

The occurrence and distribution of rare and endangered plant species in segetal communities in the Borská nížina Lowland

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Abstract: In the paper, we analyse the distribution of rare and endangered segetal species in the Borská nížina Lowland. We compare the data from the recent field research carried out in 2002-2004 with the historic data by dr. Krippelová from 1949-1955. Processed and analysed data imply that some species rapidly disappear from this area; some of them are as abundant as before, whereas some other appeared to be new for the area comparing to dr. Krippelová's findings.

Keywords: Borská nížina Lowland, rare and endangered species, distribution, cultivated fields, abandoned fields.

Introduction

The initial data on segetal vegetation in the Borská nížina Lowland, which come from the 5th decade of the 20th century, were collected by Krippelová (maiden name Opluštílová). Partly her results were published in the work "Ekológia burín v obilninách" (OPLUŠTILOVÁ 1953), but the major part of her phytocoenological material and data remained unpublished and is deposited in the Central Database of the Institute of Botany SAS in Bratislava.

In 2002-2004, we studied the vegetation of cultivated and abandoned fields in the Borská nížina Lowland to compare the situation with the segetal vegetation

in this area after ca 50 years. In course of our phytocoenological research, we have detected the larger amount of rare and endangered plant species in agrocoenoses. The aim of this paper is to present the current situation on the distribution of individual rare and endangered segetal species comparing it with published and unpublished 50 years old data by Krippelová.

The study area

The Borská nížina Lowland lies in the western part of Slovakia, alongside the borderline with the Czech Republic and Austria. Its natural border is formed by the slopes of the Malé Karpaty Mts. from the village Jablonica to Devínska Nová Ves in the east, by the Morava River between the villages Devínska Nová Ves and Kúty in the west, by the Myjava River restricting the lowland between the villages Kúty and Jablonica in the north and by the confluence of the Morava and Danube Rivers in the south. The Borská nížina Lowland covers the area of about 1000 km² with the elevation ranging from ca 138 to 260 m. The geological substrate is made from the alluvial sediments, eolian sands, sand dunes, fluvial grave-sand terraces, and sporadically from loesses and loess soils (KRIPPELOVÁ & KRIPPEL 1956; FUSÁN et al. 1980). Fytogeografically, the studied area belongs to the region of pannonian flora (Pannonicum) comprising the zone of eupannonian xerotherm flora (Eupannonicum) of the Záhorie district (FUTÁK 1980).

Considerable part of the area has already been modified by humans in the past being transformed to agricultural land. At present, almost half of the area is covered by cultivated and abandoned fields. The villages are often surrounded by small private fields, although generally the landscape is dominated by large fields where mainly cereals (rye, wheat, less barley and oats) and hoed-crops (maize, sunflower, seldom soya and potatoes) are cultivated.

Material and methods

The field research was carried out in growing seasons of 2002-2004. Primarily, our research was focused on the vegetation of large cultivated and abandoned fields. Species found there are given in alphabetical order. All species are characterised by brief data on their ecology and coenological relations based on fytooenological data and localities of occurrence. Studied localities partly present the recent research of 2002-2004 and partly belong to the historic data from 1949-1955 (KRIPPELOVÁ ined.). We came out from our own 177 phytocoenological relevés and from the representative samples of 127 relevés (Krippelová ined.) excerpted from the database of the Institute of Botany SAS. Each locality is followed by the number of its field according to the Central European network; recent localities are provided with geographic coordinates. The distribution of the taxa is illustrated by the maps. The herbarium is stored and possessed by the authors.

The nomenclature of taxa follows MARHOLD & HINDÁK (1998), the names of syntaxa are by JAROLÍMEK et al. (1997) and threatened categories are quoted

according to FERÁKOVÁ et al. (2001): CR – critically endangered, EN – endangered, VU – vulnerable, LR:nt – lower risk, near threatened. Abbreviations used below: JM – Jana Májeková, MZ – Marica Zaliberová, VJ – Vladimír Jehlík, TK – Terézia Krippelová, EK – Eduard Krippel.

Results

Adonis aestivalis LR:nt (Fig. 1a)

A relatively rare species, noticed only in few localities, with the most frequent occurrence in the margins of cereal fields. It grew in the loamy or clayey soil, more often in communities of the association *Consolido-Anthemidetum austriacae*.

Recent localities: Jakubov, 1,5 km to NE from the church, 48°25'08", 16°56'43", 150 m a.s.l., loamy soil, a cereal field margin, 11.5.2004, JM, MZ (7567d). – Záhorská Ves, 2,3 km to SE from the railway station, 48°22'07", 16°52'25", 144 m a.s.l., clayey soil, cereal field, 19.6.2003, JM, MZ (7667a); 1,5 km to SEE from the railway station, 48°22'29", 16°51'58", 145 m a.s.l., a cereal field margin, 24.6.2003, JM, MZ (7667a).

Agrostemma githago CR (Fig. 1b)

A rare species, at present it survive only in several small private fields near the village Stupava. In 2003, our colleague Mered'a jun. informed us verbally about its occurrence. The next year we confirmed it. The species occurred in cereals grown in loamy soil in the community with *Apera spica-venti* and *Papaver rhoeas*. In the past, it was common weed in cereals and 1-year abandoned fields (Krippelová ined).

