on rocky soils. A high content of nutrients in the soils is always important. It favours a certain level of habitat disturbance; it grows extremely well, for example, on rabbit diggings.

Why is it so rare?

The main cause is indubitable a marginality of its distribution range. Several sites have been completely destroyed; elsewhere it has become extinct as a result of fertilization. Only a few individuals grow on most sites, so any unsuitable influence can destroy the whole population. Its conspicuousness puts it at a great risk from plant collectors, even picking for sprays. It is a short living species and depends on frequent propagation from seeds therefore such picking activities have a very negative impact on the population.

1 2 3

1 a pair of flowering plants in relatively dense grassland

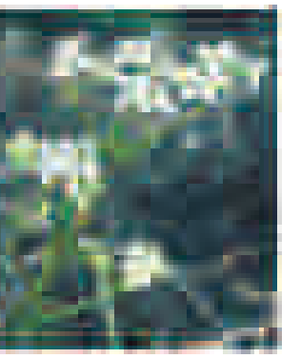
2 flowers and last year's stems, prove that this Russian viper's bugloss flowers more times in its life

3 the most numerous population of Russian viper's bugloss grows on the hillside Horky by Milotice

What is being done for its survival?

Almost all the sites are protected and suitable management practices have been applied - cutting shrubs and eventually mowing. Slight habitat disturbance is suitable for Russian viper's bugloss. The species has been studied in detail and all the sites have been mapped. Its cultivation is easy. A new introduced population has been planted in Hády. Individual specimens have been marked on the Horky site to study its life cycle. A rescue plan to strenghten weak populations is being prepared. It has got a good chance to survive and expected climate extremes will support it.

Galium sudeticum TAUSCH



a detail of small tetradynamous flowers

Sudetic bedstraw
Rubiaceae
Madder family

How do we recognize it?

That is very difficult. A reliable identification can be a problem even for experts. Generally we can say that it is a small (max. 20 cm tall) perennial, tufty bedstraw, with a bare stalk without sterile root sprouts. The leaves are in whorls of 5 – 6 in each. They are single-veined and pointed, flat and smooth at the edges. The flowers are white and the fruits, which consist of two so-called, mericarps, have spherical bulges on the surface. The fertile plants can be determined with more certainty. The plants from the Giant Mountains and Slavkovský Wood differ slightly in certain traits.

Something about life

The Sudetic bedstraw is a perennial species. Sometimes it can survive in a vegetative state during winter. It reproduce mostly by seeds. The vegetative reproduction by prolife-ration of short rhizomes is limited. It blooms from June to September and is pollinated by insects.

Where does it grow in the world and in our country?

To date we have evidence of its existence from two isolated areas. In the Giant Mountains there are three sites in the Czech part; Rudník, Kotelní jámy, and Čertova zahrádka, and two in the Polish part; Malá Sněžná jáma and a corrie of Malý Rybník. In the Slavkovský Wood it grows on several serpentine localities near the Prameny village, including the most important ones such as Křížky and Dominova Skalka. Historically, it has been observed also in Velká Kotlina in the Jeseníky Mountains but its existence there has not been verified in recent years.

What environment does it grow in?

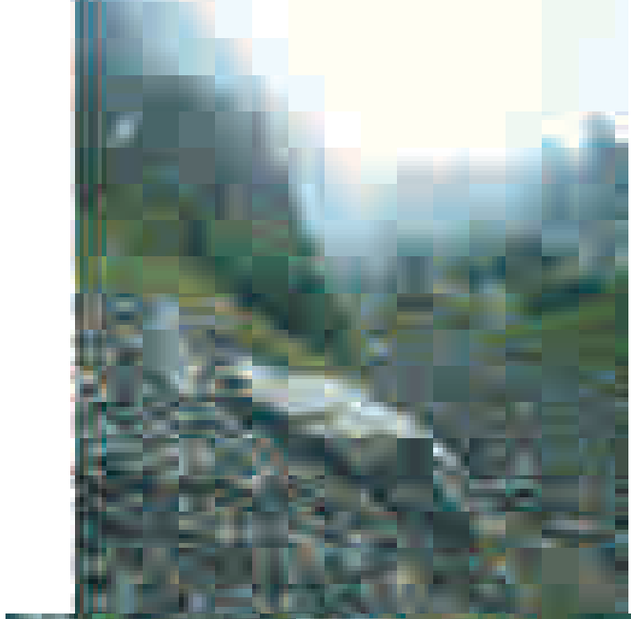
It always requires habitats, which are open, sunny, and locally warm. The soil is usually shallow but always from neutral to basic and rich in minerals. In the Giant Mountains it prefers rock terraces and outwash fans. In the Slavkovský Wood it grows on serpentine at the edges of unforested rocks or sunny places in rocks in pine wood.

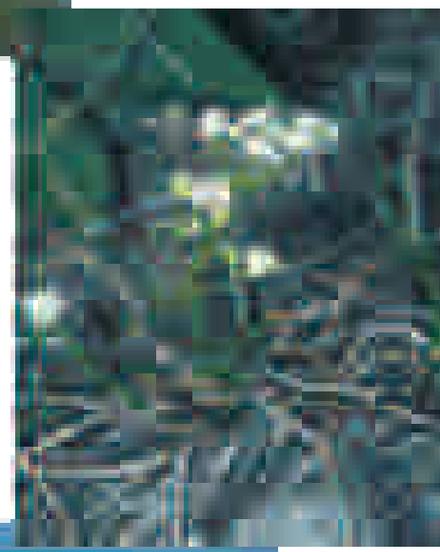
Why is it so rare?

Bedstraws from the *Leptogalium* section tend to form populations, which are described as individual species. They differ in several characteristics, especially on fruits. They are typical for their relatively small distribution ranges. This is also the case for Sudetic bedstraw, which formed in Bohemia after the last glacial age probably by a combination of chromosomes multiplication (polyploidisation) and isolation from other related species. Thus the small number of habitats is the main cause of its rarity. We can also understand it in such a way that natural selection tests the successfulness of the created plants, and concerning Sudetic bedstraw, the result has not been clearly defined. Their habitats are endangered by succession, and excessive trampling can also cause damage. Unclear is the role of avalanches in the Giant Mountains. They create new habitats for bedstraws on one hand, but on the other hand, they can smash them and destroy almost the entire population.

What is being done for its survival?

All the populations are located in strictly protected areas. However, little has been done practically for this species till now. Also very little is known about its basic biological characteristics. Thus our knowledge about this bedstraw has to be broadened, but so far it thrives well, even with its many undiscovered secrets.





1 2 3 4

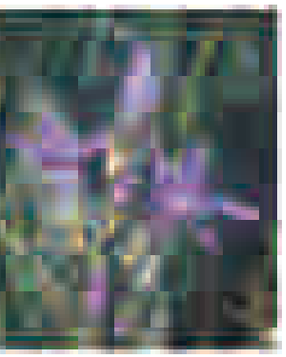
1 the population of Sudetic bedstraw grows in the stone fields on the steep Čertova zahrádka slopes in the Giant Mountains

2 the dense population in the Giant Mountains; we can see how the stems creep to colonize new places among the stones

3 small tetradynamous flowers can sometimes almost cover the tops of stems

4 plants growing on serpentines in the Slavkovský Wood do not grow to such a great height but can form large vegetation cover

Gentianella praecox (A. et J. KERNER) E. MAYER subsp. ***bohemica*** (SKALICKÝ) HOLUB



Bohemian gentian
Gentianaceae
Gentian family

autumn flowers
of Bohemian gentian
are pleasant instruments to say
good bye to the summer season

How do we recognize it?

Gentians can be, according to the conditions, under stated plants several centimeters tall with few flowers but also half-meter tall beautiful bunchy plants with many flowers. Their determination is very tricky. Every species usually has summer and fall forms, which are considered to be subspecies. These seasonal forms often differ from each other more than two different species. Our gentian has got pentamerous flowers larger than 2 cm. Most of the important traits are on the calyxes, the sepal notches on some plants are of a U shape, the sepals are longer than the calyx tube, and there are no lathy or papillary junctures. The nominative subspecies *G. p. praecox* blooms in June and July and has got a smaller number of internodes. In our country, it grew only in higher altitudes in the Šumava Mountains and the last Czech record of its existence comes from 1914. It is even possible that this subspecies has become extinct in its entire range. There are also interspecific hybrids who's determination can only be done by specialists.

Something about life

This biennial species propagates solely by seeds. In the first year it forms a leaf rosette, which survives the winter. In the second year the leaf rosette gets bigger blooming from the end of August to October. The flowers are pollinated by different kinds of insect but self-pollination is possible too. A large number of seeds forms in the capsules. For its entire life or for the first year at least, the species development is supported by a certain species of fungi inside its roots (endotrophic mycorrhiza).

Where does it grow in the world and in our country?

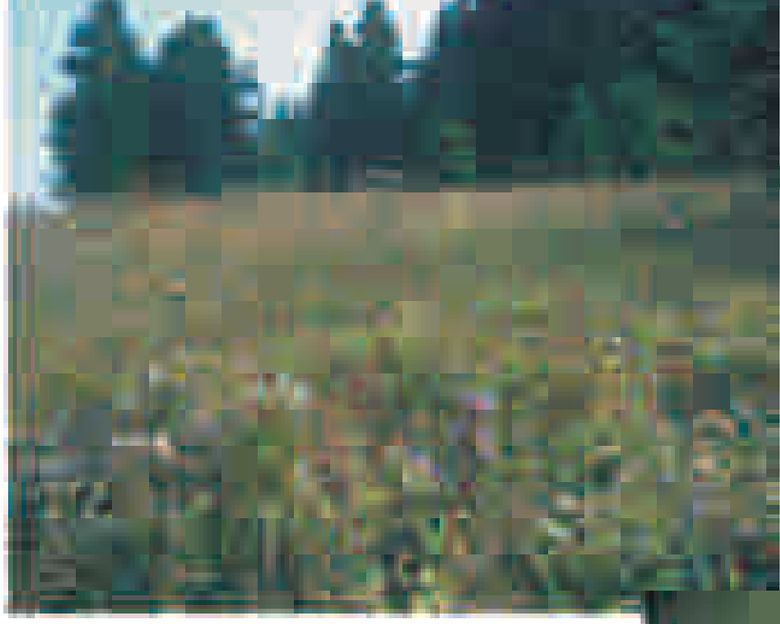
Gentians form small ranges. This subspecies is now almost endemic to the Czech Republic. It outreaches only to the Bayern part of the Šumava Mountains and neighboring Austria. It has only several localities in both countries. In the past it grew in the south of Poland as well. In the Czech Republic this gentian was once located in a wide strip from the Šumava Mountains through southwest and south Bohemia, the Czech-Moravian Highlands and the Železné Mountains to the Drahanská Highlands. Its most frequent occurrence so far has been in the Pošumaví area, isolated sites remaining in the Žďárské Hills, the Drahanská Highlands, and at one site in the Tábor area. In southwest Bohemia it meets the range of other gentian (*G. obtusifolia sturmiana*) where some sites with hybrids occur as well. It grew also in the foot-hills of the Jeseníky Mountains and we can still find it near the Orlické Mountains, in the Broumovsko region and the Giant Mountains. In this area it used to meet and interbreed with German gentian and it is still possible to find plants of the transitional appearance. Nowadays, there are approximately 50 sites known in the Czech Republic.

What environment does it grow in?

This species prefers open meadows, wastelands, and pastures without any dependency on the geological bedrock. The habitat's humidity can vary too but it slightly prefers dry habitats. In recent times it has occurred in highlands and foothill areas. In the lowlands it was rare even in the past and does not grow there anymore.

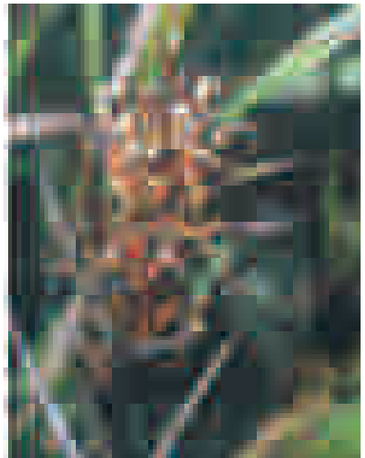
Why is it so rare?

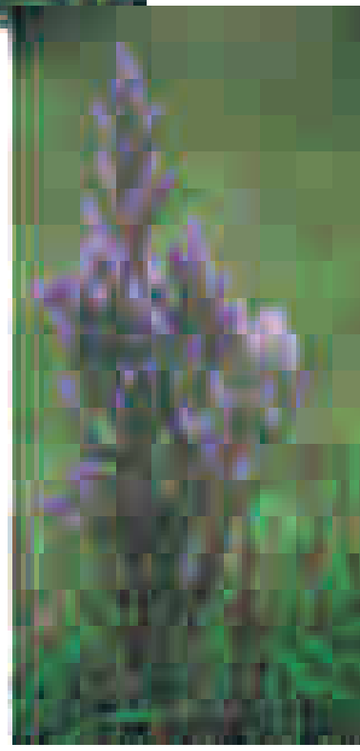
Gentians are the best examples of plants, which do not fit the present landscape. A radical decrease in numbers occurred from the 50's coinciding with the implementation of the large-scale land use system, implemented for disputable goals. However, it was disappearing even from outside the regions of the socialistic experiment, as the farmer was leaving the landscape. Today there is a lack of grazing by various animals, especially goats, sheep and fowl, or use of carriages pulled by animals or similar activities that cause slight disturbances of the soil layer. When the landscape was a heterogeneous mosaic in which man was active. The mechanical disturbances ensured that the seeds mixed with the soil and were transferred to suitable places with the right humidity conditions for their germination. The use of chemicals also played a negative role as it disturbs the complicated but well-balanced bonds between gentians and fungi. People can extensively collect pretty blooming flowers as well. Artificial cultivation has not been successful at all, thus its survival depends only on the way we treat it in its natural environment. Dependency on the regular restoration from seeds makes the situation even worse. For example, it suffered very badly from the hot season in 2003, and there were just a few places where it bloomed. The recurrence of such events in weakened populations can be fatal.



