Polish Bot. Stud. 5: 9–24, 1993

VARIABILITY, HYBRIDIZATION AND DISTRIBUTION OF *PRUNUS FRUTICOSA* (ROSACEAE) IN THE CZECH REPUBLIC AND SLOVAKIA

JAN J. WÓJCICKI AND KAROL MARHOLD

Abstract: The unintentional effects of man's activity on the evolution of wild plants are illustrated by the spontaneous hybridization between native *Prunus fruticosa* Pall. and introduced *P. cerasus* L. The frequency of spontaneous hybrids between *P. fruticosa* and *P. cerasus* (= *P. x eminens* Beck) is analyzed for the Czech and Slovakian distribution of *P. fruticosa*. Results of an analysis of morphological variability both at 'regional' and population levels are presented. Distribution maps based on revised herbarium material of *P. fruticosa* and its hybrids with *P. cerasus* are presented.

Key words: variability, taxonomy, distribution, hybridization, *Prunus fruticosa*, *P. cerasus*, *P. avium*, *P. x eminens*, *P. x mohacsyana*, Czech Republic, Slovakia

Jan J. Wójcicki, Department of Vascular Plant Systematics, Laboratory of Plant Variability, W. Szafer Institute of Botany, Polish Academy of Sciences, Lubicz 46, 31-512 Kraków, Poland
Karol Marhold, Institute of Botany, Slovak Academy of Sciences, Dúbravská cesta 14, 842 23 Bratislava, Slovakia

INTRODUCTION

Spontaneous hybridization is a relatively common phenomenon in some plant groups. In most cases it is the result of hybridization between normally allopatric taxa after their geographic barriers have been removed (Anderson 1956; Woodell 1969; Stace 1975; Grant 1981; Kornaś 1983; Kuta 1991; Abbott 1992). This process is poorly understood for native taxa exposed to the long-term influence of plants introduced by man. The example of hybridization between the native *Prunus fruticosa* Pall. and introduced *P. cerasus* L. in the Czech Republic and Slovakia is intended to contribute towards a better understanding of this process.

MATERIALS AND METHODS

In order to examine the variability and distribution of *P. fruticosa* and its hybrids with *P. cerasus* material from the following herbaria was studied: B, BHU, BP, BRA, BRNM, BRNU, DR, FI, FR, G, GHT, GLM, GOET, GZU, HAL, JE, KOR, KRAM, LAU, LTM, M, POZ, PR, PRC, SAV, SLO, SOM, STU, SZUB, TRN, VER, W, WRSL, WU, Z, ZMT, ZU, and hb. Mąd. (now in KRAM) (for abbreviations see Holmgren *et al.* 1990; Mirek 1990).

A morphological analysis was undertaken on the leaves of the short shoots of the herbarium specimens from three selected regions ('regional populations') (see Fig. 2) and from four local populations. Two quantitative and seven qualitative characters were recorded (Fig. 1). Regions shown in Fig. 2 are represented by well developed specimens from the above-mentioned herbaria. Local populations (C1–C4) are represented by population samples of 8 to 30 plants from the following localities:

C1 – TŘÍBEČ. Mt. Zobor, dolomite, elev. 560 m; 7 October 1981, *leg. Wójcicki* (KRAM),

C2 – SLOVENSKÝ RAJ. Prielom Hornádu, limestone, elev. 650 m; 27 August 1973, *leg. Staszkiewicz & Tyszkiewicz* (KRAM),

C3 – HUSTOPEČSKÁ PAHORKATINA. Obřany, Hády,

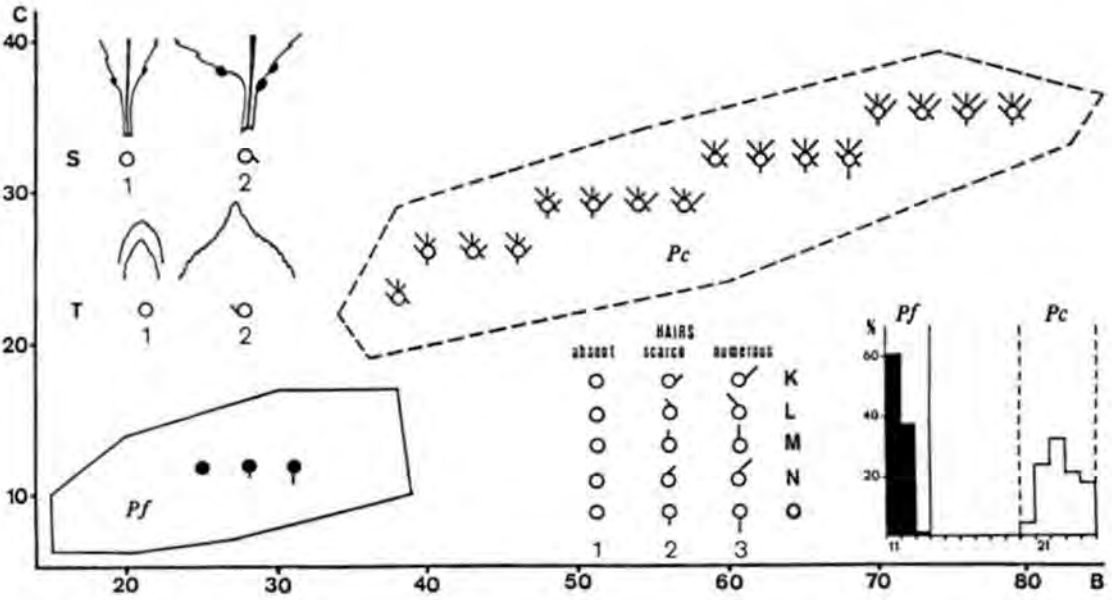

Fig. 1. Variation in vegetative short shoot leaves of *Prunus fruticosa* (*Pf*) and *P. cerasus* (*Pc*). B – length of lamina (mm); C – width of lamina (mm); hairs on: K – petiole, L – primary vein of abaxial surface of lamina, M – lateral veins of abaxial surface of lamina, N – abaxial surface of lamina, O – primary vein of adaxial surface of lamina; S – glands; T – apex; 1–3 scores of the characters; (——) – total variation in leaf size of *P. fruticosa* and (- - - -) *P. cerasus*. Pictograms are presented for representative individuals only. Histogram of hybrid index: % – percentage of individuals (modified from Wójcicki 1991a).

limestone, elev. 300 m; 1 July 1976, *leg. Blecha* (KRAM, SZUB).

C4 – ZNOJEMSKO-BRNĚNSKÁ PAHORKATINA. Brno, Nový Lískovec, Kamenný kopec, limestone, elev. 370 m; 11 July 1976, *leg. Smejkal* (KRAM, SZUB).

Results of the morphological analysis are presented in pictograms and hybrid index histograms. Values of the hybrid index include scored values of three additional characters (hairs on lateral veins of adaxial surface of the lamina – 1, and adaxial surface of the lamina – 1, and shape of leaf margin – 1) not included in Fig. 1, and scored values of the width of leaves (<18 mm – 1, ≥18 mm – 2) (cf. Wójcicki 1988).

Frequency of hybrids of *P. fruticosa* and *P. cerasus* (*P. x eminens* Beck) in the Czech Republic and Slovakia is presented as a percentage of herbarium sheets in 1° x 1° areas (Fig. 5). In cases when pure and hybrid samples were on the same sheet it was treated as two sheets.

The dot map of the distribution of *P. fruticosa* in the Czech Republic and Slovakia was prepared on the basis of revised herbarium material (see SPECIMENS EXAMINED). Data from the literature were not taken into consideration because of the many determination mistakes. The regional phytogeographic division used follows Futák (1984) and Skalický (1988).

Detailed morphological, cytological and phytochemical studies of *P. fruticosa* from the whole of its range will be published separately by the first author.

VARIATION AND HYBRIDIZATION

Detailed morphological studies from the whole range of *P. fruticosa*, supported by phytochemical investigations of phenolic compounds (Wójcicki 1988, 1991a), showed that *P. fruticosa* and *P. cerasus* are sharply distinct as presented in Fig. 1. The leaf lamina length and width of individuals of 'pure' *P. fruticosa* and *P. cerasus* fall within the limits indicated by solid and broken lines respectively. This is surprising as the characters chosen are those that even enable sterile material to be distinguished.