Recent localities: the Mást part of Stupava, below the Vrchná hora Hill, 48°15'32", 17°02'04", 168 m a.s.l., loamy soil, private cereal field, 20. 6. 2003, JM, MZ (7768a); 48°15'54", 17°02'11", 175 m a.s.l., loamy soil, pri vate cereal field, 1.7.2004, JM (7768a); 48°15'47", 17°02'09", 170 m a.s.l., loamy soil, pri vate cereal field, 1.7.2004, JM (7768a).

Historic localities: locality Abrod, the road to the villages Závod and Tomky, cereal field, 26.5.1951, TK (7467d). – Jakubov, the end of the village, at the road to the village Kostolište, sandy-loamy soil, cereal field, 22.6.1951, TK (7567d). – Kostolište–Gajary, 1 km to the right behind the chapel, sandy soil, cereal field, 13.7.1951, TK, EK (7567b). – Malacky, locality Na dekanskom, cereal field, 25.6.1951, TK (7568c); opposite to the railway station, sandy-loamy soil, cereal field, 22.6.1951, TK (7568c). – Malacky–Láb, cereal field, 5.7.1951, TK (7667b). – Malacky–Veľké Leváre, abandoned field, 29.6.1955, TK (7568a). – Malé Leváre–Veľké Leváre, the left side of the road, 300 m from the village Malé Leváre, sandy soil, cereal field, 13.7.1951, TK, EK (7567b). – Veľké Leváre, at the main road to the locality Abrod, sandy soil, 1-year abandoned field, 10.8.1949, TK (7467d). – Závod, between the railway station and the village, 1-year abandoned field, 6.5.1955, TK (7468c); cereal field, 8.7.1951, TK (7468c). – Zohor, sandy soil, cereal field and 1-year abandoned field, 29.4.1951, TK (7667d).

***Aphanes arvensis* EN (Fig. 1c)**

A rare species, which was found only in one locality, where it grew in a community of the association *Veronicetum trilobae-triphyllidi* in a cereal field creating strong population with many flowering plants.

Recent locality: Záhorská Bystrica, 1,4 km to SW from the church, 48°13'51", 17°01'40", 164 m a.s.l., loamy soil, cereal field, 19.5.2004, JM (7768c).

***Cyanus segetum* LR:nt (Fig. 2a)**

In spite of its category of endangerment species, it is relatively abundant in the Borská nížina Lowland in sandy, loamy, and loamy-sandy soils. Predominantly, it occurs in cereal fields, less in abandoned fields and in hoed-crops, most frequently in the field margins. The species is common in communities of the association *Consolido-Anthemidetum austriacae*. As it was recorded in the past (Krippelová ined.), this species often occurs in cereal fields, abandoned fields and stubbles.

Recent localities: Húšky, 0,5 km to N from the church, locality Dubník, 48°34'25", 17°03'12", 157 m a.s.l., sandy soil, cereal field, 20.6.2003, JM, MZ (7468a). – Lakšárska Nová Ves, 1,1 km to E from the church, 48°34'31", 17°12'11", 240 m a.s.l., loamy-sandy soil, a field edging, 29.6.2004, JM, MZ (7469a); SE outskirts of the village, 48°34'34", 17°11'27", 238 m a.s.l., loamy soil, cereal field, 29.6.2004, JM, MZ (7469a); 2 km to N from the church, the left bank of the stream Šaštínský potok, 48°35'33", 17°10'48", 213 m a.s.l., sandy soil, abandoned field, 23.7.2004, JM (7469a). – Malacky, N outskirts of the town, at the elevation mark 158,5, 48°26'43", 17°00'41", 158 m a.s.l., loamy soil, abandoned field, 11.6.2004, JM, MZ (7568c). – Moravský Svätý Ján, 2,5 km to SE from the church, the left bank of the stream Lakšársky potok, 48°34'13", 17°01'09", 150 m a.s.l., loamy soil, cereal field, 17.7.2003, JM, MZ (7468a); 1,8 km to SW from the church, locality Rúbanice, 48°34'38", 16°59'36", 152 m a.s.l., rnaize field, 12.7.2004, JM, MZ (7467b). – Plavecký Štvrtok, 1,3 km to S from the railway station, 48°21'41", 17°00'31", 159 m a.s.l., sandy soil, cereal field, 13.5.2004, JM (7668a). – Studienka, N outskirts of the village, 48°32'11", 17°08'09", 212 m a.s.l., sandy soil, abandoned field, 28.5.2004, JM, MZ (7468d). – Veľké Leváre, 0,2 km to S from the railway station, 48°30'25", 17°01'14", 158 m a.s.l., sandy soil, private cereal field, 21.7.2004, JM (7468c). – Závod, 1,5 km to E from the church, locality Na lúkach, 48°32'35", 17°03'15", 165 m a.s.l., cereal field, 8.7.2003, JM, MZ (7468c); 0,4 km to SE from the railway station, 48°32'14", 17°00'51", 161 m a.s.l., sandy soil, cereal field, 25.5.2004, JM (7468c).