What is being done for its survival?

Many sites are located in protected areas but it is usually not sufficient even when they are regularly mowed and raked. Only several sites are grazed. The species is being intensively monitored within Master's Thesis and Dissertations and we have enough information on its ecobiology. A rescue plan is being prepared. Even this effort may not have a happy ending in the form of a saved gentian. Six of the subspecies have already become extinct in the Czech Republic. We have started making the effort to save this species quite late and it is questionable whether it will be possible to maintain the sites in such a way to be suitable for the gentians in the long term.





1 dry submontane grasslands, and better still pastures, are habitats of the Bohemian gentian, here is the site near Protivanov

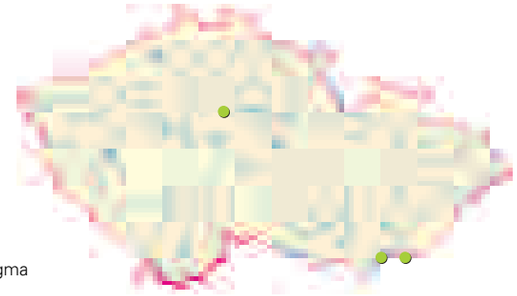
2 in good conditions gentians are stout, well branched and covered in flowers

3 a fruiting plant with open capsules

Gladiolus palustris GAUDIN

detail of a flower with a noticeable stigma and anthers

Swamp gladiolus
Iridaceae
Iris family



How do we recognize it?

Almost everybody can recognize an gladiolus and many people are amazed by the fact that two species of it grow in our country. From the more frequent meadow gladiolus, swamp gladiolus can be recognized according to the reticulate scales on the corms. Although we cannot dig out such a rarity, we can notice the pointy lower leaf (it usually has 2 leaves, 3 while blooming) about 1 cm wide. There are 3 to 7 purple flowers and the calyx tube is nearly straight. The plant can reach a height of up to 60 cm.

Something about life

This long-living perennial species survives winters thanks to its underground corm. The older corms can split up and create new plants with more stems. Even some separation from mother plants can be possible. The blooming can be quite irregular and we still are not certain whether the leaves of blooming plants rise up at all or whether corm stay dormant. It blooms for a very short time, most frequently between June and July. The blooming plants usually create seeds, especially from the lower flowers. Its pollinators are various kinds of insect, mainly hymenopterans and dipterans. The seeds fall in the vicinity of the plant. To germinate they do not have to go through freezing seasons. It seems they can naturally germinate already in the autumn.

Where does it grow in the world and in our country?

The swamp gladiolus is a species of the European continent with a discontinuous range from Lithuania, through Poland (here now extinct), central Germany to the Rhineland. Rarely does it grow in France, Italy, Switzerland, Austria, Slovakia (the last locality in Záhoří), Hungary, Romania, the countries of former Yugoslavia and Albania. There is an isolated locality in south Byelorussia and in a neighboring part of the Ukraine. It is rare in all these areas. This fact can be supported by one example from Austria, where since 1982 the number of sites has decreased from 21 to 8 (in 2001) and the total number of individuals has decreased from approximately 1200 to 463 in 2000 and 391 in 2001.

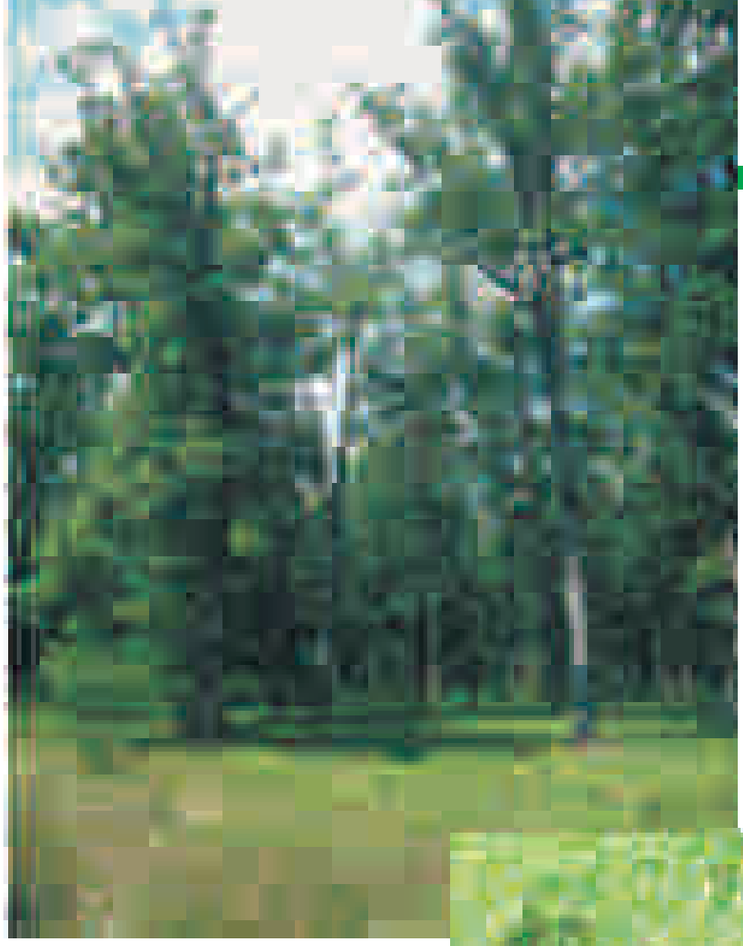
In the Czech Republic there were 15 sites known historically, but now it survives only at 3 of them. There are 4 very small sites in the Hodonínská Dúbrava, which contain approx. 60 individuals altogether. Concerning the more frequent occurrence in the White Carpathians, there are about 10 individuals known at the edge of the Čertoryje National Nature Reserve in the Vojšické Meadows. The third place of its occurrence is the NNM Slatinná Meadow near Velenka with a large population. Almost 1000 individuals can be found there.

What environment does it grow in?

The species name makes us think it must be a plant growing in wetlands but this is not completely true. The swamp gladiolus prefers rather periodically than permanently wet habitats. Most frequently it grows on *Molinia* meadows but also in periodically wet oak woods also with *Molinia*. The soils are always rich with minerals, usually neutral or slightly basic.

Why is it so rare?

From its disappearance through the entire range, we can conclude that the species may be generally dying off. However, it could be caused only by excessive habitat destruction. The general water regime destabilization represents a serious threat for this species. Many suitable habitats were drained, ploughed up, fertilized etc. In woods it is under threat by changes in the tree species composition and by extensive woodcutting. Even their collecting cannot be excluded, since the blooming plants are very attractive. However, there is one fact, which makes its rarity slightly relative. The plants which are not in bloom may be tricky to find and can be missed even during detailed surveys.



1
2

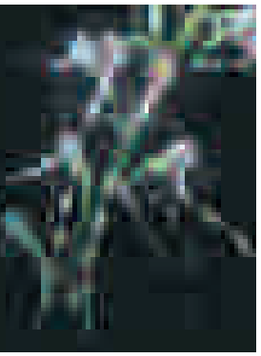
1 a numerous population of swamp gladiolus occurs in the open oak forest with *Molinia* in the Hodonínská Dúbrava near the Hovoranská road

2 a fruiting plant with open capsules

What is being done for its survival?

With the exception of several populations in Dúbrava, all other areas of its occurrence are located in protected areas with suitable management, which means mowing at the end of July and August after gladioluses shed their seeds. Most of the Czech and Moravian gladioluses have been marked and long-term monitoring has been initiated. Also a rescue plan is being prepared. It consists mainly of storing the seeds in seed banks and subsequently their cultivation, which serves as a safety precaution in case of problems in their natural habitats. The restoration of its population in Polabí is being taken into consideration as well. Although the situation in our neighbouring countries does not seem much better, we keep hoping that with the right conservation efforts its existence in the Czech Republic does not have to become a dark past.

Himantoglossum adriaticum BAUMANN



in this detail of a flower there is a visible long ligulate inner lateral perianth-segment forked at the end with short outer perianth-segments

Adriatic lizard orchid
Orchidaceae
Orchid family

How do we recognize it?

In its blooming season, the lizard orchid is a unique and well recognizable orchid with its ligulate forked labia. There is no other lizard orchid in the Czech Republic. It grows from 30 – 50 cm, rarely does it reach a height of 1 m. The leaf rosettes are harder to recognize, they can be mistaken with other orchid species.

Something about life

The lizard orchid is a perennial plant. It has got an egg-shaped corm in the ground, which can sometimes split up and form a new plant. Since the entire genus developed in a warm Mediterranean climate, in the fall the lizard orchid can already form green leaf rosettes, which can be growing in good conditions during the whole winter. The strongest plants bloom in the beginning of June, the rest have already dried up in March. Unidentified species of hymenopteran insect are probably its pollinators. A large number of seeds are created but only a small fraction of them gives birth to a new plant. That is because the sprout, which comes out of a small seed in the pre-embryo stage, has to cooperate with a certain kind of fungi, which pervades to the core of its roots (endomycorrhiza).

Where does it grow in the world and in our country?

This species was first distinguished from other lizard orchids (*Himantoglossum hircinum*) in 1978. Its range is not large, it can be found from Italy, Slovenia, Croatia, through Austria, Hungary and Slovakia, to Moravia and Bohemia.

It used to grow at the base of Milešovka (usually incorrectly identified as *Himantoglossum hircinum*) in Hády near Brno, Pálava, Výhon near Židlochovice and Podyjí. Nowadays there are about 40 individuals surviving at one site in the Chvojnice Valley near Ketkovice.

What environment does it grow in?

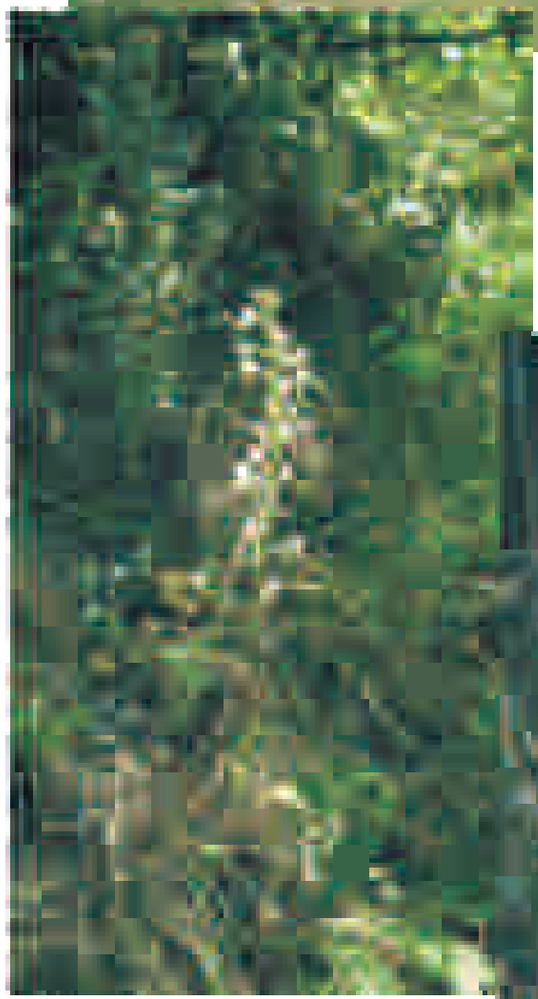
The Adriatic lizard orchid is a semi-shady species living at the edges of open pubescent oak forests or on sunny hillsides with shrubs. It grows on dry, usually shallow, rocky soils with neutral or basic reaction.

Why is it so rare?

In our country it grows at the edge of its range and certainly it was never a very frequent species. It needs semi-light habitats with moving shade, which can be difficult to find considering today's forestry practices that lead to a dense cover with permanent shade. Being an attractive plant it can be picked up or even dug out. Its cultivation is extremely complicated and attempts to propagate have been unsuccessful.

What is being done for its survival?

The only existing site is protected and regularly mowed in July and August after the orchid's seeds fall out. The vegetation cover is being trimmed to increase the variability of suitable habitats and to strengthen the populations themselves. All lizard orchids are counted every year and their position marked. A rescue plan is being prepared and should support the effort to manage its propagation as a precaution against unexpected events. The present population of lizard orchids seems viable but is very vulnerable due to its uniqueness and a low number of plants. Orchids tend to create new temporary sites and the transfer of light seeds from Austria or Slovakia to Moravia is possible. Thus we cannot even exclude the possibility of discovering new sites, although such an event is not very probable.

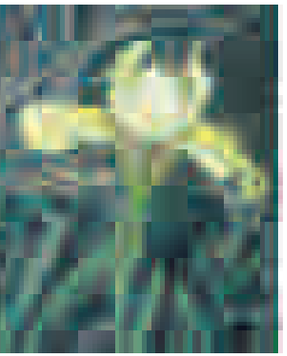


1 the site of an Adriatic lizard orchid population

2 a flowering plant has almost dry leaves

3 an inflorescence of Adriatic lizard orchid

Iris humilis GEORGI subsp. *arenaria* (WALDST. et KIT.) Á. et D. LÖVE



Sandy iris
Iridaceae
Iris family

a plant with conspicuous brushes on its outer petals

How do we recognize it?