The results of a morphological analysis of three 'regional populations' from the Czech Republic and Slovakia are presented in Fig. 2. The lines indicating the total variation in leaf length and width

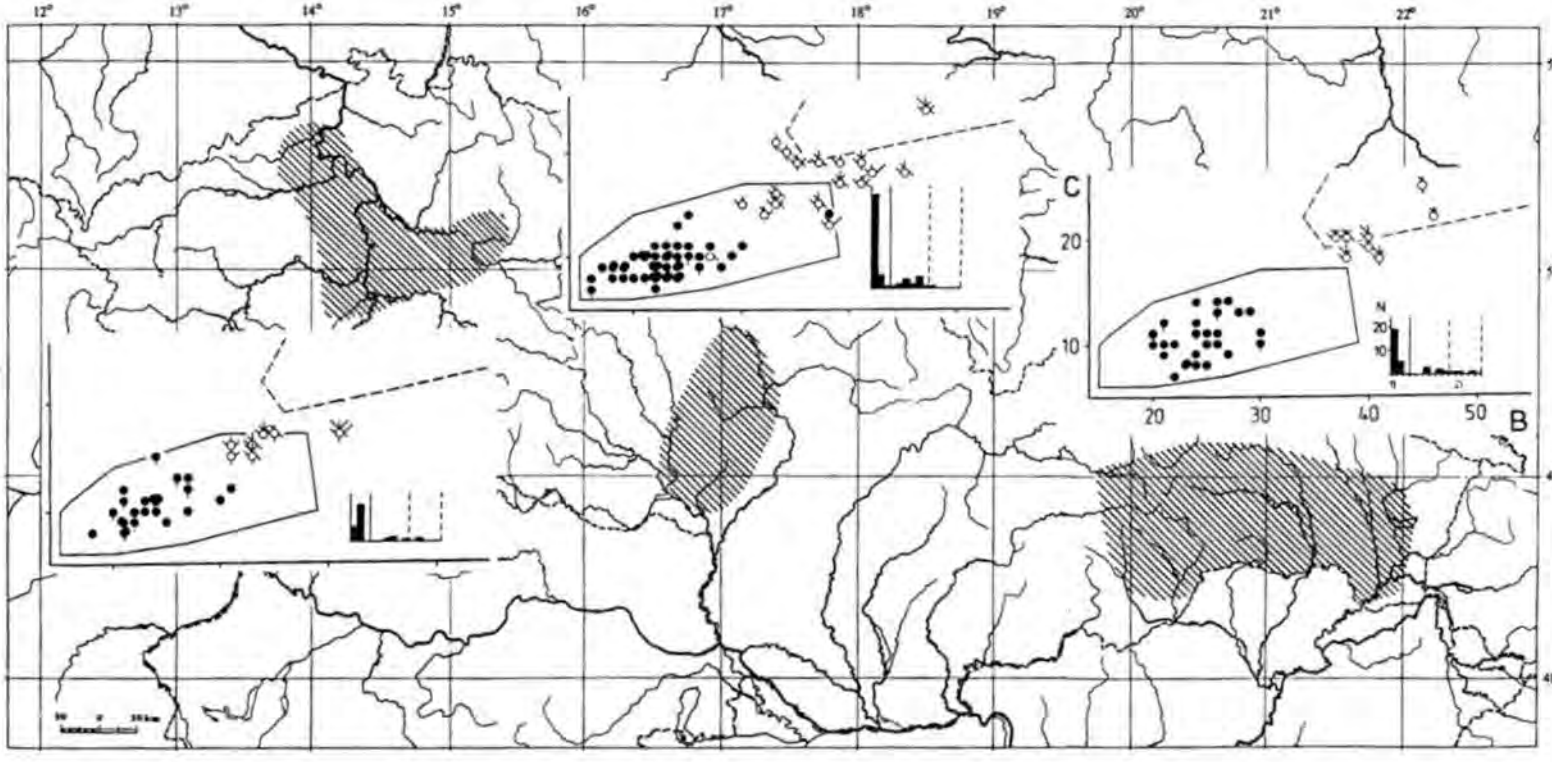

Fig. 2. Scatter diagrams and hybrid index histograms of *P. fruticosa* and *P. fruticosa x P. cerasus* vegetative short shoot leaves within three 'regional populations'. N = number of specimens. ● – *P. fruticosa*, ○ – *P. fruticosa x P. cerasus*. For additional explanation see Fig. 1.

exhibited by 'pure' *P. fruticosa* and P. *cerasus* are drawn in each scatter diagram. The morphological variation shown by all the populations investigated is fairly great in both qualitative and quantitative characters. It is caused by spontaneous hybridization of *P. fruticosa* with *P. cerasus*, a very common cultivated species sometimes escaping from gardens, and widespread within the Czech and Slovak range of *P. fruticosa*. The plants corresponding to *P. fruticosa* in quantitative characters often exhibit an intermediate phenotype in one or a few of the qualitative characters. The distribution of specimens on the scatter diagrams and histograms and qualitative characters combinations indicate that within the 'regional populations' both 'pure' *P. fruticosa* and *P. fruticosa x P. cerasus* are present, the latter probably of different generations.

VARIATION WITHIN LOCAL POPULATIONS

Morphological variation within local populations differs between the four studied localities (Fig. 3). In the case of three populations of 'pure' *P. fruticosa* (C1, C2, and C4) variation observed is restricted to both the quantitative characters (B, C) and to only one of the qualitative characters (O). This variation is also characteristic of material from other parts of the distribution of *P. fruticosa*. In the population from Mt. Zobor (C1) variation is narrow and characteristic of the local, small leaf morphotypes seen in other isolated populations of *P. fruticosa* (Wójcicki 1988). Individuals of populations from Nový Lískovec (C4) and Prielom Hornádu (C2) are scattered within the range of the variation shown by *P. fruticosa*. The population from Hády (C3) is an example of a population of hybrid origin, where *P. fruticosa* is replaced completely by hybrids of *P. fruticosa* and *P. cerasus*. As can be seen in Fig. 3 hybrids are scattered within and between the variation exhibited by both parent species and even when some specimens correspond with the quantitative characters of *P. fruticosa* it is clear that in respect of some qualitative characters they are intermediate between the parent species.

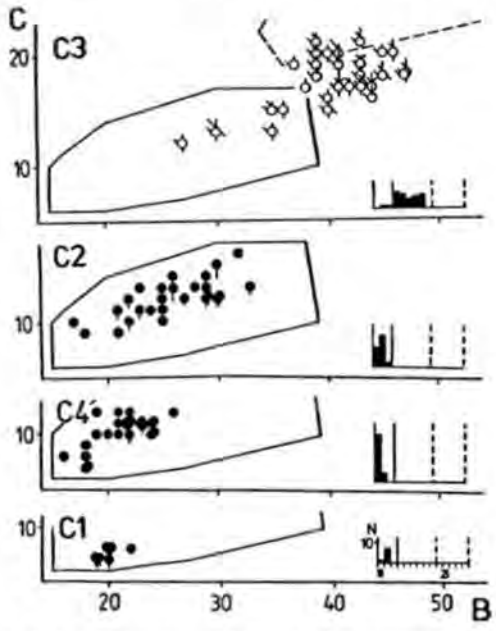

Fig. 3. Scatter diagrams and hybrid index histograms of four local populations (C1–C4) of *P. fruticosa* and *P. fruticosa x P. cerasus* (see page 9). For explanation see Figs 1 & 2.

DISTRIBUTION OF *P. FRUTICOSA* AND ITS HYBRIDS

Prunus fruticosa is a member of the Pontic-South Siberian floristic element. Its occurrence in Bohemia and Moravia is concentrated in the Thermophyticum region where it is found mainly in the hill belt of the Pannonicum province and in an isolated enclave in the Thermobohemicum province (Fig. 4). Such a distribution is typical of species classified by Slavík (1988) in the xerophyte series of the thermophytic phytochorotype.