Historic localities: Jakubov, the end of the village, the road to the village Kostolište, sandy-loamy soil, cereal field, 22.6.1951, TK (7567d). – Kostolište, the left side of the road to the village Gajary, 2 km before Gajary, sandy-loamy soil, cereal field, 13.7.1951, TK, EK (7567b). – Kúty, loamy-sandy soil, stubble, 7.8.1949, TK (7368a); sandy soil, abandoned field, 7.8.1949, TK (7368a). – Lamač, cereal field, 27.6.1951, TK (7868a); the road to Stupava, 1-year abandoned field, 13.4.1951, TK (7768c). – Malacky, locality Na dekanskom, cereal field, 25.6.1951, TK (7568c); opposite to the railway station, sandy-loamy soil, cereal field, 22.6.1951, TK (7568c); direction to the locality Farárske, 1-year abandoned field, 13.4.1955, TK (7568c); the road to the village Vinohrádok, sandy-loamy soil, cereal field, 5. 7. 1951, TK (7568c); the road to the village Veľké Leváre, abandoned field, 29.6.1955, TK (7568a). – Malé Leváre, the left side of the road to the village Veľké Leváre, 300 m from Malé Leváre, sandy soil, cereal field, 13.7.1951, TK, EK (7567b). – Veľké Leváre, at the main road to the locality Abrod, sandy soil, 1-year abandoned field,

10.8.1949, TK (7467d); sandy-loamy soil, stubble, 10.8.1949, TK (7467d). – Závod, between the railway station and the village, sandy soil, cereal field, 8.7.1951, TK (7468c); the road to the village Tomky, sandy soil, cereal field, 8.7.1951, TK (7468a). – Zohor-Lozorno, 1-year abandoned field, 30.4.1955, TK (7668c).

***Herniaria hirsuta* LR:nt (Fig. 2b)**

A rare species, which was discovered only in one locality, where several plants grew in the stubble after cereals (it is interesting that it grew in the same field, where we had found *Aphanes arvensis* in the spring). The species germinates already in spring in a cereal community, but optimal development it reaches only in summer in stubbles. All soils containing sand are suitable for it. 50 years ago, it was very abundant in the Borská nížina Lowland (OPLUŠTILOVÁ 1953).

Recent locality: Záhorská Bystrica, 1,7 km to SW from the church, 48°13'45", 17°01'37", 160 m a.s.l., loamy soil, stubble, 30.8.2004, JM (7768c).

Historic localities: Jakubov, sandy soil, stubble, 12.9.1951, TK (7567d). – Lamač, forage crops, 13.4.1951, TK (7868a); cereal field, 27.6.1951, TK (7868a); stony soil, stubble, 28.8.1951, TK (7868a). – Kúty, sandy-loamy soil, stubble, 7.8.1949, TK (7368a). – Malacky, cereal field, 21.6.1951, TK (7568c); the road to Rárbok, sandy soil, stubble, 2.9.1951, TK (7568c). – Moravský Svätý Ján, sandy-loamy soil, abandoned field, 6.8.1949, TK (7468a). – Veľké Leváre, at the main road to the locality Abrod, sandy soil, stubble, 10.8.1949, TK (7467d). – Závod, between the railway station and the village, sandy soil, cereal field, 8.7.1951, TK (7468c); sandy soil, stubble, 26.8.1951, TK (7468c).

***Hibiscus trionum* VU (Fig. 2c)**

A rare species. In 2003, MEREĎA (2003) reported it in one locality near the village Suchohrad growing in the maize community. The next year we confirmed its presence on this locality. *Hibiscus* grew in the non-ploughed part of the field, where the winter *Sinapis alba* was sown.

Recent locality: Suchohrad, 3,1 km to NE from the church, the right bank of the canal Zohorský kanál, 48°25'18", 16°53'37", 145 m a.s.l., loamy soil, a field margin, 2.10.2004, JM, MZ, VJ (7567c).

***Kickxia elatine* LR:nt (Fig. 3a)**

It occurs only in the distant isolated localities and only sporadically. According to MICHALKOVÁ (1997) the species was expected to be found in dry cultivated soils, but we have recorded it only in heavy clayey soils in depressions, where it grew with such species as *Tripleurospermum perforatum*, *Plantago uliginosa*, or *Pulicaria dysenterica*.

Recent localities: Jablonové, 2,1 km to NE from the church, 48°21'50", 17°06'45", 220 m a.s.l., clayey soil, a depression in a cereal field, 10.6.2003, JM, MZ (7668b). – Záhorská Ves, 2,4 km to SE from the railway station, 48°22'00", 16°52'17", 144 m a.s.l., clayey soil, a depression in a cereal field, 19.6.2003, JM, MZ (7667a). – Závod, 2,1 km to SW from the railway station, locality Diely, 48°31'56", 16°58'59", 150 m a.s.l., abandoned field, 24.7.2003, JM (7467d).

***Kickxia spuria* VU (Fig. 3b)**

Although this species belongs to the higher category of endangerment than *K. elatine*, it occurs in the area more frequently. We recorded it in different types of biotopes – in stubbles, cereal fields, and depressions in loamy and clayey soil. In the stubble, it grew, for example, in a community of the association *Euphorbio exigue-Melandrietum noctiflori*.