This iris is a small species about 15 cm tall. It can be confused only with a *I. pumila* but the presented species has usually dark yellow flowers on the stem, with standing not bent perianth tips. Determination of non flowering plants is difficult although *I. pumila* has wider leaves.

Something about life

This perennial species survives with a thin rhizome located close to the soil surface and forms sprouts through which it expands. Therefore, it is sometimes difficult to identify the extent of one plant. It blooms with many flowers and offers one of the first sources of food for pollinators, for it starts blooming at the end of April and blooms always in the first days of May. Each of the flowers unfurls only for one day, so the total time of blooming is short. Big seeds are formed in capsules from which they fall out during the summer. There is no information about sprouting and the seedlings' following destiny.

Where does it grow in the world and in our country?

This pontic-pannonic taxon occurs in south Russia and central Ukraine (where the local populations can be taxonomically different), Romania, Hungary, Austria, south Slovakia (the only site being in the Čenkovská Forest-steppe) and in the Czech Republic in south Moravia where it reaches the absolute north-western boundary of its natural range. In our country it grows on four sites near Moravský Krumlov, e.g. near Vémyslice (the NR Na Kocourkách) and Bohutice (the NM U Michálka). Five sites are known from Pálava, the best known occurrence is on the Svatý Kopeček in Mikulov.

What environment does it grow in?

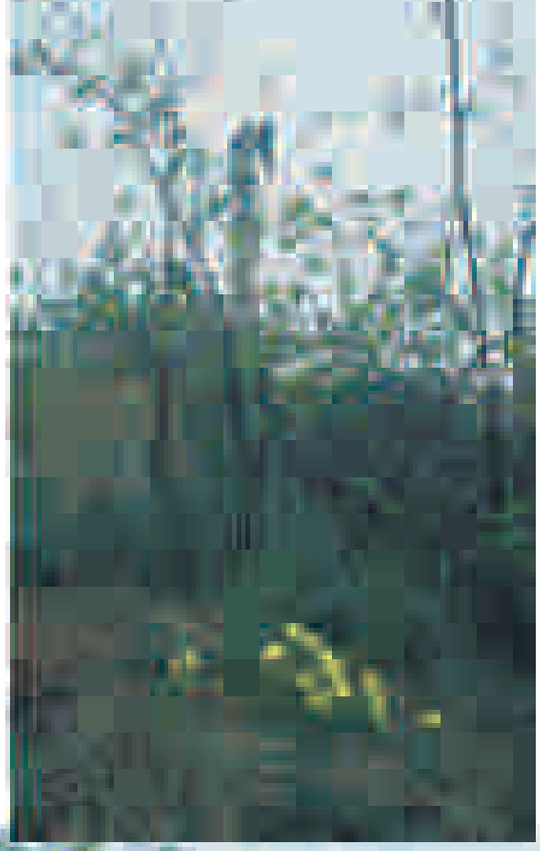
Almost everywhere in its range it grows on sands as its subspecies name suggests. In south Moravia we can find it on shallow, well-drained, skeletal soils on granite, gneiss or limestone. It is a species of sunny and hot locations with low competition from other vegetation.

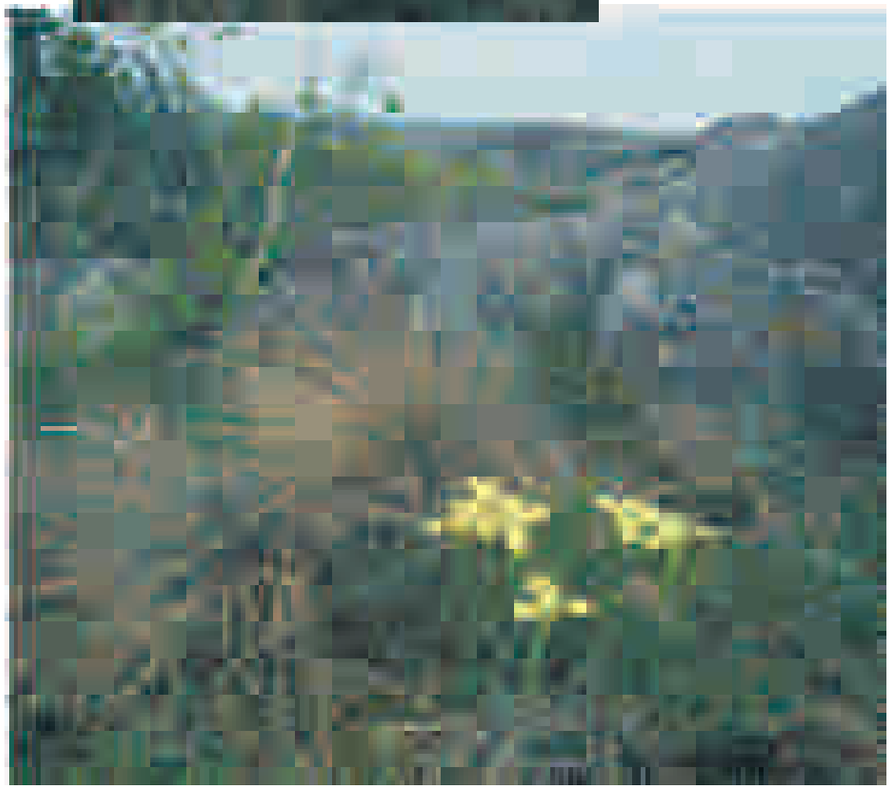
Why is it so rare?

In our country it grows at the edge of its range, so the total number of sites is fairly good. In addition, there is no apparent negative trend observed. One population was lost due to limestone mining and another due to succession by woody plants, which represents the most significant threat. Another significant threat may be the plant's attractiveness and its digging out or excessive disturbance of its habitats.

What is being done for its survival?

Most of the sites are protected. There is not much information about the species biology. Our isolated and still rich and unique populations should be used for detailed ecological and population research. Its cultivation is possible but the species is very sensitive. It is probably not directly under threat and we can look forward to its spring greetings.



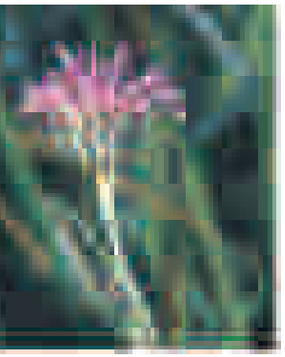


1
2

1 sandy iris starts flowering at the beginning of May and is one of the first spring greetings

2 a group of sandy irises on a shallow rocky substrate

Jurinea cyanoides (L.) REICHENB.



a flower head detail of cornflower-like knapweed with a noticeable bipartite stigma, which is a typical feature for all Daisy family

Cornflower-like knapweed
Asteraceae
Daisy family

How do we recognize it?

Jurinea resembles some cornflower species at first sight. The most reliable traits are white tomentous leaves with linear notches on the underside. At the leaf axil on a stem, there is a small axillary bud. The flowers are arranged in calathidums, which are composed exclusively from ligulate flowers. A blooming plant can reach a height of a half of a meter.

Something about life

This perennial plant expands into larger vegetation covers through its robust rhizome system. Vegetative reproduction prevails significantly. The plants create plenty of flowers while in good conditions and are pollinated by various kinds of insect. It blooms from July to September and the flowers are often attacked by gall gnat's larvae, which decrease the fruit (achenes) production. On the Czech sites the seedlings have not occured almost at all in the last decade.

Where does it grow in the world and in our country?

Cornflower-like knapweed is a species with a large continental range. The continuous range goes trough Byelorussia, Ukraine, the Caucasus, Turkistan, western Siberia and reaches as far as Altai. Isolated populations can be found in central Europe in Germany (the central Elbe region, the foothills of Harz, Niederausitz, the Rhein Valley and the Main Valley) and in the Czech Republic.

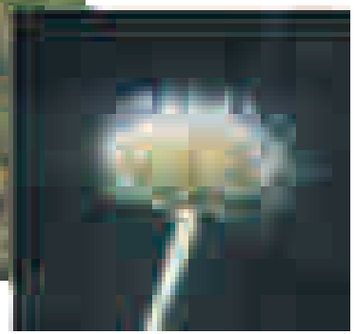
In our country, from the original 30 sites in the central and western Elbe region located between Nymburk and Litoměřice, only two of them remain to the present time, not far from the villages of Oleško and Tišice. Both of the populations are very weak right now. They consist of tens of rosettes, which can belong only to several clones.

What environment does it grow in?

It is a typical sand species (psammophyte). Their habitats are usually sunny or partially shaded. It needs open space without dense vegetation. Such a habitat can be found on sand dunes, heathlands, in sparse pine forests and frequently also at places influenced by human activities such as sandpits, road and rail banks and edges or military training grounds. It requires basic or slightly acidic soils. In central Europe this species grows on very fine-grained soils rich in minerals. In the area of its main range it grows on black earth soils or sunny calcic hillsides.

Why is it so rare?

As mentioned many times before, the fact that it is at the edge of its range and isolated from other populations is a negative factor because the local populations are genetically deprived. It is diversity, which gives the species the trump cards in the natural selection play. The present situation of the Czech populations is even more extreme as there is nearly nothing to select from. It is possible that the low seed production is caused by the fact that all the remaining plants are too closely related and their reproduction is complicated, if it happens at all. We have been writing about the threats to sandy habitats in the section about pinks, so it can just be summarized that they are already become stabilized/motionless, and often frequently destroyed by sand exploitation, forestation (especially by *Robinia*, which means irreversible damage since the soil gains nitrogen) or by agricultural activities (directly by liquidation or indirectly by fertilization). Nutrients also get into the soil via rain from the atmosphere. In addition, some aggressive species of our flora can spread onto the sites; most frequently it is *Calamagrostis epigejos*.



1 2 3

1 the view from the site Písčina by Tišice, in the past cornflower-like knapweed thrived from disturbance by fires caused by steam locomotives

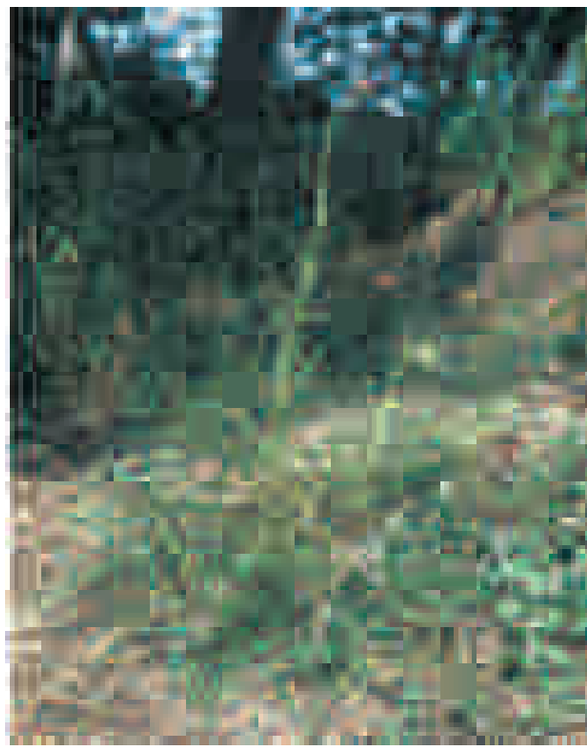
2 the fruiting flower head of cornflower-like knapweed is also attractive; in 2003 this was the only ripen one in the Czech Republic

3 a complex view at a flowering plant of cornflower-like knapweed with a rich base rosette of pinnatifid leaves

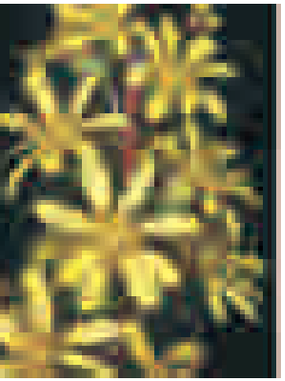
What is being done for its survival?

The best way would be to blow in such a way that the sand got in motion again. Alas, the old times have passed. However, there are still some management techniques, which can help, such as the removal of woody plants and reed grass, surface soil disturbance, and other activities, which keep the soil surface opened. The site near Tišice is protected; the one near Oleško will be in the near future. Cultivation of cornflower-like knapweed is not too difficult, however, it has not been done so far. A rescue plan is being worked on which is supposed to specify the best management of the habitats, develop ways of *Jurinea*'s propagation, above all, ensure the genetic structure of both populations is researched so it is clear what has really remained. Without such knowledge all attempts to propagate this species are like shooting with closed eyes.

Cornflower-like knapweed has been disappearing so quickly in the last decades it has become our most endangered species and the closest to extinction from all the other species presented in this publication. Its conservation will be possible not only by an extreme effort but also with plenty of luck and intuition.



Ligularia sibirica (L.) CASS.



Siberian leopard plant
Asteraceae
Daisy family

a detail of calathidums with differentiated sterile linguiform flowers and reproductive tubular flowers, bipartite stigmas can also be seen

How do we recognize it?

The plentiful Asiatic genus has only one representative in the Czech Republic. Siberian leopard plant is an impressive stout plant and in its blooming period cannot be confused with any other plant due to its remarkable thin inflorescence of big yellow calathidums. In good conditions it can reach a height of 1.5 m. The leaves have an oval kidney shape and are similar to the ones of *Petasites* or *Tussilago* but the petioles have a deep groove on the upper side.

Something about life

Siberian leopard plant is a perennial plant, which creates side leaf rosettes when getting older. The older plants proliferate this way and form tufts with a large number of flowers. It blooms usually in the middle of June and the blooming period lasts till the end of the summer. Not only are hymenopterans pollinators but the wind is as well. It spreads numerous downy achenes. They germinate very well but most of the seedlings do not survive their first season in their natural environment.

