

DYNAMICS OF THREATENED SPECIES OF THE FAMILY *RANUNCULACEAE* ON THE STEPPE LOCALITIES OF DOUTNÁČ HILL IN THE NATIONAL NATURAL RESERVE OF KARLŠTEJN

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This article describes methods of circumstantial observation of populations of the species windflower (anemone), pasqueflower, and meadow rue over a period of several years. From these observations we can conclude the dynamics of these micro-populations. With the help of a special "eye method drawing" individual to the map, I will describe the details on these maps of how dynamic species have evolved. Each map was digitized in the program Arc view. Generally, we can say that independent from sectional micro-populations, a single species of these localities in its own typical conditions increase.

steppe; vegetation; windflower (anemone); pasqueflower; meadow rue

INTRODUCTION

CHKO (protected area) Český Kras lies on the area downs of Karlštejn, which is a part of upland Brdy and to a lesser degree, includes the tableland of Choteč. This area is a rich terrain, where valleys, hillsides and rock outcrops were formed mainly from limestone and slate of the Silurian and Devonian periods. Sporadically included in this area are Ordovician series of rocks. These include basalt, basalt-tuffs and minor Quaternary sediments like denudation relics of late Cretaceous and Neogene sediments. Several types of gravel terrace border the Berounka River on the Quaternary fluvial terrace.

The altitude of Český Kras is between 199 m and 499 m, and the altitude of localities on the hill Doutnáč are between 334 m and 433 m. Climate varies from softly warm to softly dry with a mild winter. Average yearly temperature is near 8 °C, and the medium rainfall of the year is 530 mm. Rainfall maximum is in July and minimum is in the winter months. A mantle of snow lays on the ground for a short time but is rarely very deep. Western and southwest (locally northwest) winds predominate there. In the valleys there are frequent inversions. Microclimatic influences are quite strong due to the richness of terrain and character of the vegetation. Only one meteorological station is operating inside this CHKO and is located in the village of Karlštejn.

The exceptional steppe plant communities found in the southern hillsides areas of Karlštejn are noted for secondary stands at present, where there were originally probably more occurrences of forest and forest steppe communities. These communities disappeared as a result of human activity such as forage, or other human economic activities. These activities began about 4000–1250 years B.C., and they resulted in plant steppe communities, which adapted to extreme sunny and dry southern hillsides with shallow soil profiles lying on bow limestone rocks.

These plant communities have seen the recent introduction of non-native species that can flourish in the area. Paying a high priority to them today, experts structure management measures in order to save some fragments of the original steppe communities. There are typical frequent rare species and threatened taxons. Because the last research of the hill Doutnáč was done in the 1950's, I decided to study this site.

MATERIAL AND METHOD

Field works are under way on two sectional localities (see Fig. 1). They are the main steppe locality, and the second smaller steppe locality separated in the southwest in a thermophilous oak forest. My field observations took place in the years 2000, 2003, 2004, 2005 (Figs 2, 3, 4 apply only to the period of 2003–2005) according to vegetation circumstances. I endeavored to observe and depict single species in a blooming season, when you can better see small individual flowers. After the blooming season the vegetation is higher around the flowers, and it is more difficult to inspect these individual species easily.

Members of the family *Ranunculaceae* can be found on up steppe localities. One of the new species that is proliferating in recent years is Adonis (*Adonis aestivalis* L.). It grows in places impacted by the disturbance of animals. The Adonis is a yearling venomous flower. The bloom's size is about 2–3 cm. The color is brick red often with a black blot on the base of thin oval petals. This species is a medium high (0.2–0.5 m) therophyte. It blooms from May to July. Literature (Kubát et al., 2002) indicates that the species grows from flatlands to downs (pla. 200 m – Co. 400 m) in fields and wastelands. It has a straggly occurrence in warm regions (C2 flower).

Liverwort (*Hepatica nobilis* Schreber) occurs very singularly in communities of dry herbaceous fringes

Fig. 1. The original map of Praha 1976.
1:4700

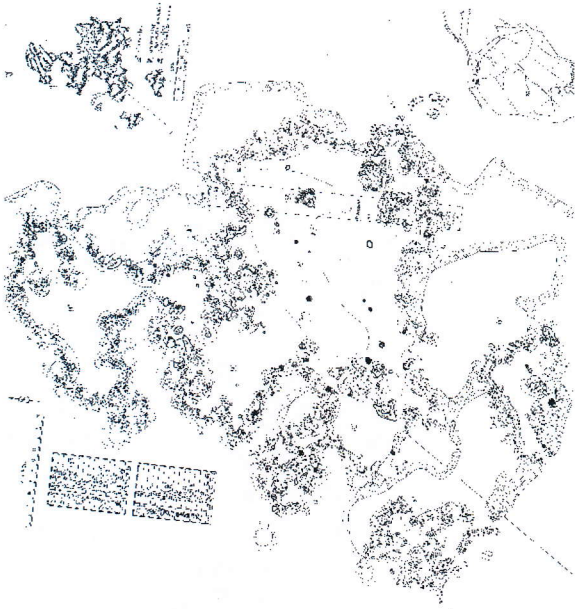


Fig. 1. With a changes after 30 years.
1:4700



Fig. 1. Two sectional localities.
1:4700

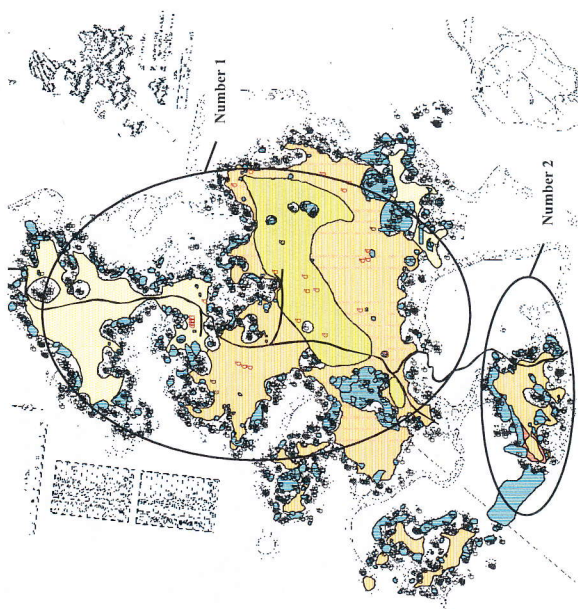


Fig. 1. The digital map drawn in ARC VIEW 3.2.
1:4700

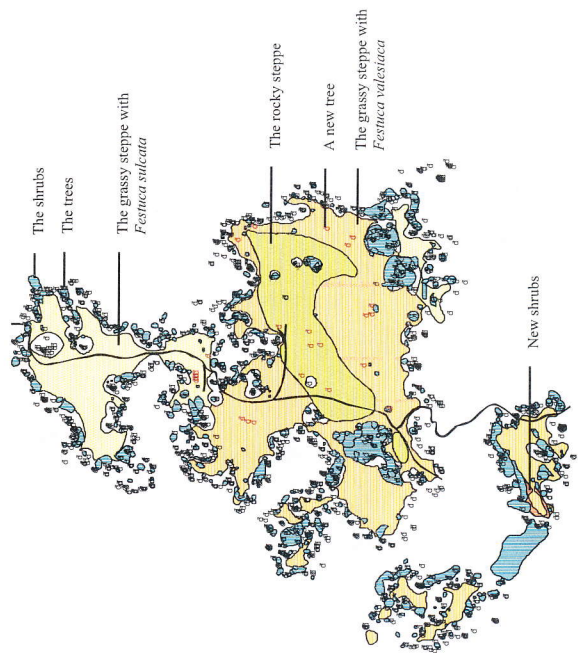


Fig. 1. The original map with single localities described in the article

Fig. 2. Distribution of windflower (*Anemone sylvestris*) on locality 1 (2004).