Recent localities: Kuklov, 0,1 km to SE from the railway station, 48°38'56", 17°04'12", 160 m a.s.l., loamy soil, stubble, 9.9.2004, JM, MZ (7368c). – Suchohrad, E outskirts of the village, the right bank of the Hlinec stream, 48°24'22", 16°52'07", 145 m a.s.l., loamy-clay soil, a depression in a colza field, 25.6.2003, JM, MZ (7567c). – Vysoká pri Morave, 0,3 km to E from the railway station, the right bank of the Rudavka stream, 48°19'59", 16°55'04", 143 m a.s.l., loamy soil, pri vate cereal field, 19.8.2003, JM, MZ (7667d). – Záhorská Bystrica, 1 km to NE from the church, 48°14'48", 17°02'50", 190 m a.s.l., loamy soil, stubble, 8.9.2003, JM (7768c). – Záhorská Ves, 2,4 km to SE from the railway station, 48°22'00", 16°52'17", 144 m a.s.l., a depression in a cereal field, 19.6.2003, JM, MZ (7667a).

***Papaver argemone* VU (Fig. 3c)**

An abundant species, which has the optimum of its development early in the spring (in the area it blooms as the first from the genus *Papaver*). Sandy and loamy-sandy soils are convenient for it. It grows more often in communities of the association *Veronicetum trilobae-triphyllidi* in cereal and abandoned fields and often forms characteristic edgings along fields and field ways.

Recent localities: Lozorno, SW outskirts of the village, 48°19'48", 17°01'57", 178 m a.s.l., loamy-sandy soil, cereal field, 11.5.2004, JM (7668c). – Plavecký Štvrtok, 1,1 km to S from the railway station, 48°21'45", 17°00'29", 159 m a.s.l., sandy soil, cereal field, 13.5.2004, JM (7668a); 1,3 km to S from the railway station, 48°21'41", 17°00'31", 159 m a.s.l., sandy soil, cereal field, 13.5.2004, JM (7668a); 1,1 km to SW from the railway station, 48°22'00", 16°59'46", 154 m a.s.l., sandy soil, abandoned field, 13.5.2004, JM (7667b). – Studienka, N outskirts of the village, 48°32'15", 17°08'04", 212 m a.s.l., sandy soil, abandoned field, 22.4.2004, JM, MZ (7468d); 4 km to N from the church, 48°33'40", 17°07'54", 197 m a.s.l., sandy soil, cereal field, 10.5.2004, JM, MZ (7468b). – Veľké Leváre, 3 km to NNW from the church, 48°31'35", 16°59'21", 153 m a.s.l., sandy soil, abandoned field, 9.6.2003, JM, MZ (7467d). – Záhorská Bystrica, 1,4 km to SW from the church, 48°13'51", 17°01'40", 164 m a.s.l., loamy soil, cereal field, 19.5.2004, JM (7768c). – Závod, 1,7 km to NWW from the railway station, 48°32'40", 16°59'15", 153 m a.s.l., loamy-sandy soil, cereal field, 27.4.2004, JM (7467d); 0,4 km to SE from the railway station, 48°32'14", 17°00'51", 161 m a.s.l., sandy soil, cereal field, 25.5.2004, JM (7468c).

***Papaver dubium* subsp. *austromoravicum* LR:nt (Fig. 4a)**

An abundant species, growing predominantly in winter cereals, less occurring in abandoned fields, mainly in loamy, loamy-sandy or sandy soil. It is often a member of the association *Veronicetum trilobae-triphyllidi*.

Recent localities: Borský Svätý Jur, 0,7 km to SE from the church, 48°36'28", 17°03'17", 175 m a.s.l., loamy-sandy soil, cereal field, 10.5.2004, JM (7368c). – Devínska Nová Ves, 2,7 km to NE from the church, 48°13'25", 17°00'11", 160 m a.s.l., loamy soil,

cereal field, 24.5.2004, JM, MZ (7768c). – Jakubov, 1,5 km to NE from the church, 48°25'07", 16°56'45", 151 m a.s.l., loamy soil, cereal field, 11.5.2004, JM, MZ (7567d); 48°25'08", 16°56'43", 150 m a.s.l., loamy soil, cereal field, 11.5.2004, JM, MZ (7567d). – Lozorno, SW outskirts of the village, 48°19'48", 17°01'57", 178 m a.s.l., loamy-sandy soil, cereal field, 11.5.2004, JM (7668c). – Plavecký Štvrtok, 1,3 km to S from the railway station, 48°21'41", 17°00'31", 159 m a.s.l., sandy soil, cereal field, 13.5.2004, JM (7668a). – Studienka, N outskirts of the village, 48°32'25", 17°08'14", 217 m a.s.l., sandy soil, abandoned field, 28.5.2003, JM, MZ (7468d). – Stupava, 1 km to NW from the church, 48°16'51", 17°01'24", 178 m a.s.l., loamy-sandy soil, cereal field, 24.5.2004, JM (7768a). – Veľké Leváre, 1,5 km to NW from the church, at the elevation mark 153,7, 48°30'39", 16°59'09", 153 m a.s.l., sandy soil, cereal field, 30.4.2004, JM, MZ (7467d). – Záhorská Bystrica, 1,4 km to SW from the church, 48°13'51", 17°01'40", 164 m a.s.l., loamy soil, cereal field, 19.5.2004, JM (7768c); 1,3 km to SW from the church, 48°13'59", 17°01'35", 162 m a.s.l., loamy soil, cereal field, 19.5.2004, JM (7768c); 2,2 km to W from the church, 48°14'40", 17°00'34", 156 m a.s.l., loamy-sandy soil, cereal field, 19.5.2004, JM (7768c).