Where does it grow in the world and in our country?

This continental species of the temperate regions thrives in Siberia and reaches the Amur region in the east. Concerning central and west Europe, Siberian leopard plant got there right after the glacial period in the preboreal and rarely did it stay till today. It grows on several sites in Slovakia, Poland, Austria, Romania, Bulgaria, Croatia, and seclusively in one area in France. In Bohemia we can find it in two areas in the Doksy region. In the Bělá River floodplain between Bělá pod Bezdězem and Rečkov and there are tens of thousands of Siberian leopard plants in the protected areas of Rečkov and Klokočka. Another area where it is found is between Staré Splavy and Jestřebí in the Sluneční Dvůr Nature Reserve and its surroundings. Recently there has been a new population of several individuals discovered in Pošumaví near the Olšina fishpond north of Lipno.

What environment does it grow in?

Siberian leopard plant grows in sedge and reed swamps, where the organic matter accumulates in the soil due to the high humidity and the lack of oxygen. It can tolerate temporary inundation, although it prefers habitats with permanent water on the surface or just below it. It has the ability to survive long-time droughts; however, it does not tolerate dry conditions caused by competition of other expansive species. It is a heliophyte but it grows also in the shade of trees where it survives but does not bloom. It occurs from the lowlands to sub-mountainous regions.

Why is it so rare?

In central Europe it is a postglacial relict, which survived at only a few places. Such species are sensitive to various changes and do not spread to new places anymore. The biggest threat to Siberian leopard plant could be the decrease in ground-water level, as has happened in Sluneční Dvůr. It is also weakened when the sites overgrow with alder trees.

What is being done for its survival?

Fortunately Siberian leopard plant is numerous on its sites and most of its sites are in protected areas. The sites near Doksy are being mowed; the best mowing regime for Siberian leopard plant is the repetition of mowing every 3 – 5 years, but in order to manage the other rare species the mowing is done every year or every other year. The best time for mowing is from the beginning of July to the end of August. Clearing of the self-seeding trees is also a part of the management. At least some plants should be left un-mown so they can generate seeds. Near Sluneční Dvůr on the Robeč Creek weirs are being built which are supposed to increase the water level. Siberian leopard plant is also being cultivated in several institutions. The future survival of this species should not be a problem in our country.

1 the population of Siberian leopard plant at Klokočka in the sunny wet habitat, it extends to alder stands but it does not flower there

2 Siberian leopard plant contains many fruits, achenes have pappus

Liparis loeselii (L.) L. C. RICH.

a flower detail

Fen orchid
Orchidaceae
Orchid family

How do we recognize it?

This small orchid with green flowers and shiny leaves grows up to the height of 25 cm but it is smaller most of the time. That is why it is a bigger problem to find the plant than to determine it.

Something about life

This perennial and probably even long-living species winters with tubers. Leaf rosettes grow from these tubers in April; the plants bloom in May or June. After the blooming stage the tubers pass on the rest of their reserve substances and new tubers are formed at the base of the leaf rosettes. In this way fen orchid keeps itself permanently at the surface of the growing mossy tussock. The vegetative propagation through daughter tubers represents a significant part of the total species reproduction. Insect pollinates the flowers but have the ability of self-pollination as well. A lot of small seeds in the proembryo stage are created, however, the way to produce a new plant is quite complicated and takes several years with the necessary cooperation of the fungi partner (endomycorrhiza). The adult fen orchid plants are then less dependent on the fungi component. The seeds are released during the fall or the winter; the dry stems stay till the next spring.

Where does it grow in the world and in our country?

Fen orchid has got a huge but gappy range in the entire northern hemisphere. The southern and south-eastern boundary of its Euro-Asian distribution spreads through the European part of Russia, Romania, Bosnia, northern Italy, France, and the Pyrenees. The eastern boundary of its continual occurrence ends in middle Asia; isolated populations can be found in the Jakutsk region. The northern boundary in Euro-Asia goes through the south-west of England, southern Scandinavia and the Baltic region to the Ob River in western Siberia. In Europe it is already rare everywhere. In North America fen orchids grow from Nova Scotia to Saskatchewan; on the south it reaches Alabama and Missouri.

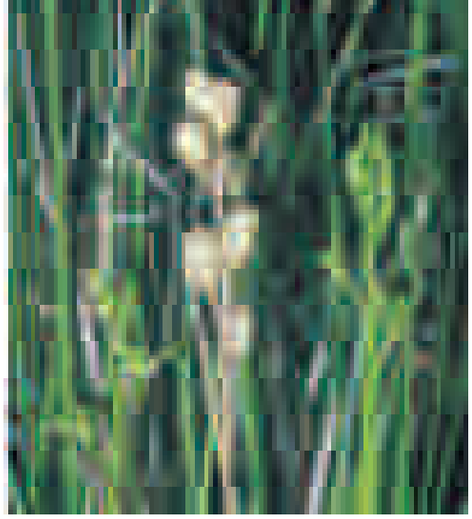
In the Czech Republic there are about 14 sites known today, from which 8 sites are located in the Českolipsko region. At the Shnilé Meadows near Jestřebí, there is one population with more than a thousand individuals, which consists of more fen orchids than there are in the rest of the country. Other sites can be found in Český ráj (the Vidlák peatbog) near Byšičky and at the Broumar Pond. In South Bohemia there is only one but quite plentiful population near the Horusický Pond and in Moravia only seve-ral individuals grow in the White Carpathians.

What environment does it grow in?

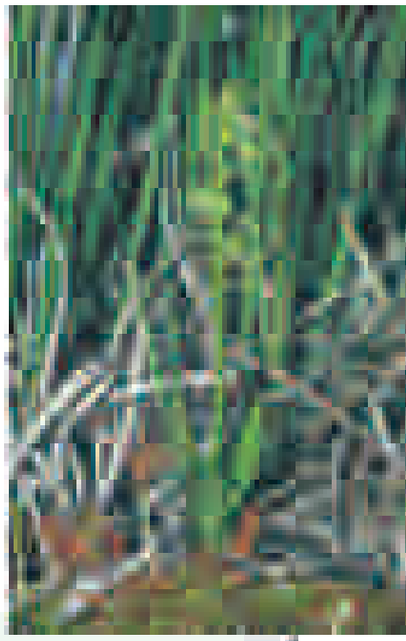
The fen orchid has got very strict demands concerning its habitats. They have to be quite sunny or with a partial shade created by tall grass but not trees. A high water table is very important; you usually wet your shoes when you visit such a habitat. The soil should be neutral or basic but poor on nutrients. The general look of the habitat is usually mossy with sparse reed or sedge plants. Fen orchid grows often at the bottom of small sedge tussocks.

Why is it so rare?

The specific habitats which fen orchids like do not occur at many places. In addition to that they tend to be threatened by human activities, mainly by draining or total destruction. Even the higher input of nutrients from agricultural activities can be harmful. The sites can also be overgrown by alder trees. In the last decades fen orchids have disappeared from many sites, including protected areas, but have occurred on several new sites probably due to the long-distance transfer of seeds.

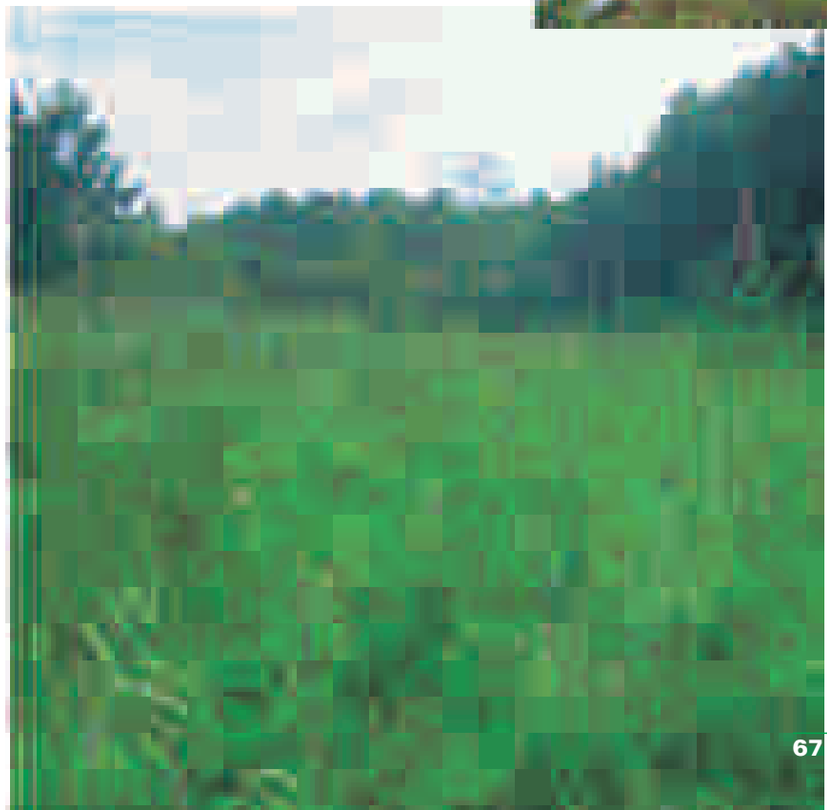


1 this year's and last year's inflorescence of fen orchid
2 a flowering fen orchid plant with round-leaved sundew at the front
3 habitats of fen orchid are wet meadows with sparse sedge and reed cover

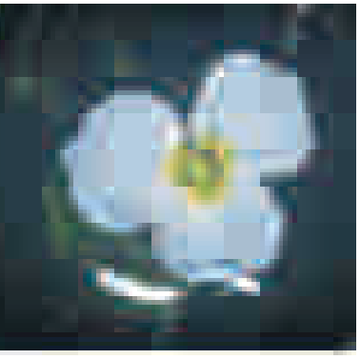


What is being done for its survival?

Most of the sites are protected. The trees growing on them are being removed and the reed is being mowed after the fen orchids have bloomed while at the same time marked plants are left alone. Some years the mowing is done later in August after the seeds get mature. We have quite a lot of information about the species biology and it is studied further at many places where it occurs. In our country all the popu-lations are counted regularly so we have a good picture of its status. The basic approach to its conservation must be the preservation of the large populations, which can serve as a permanent source of seeds for further dispersion. So far the fen orchid has not come close to extinct in our country and if we continue to cut down the overgrowing trees in its habitats, making the habi-



Luronium natans (L.) RAFIN



Floating water-plantain
Alismataceae
Water-plantain family

a flower detail

How do we recognize it?

Blooming water-plantain is easy to determine; this small water plant has got characteristic monoclinous trimerous white flowers. More difficult is the determination of the submerged plant, which grows in rosettes of linear leaves, but even in this case, it is not likely to be confused with other plants.

Something about life

This perennial water plant spreads vegetatively by rhizomes, which are able to create roots. Concerning water plants, it is almost a rule that vegetative propagation predominates. However, water-plantain does not neglect generative propagation. It blooms with many flowers on suitable sites and creates plenty of seeds through which it transfers to other ponds and lakes. It is interesting that the flowers can develop even submerged, they do not open at all and pollination happens in the closed flowers.

Where does it grow in the world and in our country?

It grows strictly in Europe, although it is closely tied to the strip of land up to a thousand kilometers from the sea (subatlantic species). Why it likes the sea climate is not well known; it is most probably due to the connection with frosts and the frequent strong or perhaps longer water freezing periods further inland. The hot spot of its occurrence is in Great Britain, especially in Wales. It grows in Ireland as well. Two of sites are situated in Spain, more frequent it is in France, Belgium, and Netherlands but we can find it also in Germany, Poland, and in the east were it reaches as far as Lithuania. In the north of Europe it grows in Denmark on the Jut peninsula, and in southern Sweden.

In our country water-plantain was first identified in the Frýdlant region, from where it has already disappeared. It was found in the Labské Sandstones in 1999 and thus became a rediscovered species of our flora. At present it grows near Králův mlýn and in a close fire pond. Not far away from these two sites there is another site in the Taubenteich Pond near the border with Sachsen.

What environment does it grow in?

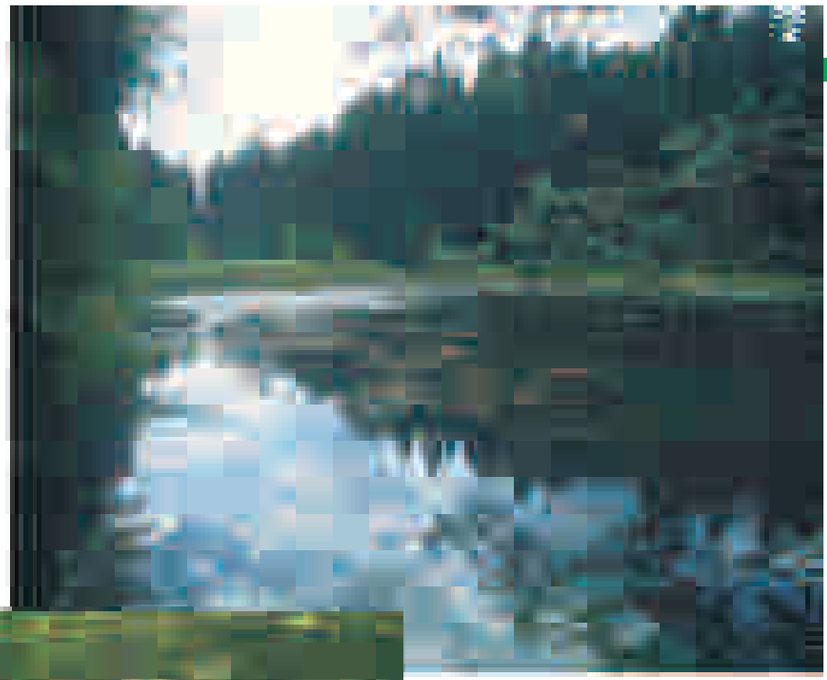
Water-plantain grows in shallow waters and waters up to 4 meters deep, but at this depth it does not bloom and does not create floating leaves. It is a good stress tolerator and thus can grow slowly in conditions where other plants do not survive. It cannot compete with larger water species so it took refuge in colder waters with fewer nutrients where little competition occurs. It was thought for a long time that this type of habitat was optimum for this species. However, there is some French research evidence that indicates it is able to thrive in waters with more minerals but it is necessary to have permanent disturbance by waves, boat transportation, etc. Again, the stress tolerant nature of water-plantain allows it to deal with these situations better than other plants and above all it can occupy new environments very quickly after such disturbance thanks to its fast growing stems.