1:1700

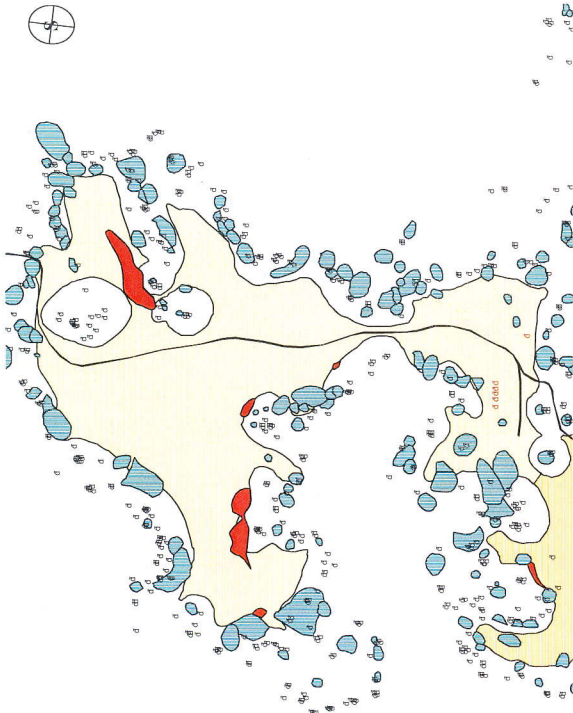


Fig. 2. Distribution of windflower (*Anemone sylvestris*) on locality 1.

1:1700

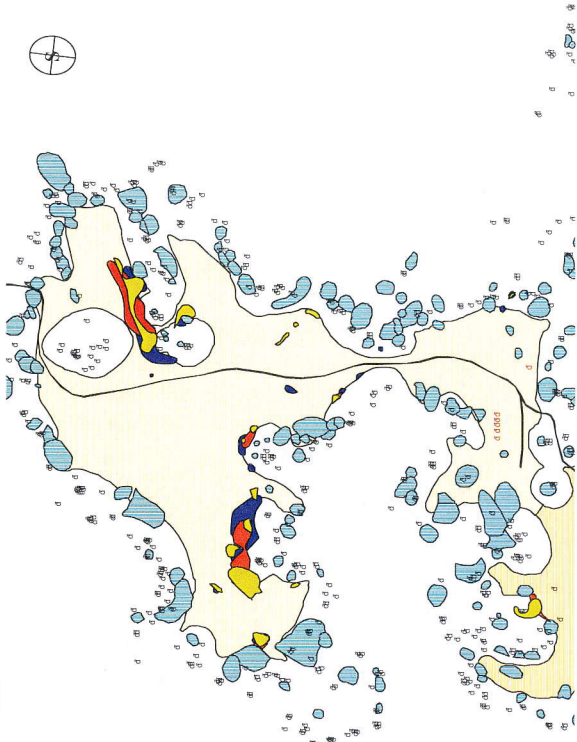


Fig. 2. Distribution of windflower (*Anemone sylvestris*) on locality 1 (2003).

1:1700

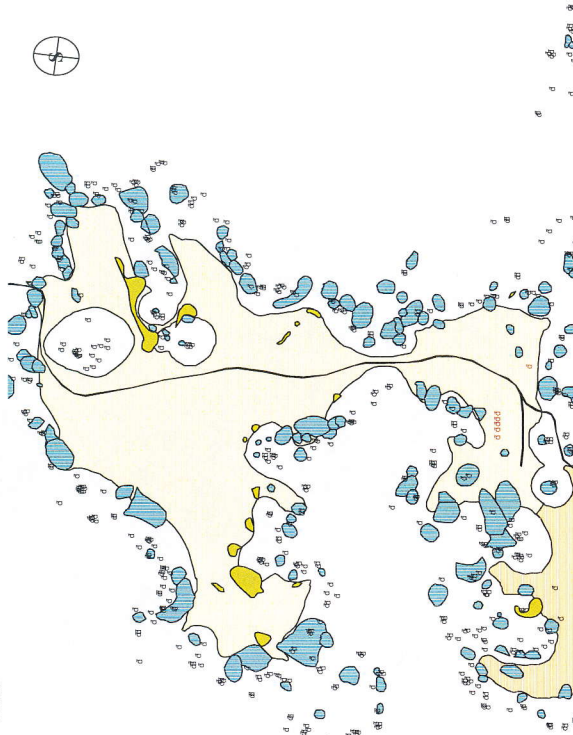


Fig. 2. Distribution of windflower (*Anemone sylvestris*) on locality 1 (2005).

1:1700

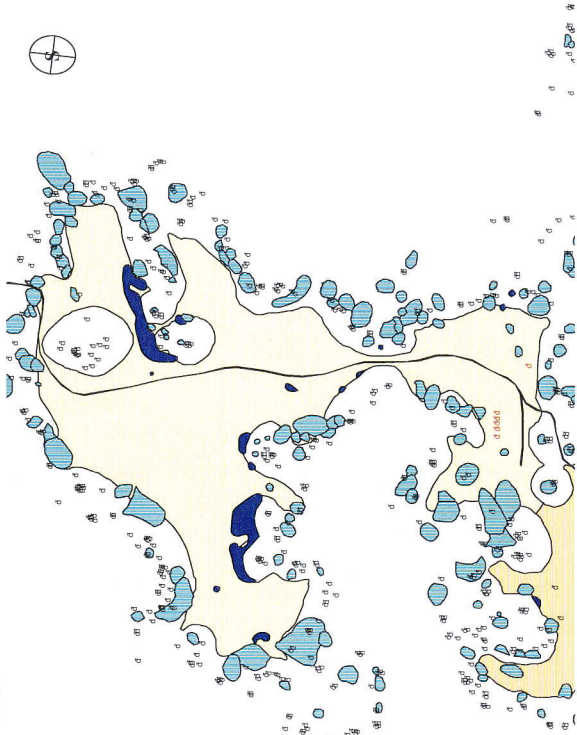


Fig. 2. Distribution of windflower (*Anemone sylvestris*) on locality 1

Fig. 3. Distribution of windflower (*Anemone sylvestris*) on locality 2 (2004).
1:1150