In the Thermobohemicum *P. fruticosa* is known from the districts of Střední Poohří, Lounsko-labské středohoří, Džbán, Středočeská tabule, Český kras, Rožďalovická pahorkatina and Dolní Povltaví. Its occurrence in the neighbouring province of Mesophyticum Massivi bohemici is restricted to the most xerothermic localities on the slopes of river valleys (Vltava River in the case of Zbraslav in Střední Povltaví district and Berounka River in the case of Křivoklátsko district). Elsewhere the presence of *P. fruticosa* in Messophyticum Massivi bohemici is closely related to its presence in the

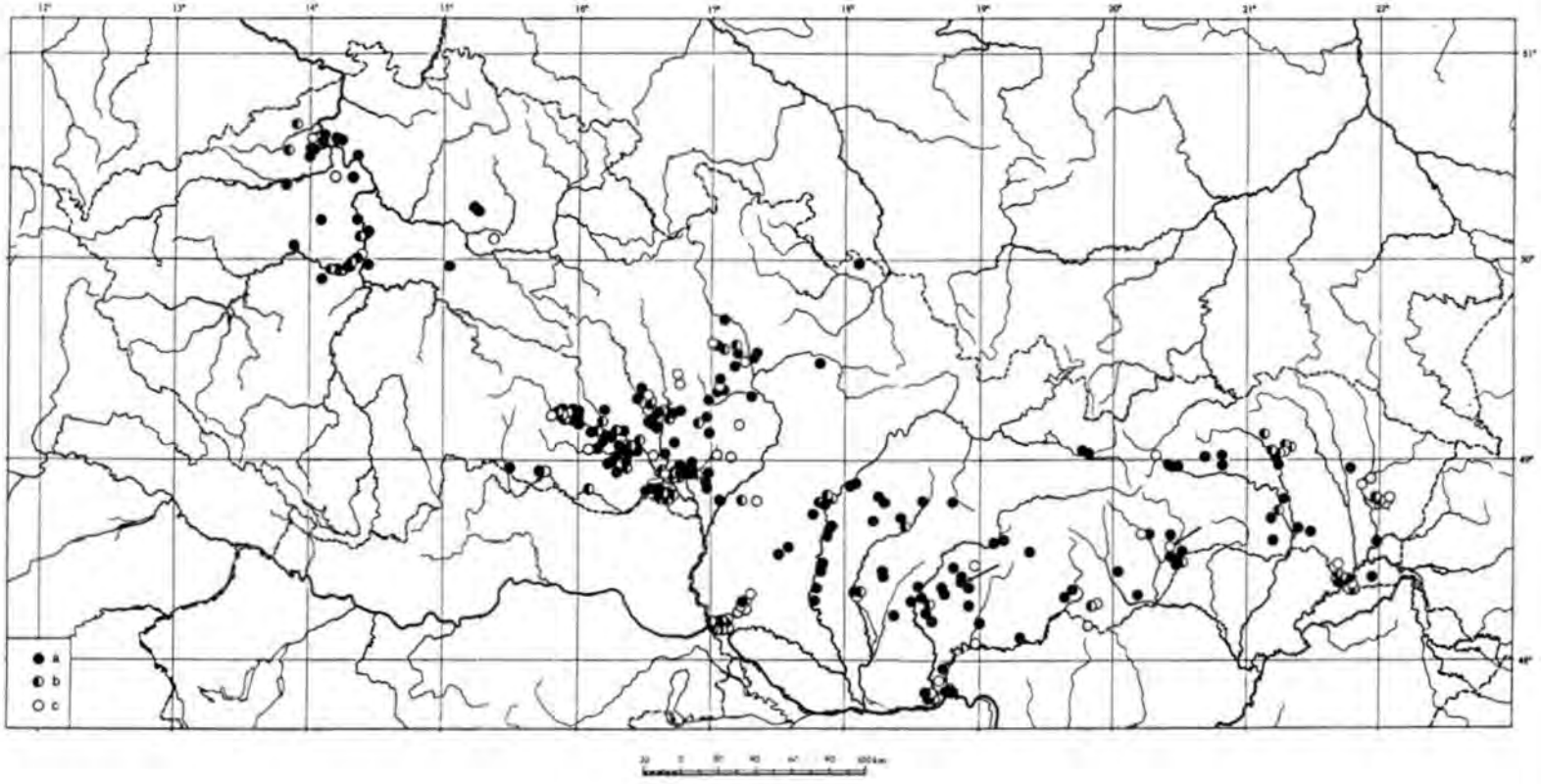

Fig. 4. Distribution of *P. fruticosa* and its hybrids in the Czech Republic and Slovakia based on herbarium material (see SPECIMENS EXAMINED). a – *P. fruticosa*, b – *P. fruticosa* and *P. fruticosa x P. cerasus*, c – *P. fruticosa x P. cerasus*, arrows – *P. fruticosa x P. avium*. Bullets may represent more than one specimen.

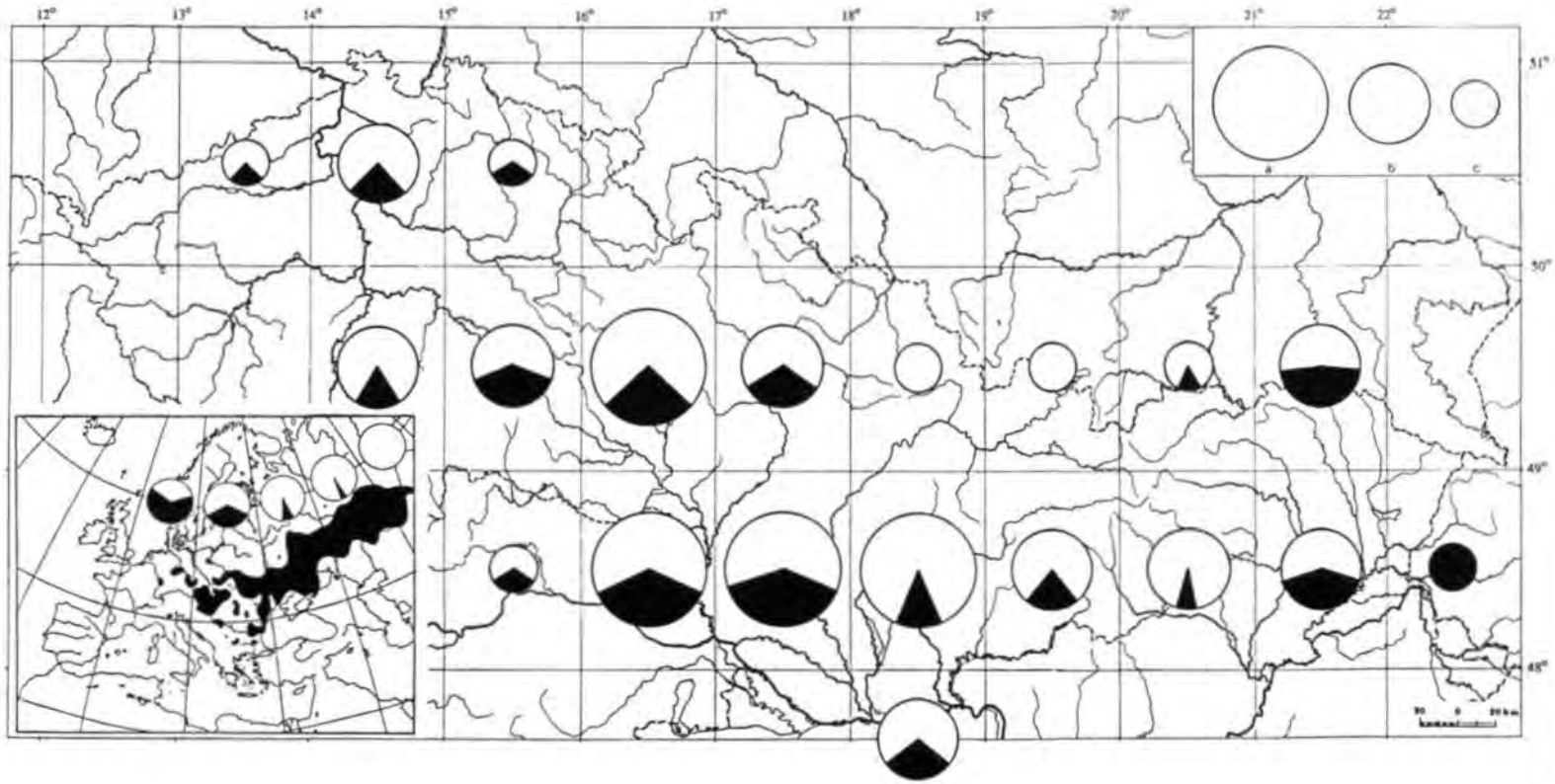

Fig. 5. Frequency of *P. fruticosa* and *P. fruticosa x P. cerasus* in the Czech Republic and Slovakia (black part of piechart indicates percentage of hybrids in geographical coordinates 1° x 1°). No. of herbarium sheets: a – >50, b – 10–50, c – <10. Inset – distribution map of *P. fruticosa* and frequency of *P. fruticosa x P. cerasus* within the total range of *P. fruticosa* in 15° sectors of longitude (slightly modified from Wójcicki 1991a).