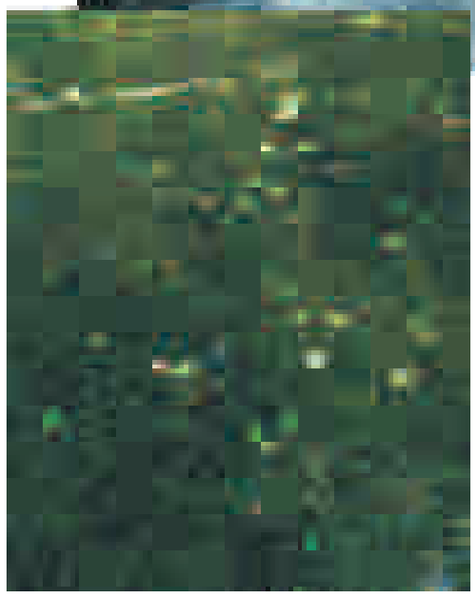
Why is it so rare?

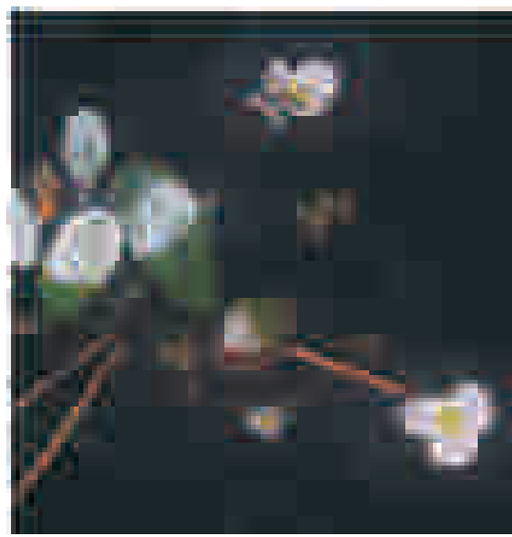
Water-plantain stays at the edge of the Czech Republic and does not pervade further into the interior. The main threat to it may be the increase of mineral content in the water on its sites.

What is being done for its survival?

The Královomlýnský Pond was designated a protected area right after floating water-plantain was discovered there. In 2001, water-plantain was planted to several newly built reservoirs near a fire pond to lower the risk of its extinction. Specimens from the same populations were also planted in Třeboňsko but such a project outside its original range was not given much attention. There is enough information about its biology, as it is, together with orchids, one of the best explored species included in Natura 2000. The expectations of its future existence in our country are fairly good. However, some climate changes, which are out of our control could force it out.





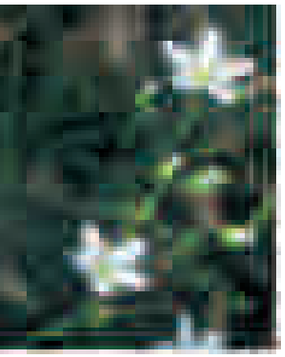


1 the Královomlýský Pond where floating water-plantain grows submerged

2 a population of floating water-plantain, floating leaves form on submerged stems when they reach the surface

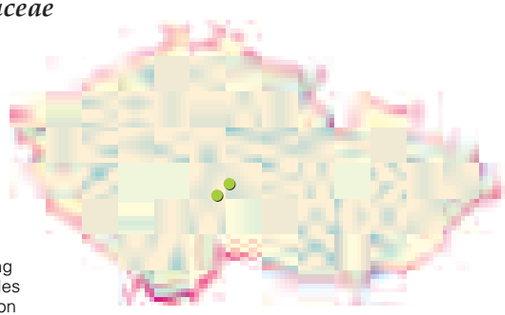
3 flowers and the floating leaves of floating water-plantain

Minuartia smejkalii DVOŘÁKOVÁ



a flower detail showing new originated capsules forming after pollination

Serpentine sandwort
Caryophyllaceae
Pink family



How do we recognize it?

Serpentine sandwort was not scientifically described until 1988. Its proper determination is difficult in herbariums; it does not gather with other species of sandworts in the natural environment. It is a small (up to 15 cm tall) tufty plant, with single-veined linear leaves. Its white flowers are arranged in dichasiums of 3 – 12, reaching a width of 8 mm with 3 styles. The sepals with a narrow membranous edge are shorter than the petals. The anthers change their colour to light pink after pollination and the seeds are spiky with tubercles, which are rather longer vertically than horizontally.

Something about life

This perennial species can lignify at the base of its relatively strong stem. There is not much known about the age of the tussocks but it seems that sandworts are a rather long-living species. The plants start blooming at the end of May; most of them terminate the blooming period in the middle of June but some bloom even in July. The rich bloom setting attracts various small pollinators. A large number of seeds are formed in capsules and the plants use them to take hold at other suitable places. Mortality of young plants is fairly high.

Where does it grow in the world and in our country?

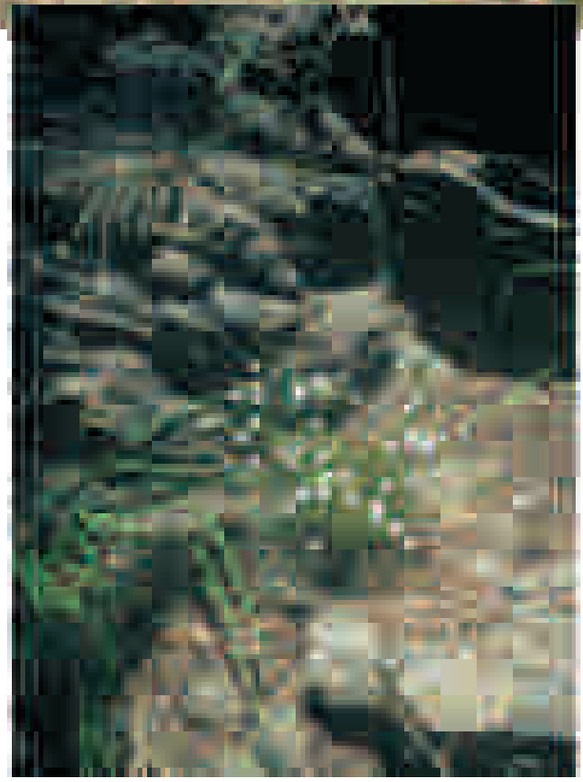
Serpentine sandwort is exclusively a Czech species, an endemic of one small Bohemian region southeast from Prague. It was discovered at three other places but became extinct in the Choteboř region in the 70's. The most numerous populations are located in the region of Dolnokralovické Serpentines near the Želivka Lake, where nearly 500 individuals grow. The last place is the Kambersko region near Mladá Vožice, where only one site with several tens of plants survives near Hrnčíře.

What environment does it grow in?

To be an obligate serpentinephyte means that such a species grows exclusively on serpentines. On such inhospitable ground, it seeks cracks in rocks. We can find it in shallow soils near rocks, in sparse grass vegetation usually at slightly shaded sites of serpentine pine forests and at their edges along roads. In dense closed forests it does not have a chance to live and thus retreats.

Why is it so rare?

Its ancestor is *Minuartia verna*, which in the glacial period retreated from the Alps to lower altitudes and then came back again. However, some of its populations started to change into new species due to their isolation, which is the case for serpentine sandwort. In previous chapters we wrote that serpentines, due to their extreme character, accelerate species evolution. Nowadays serpentine sandwort is "arrested" on convenient serpentines, from which it is not able to spread to other sites with higher competition. Its survival thus depends on preserving good conditions on the sites. A part of the populations was destroyed by the Želivka dam construction and maybe by the construction of the Prague-Brno highway, which goes right along the most numerous populations. The causes of its extinction near Borek in the Skuteč region are not clear. The biggest threat may be changes in the tree species composition, especially replacing pine trees by spruce or larch, which can increase the site's shading and thus kill serpentine sandwort.



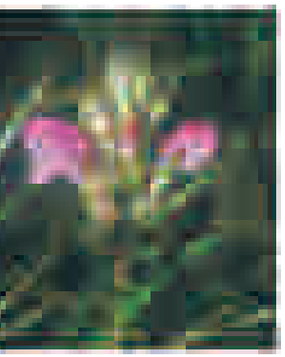
1 habitats of serpentine sandwort are most often serpentine rocks, and also open areas in sparse pine forests

2 one hundred flowering stems can form dense tufts

What is being done for its survival?

At the present time none of the sites are under protection but this is under review in the ongoing designation of protected areas. Long term monitoring has also been started and a rescue plan is being prepared. Within the rescue plan the tree stand in the forest near Hrnčíře will be opened and the possibilities of its cultivation and storage in a seed bank will be studied. If we had increased our effort just a little bit more in the past, serpentine sandwort would not have to be a species heading towards extinction.

Pedicularis sudetica WILLD.



Sudetic lousewort
Scrophulariaceae
Snapdragon family

a flowering plant

How do we recognize it?

It does not occur with any other lousewort in its range. It has strongly pinnate leaves in a ground rosette, a low height, and colourful flowers in dense racemes, which make it look unique.

Something about life

Sudetic lousewort is a perennial semi-parasitic species. In comparison with complete parasites it is green and able to produce important organic substances by photosynthesis. However, it has got a weak root system and gets the essential elements for its life processes from soil by connecting to the host's roots. The hosts are of various kinds from ferns to woody plants. It propagates mainly vegetatively. It blooms during June or the beginning of July, the flowers are pollinated mainly by horn-bees and butterflies. If pollination by outside pollen is not possible, the flowers are capable of self-pollination. A lot of seeds are usually created but their germination is low. During experiments it was about 5% germination on site and 17% in the laboratory. The reasons lie probably in the semi-parasitism and the mycorrhizal coexistence with fungi.

Where does it grow in the world and in our country?

Its range is circumpolar, which means that it grows along the Arctic Circle in all continents very far to the north. In Novaya Zemlya it reaches the 74th degree latitude. Besides this northern belt it grows only 2500km from there in the Giant Mountains on both Czech and Polish sides. It was first described here so even the Canadian plants bear the name "Sudetic". The northern populations are sometimes described as different subspecies.

Sudetic lousewort has most of its sites in the eastern part of the Giant Mountains, especially in the vicinity of Luční Chalet and around the former Renner's Chalet. It is less frequent in the western Giant Mountains, where it grows mainly on the Labská Meadow. From 30 historically recorded sites only 12 of them are known today.

What environment does it grow in?

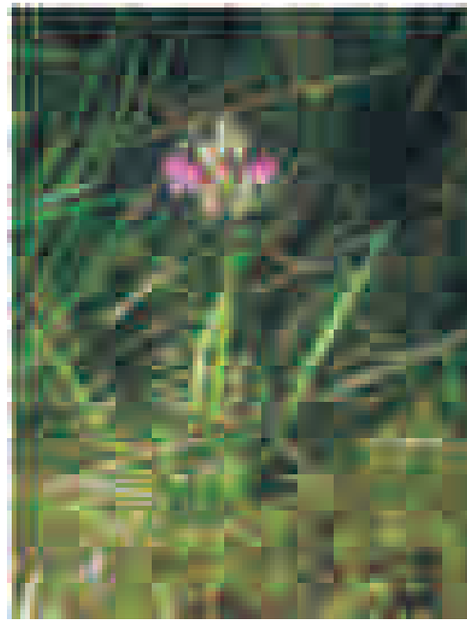
It grows on wet spots with rising spring or running water and does not tolerate the stagnant waters of peat bogs. These habitats are covered with moss and dispersed plants or grass. The altitudes vary between 1150 m and 1450 m but it would grow even at the top of Sněžka if there were suitable habitats. It was originally thought that it preferred locations with a long- standing snow cover; however, detailed monitoring did not confirm this expectation.

Why is it so rare?

Together with *Rubus chamaemorus* it is the most valued example of a so-called glacial relict, which means a species that survived from the ice age. At the time of maximal glaciation lousewort came to our country and found such good conditions in the Giant Mountains that it remains there still today. It has encountered big problems in the last few decades, especially in the western Giant Mountains due to the effect of imissions, which is probably the main reason for the total depletion of its sites. Also, some sites disappeared because of the unthoughtful planting of dwarf pine scrubs.

What is being done for its survival?

All its sites are included in the core zones of the Giant Mountains National Park with strict protection. The lousewort's populations are well mapped and under long-term monitoring. The monitoring of the temperature changes on selected sites is being carried out as well. The present climate itself is a factor, which can be a threat for lousewort in the Giant Mountains. The cold brought it here and the warming can destroy it.



1 2 3

1 the most numerous populations of Sudetic lousewort grow around Luční Chalet

2 fruiting plants capsules do not form on every flower

3 Sudetic louseworts grow in places with a well developed moss layer

Poa riphaea (ASCHERSON et GRAEBNER) FRITSCH

a detail of a raceme

Ash-mountains meadow-grass
Poaceae
Grass family

How do we recognize it?