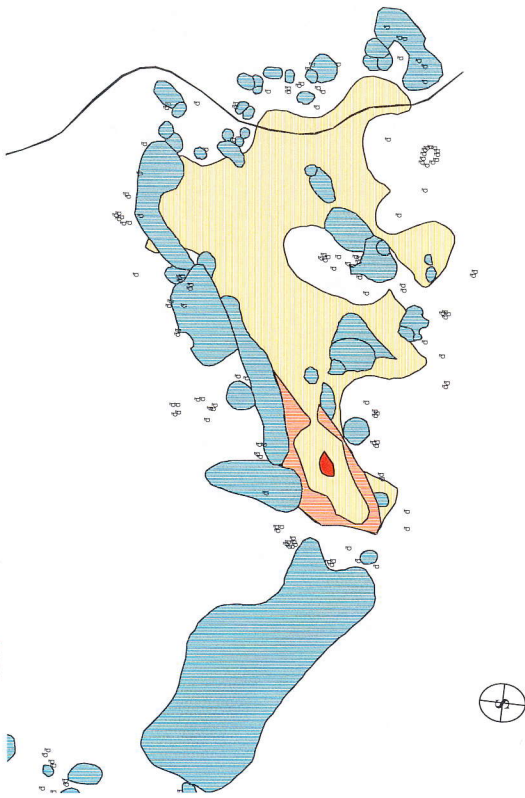


Fig. 3. Distribution of windflower (*Anemone sylvestris*) on locality 2 (2003).
1:1150

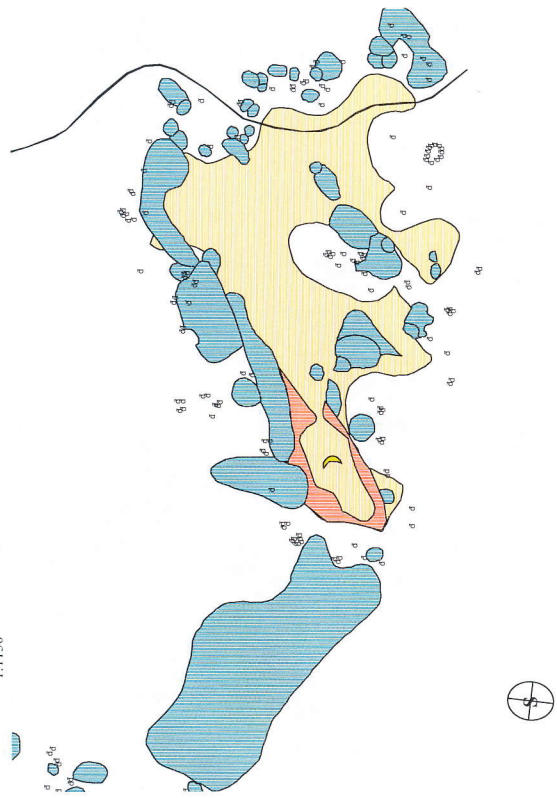


Fig. 3. Distribution of windflower (*Anemone sylvestris*) on locality 2.
1:1150

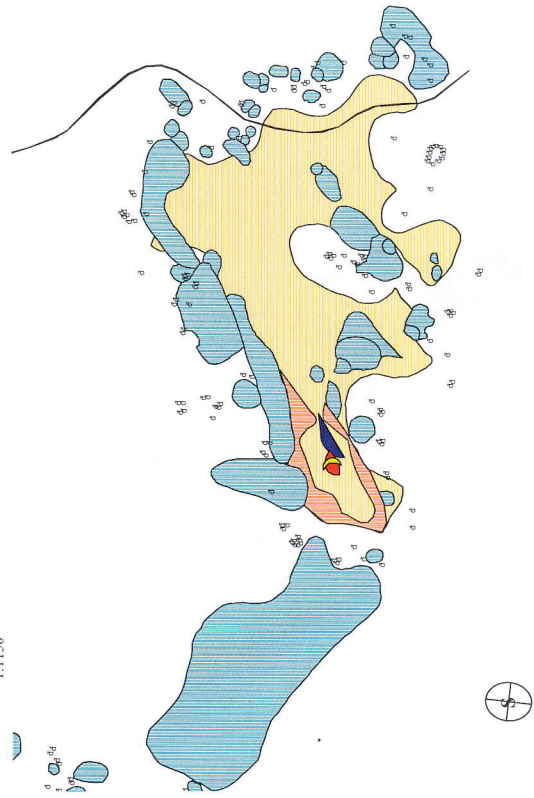


Fig. 3. Distribution of windflower (*Anemone sylvestris*) on locality 2 (2005).
1:1150



Fig. 3. Distribution of windflower (*Anemone sylvestris*) on locality 2

Fig. 4. Distribution of pasqueflower (*Pulsatilla pratensis* subsp. *bohemica*) on locality I (2004).
1:2150

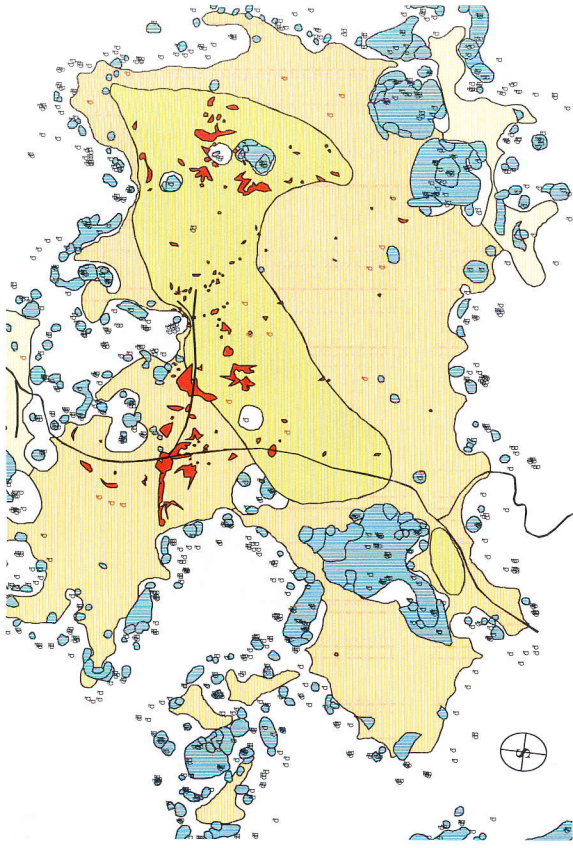


Fig. 4. Distribution of pasqueflower (*Pulsatilla pratensis* subsp. *bohemica*) on locality I.
1:2150