***Ranunculus arvensis* LR:nt (Fig. 4b)**

At present, this is a relatively rare species. It occurs in several localities, containing, however, fewer exemplars. It grows mainly in the field margins, what was already noticed by OPLUŠTILOVÁ (1953), when the species was relatively abundant in the Borská nížina Lowland.

Recent localities: Jablonové, 2,2 km to NE from the church, 48°21'40", 17°07'16", 250 m a.s.l., sandy soil, cereal field, 10.6.2003, JM, MZ (7668b); 1,5 km to NE from the church, 48°21'25", 17°06'48", 238 m a.s.l., loamy-sandy soil, cereal field, 29.6.2004, JM, MZ (7668b). – Lakšárska Nová Ves, SE outskirts of the village, 48°34'34", 17°11'27", 238 m a.s.l., loamy soil, a cereal field margin, 29.6.2004, JM, MZ (7469a). – Malé Leváre, 1,6 km to W from the church, 48°30'14", 16°57'09", 147 m a.s.l., loamy soil, a cereal field margin, 8.6.2004, JM (7467d). – Plavecký Štvrtok, 1,3 km to S from the railway station, 48°21'41", 17°00'31", 159 m a.s.l., sandy soil, cereal field, 13.5.2004, JM (7668a).

Historic localities: locality Abrod, the road to the villages Závod and Tomky, cereal field, 26.5.1951, TK (7467d). – Lamač, loamy-sandy soil, cereal field, 13.4.1951, TK (7868a). – Malacky, the road to the village Studienka, sandy-loamy soil, cereal field, 15.4.1951, TK (7568a); opposite to the railway station, sandy-loamy soil, cereal field, 22.6.1951, TK (7568c); locality Na dekanskom, sandy-loamy soil, cereal field, 25.6.1951, TK (7568c); the road to the village Vínohrádok, sandy-loamy soil, cereal field, 5.7.1951, TK (7568c). – Závod, at the road to the village Tomky, sandy soil, cereal field, 8.7.1951, TK (7468a).

***Veronica triphyllos* VU (Fig. 4c)**

It is the most common endangered species in the Borská nížina Lowland. The optimum of its development is early in the spring, when it participates in formation of the association *Veronicetum trilobae-triphylloidi*, being a characteristic species for this association. This community is typical for winter cereals, and is seldom in abandoned fields. We recorded the species in sandy, loamy-sandy, and loamy soils. The species was abundant in the Borská nížina Lowland in the past, too (Krippelová ined.).

Recent localities: Borský Svätý Jur, 0,7 km to SE from the church, 48°36'28", 17°03'17", 175 m a.s.l., loamy-sandy soil, cereal field, 10.5.2004, JM (7368c). – Devínska Nová Ves, 2,7 km to NE from the church, 48°13'25", 17°00'11", 160 m a.s.l., loamy soil, cereal field, 24.5.2004, JM, MZ (7768c); 3,6 km to E from the church, 48°12'17", 17°01'27", 180 m a.s.l., loamy soil, cereal field, 24.5.2004, JM (7768c). – Húšky, 0,7 km to N from the church, 48°34'31", 17°03'20", 157 m a.s.l., loamy-sandy soil, cereal field, 10.6.2004, JM (7468a). – Jakubov, 1,5 km to NE from the church, 48°25'08", 16°56'43", 150 m a.s.l., loamy soil, cereal field, 11.5.2004, JM, MZ (7567d). – Lozorno, SW outskirts of the village, 48°19'48", 17°01'57", 178 m a.s.l., loamy-sandy soil, cereal field, 11.5.2004, JM (7668c). – Malacky, 4,3 km to NNW from the railway station, 48°28'15", 17°00'45", 152 m a.s.l., sandy soil, cereal field, 30.4.2004, JM, MZ (7568a); 3,8 km to NNE from the railway station, 48°28'00", 17°02'30", 168 m a.s.l., loamy-sandy soil, cereal field, 10.5.2004, JM (7568a). – Plavecký Štvrtok, 1,3 km to S from the railway station, 48°21'41", 17°00'31", 159 m a.s.l., sandy soil, cereal field, 13.5.2004, JM (7668a); 1,1 km to SW from the railway station, 48°22'00", 16°59'46", 154 m a.s.l., sandy soil, abandoned field, 13.5.2004, JM (7667b). – Studienka, N outskirts of the village, 48°32'05", 17°08'04", 212 m a.s.l., sandy soil, abandoned field, 5.4.2004, JM, MZ (7468d); 3,4 km to N from the church, locality Na ohradách, 48°33'26", 17°08'05", 204 m a.s.l., sandy soil, abandoned field, 5.4.2004, JM, MZ (7468b). – Stupava, 1 km to NW from the church, 48°16'51", 17°01'24", 178 m a.s.l., loamy-sandy soil, cereal field, 24.5.2004, JM (7768a). – Veľké Leváre, N outskirts of the village, 48°30'42", 16°59'42", 155 m a.s.l., sandy soil, cereal field, 30.4.2004, JM, MZ (7467d); 1,5 km to NW from the church, at the elevation mark 153,7, 48°30'39", 16°59'09", 153 m a.s.l., sandy soil, cereal field, 30.4.2004, JM, MZ (7467d). – Záhorská Bystrica, 1,4 km to SW from the church, 48°13'51", 17°01'40", 164 m a.s.l., loamy soil, cereal field, 19.5.2004, JM (7768c); 2,2 km to W from the church, 48°14'40", 17°00'34", 156 m a.s.l., loamy-sandy soil, cereal field, 19.5.2004, JM (7768c). – Závod, 1,7 km to NWW from the railway station, 48°32'40", 16°59'15", 153 m a.s.l., loamy-sandy soil, cereal field, 27.4.2004, JM (7467d).