Ash-mountains meadow-grass is a very tough tufty grey grass with cucullate leaves. The lower branches of the sparse panicle grow individually or in groups of two; the yellow-green spikelets are evenly distributed. The plant's height does not exceed 20 cm.

Something about life

This perennial tufty species of meadow-grass spreads by so-called outer sheath sprouts (they pierce through the leaf sheath, which covers the stem in its lower part, while the inner sheath sprouts are closed in the leaf sheath and grow through at the place where the leaf sheath becomes a leaf blade). It blooms in July and August; the pollination happens with the help of the wind. It produces plenty of fruit (caryopsis), which become ripe usually in September. The ecesis of the seedlings in inhospitable environments is rather a rarity than a rule.

Where does it grow in the world and in our country?

The only site of its occurrence in the world is the Petrovy Stones and only on its eastern aspect. There are about 150 tufts altogether.

What environment does it grow in?

It grows in rock cracks and crevices usually alone or accompanied by several other species if it is on flat rock terraces.

Why is it so rare?

It belongs to the group of glaucous meadow-grass (*Poa glauca*), which got to the Central-European mountain ranges during the colder climate of the glacial period. The plants, which remained here on the exposed rocks in an extreme environment and isolation, became more and more different from the original glaucous meadow-grass.

What is being done for its survival?

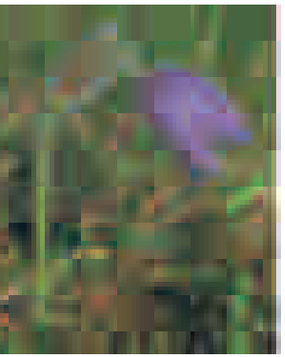
Most of the important information about the Petrovy Stones was described in the *Campanula gelida* section. We can briefly summarize that the habitat protection is on a good level. Ash-mountain meadow-grass is now studied intensively from both taxonomic and population points of view, and the mutual affinity of the individual tufts is being examined, so it is known how heterogeneous population this one rock hosts. The tufts are marked on the rock and monitored regularly. The task is to gather information about the tufts' longevity, their spreading, and the number of flowers. The research should discover how often and in what numbers do the plants sprout. Ash-mountains meadow-grass is cultivated successfully. Its prospects seem fairly good today. Everything depends on the way the climate will change. The hot and dry summers do not suit Ash-mountains meadow-grass well.

1 the Petrovy Stones provide an excellent refuge for this endemic, more then one hundred tufts grow on their sheer rock sides

2 a tuft of Ash-mountains meadow-grass in a rock crevice with visible greyish colouring and rigid culms

3 a big tuft of Ash-mountains meadow-grass with many flowering culms in a rock crevice

Pulsatilla grandis WENDEROTH



Pasque flower
Ranunculaceae
Buttercup family

flowers grow individually or in tufts

How do we recognize it?

Almost everyone can recognize the pasque flower, although the determination of the individual species is a little complicated. All pasque flowers can interbreed, and in addition to that, there are continuous transitions among individual species. Presented species has purple flowers with protruding stamens; its ground leaves are formed after the end of the blooming stage and are divided into narrow parts. We can confuse it only with two related species. In western Europe there is *P. vulgaris*. Its leaves have sprouted already at the budbreak period; they are pressed to the ground and the parts of the leaves are only 2 – 3 mm wide. *P. slavica* have the parts of its leaves wider (up to 8 mm) than both of its relatives and its flowers are bigger too. All three species are often cultivated in gardens. Pasque flower interbreeds with *P. pratensis* subsp. *bohemica* and the resulting hybrid is called *P.* x *mixta*. In Germany it interbreeds also with *P. vulgaris*.

Something about life

This perennial long-living species expands into larger tufts through underground rhizomes. The tufts can split up at a later age. It blooms amply and regularly in suitable conditions. The blooms open during March and April and become an attractive food for various kinds of hymenopteran insect. The fruit (achenes) production is good. They become ripe in June and germinate in the summer. The germination is usually high; however, many seedlings die and the populations are replenished with new plants very slowly.

Where does it grow in the world and in our country?

Pasque flower has a range from central Moravia to western Slovakia, Austria, northern Hungary, Vojvodina, and along the Danube River to the west and east of Bayern.

In the Czech Republic it is exclusively a Moravian species. It grows from the Grygovské Hills near Olomouc, through the Prostějov region to the Brno region; more sites can be found also in the White Carpathians. From Brno it is distributed to the foothills of Vysočina in the Třebíč region and also to Podyjí. Rarely does it grow in Pálava. The most numerous populations consist of several thousand individuals. There are more than 200 sites documented in total.

What environment does it grow in?

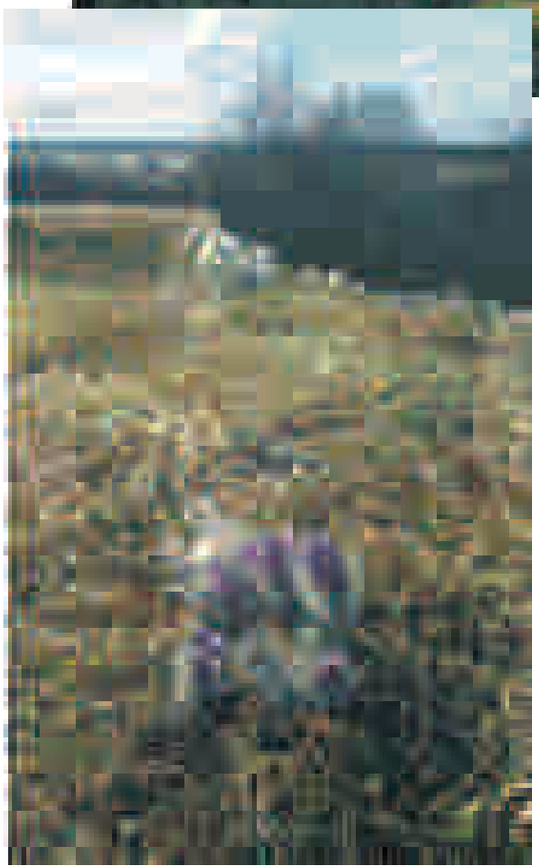
It is a species of dry and hot open sites on deep soils rich in minerals with calcic substrates, but it grows on acidic substrates as well and rarely on serpentines too.

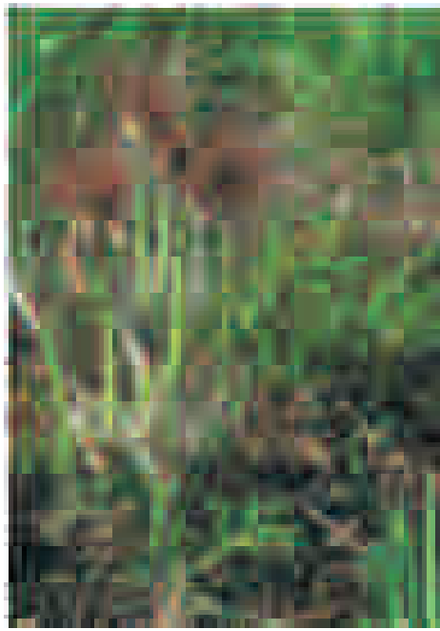
Why is it so rare?

We cannot talk of its rarity in Moravia since it grows on most suitable locations. It is not even on the Red List of the Czech Republic among the critically endangered species. Its inclusion among the species of Natura 2000 means a complication for the Czech Republic. In our country it grows at the northern edge of its distribution and our populations are an important part of its small range. It is endangered by the steppe habitat destruction, their cultivation fertilizing etc. and also by shrub succession. However, it tolerates burning very well. A big threat comes from garden lovers, since you can find it in every garden when it is in the vicinity of a pasque flower site.

What is being done for its survival?

It grows in the representative network of protected areas. Its sites are usually mowed every year or so according to the state of the population. It is important for the species that the mowing takes place after the plant sheds its seeds, so it is first cut in July. The shrubs are being removed from the sites as well. The extinction of pasque flower in Moravia in the next decade could be caused only by the fall of a large meteorit.



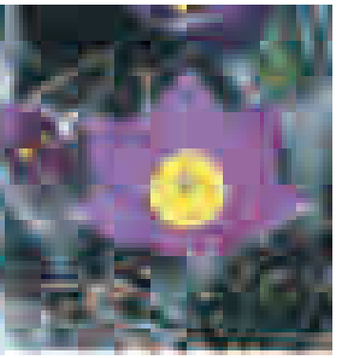


1 however, the Grygovské Hills represents the most northerly distribution of the species, one of the largest populations in the world grows here

2 the hairy heads of the buds will tolerate frosts

3 long plumes form on ripening achenes after flowering, which helps wind distribution; we can also see young sprouting pinnate leaves at the base

Pulsatilla patens (L.) MILL.



a flower detail

Eastern pasque flower
Ranunculaceae
Buttercup family

How do we recognize it?

The only one of our pasque flowers that has tripinnately compound leaves, which makes it unique all year round because the leaves stay dry at the base of the plant till the blooming stage, and the new leaves are formed after the end of the blooming period. It reaches a height of 20 cm, or about 40 cm during the fruit-bearing stage. On its sites it only occurs with *P. pratensis* subsp. *bohemica*, of which flowers are purple or almost black, pendent and cylindrical. It interbreeds frequently with this species and the resultant hybrid is called *P.* x *hackelii*.

Something about life

The life of the eastern pasque flower is not much different from the life of pasque flower.

Where does it grow in the world and in our country?

It grows from Russia, Ukraine and Byelorussia, through Poland to Bohemia, and formerly even to Northern Germany, where it is now extinct. In the north we can find it in southern Finland and central Sweden. It has a quite fragmented range in the south, which includes Romania, Hungary, southern Slovakia, and Bayern near Munich.

It is located in five areas in the Czech Republic. Most of the sites are in the Doupovské Mountains; it grows also in Podkrušnohoří, České Středohoří, Českolipsko and several plants still survive south from Prague in Povltaví. Generally, the entire population has declined and although it remains on all of its sites, the situation is very bad at many of these locations. There are 17 sites with approximately 2.000 plants in total. The literature documents a steep decline of the populations in the České Středohoří from 30 to 3 today and on Holý Hill the number of individuals decreased from tens of thousands to several tens today.

What environment does it grow in?

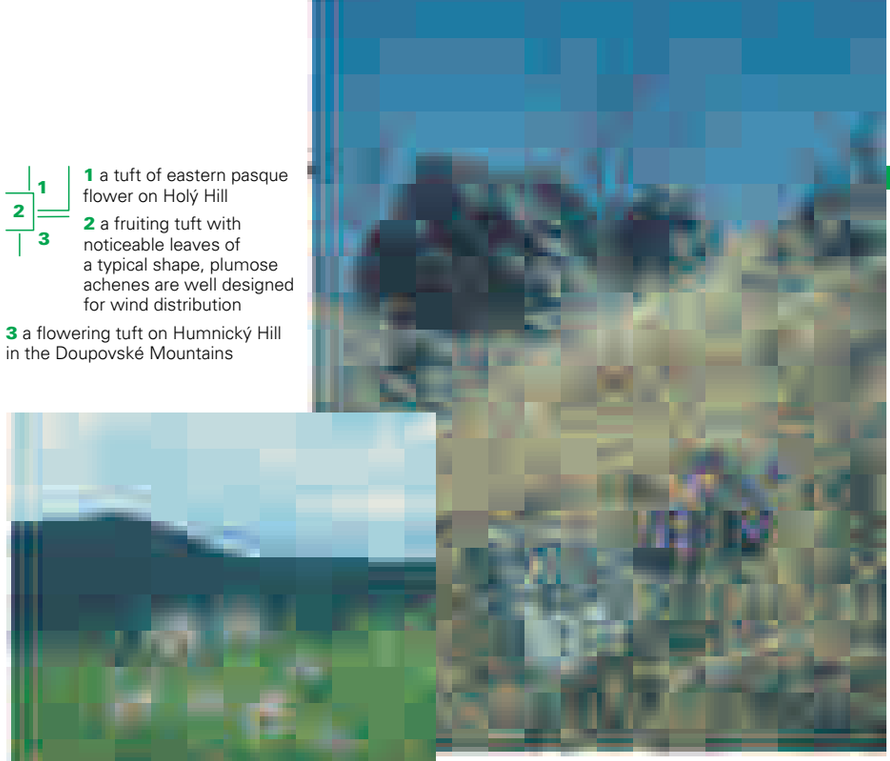
Eastern pasque flower is seemingly not demanding with regards to its needs. It grows mostly on steep habitats with a predominant north or west exposure, on dry but also slightly wet locations. It is rather thermophilic but reaches the altitudes of 700 m. The soils can be deep or stony, usually acidic on various substrates including sandstones. It grows also in light pine forests.

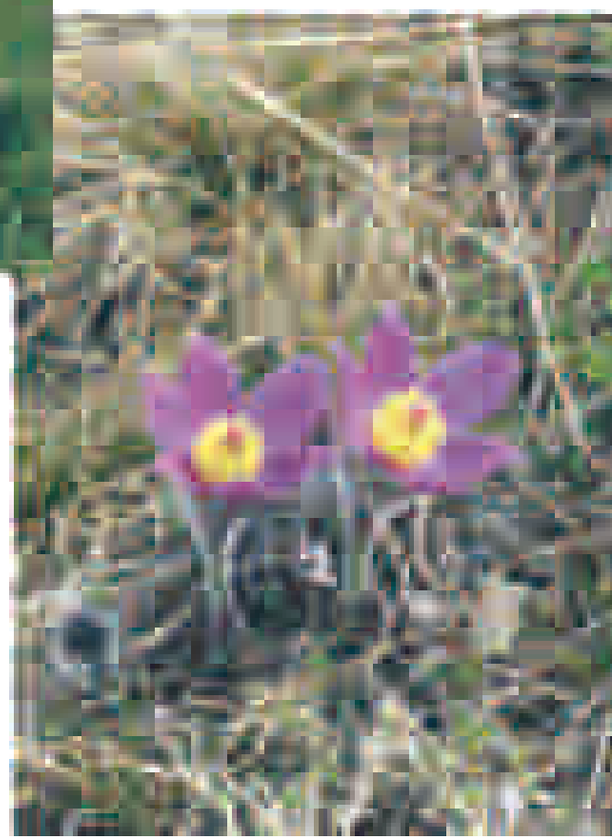
Why is it so rare?