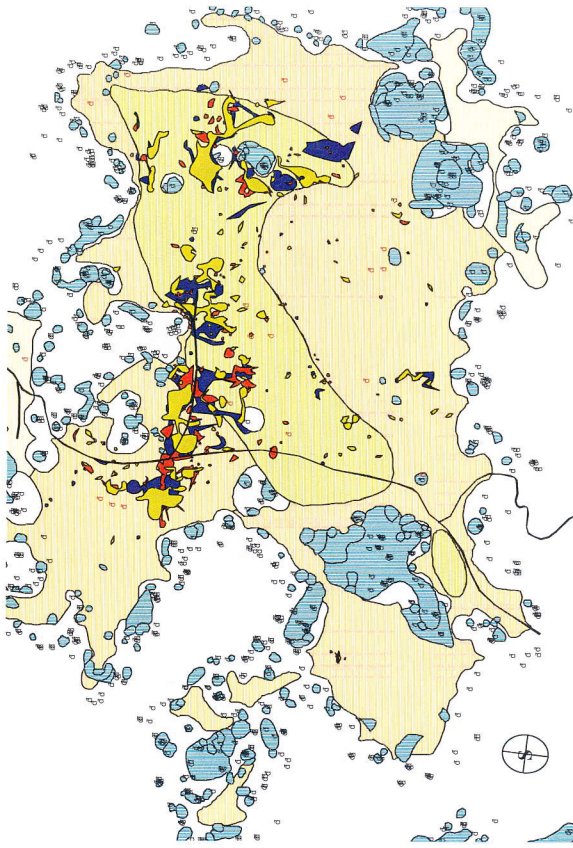


Fig. 4. Distribution of pasqueflower (*Pulsatilla pratensis* subsp. *bohemica*) on locality I (2003).
1:2150

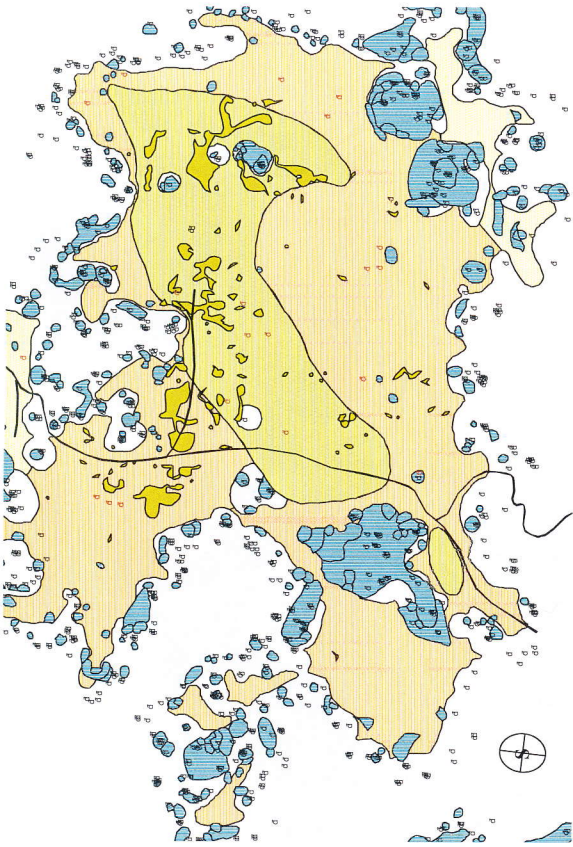


Fig. 4. Distribution of pasqueflower (*Pulsatilla pratensis* subsp. *bohemica*) on locality I (2005).
1:2150

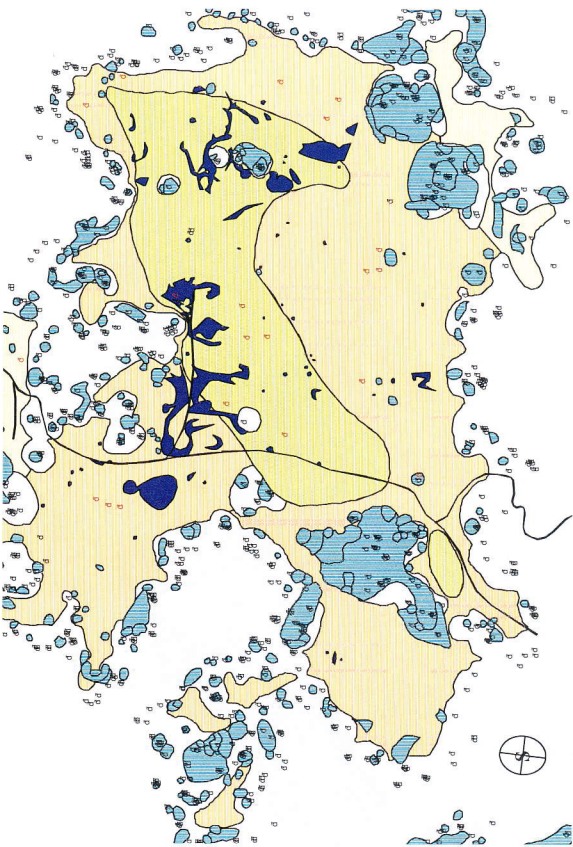


Fig. 4. Distribution of pasqueflower (*Pulsatilla pratensis* subsp. *bohemica*) on locality I

Fig. 5. Distribution of pasqueflower (*Pulsatilla pratensis* subsp. *bohemica*) on locality 2 (2004).
1:1150

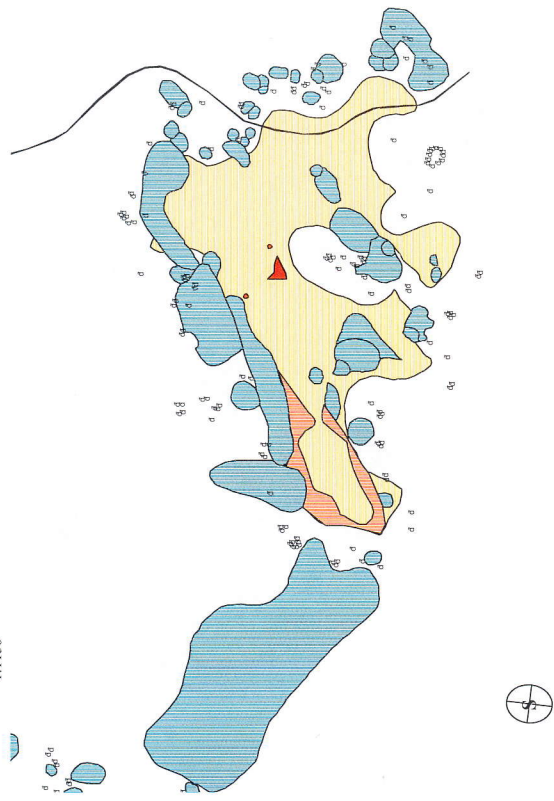


Fig. 5. Distribution of pasqueflower (*Pulsatilla pratensis* subsp. *bohemica*) on locality 2.
1:1150