Historic localities: locality Abrod, the road to the villages Závod and Tomky, sandy soil, cereal field, 26.5.1951, TK (7467d). – Lamač, loamy-sandy soil, cereal field and forage crops, 13.4.1951, TK (7868a); the road to Stupava, sandy-loamy soil, 1-year abandoned field, 13.4.1951, TK (7768c). – Malacky, the road to the locality Farárske, 1-year abandoned field, 13.4.1955, TK (7568c); the right side of the road to the village Pernek, 1-year abandoned field, 18.4.1955, TK (7668b); opposite to the railway station, sandy-loamy soil, cereal field, 22.6.1951, TK (7568c). – Závod, between the railway station and the village, 1-year abandoned field, 6.5.1955, TK (7468c); sandy soil, cereal field, 8.7.1951, TK (7468c). – Zohor, sandy-loamy soil, 1-year abandoned field, 29.4.1951, TK (7667d); the road to the village Lozorno, 1-year abandoned field and forage crops, 30.4.1955, TK (7668c).

***Stachys annua* – (Fig. 5)**

Although it does not belong to any category of endangerment, the species is relatively rare both according to the results of our research and to the historic data related to the Borská nížina Lowland. Therefore, we suggest inserting this species on the list of rare and endangered species at least of this area. We found it mainly in stubbles, less in cereal communities, and always in low number of individuals. It is a member of the associations *Euphorbio exiguae-Melandrietum noctiflori* and *Stachyo annui-Setarietum pumilae*.

Recent localities: Kuklov, 0,1 km to SE from the railway station, 48°38'56", 17°04'12", 160 m a.s.l., loamy soil, stubble, 9.9.2004, JM, MZ (7368c). – Plavecké Podhradie, 0,7 km to SSW from the railway station, at the elevation mark 216,4, 48°28'40", 17°14'51", 216 m a.s.l., loamy stony soil, stubble, 9.9.2004, JM, MZ (7569a). – Vysoká pri Morave, 0,3 km to E from the railway station, the right bank of the stream Rudavka, 48°19'59", 16°55'04", 143 m a.s.l., loamy soil, private cereal field, 19.8.2003, JM, MZ (7667d); 3,7 km to SE from the church, 48°18'27", 16°56'45", 142 m a.s.l., loamy soil, stubble, 24.8.2004, JM (7667d).

Historic localities: Malacky, locality Na dekanskom, sandy-loamy soil, cereal field, 25.6.1951, TK (7568c). – Kúty, sandy-loamy soil, stubble, 7.8.1949, TK (7368a).

Conclusion

Despite the extensive human intervention to the agricultural landscape, we have detected 13 rare and endangered species of the Slovak flora in the Borská nížina Lowland. Some species that Krippelová (ined.) quoted as common weeds in the 50s of the 20th century have already become rare (e.g. *Agrostemma githago*, *Herniaria hirsuta*), but some of them survived forming strong and numerous populations (*Cyanus segetum*, *Veronica triphyllos*). Unfortunately, the presence of some species (e.g. *Bromus secalinus*, *Nigella arvensis*, *Veronica triloba*) was not confirmed in the studied area. Conversely, we have recorded some taxa that Krippelová did not quote for the Borská nížina Lowland, e.g. *Adonis aestivalis*, *Aphanes arvensis*, *Hibiscus trionum*, *Kickxia elatine*, *K. spuria*, *Papaver argemone*, and *P. dubium* subsp. *austromoravicum*.