The species with wider habitat requirements are relatively abundant. However, the eastern pasque flower belongs amongst the presented species right behind gentian with regards to the speed and the extent of its decline. The edge of its range plays an important role in its rarity, but there seems to be another unknown affect of its sensitivity to some factors of environmental pollution, because it disappeared, for example, from the entire north of Germany. Maybe it is just a response to the general overgrowing of its sites with aggressive species of grass such as chee reed grass and oatgrass, or to the vegetation closure where the seedlings have problems to root. Many sites were damaged by inappropriate agricultural activities – extensive ploughing and use of chemicals. However, some sites have disappeared because of a lack of management after the end of pasture or other unintensive agricultural activities. For its attractiveness garden lovers often dig it up, so the plants are in permanent danger due to this vandalism. Wild animals also browse it.

What is being done for its survival?

Some of the sites where it is present lie in protected areas but a lot of them remain without any protection. This should be solved with the introduction of Natura 2000. Nearly every method has been used on the sites to create good conditions for pasque flowers. The shrubs are being removed and most of the sites are mowed in the summer time. The soil surface disturbance is handled by raking and harrowing. The affect of fire is being tried as well. Pastoral grazing does not happen anymore; however, this is not essential in the changed conditions. Some sites are watched or fenced to lower the loss from plant collection. The recovery cultivation including *in vitro* cultures, additional sowing on the sites and the seedlings' pre-cultivation is under the way. Eastern pasque flower is an interesting problem from which conservationists do not omit but do not have much success with either. Its future existence in our environment is thus unclear.



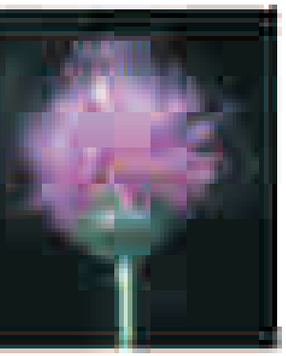


1 a tuft of eastern pasque flower on Holý Hill

2 a fruiting tuft with noticeable leaves of a typical shape, plumose achenes are well designed for wind distribution

3 a flowering tuft on Humnický Hill in the Doupovské Mountains

Serratula lycopifolia (VILL.) KERNER



a flower head detail with visible bipartite stigmas and hairless involucred bracts under the calathidum

Hungarian saw-wort
Asteraceae
Daisy family

How do we recognize it?

The blooming plants resemble our cornflowers but have only one big flower head. The flowers do not get bigger even at the edge of the head where there are usually sterile radial flowers on most daisies. The involucred bracts, which support the head, have no appendixes. The stem is without leaves at its upper part; the most upper leaves split up to the central vein (pinnately sected) and resemble the leaves of one plant from the Labiate family called bugleweed.

Something about life

This perennial plant with a rich rhizome system often creates large covers where it is impossible to distinguish the border among individuals. Generative propagation is not very frequent and blooming is irregular for some reason. The blooming stage occurs in the second half of June or the beginning of July, and the plants are often mowed before they bloom. If the plant does come into bloom butterflies and various hymenopteran and dipteran insects pollinate them. The fruits (achenes) have a pappus and are spread around by the wind. Germination in cultivations is fairly good but there is nothing known about germination in nature.

Where does it grow in the world and in our country?

Hungarian saw-wort is an ancient European species with a small and fragmented range. The main distribution is centred around the Black Sea and in the Great Hungarian Lowland (the so called pontic-pannonic range). It grows most abundantly in Ukraine, Romania and southern Russia, and from there it spreads to Hungary, Austria, Slovenia, Croatia and also Poland. It can be found rarely in Slovakia; the only known site today is in the White Carpathians; previously it was documented near the city of Nitra. It has been recorded in isolated places in the mountains of central Italy (Abruzzo) and in southeastern France.

In the Czech Republic it grows only in southern Moravia on 9 sites. Four of the sites are in the White Carpathians with large covers in Čertoryje, the other four sites are on the hillsides between Čejč and Velké Pavlovice where it is abundant at the Hovoranské Meadows. Further to the west there is one poor population on the hillside of Dunajovice near Mikulov.

What environment does it grow in?

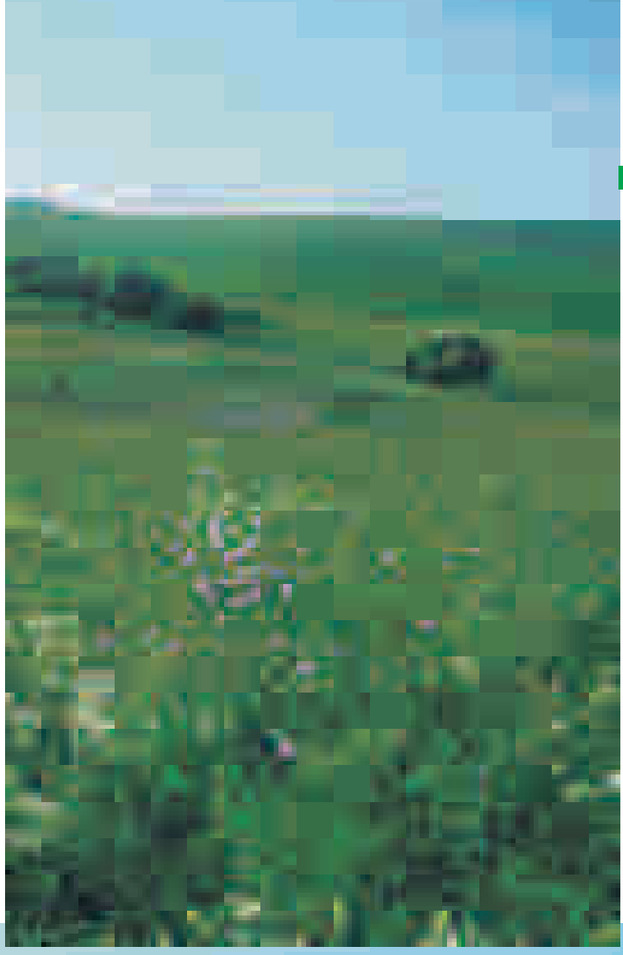
It grows on sunny or slightly shaded grassy or bushy hillsides on loesses or calcic sandstones, on deep rather heavy-textured soils, which are rich in minerals. It is not really a xerophyte and it prefers slightly wet habitats. It typically occurs in ecologically valuable vegetation covers, rich in species, where it has become a worthwhile indicator of the environmental quality.

Why is it so rare?

It is not really a rare species. After botanists learned how to find it, they found out that its populations are fairly rich. It is possible that it still grows at some other, as yet, unidentified locations in our country. However, we cannot call it an abundant plant. There is a lack of evidence from the past so we cannot decide whether it is disappearing or expanding. The populations are damaged by all unsuitable landscape and agricultural activities, which have been mentioned many times in our publication.

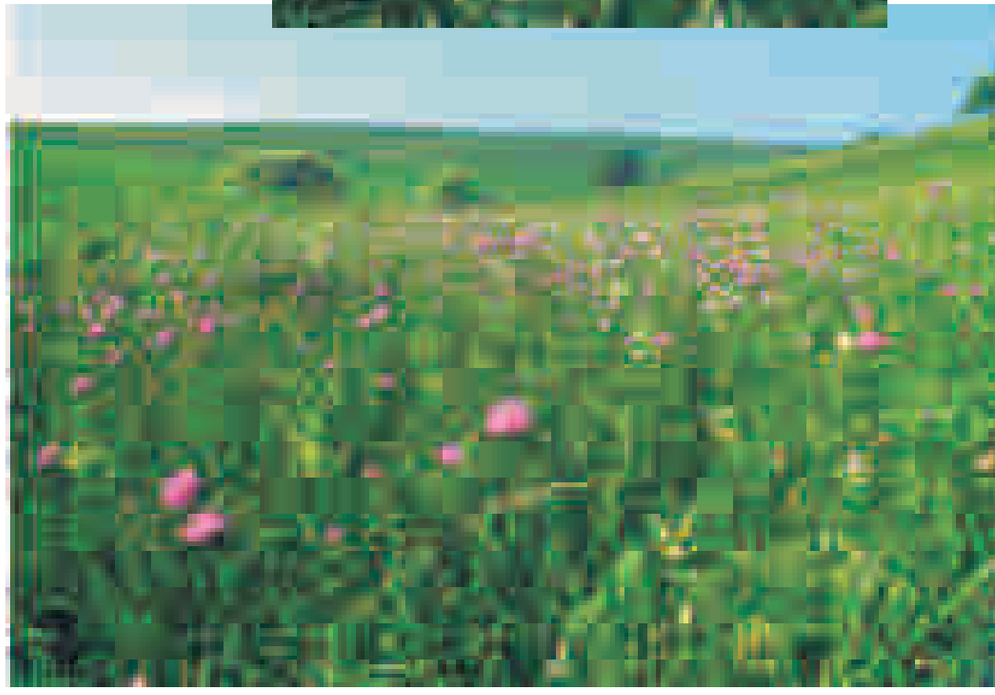
What is being done for its survival?

Its bond to valuable vegetation covers with high biodiversity guarantees it good protection at most of the sites, which includes annual mowing. On some sites a part of the vegetation is left unmowed to enable the plants to bloom and shed their seeds. Other than that this species is a "blank page" nobody has studied it and almost nothing is known about it. Hungarian saw-wort itself does not seem to care but botanists should face this interesting challenge. We assume that if it did fine without our awareness, it will survive a little bit of our attention as well.

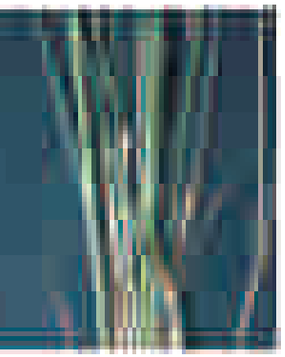


1 the Hovoranské Meadows with pink blots representing flowering Hungarian saw-wort

2 Hungarian saw-wort can grow in large stands, and in 2003 it flowered in large numbers



Stipa zalesskii WILENSKI



Gally feather grass
Poaceae
Grass family

the presence of hairs on the abaxial surface is important for species determination

How do we recognize it?

Whereas the differentiation of feather grasses from other grasses is easy even for any garden lover, the determination of this species among other feather grasses can be managed only by a few specialists in our country. Unfortunately, the authors of this text do not belong to them. We can just summarize what is needed for noticing. It belongs among vernal species of feather grasses with significantly long feather-shaped awns on caryopsises. The leaves are not extended into a long awned point and they are without a tuft of bristles. The leaves' sheaths are densely hairy. The lower side of the leaves is rough due to the presence of coarse papillas but never hairy. So we can say it is the most hairless species among hairy feather grasses.

Something about life

All feather grasses are perennial, long-living, dense, tufty grasses. Almost all of them bloom early in the spring at the end of April and during May; the awned caryopsises get ripe and fall off in June at the latest. The flowers' pollination happens by wind as is usual with all grasses. Even the caryopsises depend on wind, which spreads them around. The caryopsis collects air humidity, in this way it rolls and thus bores the seed in the ground where the better moisture conditions for germination can be found. The boring is eased by a small but sharp crooked spike at the end of the caryopsis. To germinate it needs a cold winter and germinates then in the spring.

Where does it grow in the world and in our country?

This feather grass has a remarkable range, which includes the steppes in Ukraine and the Czech Republic far to the west.
In our country it grows only in the České Středohoří which is the promised-land to feather grasses with an extremely dry climate in the Krušné Mountains rain shadow. It is known at a mere 5 sites, from which 3 are located on the hills called Oblík, Brník and Srdov, where around 500 individuals exist. Several tufts grow on Holý Hill near Sutom, and the northeast site with approximately 50 tufts on Deblík.

What environment does it grow in?

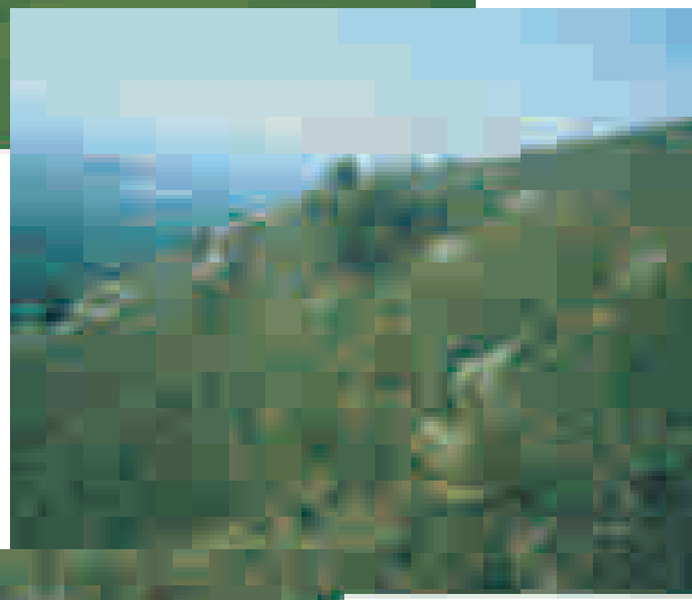
It prefers south and west exposures and grows on deep, extremely desiccative, basic soils. It requires full sun without the presence of shrubs.