neighbouring districts of Pannonicum. Here it is widespread in Moravské podhoří Vysočiny district and documented for some localities of Českomoravská vrchovina district (mainly around Třebíč), Moravský kras, Drahanské podhůří and Zábřežsko-uničovský úval. There is also one locality around Kelč in Mesophyticum carpaticum province, but it is doubtful whether this occurrence is natural. There are herbarium specimens from all districts and subdistricts of Pannonicum.

In Slovakia *P. fruticosa* occurs chiefly in the region of Pannonicum (both provinces – Eupannonicum and Matricum). Here it grows mainly in the hill belt. In the lowlands it occurs only on small elevated hills. It is also found on the southern edge of the West Carpathians (region Carpaticum occidentale), in the districts of Biele Karpaty (in its southern part only), Malé Karpaty, Považský Inovec, Tríbeč, Strážovské and Súľovské vrchy, Slovenské stredohorie (in its southern part only), Stredné Pohornádie, Šarišská vrchovina, Slanské vrchy and Vihorlatské vrchy, and in one locality in Nízke Beskydy district. In Slovenské rudohorie district it is most widespread in the subdistrict of Štiavnické vrchy and along the Hron River it is well documented as far as Zvolen in the subdistrict of Poľana. One locality near Vígľaš is also known in the latter subdistrict. In Fatra district only one locality in the subdistrict of Lúčanská Malá Fatra is recorded. Along the Hornád River *P. fruticosa* ranges from Slovenský raj district to the subdistrict of Spišské kotliny (Dreveník hill, Spišský hrad hill, Spišský Hrhov and Klčov) and to Zámčisko hill near Kvetnica in the Nízke Tatry. There is also an interesting, isolated relic locality near Kráľova Lehota (Hajdúk 1965).

Prunus fruticosa x P. cerasus is dispersed within the Czech and Slovak range of *P. fruticosa*. Its frequency in some areas is rather high as indicated in Fig. 5. Mean frequency of hybrids for this area is *ca* 35%.

Only in two Slovak localities have hybrids between *P. fruticosa* and *P. avium* (= *P. x mohacsyana* Kárpáti) been found (Fig. 4; see also SPECIMENS EXAMINED and Marhold & Wójcicki 1992). Results of a more detailed study of this hybrid will be published later.

HABITAT

In the Czech Republic and Slovakia *P. fruticosa* occupies a rather narrow range of habitats. It occurs mainly on open hills, S, SE, SW and, less frequently, E and W facing steep slopes, gorges and river valley edges. The altitudinal range is up to 800 m in the Nízke Tatry near Kráľova Lehota (*leg. Futák* 1956, SAV). This is the highest altitudinal record known for the species.

Prunus fruticosa is found in xerothermic shrubby communities of the order *Prunetalia* (*Prunion fruticosae* and *Prunion spinosae*), forest communities of the order *Quercetalia pubescentis* (*Quercetion pubescentis-petreae*) and xerothermic grass communities of the union *Festucion valesiacae*, sometimes with introduced *Pinus nigra* Arnold (Jurko 1964; Hajdúk 1965; Michalko & Džatko 1965; Šmarda 1970; Maglocký 1971; Pitoniak *et al.* 1978).

Prunus fruticosa usually grows on dolomite, limestone, travertine, thin layer rendzina, and also on sandstone, andesite, clay-sand and loess.

The occurrence of *P. fruticosa* and *P. cerasus* hybrids is primarily determined by two factors: (1) the availability of repeatedly or permanently open, mostly man-made habitats, including vineyards, roadsides, fallow, balks, and (2) the intensity of *P. cerasus* cultivation.

DISCUSSION

These studies have provided strong evidence that the great morphological variation exhibited by *P. fruticosa* in the area studied is due to hybridization with *P. cerasus*. The revision of herbarium material of *P. fruticosa* and *P. fruticosa x P. cerasus* has enabled the preparation of detailed distribution maps. Until now only a few maps have been published for some parts of former Czechoslovakia (e.g. Futák 1947; Šmarda 1963; Kubát 1970, Kubát *et al.* 1972). Marhold and Wójcicki (1992) recently have published distribution maps for *P. fruticosa* and *P. fruticosa x P. cerasus* in Slovakia. Hybrids are known chiefly from disturbed habitats in scattered localities throughout the area. Our

study supports Chrtek's (1992) statement that in some localities hybrids are much more common than 'pure' *P. fruticosa*. There also are many localities where *P. fruticosa* is completely replaced by hybrid populations. The problem of 'solution' of one species genotype in another is also reported in other plant groups (e.g. Hinton 1975, 1976; Stace 1975; DePamphilis & Wyatt 1989; Kuta 1990, 1991; Riesenberg 1991; Staszkiewicz & Wójcicki 1992). Hybridization appears to be a major threat to the existence of 'pure' *P. fruticosa* in the Czech Republic and Slovakia. This threat is directly connected with man's activity. *P. cerasus* is a cultivated, introduced species, with hybrids found mainly in habitats influenced by human activity. This kind of hybridization was termed anthropohybridization by Wójcicki (1991a). Hybridization between *P. fruticosa* and *P. cerasus* should be seen as an unintentional consequence of the influence of man on wild plant evolution.

In the area investigated hybrids between *P. fruticosa* and *P. avium* (= *P. x mohacsyana* Kárpáti) have also been found. These are of less importance as they probably produce only sterile triploid progeny due to the fact that *P. fruticosa* and *P. avium* are only known to occur in the wild as diploids and tetraploids respectively (Olden & Nybom 1968; Wójcicki 1988).

The presence of very variable hybrid forms has confused botanists in the past. Hrabětová-Uhrová (1958) described a new forma, *Cerasus fruticosa* var. *dispar* forma *acutipyrena* (Fig. 6) and Kárpáti (1944) described a new hybrid, *P. x javorkae* (= *P. fruticosa x P. mahaleb*) (Fig. 7) from former Czechoslovakia. Both names are considered here synonymous with *P. fruticosa x P. cerasus*.

SELECTED SYNONYMY

Prunus fruticosa Pallas

Fl. Ross. **1**(1): 19. 1784. – *Prunus chamaecerasus* Jacquin [var.] β *fruticosa* (Pallas) Willdenow, Sp. Pl. 4 ed. **2:** 990. 1799. – *Prunus intermedia* Poiret *in* Lamarck, Encycl. méth. Bot. **5:** 674. 1804. – *Cerasus fruticosa* Pallas, Fl. Ross. **1**(1), tab. VIII B. 1784. – *Chamaecerasus fruticosa* (Pallas) Seringe *in* DC., Prodr. **2**: 664. 1825., *in synon.* – *Prunus cerasus* [var.] γ *pumila* L., Sp. Pl. **1:** 474. 1753. *non Prunus pumila* L., Mantissa **1:** 75. 1767. – *Prunus cerasus* Pollich, Hist. Pl. Palat. **2:** 27. 1777., *nom. illeg., non Prunus cerasus* L., Sp. Pl. **1:** 474. 1753. – *Prunus chamaecerasus* Jacquin, Collect. Bot. **1:** 133. 1786. – *Cerasus chamaecerasus* (Jacquin) Loiseleur *in* Duhamel, Nouv. Duh. **5:** 28. 1812. – *Prunus cerasus* L. subsp. *chamaecerasus* (Jacquin) Čelakovsky, Prodr. Fl. Böhm. **3:** 649. 1875. – *Cerasus humilis* Host, Fl. Austr. **2:** 7. 1831. – *Prunus chamaecerasus* Jacquin var. *fruticosa* (Pallas) Willdenow forma *umbellifera* Beck, Fl. Nieder-Österr. **1:** 821. 1890. – *Prunus chamaecerasus* Jacquin [var.] β *dispar* Beck, Fl. Nieder-Österr. **1:** 821. 1890.