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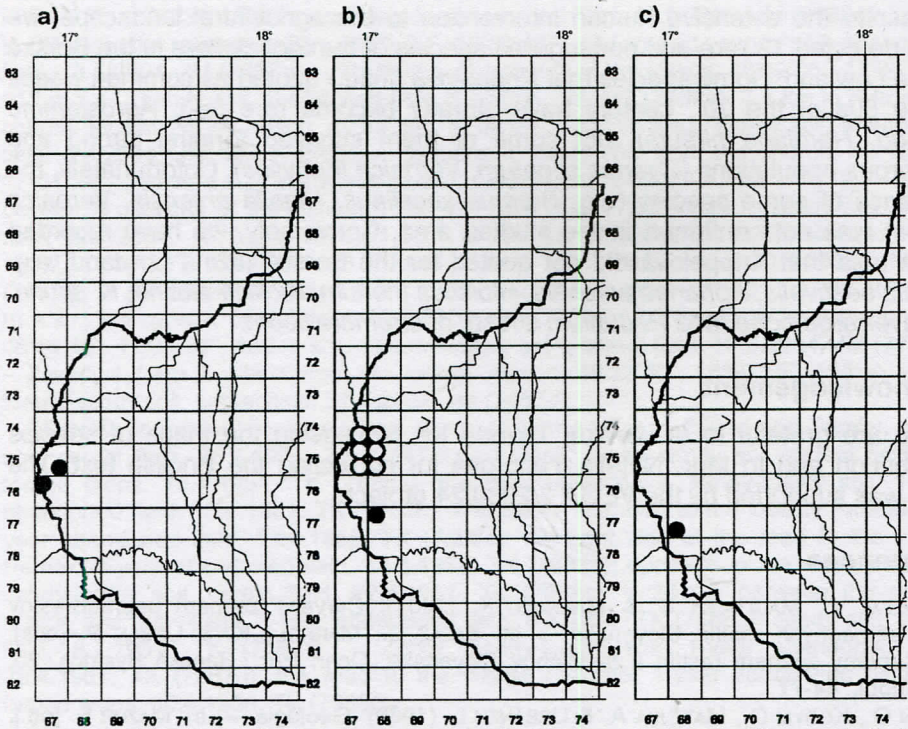


Fig. 1. Distribution of a) *Adonis aestivalis* b) *Agrostemma githago* c) *Aphanes arvensis* on the Borská nížina Lowland. ○ – recent occurrence, ● – historic occurrence, ◐ – recent and historic occurrence

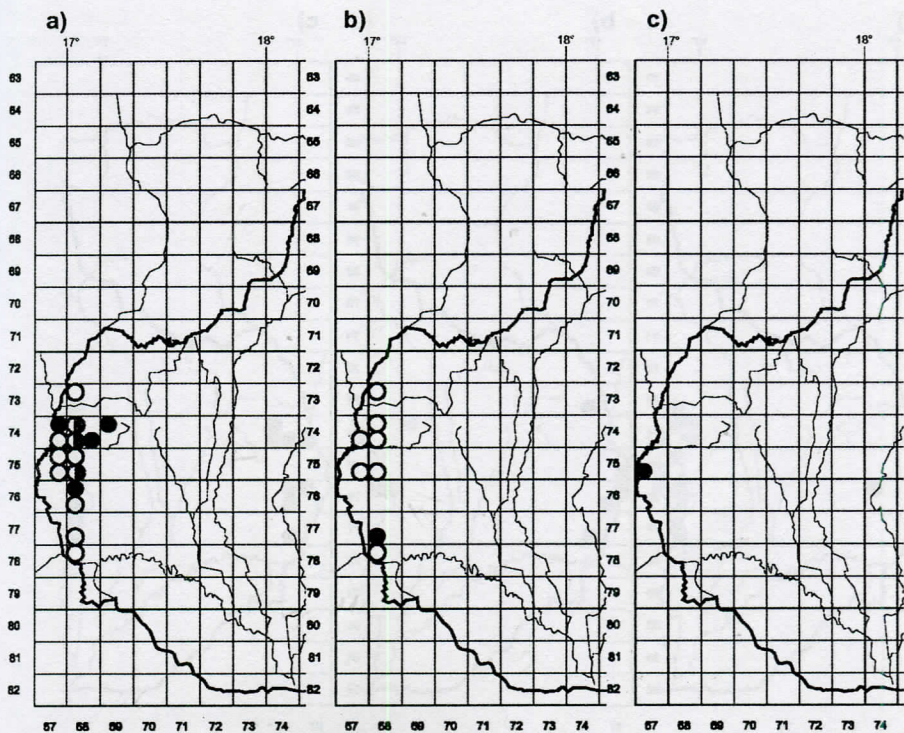


Fig. 2. Distribution of a) *Cyanus segetum* b) *Herniaria hirsuta* c) *Hibiscus trionum* on the Borská nížina Lowland. ○ – recent occurrence, ● – historic occurrence, ⊙ – recent and historic occurrence