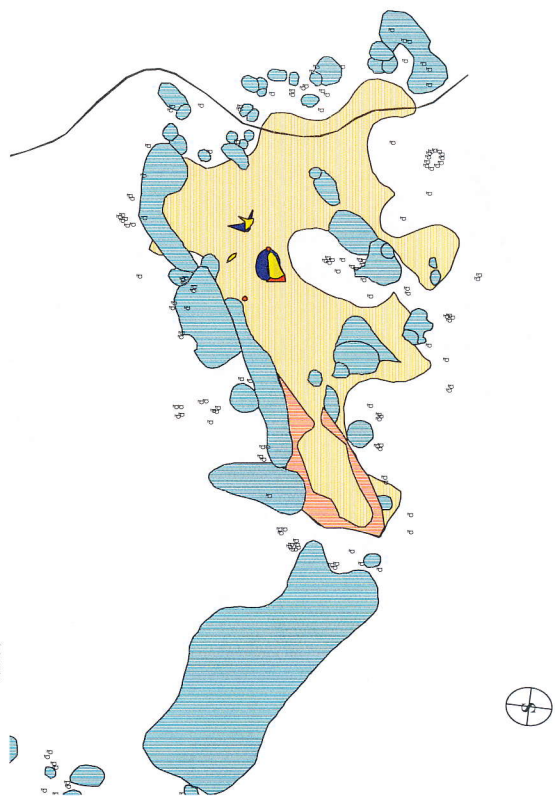


Fig. 5. Distribution of pasqueflower (*Pulsatilla pratensis* subsp. *bohemica*) on locality 2 (2003).
1:1150

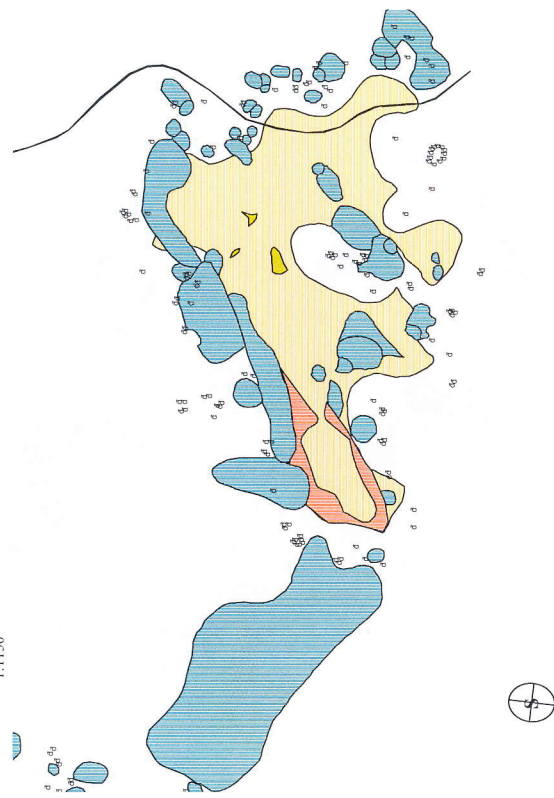


Fig. 5. Distribution of pasqueflower (*Pulsatilla pratensis* subsp. *bohemica*) on locality 2 (2005).
1:1150

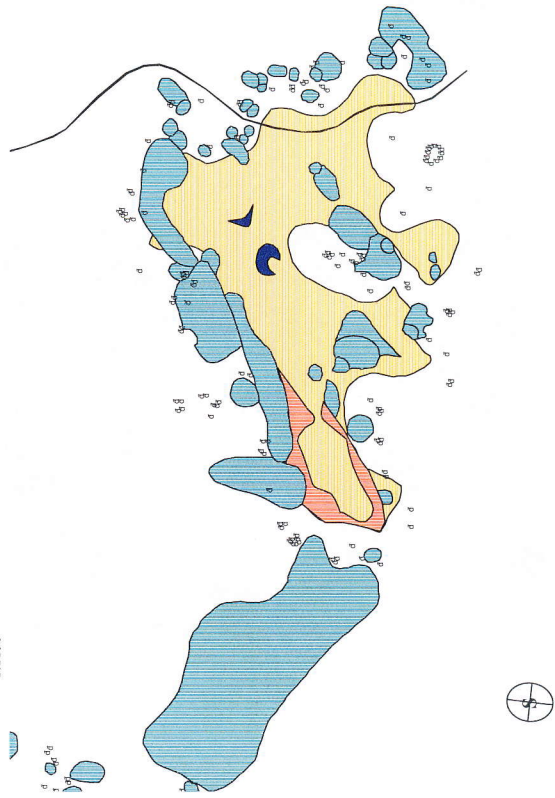


Fig. 5. Distribution of pasqueflower (*Pulsatilla pratensis* subsp. *bohemica*) on locality 2

Fig. 6. Distribution of meadow rue (*Thalictrum minus*) on locality 1 (2004).
1:1700