Prunus x eminens Beck
= *P. fruticosa* Pallas x *P. cerasus* L.

Fl. Nieder-Österr. **2**(1): 821. 1892. – *Prunus pumila* L. var. *aucta* [sic!] Borbás, A Balaton tavanak: 420. 1900. – *Prunus x javorkae* Kárpáti (= *Prunus fruticosa* Pallas *x P. mahaleb* L.), Magyar Kert. Szölész. Föisk. Közlem. **10:** 78. 1944. – *Prunus fruticosa* forma *arborescens* Nyárády, Bul. Stiint. Sect. Stiinte Biol. Agr. Geol. Geogr. **3**(1): 5. 1951. – *Cerasus x eminens* (Beck) Buia, Fl. Rep. Pop. Romane **1:** 883. 1956. – *Cerasus fruticosa* Pallas var. *dispar* Beck forma *acutipyrena* Hrabetová-Uhrová, Acta Acad. Sc. Czechoslov. Basis Brun. **30**(6): 232. 1958. – *Cerasus klokovii* Sobko, Ukr. Bot. Zhurn. **30**(5): 664. 1973.

Prunus x mohacsyana Kárpáti
= *P. fruticosa* Pallas *x P. avium* (L.) L.

Magyar Kert. Szölész. Föisk. Közlem. **10:** 70. 1944. – *Cerasus x mohacsyana* (Kárpáti) Janchen, Phyton **8:** 237. 1959.

ACKNOWLEDGMENTS. We would like to thank the directors and curators of the herbaria indicated on page 9 for the loan of herbarium material. In addition our gratitude is extended to Dr L. Hrouda (Prague) for help in determining the whereabouts of certain localities in the Czech Republic. This work was supported by the Polish Academy of Sciences, Polish Research Committee and the Grant Agency for Science, Bratislava (Grant no. 2/40/93).

Fig. 6. Type specimen of *Cerasus fruticosa* var. *dispar* forma *acutipyrena* Hrabětová-Uhrová, BRNU 404196 (scale bar = 5 cm).

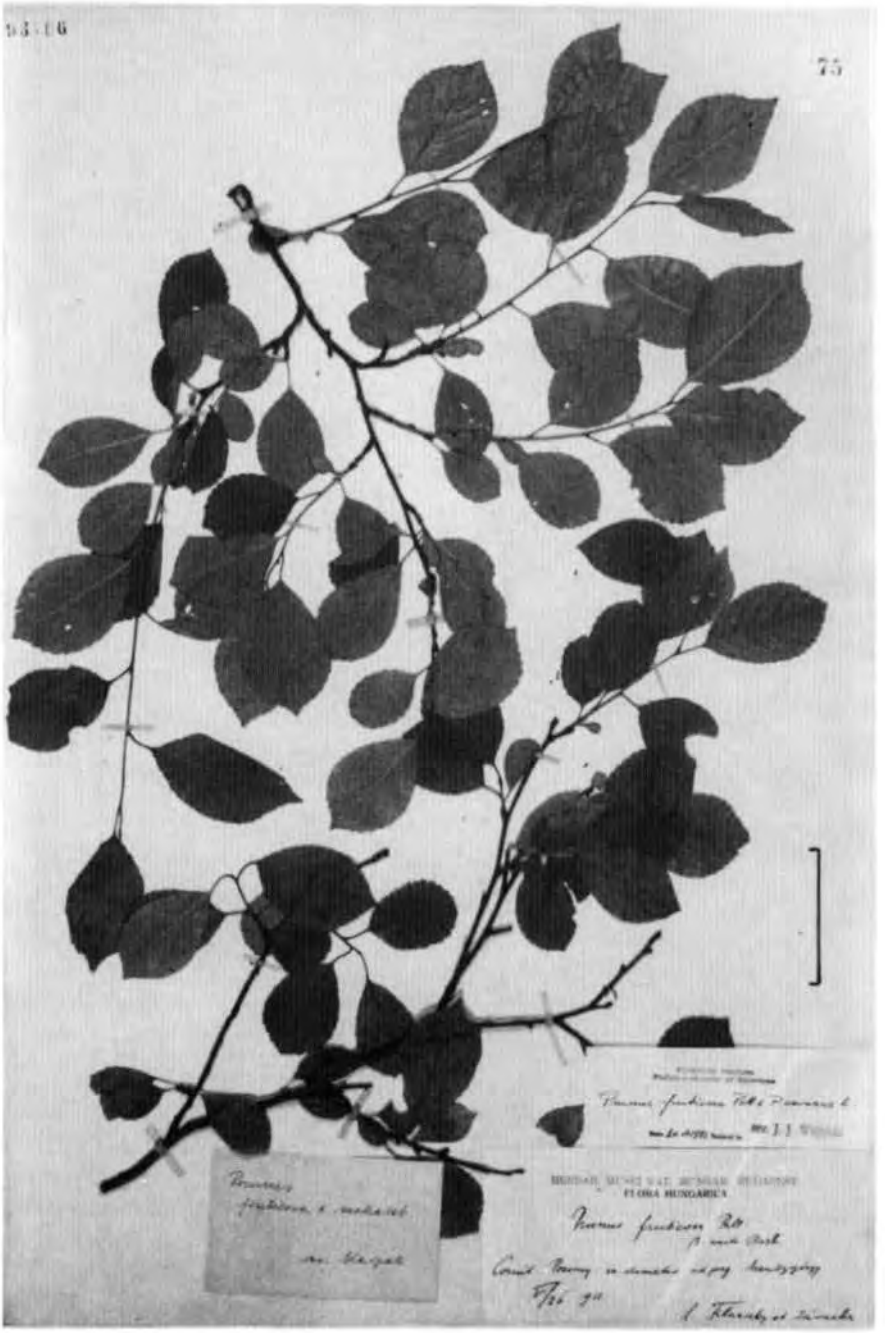

Fig. 7. Type specimen of *Prunus x javorkae* Kárpáti (= *P. fruticosa* Pall. *x P. mahaleb* L.) BP 93166 (scale bar = 5 cm).

SPECIMENS EXAMINED

Prunus fruticosa and *P. fruticosa x P. cerasus*

Abbreviations:
^{x} – *Prunus fruticosa x P. cerasus*
$^{!x}$ – *P. fruticosa* and *P. fruticosa x P. cerasus* on the same sheet.

CZECH REPUBLIC

THERMOPHYTICUM[1]

THERMOBOHEMICUM

2a. ŽATECKÉ POOHŘÍ: Louny, *leg. Podpěra*, 1902 (BRNU).

4a. LOUNSKÉ STŘEDOHOŘÍ: Lovosice, Lovoš, *leg. Hilitzer*, 1932 (GLM^{x}); *leg. Drude*, 1897, 1900 (DR); *leg. Mądalski*, ? (hb. Mąd.) – Bílina, Bořeň, *leg. Bubák*, 1889 (PR$^{!x}$).

4b. LABSKÉ STŘEDOHOŘÍ: Teplice, *leg. Winkler*, 1852 (WRSL$^{!x}$); *leg. Dichtl*, 1881 (JE) – Třebenice, Košťálov, *leg. Bubák*, 1889 (PR) – Lovosice, Malé Žernoseky, *leg. Schäfer*, 1899 (GLM) – Sebuzín, *leg. Missbach*, 1909 (M, Z) – Litoměřice, *leg. Čelakovský*, 1870 (PR$^{!x}$); *leg. Missbach*, 1897 (JE); *leg. Ulrich*, 1901 (BHU^{x}); *leg. Lorinser*, ? (GOET) – Litoměřice, Loreta, *leg. Čelakovský*, 1870 (PR) – Žitenice, 'Eulenberg', *leg. Klášterský*, 1928 (PR); *leg. Schöne*, 1931 (DR).