Why is it so rare?

Its locations in our country have absolutely no contact with the Ukraine range. It is a remnant from the times when the steppe species could spread from east to west. Also, one of the questions is how much can we distinguish this species from other feather grasses – detailed research would probably provide a better picture of its distribution. On its sites, it is under threat mainly from collection of its attractive fertile stems for decorative purposes, which limits the creation of new generations. Sometimes whole tufts are dug out for gardens of course without any attempt to distinguish this super rare species from the more abundant *Stipa joannis*. On the Deblík site it is also limited by mining activities.

What is being done for its survival?

On Oblík it grows in a strictly protected area, the remaining sites will be designed as the Natura 2000 sites. Other than that there is nothing being done for its survival. Only the instigation of monitoring has started, whilst the most important thing is its correct w what determination and marking of the located tufts . Without the knowledge of its ecobiology its prospects are hard to estimate. We do not know what its relationships are to other feather grasses with which it grows on common sites, e.g if any of them out compete it out or not. There is a prevailing opinion now that the future existence of gally feather grass is not significantly under threat in our country.



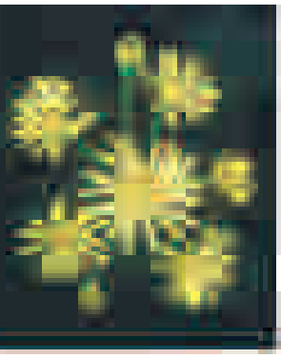
1 2 3

1 the most numerous population of gally feather grass grows at the top areas of Oblík

2 the steppe vegetation on Oblík contains many feather grass species, which are difficult to determinate from each other

3 a tuft of gally feather grass on the peak of Oblík

Tephroseris longifolia (JACQ.) GRISEB. et SCHENK subsp. *moravica* HOLUB



an inflorescence of long-leaved fleawort in an umbel of flower heads, the middle flower head starts flowering from the edge

Long-leaved fleawort
Asteraceae
Daisy family

How do we recognize it?

Long-leaved fleawort is a perennial species with a ground leaf rosette. The petioles are longer than the leaf blades; the leaves are only slightly hairy, whereas they are distinctly hairy on the nominative subspecies. It reaches a height of 0.5 m, rarely 0.7 m. The different number of chromosomes, which manifests different evolution ways, makes the plants that belong to *Tephroseris* genus distinct from the ones of *Senecio* genus. Also the small bottom bracts (so called involucre) are missing in the flower head.

Something about life

The perennial long-leaved fleawort survives winters by a short rhizome present just under the soil surface. There is no information about its life span. It blooms from May to June; hymenopteran and dipteran insects and butterflies pollinate its flowers. It creates a large number of pappous achenes, which are spread a long distance by wind. Their germination in suitable conditions at open places is good, however, they are often attacked by insect. Occasionally, *Tephroseris longifolia* can propagate vegetatively.

Where does it grow in the world and in our country?

It is a central European endemic at the species level. It occurs especially in the eastern Alps in Austria with an overlap to north-eastern Italy, Slovenia, northern Croatia, and also to western Hungary and in seclusion in Bosnia. The Moravian subspecies covers only a small area of the Western Carpathians in Moravia and Slovakia where it grows on 9-10 sites.

In the Czech Republic it grows exclusively in the northern part of the White Carpathians near Brumov on 3 sites close to the Slovakian border. The population consists of about 500 to 600 plants. The most abundant population is located in the Hrušov Valley near Nedašov.

What environment does it grow in?

Long-leaved fleawort is a species of highlands and submontaneous altitudes, where it usually grows on meadows or bushy hillsides or open forests. It prefers so-called ecotones – the transitional zones between forested and unforested environments with partial shade but unmowed or irregularly mowed habitats. It requires deeper, loamy, slightly moist soils.

Why is it so rare?

This subspecies evolved in isolation at the edge of the species' range and was probably never much widespread. In the last decades it was significantly damaged by large-scale logging, the shift in the species composition towards coniferous trees and the decline in the coppice system management making the forests more shaded. Fertilizing and cultivation are the threats to meadows but it seems that regular mowing also has a negative affect. Pasture might be more suitable but we know so little about long-leaved fleawort requirements.

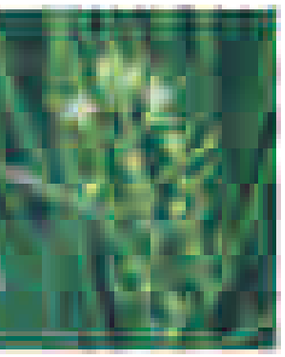
What is being done for its survival?

The site with the most abundant population is located in a protected area and is mowed during June and July, when the long-leaved fleawort´s achenes should be ripe. Even its cultivation has been managed. To continue to pay poor attention to this subspecies is definitely inappropriate given its rarity. The first research efforts have started already, so we can hopefully believe that it will remain a part of our flora even though it will continue to be quite rare.

1 flowering plants in the Hrušová Valley

2 long-leaved fleawort belongs to the early flowering species

Thesium ebracteatum HAYNE



small flowers of bractless toadflax look slightly like stars

Bractless toadflax
Santalaceae
Sandalwood family

How do we recognize it?

Most people would not notice bractless toadflax because of their small appearance with small white star-shaped flowers. Bractless toadflax misses braclets under its flowers, which are an important determination character. The lower part of the stem stays sterile without flowers. The perianth has a campanulate shape and is shorter than the achene while fruiting. The plants do not exceed 30 cm.
It is worth noting that the genus *Thesium* is our only representatives of the otherwise tropical Sandalwood family.

Something about life

This perennial species expands through underground sprouts, which is probably the main way it propagates. It blooms during May and an insect is the pollinator. The fruits (achenes) get ripe in June. The circumstances of its germination are unknown. All *Thesium* species are semi-parasites, which grow probably on a wide range of hosts but more detailed information is missing. For this species of *Thesium*, significant irregularity of blooming during the years is typical.

Where does it grow in the world and in our country?

Bractless toadflax is an eastern European species rarely reaching central Europe. Its range covers the area from the Ural through Russia, Byelorussia, northern Ukraine and the Baltic region to Poland. In the south it grows in Moldavia and central Romania. At the western edge of its range there are individual isolated populations remaining in the Vienna Basin (this being related to the only disappeared site in the Slovakian Záhoří region), in northern Germany and historically in Denmark too. One Czech site at the southwestern edge of its range belongs to this category as well.

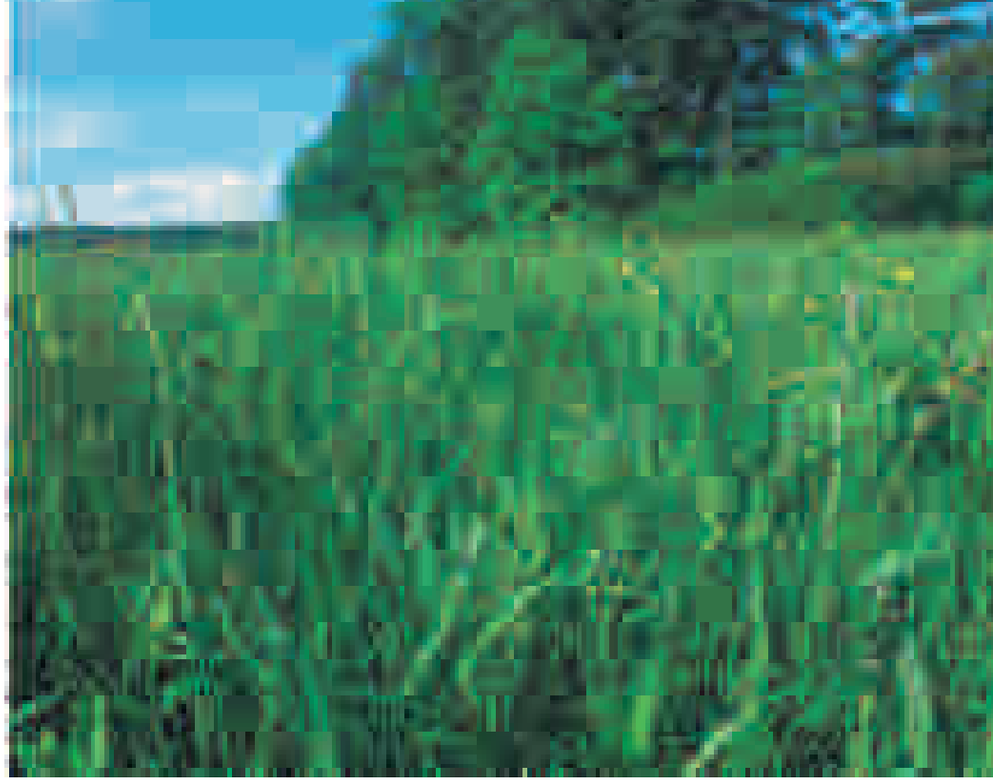
Bractless toadflax reached our country from the northeast (a so-called a sarmat migrant). Altogether, there are six localities documented from which only one remains today the Slatinná Meadow near Velenka, not far away from Kersko. It still occurs in large numbers there. At the other sites (Mělnická Vrutice, Sadská, Dřísy, Běchovice near Prague, and Český Dub), bractless toadflax has not been observed for more than several decades or even a century. Considering its unimpressive look, it is possible that it might be identified again on these sites or on new sites. However, the optimism of such a claim must be tempered down with regard to it being on the edge of the species' range and its general retreat.

What environment does it grow in?

Its occurrence in the Czech Republic is connected with wet, mineral rich, fen type meadows with a neutral soil reaction. In the east of its range it grows also in much dryer habitats especially on a sandy substrate.
It is a species of meadow communities or semi-shaded light woods. In our country it has always grown on meadows near or inside of a larger forest complex.

Why is it so rare?

In the case of bractless toadflax, it is definitely on the edge of its range. As with other sarmat migrants (marsh angelica, eastern pasque flower) it does not like today's climate. Their ranges are being torn apart into discontinual regions with more suitable conditions, but even in these regions they are still retreating. When they become isolated from other populations, this can lead to new adaptations to the changed conditions and/or creation of a new species (this is the more optimistic and less probable alternative) or to gradual extinction. The third alternative is some sort of immobile constancy remaining in the suitable locality. Bractless toadflax is potentially under threat mainly by meadow habitat destruction, drainage and chemicalization.



1
2

1 the Slatinná meadow near Velenka during flowering of bractless toadflax without any colourful dominants present

2 a fruiting bractless toadflax

What is being done for its survival?

Its only site is located in a strictly protected area. The population is under detailed monitoring. We have very little information about its biology; we do not know if it is possible to cultivate it artificially. The lack of knowledge about its germination prevents us from storing the seeds in seed banks. Its future existence seems to be at present secure, but the predictions with respect to it only existing on one site, must be stated with almost political prudence.

SAGITTARIA

Association for Nature Conservation of Central Moravia

Who we are?

A non-governmental organization dealing with practical nature conservation and scientific research.

Where we work?

Mainly in the Central Moravia region, but we are also engaged in several projects covering the whole of the Czech Republic.

What we do?

- inventory surveys and mapping of valuable landscape areas
- management plans for protected areas and proposals for designation of new protected areas
- practical field management for valued nature areas
- support the nesting of birds of prey and owls
- public environmental education in nature conservation (booklets, leaflets, educational paths, information boards for valued nature areas)
- cooperate with regional authorities in the nature conservation field
- renting and purchasing of valuable areas and their management - Land Trust Sagittaria
- conservation and research of endangered butterfly species

Address and contacts:

SAGITTARIA

Association for Nature Conservation of Central Moravia

Lazecká 6
779 00 Olomouc

Tel./fax: 585 228 438
sagittaria@volny.cz

www.sagittaria.ecn.cz

Come and see Prague Botanical Garden

Opening hours:

Outside exhibition		
April	daily	9 a.m. - 6 p.m.
May - September	daily	9 a.m. - 7 p.m.
October	daily	9 a.m. - 5 p.m.
November - March		Tuesday - Sunday

Greenhouse Fata Morgana		
April	Tuesday - Sunday	9 a.m. - 6 p.m.
May - September	Tuesday - Sunday	9 a.m. - 7 p.m.
October	Tuesday - Sunday	9 a.m. - 5 p.m.
November - March	Tuesday - Sunday	9 a.m. - 4 p.m.

Address:

Prague Botanical Garden
Nádvorní 134
171 00 Prague 7 - Trója

Tel.: 234 148 111
e-mail: info@botanicka.cz
www.botanicka.cz

Connection: bus no. 112
from underground station Nádraží Holešovice (Train station Holešovice) to station ZOO or Botanical Garden Trója

The maps of plant species distribution were provided by the Agency for Nature Conservation and Landscape Protection of the Czech Republic (AOPK ČR). The data about species distribution were adopted from the results of the mapping for the Natura 2000 network, which was coordinated and financed by AOPK ČR in 2001 - 2003.

The publication was prepared in cooperation with the Prague Botanical Garden.

Preparation and publishing of the publication was supported financially by following organizations:

- **Ministry of Environment** from a grant for the support of NGO projects
- **Olomouc District** from the Operation Programme of the Olomouc District in 2004
- **Vysočina District** from the Fond Vysočina
- **Veronica Foundation**
- **Department of Environment, Municipal Government of the Olomouc city**
- **District of South Moravia**
- **Pardubice District from the programme for environmental education and public awareness**

A ladybells last ringing...