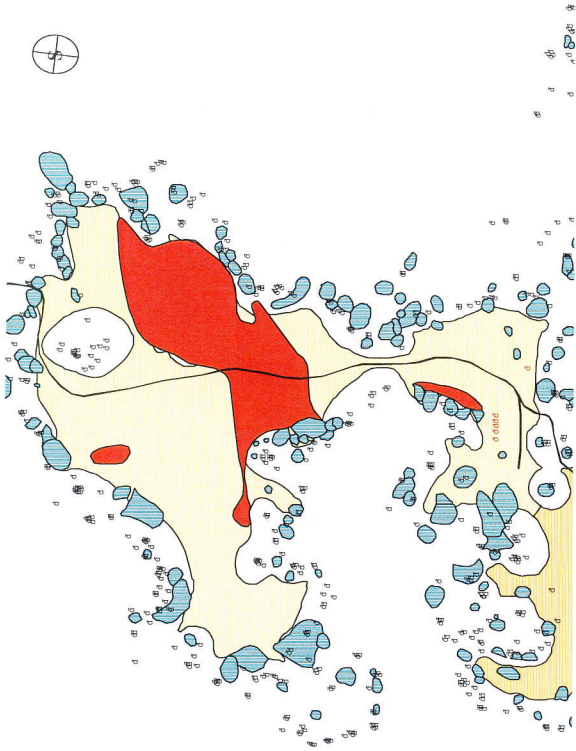


Fig. 6. Distribution of meadow rue (*Thalictrum minus*) on locality 1.
1:1700

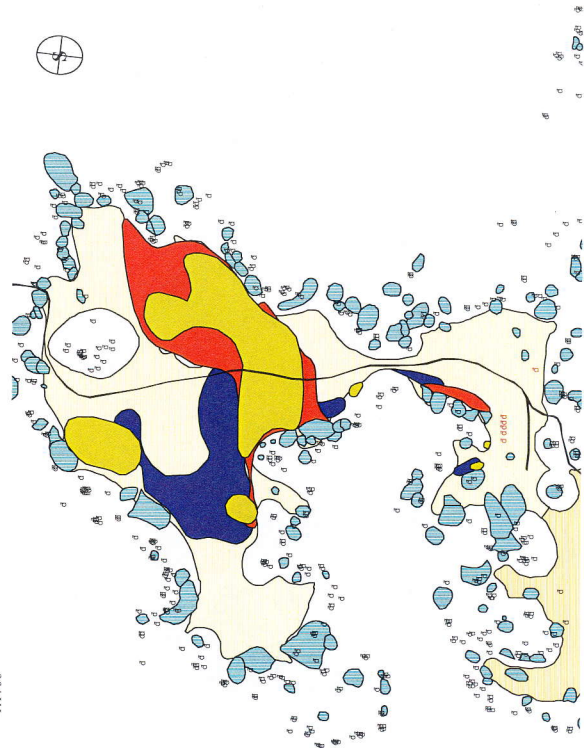


Fig. 6. Distribution of meadow rue (*Thalictrum minus*) on locality 1 (2003).
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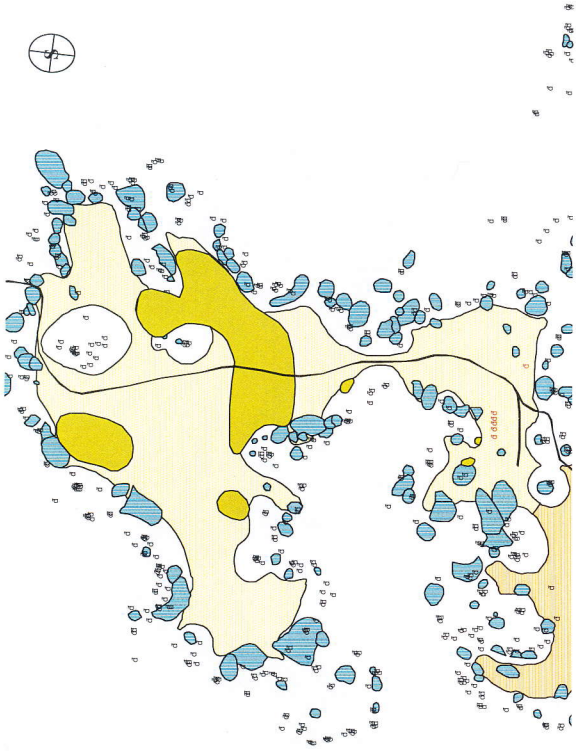


Fig. 6. Distribution of meadow rue (*Thalictrum minus*) on locality 1 (2005).
1:1700

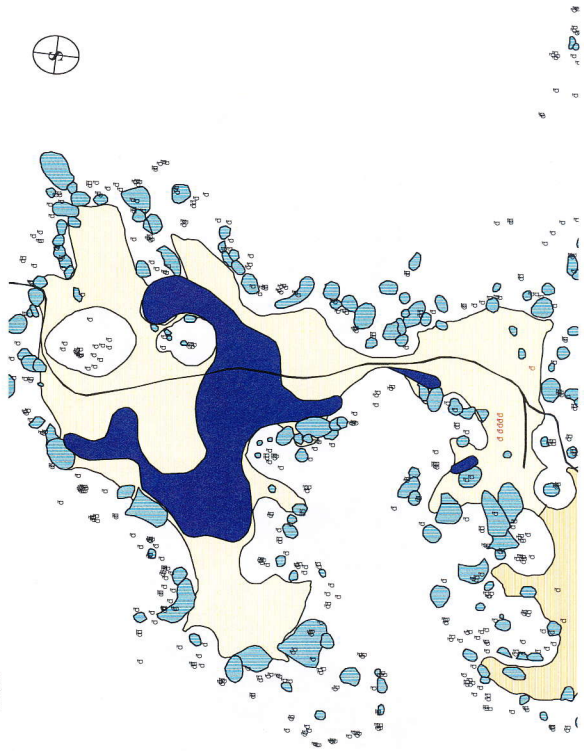


Fig. 6. Distribution of meadow rue (*Thalictrum minus*) on locality 1

Fig. 7. Distribution of meadow rue (*Thalictrum minus*) on locality 1 (2004).

1:2150

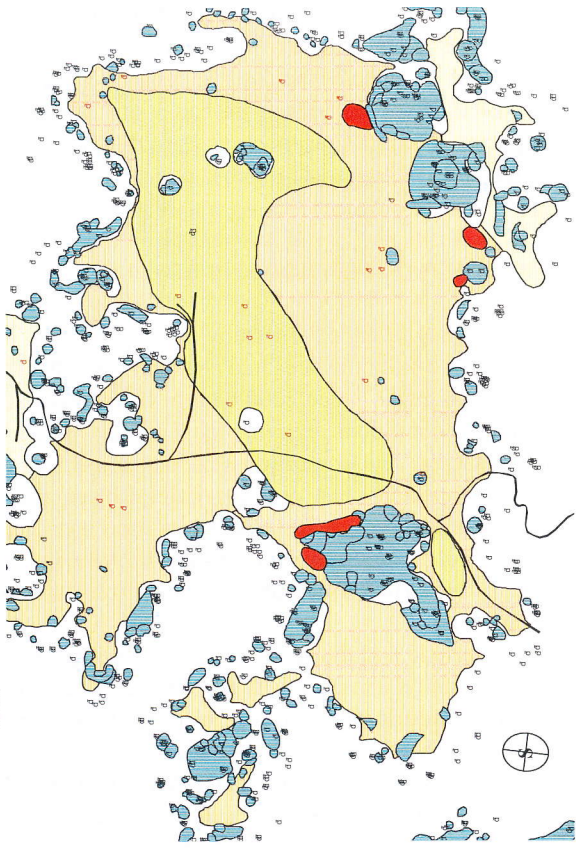


Fig. 7. Distribution of meadow rue (*Thalictrum minus*) on locality 1.

1:2150

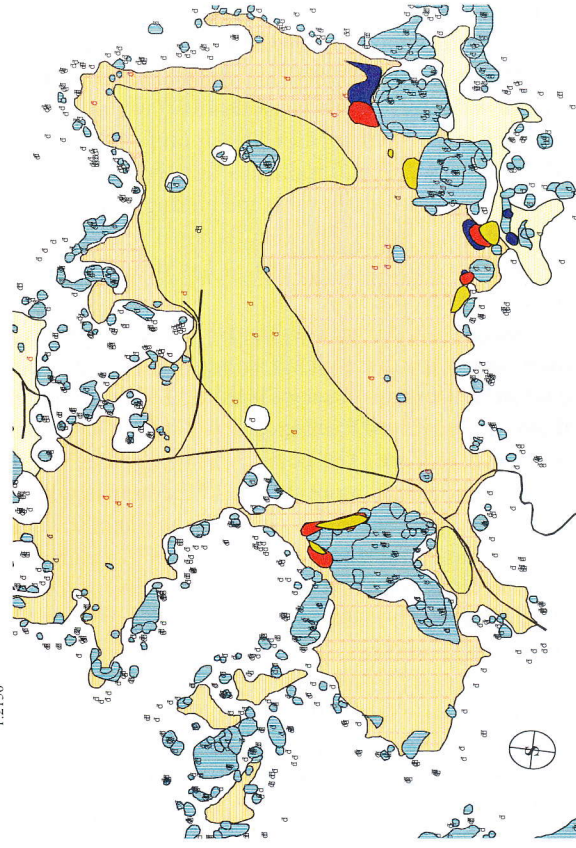


Fig. 7. Distribution of meadow rue (*Thalictrum minus*) on locality 1 (2003).