6. DŽBÁN: Smečno, *leg. Bílek*, 1889 (PR).

7a. LIBOCHOVICKÁ TABULE: Vrbka, Holý vrch, *leg. J. Dostál & Novák*, 1947 (PRC^{x}).

7b. PODŘIPSKÁ TABULE: Hoštka – Libinky, *leg. Klika*, 1937 (PR) – Říp, *leg. Schustler*, 1916 (PR).

8. ČESKÝ KRAS: Srbsko, *leg. Tocl*, 1896 (PR); *leg. Pulchart*, 1940 (PRC^{x}) – Suchomasty, Kotýz, *leg. J. Dostál*, 1943 (PRC) – Karlštejn, *leg. Wettstein*, 1893 (WU); *leg. J. Dostál*, 1925 (PRC) – Karlštejn, Plešivec, *leg. J. Dostál & Novák*, 1939 (PRC). – Dobřichovice, *leg. Polák*, 1874 (PRC) – Solopysky, *leg. ?*, 1906 (PRC) – Radotín, *leg. Sterneck*, 1895 (PRC); *leg. Domin*, 1915 (PRC); *leg. Schustler*, 1915 (PR); *leg. Ďuriš*, 1922 (PR^{x}) – Praha, Chuchelský vrch, *leg. Koštál*, 1892 (BRNU^{x}).

9. DOLNÍ POVLTAVÍ: Praha, Šárka, *leg. Hofmeister*, 1848 (W$^{!x}$) – Praha, Podhoří, *leg. Deyl*, 1939 (PR) – Libčice – Žalov, *leg. Klášterský*, 1939 (PR).

13. ROŽĎALOVICKÁ PAHORKATINA: Dymokury, Jakubský rybník, *leg. Šourek*, 1940 (PRC) – Dymokury, Holý vrch, *leg. J. Dostál*, 1941 (PRC) – Radovesnice – Polní Chrčice, *leg. Klika*, 1934 (PR^{x}).

PANNONICUM

16. ZNOJEMSKO-BRNĚNSKÁ PAHORKATINA: Trstěnice, *leg. Pospíšil*, 1963 (BRNM) – Trstěnice, Vysoká, *leg. Horňanský*, 1944 (PRC) – Džbánice, *leg. Horňanský*, 1944 (BRNM) – Vemyslice, Varta, *leg. Horňanský*, 1942 (PRC) – Hostěradice, *leg. Suza*, 1932 (BRNU) – Bohutice, *leg. Suza*, 1932 (BRNU) – Bohutice, Michálek, *leg. Hrabětová*, 1957 (BRNU$^{!x}$) – Bohutice, Kamenná horka, *leg. Krist*, 1933 (BRNU^{x}) – Moravský Krumlov, Vedrovice, *leg. Suza*, 1932 (BRNU) – Moravský Krumlov, Lišky, *leg. Suza*, 1930 (BRNU) – Moravský Krumlov, *leg. Švestka*, 1926 (BRNM^{x}); *leg. Hrabětová*, 1954 (BRNU) – Tábor, *leg. Černoch*, 1952 (SOM) – Mohelno, *leg. Krajina*, 1921 (PRC); *leg. Jičínský*, 1921, 1922 (ZMT); *leg. Dvořák*, 1921 (BRNM), 1926, 1933 (ZMT); *leg. Suza*, 1927 (BRNM), 1931 (BRNU); *leg. Ondráčková*, 1968 (ZMT) – Mohelno, Lhánice, *leg. Suza*, 1931 (BRNU) – Ivančice, *leg. Hrabětová*, 1970 (BRNU); *leg. Schröder*, 1880 (GOET); *leg. Podpěra*, 1911 (BRNU ^{x}) – Ivančice, Hlína, *leg. Hrabětová*, 1959 (BRNU$^{!x}$), 1970 (BRNU) – Ivančice, Nové Bránice, *leg. Hrabětová*, 1960 (BRNU) – Dolní Kounice, *leg. Suza*, 1930 (BRNU) – Dolní Kounice, Medlov, *leg. Podpěra*, 1938 (BRNU^{x}) – Bohunice u Brna, *leg. ?*, 1924 (BRNM) – Brno, Kohoutovice, *leg. Formánek*, ? (BRNM) – Brno, Bystrc, *leg. Suza*, 1931 (BRNU) – Brno, Nový Lískovec, *leg. Smejkal*, 1975 (BRNU), 1976 (KRAM, SZUB) – Brno, Komín, *leg. Podpěra*, 1922 (BRNU^{x}) – Řečkovice – Medlánky, Baba, *leg. Podpěra*, 1941 (BRNU^{x}) – Kuřim, Zborov, *leg. Šmarda*, 1928 (PR) – Kuřim, Zlobica, *leg. Šmarda*, 1928 (BRNU) – Kuřim, Šiberná, *leg. Šmarda*, 1928 (PR^{x}) – Tišnov, Malhostovice, *leg. Šmarda*, 1928 (BRNU^{x}).

17a. DUNAJOVICKÉ KOPCE: Novosedly, 'Königsberg', *leg. Rechinger*, 1896 (GZU) – Mikulov, Jánská hora, *leg. Širjaev*, 1923 (BRNU) – Dolní Dunajovice, Liščí hora, *leg. Weber*, 1933 (PRC) – Dolní Dunajovice, Sluneční vrch, *leg. Pospíšil*, 1953 (BRNM).

17b. PAVLOVSKÉ KOPCE: Mikulov, Turold, *leg. Jičínský*, 1924 (ZMT); *leg. Klášterský & Deyl*, 1935 (PR); *leg. Pospíšil*, 1962 (BRNM); *leg. R. & M. Moriz*, 1983 (JE) – Mikulov, *leg. Laus*, 1932 (STU) – Mikulov, Mariánská hora, *leg. Podpěra*, 1949 (BRNU^{x}) – Mikulov, 'Annaberg', *leg. Podpěra*, 1933 (LAU, ZV^{x}).

17c. MILOVICKO-VALTICKÁ PAHORKATINA: Milovice, *leg. Fiek*, 1891 (WRSL$^{!x}$).

18a. DYJSKO-SVRATECKÝ ÚVAL: Šakvice – Popice, *leg. Hrabětová*, 1957 (BRNU^{x}) – Lednice, Janohrad, *leg. ?*, 1902 (PR).

18b. DOLNOMORAVSKÝ ÚVAL: Mikulčice, *leg. Šebesta*, 1878 (BRNM).

19. BÍLÉ KARPATY STEPNÍ: Strážnice, Mlynky, *leg. Hrabětová*, 1950 (BRNU^{x}).

20a. BUČOVICKÁ PAHORKATINA: Dražovice, Větrníky, *leg. Čouka*, 1912, 1917 (BRNU); *leg. Deyl*, 1940 (PR);

[1] The regional phytogeographic division follows Skalický (1988).

leg. J. Dostál, 1942 (PRC); *leg. Kavka*, 1948 (BRA) – Bučovice, Letonice, *leg. Deyl*, 1940 (PR) – Bučovice – Muřinov, *leg. Deyl*, 1940 (PR) – Kroměříž, Lísky, *leg. Pospíšil*, 1957 (BRNM^{x}).