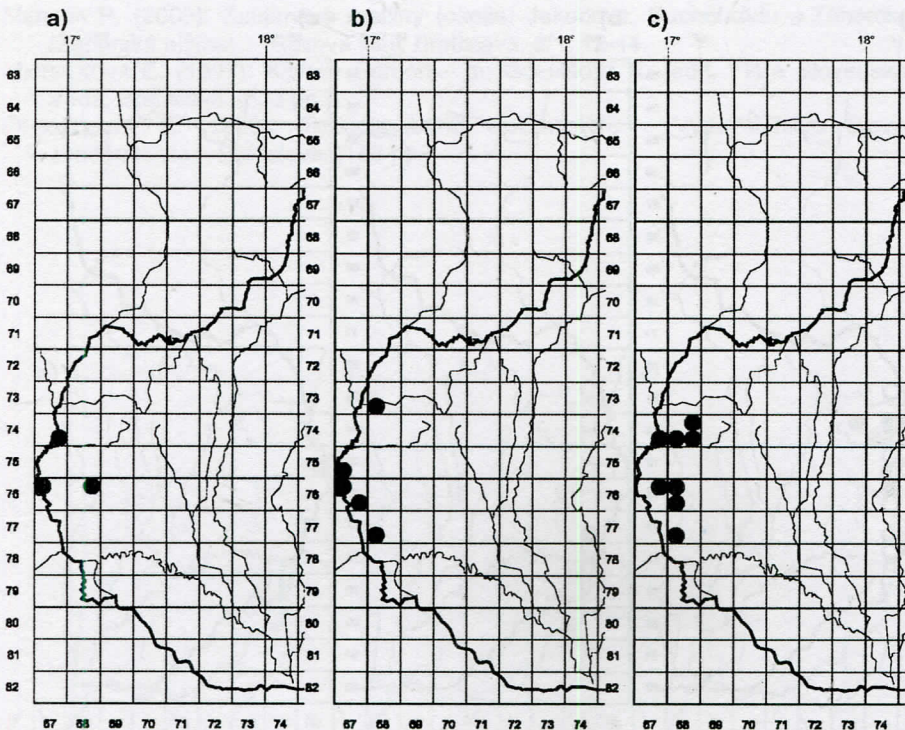


Fig. 3. Distribution of a) *Kickxia elatine* b) *Kickxia spuria* c) *Papaver argemone* on the Borská nížina Lowland. ○ – recent occurrence, ● – historic occurrence, ● – recent and historic occurrence

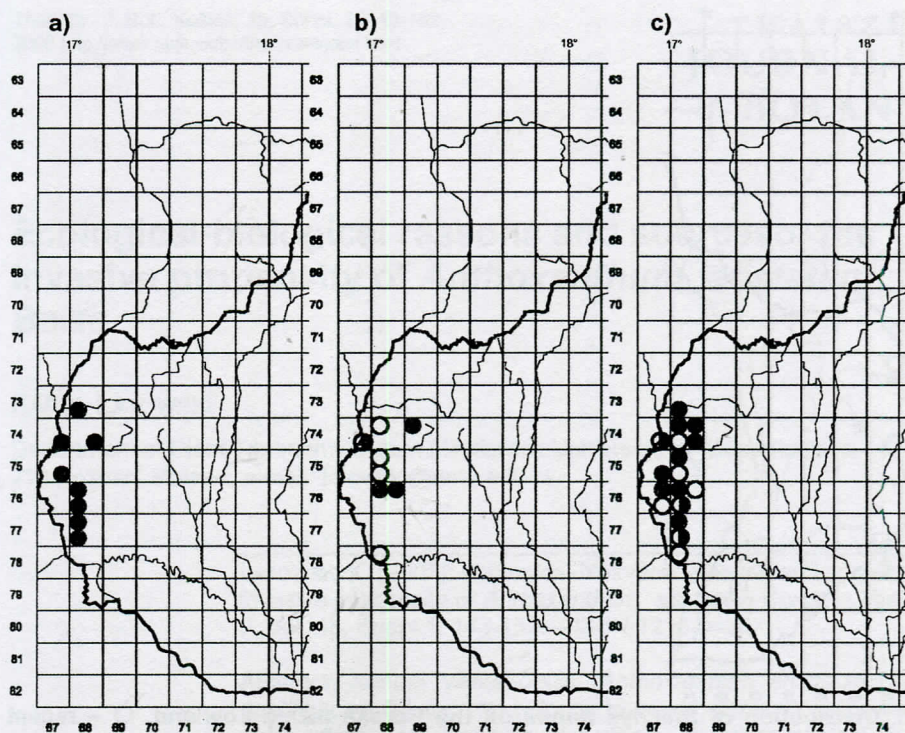


Fig. 4. Distribution of a) *Papaver dubium* subsp. *austromoravicum* b) *Ranunculus arvensis* c) *Veronica triphyllos* on the Borská nížina Lowland. ○ – recent occurrence, ● – historic occurrence, ◐ – recent and historic occurrence

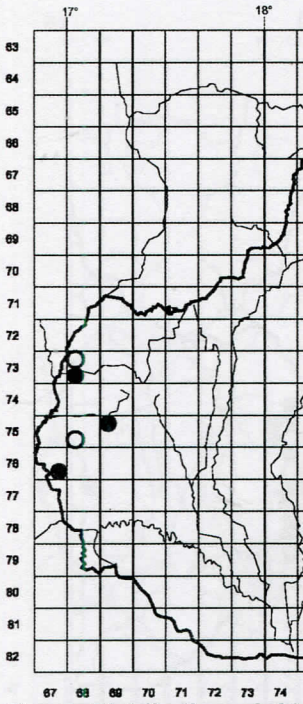


Fig. 5. Distribution of *Stachys annua* on the Borská nížina Lowland. ○ – recent occurrence, ● – historic occurrence, ◐ – recent and historic occurrence