1:2150

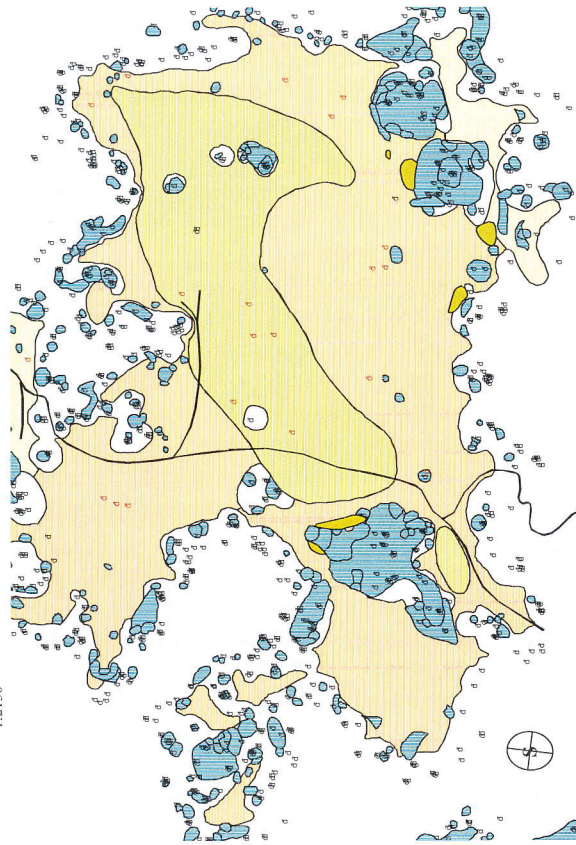


Fig. 7. Distribution of meadow rue (*Thalictrum minus*) on locality 1 (2005).

1:2150

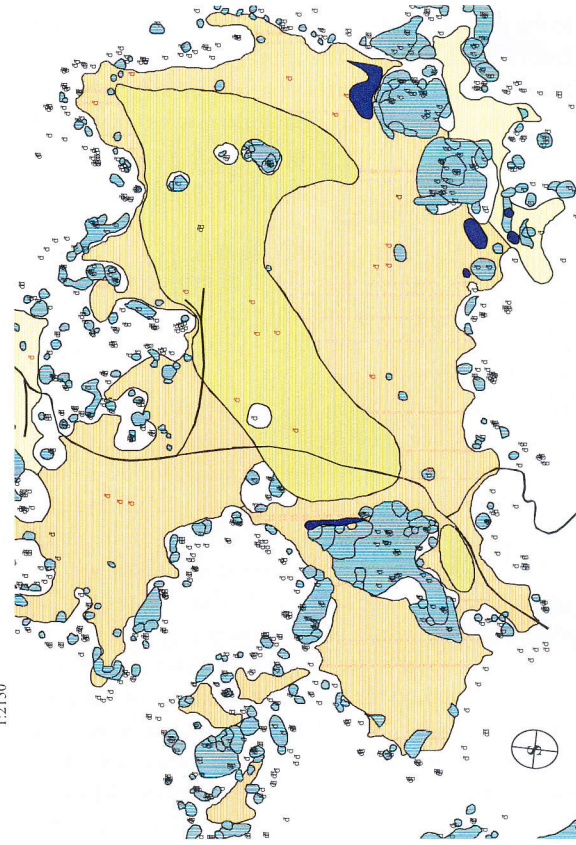


Fig. 7. Distribution of meadow rue (*Thalictrum minus*) on locality 1

(Chytrý et al., 2001). This is a perennial flower with trilobate leaves growing into a leafy rosette. They usually grow after the blooming season and stay through the whole winter. The bloom's color is usually blue (yet sometimes pink or white). The flower is a shorter (0.05–0.2 m) hemicryptophyte. It blooms from March until April. Literature (Kubát et al., 2002) indicates that the species is found in leafy and assorted forests, and among shrubs from flats to downs. It is rarely found in foothills (pla. 200 m – Co. 400 m, rare to sbmo. 700 m). It has straggly occurrence [*H. triloba* Gilib.].

We can find the windflower (*Anemone sylvestris* L.) in more shady locations (such as a grove of thermophilous oaks or in the grassy base of hillsides). This is a perennial flower with delayed free bracts on its stem. The bloom size is about 3 to 6 cm. The color is white and each stem has one or two (usually more) blooms. The stem is pilose. The flower blooms from May to June at a height of 0.15 to 0.25 meters. The literature (Kubát et al., 2002) indicates that this species is found on sunny hillsides, warm forest edging, and in photic forests from the flats to the foothills (pla. 200 m – Co. 400 m). It takes on a straggly appearance in warmer locations, elsewhere it appears rarely (C3 flower).

The pasqueflower (*Pulsatilla pratensis* (L.) Mill. subsp. *bohémica* Skalický) is typically found on the sunny and dry stands of secondary steppes. It is a perennial flower with 2 to 4 times pinnatisect or pinnate leaves, or palmatum tripartite leaves. The leaves die off before winter. The flower is a white pilose. The bloom is pendent, short, and cylindrical. The petals are dark violet. The flower is low to the ground (0.08–0.2 m), is hemicryptophyte, and blooms from March to May. The literature (Kubát et al., 2002) indicates that this species is found on steppe hillsides and on rocky steppes from flatlands to downs (pla. 200 m – Co. 400 m). It has a straggly appearance particularly in Moravia and the central area of Bohemia (C2 flower) [*P. p.* subsp. *nigricans* auct.].

The last flower of this family is the meadow rue (*Thalictrum minus* L.). The micro-population of this flower has appeared in recent years. It is a perennial flower with obovate leaves about 0.5–3 cm. The base is round and wide to wedge shaped. It has a grooved to angular stem. The bloom is yellowish and upright (*Th. m.* subsp. *elatum* (Jacq.) Stoj. et Stefanov). The flower varies from 0.3–1.5 m high, is hemicryptophyte, and blooms from June to July. The literature (Kubát et al., 2002) indicates that this species grows on sunny hillsides from flatlands to uplands (pla. 200 m – Co. 400 m). It takes on a straggly appearance in České Středohoří, Český Kras, and in south and Southeast Moravia (C3 flower).

For my observations I used the "special eyes method". With this method the observer stands in one place, which forms the center of a calculated observational cross. This technique allows the observer to locate and draw individual species on a map (Průša, 1976). More recently these maps can be redrawn digitally (Průša, 1985). The digital maps differ slightly from the original maps from the manuscript of Průša. They are drawn in a program

called ARC VIEW 3.2. These maps allow the observer to plot the exact location of species and to track the increase or decrease of abundance of species and to also track the movement of species across the grassy hillsides and amongst the rocky hillsides. One can relate the movement of species to conditions, such as humidity, temperature, trophic and soil types and depths.