20b. HUSTOPEČSKÁ PAHORKATINA: Obřany, Hády, *leg. Uechtritz*, 1855 (WRSL), 1859 (JE); *leg. Makovsky*, ? (PR); *leg. Švestka*, 1924 (BRNU^{x}), 1925 (BRNU$^{!x}$, FI^{x}, G^{x}, LAU^{x}); *leg. Hrabětová*, 1955 (BRNU), 1960 (BRNU), 1962 (BRNU^{x}); *leg. Rauschert* 1965 (HAL), *leg. Blecha*, 1976 (BRNU^{x}), 1976 (KRAM, SZUB); *leg. ?*, 1981 (PR^{x}) – Tvarožná, *leg. Švestka*, 1926 (BRNM) – Velatice - Tvarožná, *leg. Švestka*, 1925 (BRNM) – Velatice, *leg. Skryva*, 1925 (BRNM^{x}) – Židlochovice, *leg. Švestka*, 1934 (BRNM) – Sokolnice – Újezd, *leg. Vladařová*, 1960 (BRNU) – Pouzdřany, *leg. Skryva*, 1922 (BRNM); *leg. Jičínský*, 1925 (ZMT); *leg. Futák*, 1958 (SAV); *leg. Gostyńska*, 1960 (KOR); *leg. Dvořáková*, 1976 (KRAM, SZUB) – Pouzdřany, Stráž-ná, *leg. Širjaev*, 1925 (G^{x}, LAU^{x}, M^{x}, ZV^{x}) – Popice, *leg. Oborny*, 1896 (BRNU$^{!x}$), 1897 (PRC$^{!x}$) – Starovice, Petlová, *leg. Hrabětová*, 1957 (BRNU) – Hustopeče, Stará hora, *leg. Hrabětová*, 1956 (BRNU), 1957 (BRNU$^{!x}$), 1958 (BRNU$^{!x}$) – Hustopeče, *leg. Semerle*, 1894 (ZMT); *leg. Hrabětová*, 1955 (BRNU$^{!x}$) – Hustopeče, 'Wechselberg', *leg. Hrabětová*, 1957 (BRNU$^{!x}$); *leg. Hrabětová*, 1958 (BRNU$^{!x}$) – Hustopeče – Šakvice, *leg. Hrabětová*, 1958 (BRNU$^{!x}$) – Kurdějov, Kamenný vrch, *leg. Hrabětová*, 1954, 1956, 1957 (BRNU) – Kurdějov, *leg. Dvořák*, 1976 (BRNU) – Horní Bojanovice, *leg. Hrabětová*, 1955 (BRNU) – Bořetice, *leg. Domin & Jirásek*, 1939 (PRC); *leg. Klika*, 1933 (PR) – Klobouky, *leg. Deyl*, 1940 (PR) – Klobouky, Morkůvky, *leg. Krist*, 1939 (BRNU) – Kobylí, *leg. Širjaev*, 1924 (BRNU^{x}); *leg. Dvořák* 1975 (BRNU) – Čejč, *leg. Bubela*, 1881 (PRC) – Čejkovice, *leg. ?*, ? (SAV) – Starý Podvorov, *leg. Pospíšil*, 1963 (BRNM); *leg. Gostyńska*, 1960 (KOR) – Ždanice, Archlebov, Nové hory, *leg. Podpěra*, 1933 (BRNU^{x}) – Kyjov, *leg. Podpěra*, 1933 (BRNU^{x}).

21a. HANÁCKÁ PAHORKATINA: Vyškov, Dědice, *leg. Čouka*, 1917, 1928 (BRNU); *leg. Skřivánek*, 1941 (PRC) – Vyškov – Drysice, *leg. Pospíšil*, 1957 (BRNM) – Drysice, Bílá skála, *leg. Pospíšil*, 1963 (BRNM) – Vyškov, Želeč, *leg. Spitzner*, 1888 (BRNU); *leg. Čouka*, 1918 (BRNU) – Ondratice, *leg. Čouka*, 1928 (BRNU^{x}) – Dětkovice, *leg. Spitzner*, 1886 (BRNU); *leg. Kavka*, 1950, 1956 (BRA) – Kojetín, Kovalovice, *leg. Pospíšil*, 1962 (BRNM) – Vrahovice, *leg. Otruba*, 1939 (PRC); *leg. Pospíšil*, 1966 (BRNM) – Olomouc, Grygovské kopce, *leg. Otruba*, 1941 (PRC) – Velký Týnec, *leg. Bubák*, 1890 (PR) – Žernůvky, *leg. Pospíšil*, 1968 (BRNM) – Hněvotín, *leg. Čouka*, 1904 (BRNU$^{!x}$), 1905 (BRNU$^{!x}$); *leg. Laus*, 1908 (GHT), 1932 (FI$^{!x}$), 1934 (JE^{x}), 1939 (HAL^{x}) – Slatinice, Lomy, *leg. Otruba*, 1943 (PRC) – Slatinice, *leg. Otruba* 1943 (PRC^{x}).

21b. HORNOMORAVSKÝ ÚVAL: Olomouc, Čertoryjská skála, *leg. Skyva*, 1910 (BRNU^{x}).

MESOPHYTICUM

MESOPHYTICUM MASSIVI BOHEMICI

32. KŘIVOKLÁTSKO: Křivoklát – Městečko, *leg. Schustler*, 1914 (PR).

41. STŘEDNÍ POVLTAVÍ: Zbraslav, *leg. Schustler*, 1915 (PR).

44. MILEŠOVSKÉ STŘEDOHOŘÍ: Velemín, Kletečná, *leg. Klika*, 1935 (PR^{x}).

65. KUTNOHORSKÁ POHORKATINA: Kuřim, Zášmuky, Vlčí důl, *leg. Bubák*, 1893 (PR).

67. ČESKOMORAVSKÁ VRCHOVINA: Třebíč, Hvězdovice, *leg. Jičínský*, 1951 (ZMT^{x}) – Třebíč, Budíkovice, *leg. Jičínský*, 1950 (ZMT) – Třebíč, Trnava, *leg. Suza*, 1931 (BRNU); *leg. Ondráčková*, 1968 (ZMT) – Střížov – Okrašovice, *leg. Suza*, 1932 (BRNU).

68. MORAVSKÉ PODHŮŘÍ VYSOČINY: Nové Sady, *leg. Křížek*, 1968 (BRNU) – Zblovice, Svobodův mlýn, *leg. Hrabětová*, 1960 (BRNU) – Bítov, Růžový vrch, *leg. Hrabětová*, 1955 (BRNU^{x}) – Přibyslavice, *leg. Ondráčková*, 1974 (ZMT$^{!x}$) – Přibyslavice, Hájný kopec, *leg. Suza*, 1931 (BRNU) – Třebíč, Týn, *leg. Jičínský*, 1951 (ZMT^{x}), 1952 (ZMT) – Třebíč, Pocoucov, *leg. Jičínský*, 1950 (ZMT^{x}) – Třebíč, Podklášteří, Nehradov, *leg. Jičínský* 1948 (ZMT), 1950 (ZMT$^{!x}$), 1951 (ZMT^{x}), 1952 (ZMT) – Třebíč, Ptačov, *leg. Zavřel*, 1875 (PRC) – Třebíč, *leg. Zavřel*, 1877 (BRNM$^{!x}$); *leg. Suza*, 1931 (BRNU ^{x}) – Třebíč, Táborský mlýn, *leg. Zeibert*, 1912 (ZMT); *leg. Suza*, 1931 (BRNU) – Třebíč, Hostákov, *leg. Palík*, 1974 (BRNU, ZMT) – Vladislav, *leg. Suza*, 1931 (BRNU) – Jasenice, *leg. Ondráčková*, 1963 (ZMT) – Náměšť nad Oslavou, *leg. Roemer*, 1857 (JE$^{!x}$), 1863 (BP$^{!x}$), 1863 (B, LAU, M, POZ, W), 1880 (G); *leg. Feichtinger*, ? (Z); *leg. Suza*, 1932 (BRNU) – Náměšť nad Oslavou, Vlčí kopec, *leg. Suza*, 1932 (BRNU) – Přešovice, *leg. Suza*, 1932 (BRNU^{x}) – Dalešice, Dalešický mlýn, *leg. Suza*, 1930, 1931 (BRNU); *leg. Ondráčková*, 1974 (ZMT) – Kramolín, Dřínové hory, *leg. Ondráčková*, 1966 (ZMT$^{!x}$), 1967 (ZMT) – Ketkovice, Plánice, *leg. Dvořák*, 1932 (ZMT^{x}) – Ketkovice, *leg. Dvořák*, 1926 (BRNM) – Ketkovický hrad, *leg. Suza*, 1923 (BRNU) – Čučice – Oslavany, *leg. Suza*, 1932 (BRNU) – Moravský Krumlov, Jamolice, *leg. Suza*, 1930 (BRNU) – Dukovany, *leg. Ondráčková*, 1976, 1983, 1985 (ZMT) – Veverská Bitýška, Hradčany, vrch Sokolí, *leg. Podpěra*, 1927 (BRNU) – Drásov, Keblany, *leg. Šmarda* 1928 (BRNU) – Drásov, Stráž, *leg. Šmarda*, ? (PR) – Moravské Knínice, Sychrov, *leg. Podpěra*, 1941 (BRNU^{x}) – Moravské Knínice, *leg. Šmarda*, 1928 (PR) – Bilovice, *leg. Formánek*, 1833 (BRNM); *leg. Doležal*, 1927 (BRNU) – Soběšice, *leg. Staněk*, 1920 (BRNU); *leg. Veselský*, 1935 (ZMT) – Obce – Ochoz, *leg. Doležal*, 1928 (BRNU).