DISCUSSION OF METHOD AND RESULTS

At the beginning of this study in the year 2000 it was amazing how little this area had changed from that shown on very old maps. Since 2000 change has been rapid due to climatic conditions, extreme local conditions, and animal pressures. The proportion of stronger species has increased, especially fast growing ruderal ones, and thermophilic edge species have occupied free space on the steppes (genus *Thalictrum*, *Anemone*, *Dictamnus*, *Origanum*). Increased sprouting of seedlings of trees and shrubs are common.

This article and the accompanying material are a part of my thesis (Němcová, 2001) and dissertation. This work is the result of four years observation of the micro-populations described above. The study includes the charting of all vegetation on the hill Doutnách and the nearby hills of Boubová and Na Pláních as phytosociological and typological methods have determined it in phytosociological images.

The next part of the article deals with the progress of threatened species since the year 2000.

Graphical data concerning protected and threatened species indicate a general and continuing proliferation.

Micro-populations of the windflower (Figs 2 and 3) continue to increase amongst the forest edges of thermophilic oak (*Quercus pubescens* Willd.). However, the growth of the windflower stagnates on the grassier hillsides of the main steppes.

Micro-populations of the pasqueflower (Figs 4 and 5) have also drifted to the rocky steppes. The pasqueflower is not a strong species and cannot resist the competitive pressure of grasses and sedges. Also, the slow growth of the flower cannot stand up to the faster growing ruderal species invading its environment.

Along with the pressure of fast growing grasses and sedges we also can observe the general proliferation of meadow rue (Figs 6 and 7).

The transfer from terrain maps to digital maps may have led to some mistakes of observation in this study. Otherwise a subjective mistake may have occurred during the charting, which would have remained constant in the maps and periods of observation.

Acknowledgements

Thanks to English translation consultant Norman L. Rogers, M. A., University of California, Berkeley, USA.

Index of appendices

- pla. – Altitudinal zone – flat
Co. – Altitudinal zone – uplands
sbmo. – Altitudinal zone – foothill
therophytes – yearling flowers. We can discern spring, summer or autumn ephemerals with a short vegetation period and summer theophytes with vegetation through most of the vegetation season. We can articulate therophytes after their increase on herbaceous and grassy areas and on tufty, upright, ground, or lodging and succulents (M o r a v e c et al., 1994).
hemicyptophyte – recovery buds on the soil surface. We can articulate them after their increase on tufty, upright, rosette and lodging on the ground (M o r a v e c et al., 1994).
C2 flower – its taxons reveal different threat levels – heavily threatened (P r o c h á z k a, 2001)
C3 flower – its taxons reveal different threat levels – threatened (P r o c h á z k a, 2001)
[] – indicates a synonym. The botanic nomenclature has changed as a result of new theories and knowledge.
taxon – this is systematic unit of a biological system.

REFERENCES

- ANONYMOUS: Květena Českého krasu se zvláštním zřetelom k vegetaci Rezervace Velká hora.
CHRTEK, J. – TOMŠOVIC, P. – KOVANDA, M.: Květena České republiky. Praha, Academia 1997.

PEKAŘOVÁ, K. (Lesy České republiky, s. p., odbor lesního hospodářství a ochrany přírody, Hradec králové, Česká republika):

Dynamika ohrožených druhů čeledi *Ranunculaceae* na stepních lokalitách kopce Doutháček v NPR Karlštejn.

Scientia Agric. Bohem., 38, 2007: 24–33.

Cílem práce bylo zachytit postup či ústup ohrožených taxonů na území druhotné stepi, která leží na jižní expozici kopce Doutháček v CHKO Český kras. V článku je detailně popsáno několikaleté sledování mikropopulací ohrožených druhů čeledi *Ranunculaceae* (sasanka, koniklec, žluťucha), z něhož se dá vyvodit dynamika těchto mikropopulací v daném období.

Je zde popsána použitá „okulární metoda“ zákresu jedinců do mapy, pomocí které byly detailní mapy dynamiky druhů vypracovány. Metoda je založena na terénních pozorováních. Pozorovatel stojí na místě a formou záměrného kříže, jehož je středem, se orientuje na mapě a zakresluje jednotlivé jedince daného druhu. Digitální podoba map byla vytvořena programem ArcView GIS 3.2. Jako základ byla použita Průšova mapa z roku 1976.

Na lokalitách kopce Doutháček, bez jakýchkoliv managementových opatření, výše zmiňované ohrožené druhy celkově prosperují do té míry, že je pozorovatelný nárůst většiny mikropopulací v celém cyklu pozorování. Obecně lze říci, že nezávisle na dílčích mikropopulacích se jednotlivé druhy na lokalitě rozrůstají v jejich typických podmínkách.

Trochu výjimkou ze tří popsaných druhů (*Anemone sylvestris*, *Pulsatilla pratensis* subsp. *bobemica*, *Thalictrum minus* subsp. *elatum*) je koniklec, který se jeví jako méně konkurenceschopný druh. Z terénních dat je patrný posun jedinců z travnatých na méně zarostlá stanoviště ve vyšších částech svahu.

Vzhledem k relativně krátkému období pozorování nelze jednoznačně určit vývojový trend těchto mikropopulací v dlouhodobém měřítku. Lze ale odhadnout, že v případě neměnných nebo pomalu se měnících podmínek lokalit je pravděpodobné další zvyšování stavů těchto ohrožených taxonů.

step; vegetace; sasanka; koniklec; žluťucha

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- CHYTRÝ, M. – KUČERA, T. – KOČÍ, M. (eds.): Katalog biotopů České republiky. Praha, Agentura ochrany přírody a krajiny ČR 2001.
<http://www.ceskras.schkoecr.cz/>, 2001 (stav v červenci 2005).
KUBÁT, K. – HROUDA, L. – CHRTEK, J. Jr. – KAPLAN, Z. – KIRSCHNER, J. – ŠTĚPÁNEK J. (eds.): Klíč ke květeně České republiky (Key to flora of the Czech Republic). Praha, Academia 2002. 928 pp.
MORAVEC, J. et al.: Fytocenologie. Praha, Academia 1994.
MORAVEC, J. et al.: Rostlinná společenstva České republiky a jejich ohrožení. Severočeskou přírodou, příloha. Litoměřice, 1995.
NĚMCOVÁ, K.: Vegetace kopce Doutháček (NPR Karlštejn). – Ms. [Diss.; depon. in: Knih. KDSLD Lesnic. Fak. ČZU Praha, 2001].
PROCHÁZKA, F. (ed.): Černý a červený seznam cévnatých rostlin České republiky (stav v roce 2000). Příroda, Praha, 18, 2001: 1–166.

Maps:

- PRŮŠA, E.: Die böhmischen und mährischen Urwälder – ihre Struktur und Ökologie. Praha, Academia 1985. 580 pp. *(Quoting the original map from 1976)
Digitální zpracování původní mapy – Agentura ochrany přírody a krajiny ČR, úsek ekologie krajiny a lesa, oddělení ekologie lesa (Janík D., Adam D., 2004).

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