70. MORAVSKÝ KRAS: Brno, Velká Klajdovka, *leg. Formánek*, 1883 (BRNM); *leg. J. Dostál*, 1943 (PRC) – Blansko, Staré Zámky, *leg. Pospíšil*, 1962 (BRNM^{x}) – Sloup, Neveselov, *leg. Müller*, 1947 (BRNU^{x}).

71c. DRAHANSKÉ PODHŮŘÍ: Laškov, *leg. Němec* 1941 (PRC^{x}) – Laškov – Ludéov, *leg. Otruba*, 1908 (BRNM).

72. ZÁBEŽSKO-UNIČOVSKÝ ÚVAL: Litovel, *leg. Otruba*, 1941 (PRC).

74b. OPAVSKÁ PAHORKATINA: Kobeřice, *leg. Pospíšil*, 1968 (BRNM).

MESOPHYTICUM CARPATICUM

76a. MORAVSKA BRÁNA VLASTNÍ: Kelč, *leg. Spitzner*, 1885 (BRNU) (cultivated ?).

OREOPHYTICUM

OREOPHYTICUM MASSIVI BOHEMICI

90. JIHLAVSKÉ VRCHY: Rouchovany, *leg. Suza*, 1929, 1932 (BRNU).

SLOVAKIA

PANNONICUM[2]

MATRICUM

1. BURDA: Štúrovo, Kováčov, *leg. Suza*, 1929 (BRNU) – Chľaba, *leg. Grundik*, 1856 (BRA).

2. IPEĽSKO-RIMAVSKÁ BRÁZDA: Tekovská Nová Ves, *leg. Futák*, 1941 (SLO$^{!x}$) – Levice, Vápnik, *leg. Maloch*, 1919 (PRC); *leg. Futák*, 1946 (SLO); *leg. Májovský*, 1965 (SLO); *leg. David*, 1983 (LTM) – Levice, *leg. Májovský*, 1958 (SLO) – Kamenín, 'Ördöngös völgy', *leg. Futák*, 1958 (SAV^{x}) – Pastovce, *leg. Krist*, 1936 (BRNU) – Bohunice, *leg. Klášterský & Deyl*, 1933 (PR^{x}) – Sebechleby, *leg. Kmeť*, 1876 (BRA) – Plášťovce, *leg. ?*, 1955 (SLO) – Šahy, *leg. Domin & Sillinger*, 1933 (PRC^{x}) – Slovenské Ďarmoty, *leg. Domin & Sillinger*, 1933 (PRC) – Lučenec, *leg. Futák*, 1953 (SAV) – Vieska pri Lučenci, *leg. Kunszt*, 1966 (BRA) – Šiatorská Bukovinka, Lazy, *leg. Domin & Sillinger*, 1933 (PRC^{x}) – Fiľakovo, Kohútí vrch, *leg. Domin & Sillinger*, 1933 (PRC^{x}); *leg. Smejkal*, 1965 (BRNU) – Fiľakovo, 'Remete hegy', *leg. Klášterský*, 1956 (PR^{x}) – Rimavská Sobota, the forest 'Gernyö', *leg. Fábry*, 1864 (BRA).

3. SLOVENSKÝ KRAS: Jelšava, Tri peniažky, *leg. Kliment*, 1977 (SAV^{x}) – Jelšavská Teplička, Stráňa, *leg. J. Dostál* 1933 (PRC) – Plešivec, Veľký vrch, *leg. Lengyel*, 1926 (BP) – Plešivec, *leg. Lengyel*, 1924 (BP) – Ardovo, *leg. Deyl*, 1962 (PR) – Domica, *leg. Klášterský*, 1935 (PR); *leg. Futák & Magic*, 1948 (SLO); *leg. Blattny*, 1961 (BRA); *leg. Pecníková*, 1965 (BRA); *leg. Dvořák*, 1967 (BRNU); *leg. F. & J. Meyer*, 1975 (JE) – Kečovo – Plešivec, Poronya, *leg. Krajina*, 1933 (PR$^{!x}$); *leg. Klášterský*, 1935 (PR) – Brezová – Silica, *leg. J. Hadač*, 1934 (PRC).

EUPANNONICUM

4. ZÁHORSKÁ NÍŽINA: Skalica, Veterník, *leg. Holuby*, 1861 (PR, SLO); *leg. Scheffer*, 1921 (SLO$^{!x}$); *leg. Weber*, 1923 (PR^{x}); *leg. Sillinger*, 1926, 1927, 1939 (PRC), 1929 (SLO, PR, PRC, BRNU); *leg. Nevole*, 1949 (SLO$^{!x}$); *leg. Májovský*, 1951 (SLO); *leg. Červenka*, 1968 (SLO).

5. DEVÍNSKA KOBYLA: Devín, Devínska Kobyla, *leg. Brancsik, ?*, (WRSL); *leg. Degen*, 1884 (BP); *leg. Bäumler*, 1893 (BP^{x}); *leg. Gáyer*, 1916 (BP^{x}, PRC, W^{x}); *leg. Scheffer*, 1920 (SLO^{x}), 1928 (SLO^{x}); *leg. Rechinger*, 1928 (TRN ^{x}); *leg. Mikeš*, 1935 (PRC^{x}); *leg. Futák*, 1945 (SLO), 1961, 1962 (SAV); *leg. Polívka*, 1947 (PR^{x}); *leg. Pavelková*, 1958 (SLO); *leg. Kaleta*, 1966 (BRA^{x}); *leg. Hubová & Flašíková*, 1971 (SAV) – Devín, Merice, *leg. Schidlay*, 1932 (BRA) – Devín, *leg. Májovský*, 1969 (SLO) – Bratislava, Lamač, *leg. Valenta*, 1938 (BRA) – Bratislava, Dúbravka, 'Fünfeck', *leg. Valenta*, 1938 (BRA) – Bratislava, Karlova Ves, *leg. Májovský*, 1958 (SLO) – Bratislava, Karlova Ves, Glavica, *leg. Valenta*, 1938 (BRA^{x}).

6. PODUNAJSKÁ NÍŽINA: Bratislava, Bôrik, *leg. ?, ?* (GOET); *leg. Gáyer*, 1916 (GZU^{x}); *leg. Scheffer*, 1919 (SLO^{x}) – Bratislava, Dynamitka, *leg. V. Nábělek*, 1936 (SAV^{x}) – Sereď, Svätý Chrast', *leg. Suza*, 1930 (BRNU) – Dvorníky, Panónia, *leg. Feráková*, 1966 (SLO) – Hlohovec, Soroš, *leg. Zajacová*, 1962 (SLO) – Otrhánky – Chlievany, *leg. Schidlay*, 1944 (SAV) – Čifáre – Podkamenie, *leg. David*, 1983, 1984 (LTM) – Kozárovce, *leg. Kupčok*, 1922 (PR); *leg. Klika*, 1947 (PR); *leg. David*, 1983 (LTM) – Levice, Kusá hora, *leg. Futák*, 1946 (SLO) – Kamenný Most, *leg. Domin*, 1929 (PRC^{x}) – Belanské kopce, Modrý vrch, *leg. Domin*, 1929 (PRC$^{!x}$); *leg. Krist*, 1934 (BRNU); *leg. Domin & Jirásek*, 1938 (PRC); *leg. Futák*, 1949 (SAV^{x}, SLO); *leg. Holubičková & Ondráková*, 1952 (PR^{x}); *leg. Popovič*, 1960 (SAV) – Belanské kopce, Veľký vrch, *leg. Domin & Jirásek*, 1936 (PRC) – Belanské kopce, Mužla, *leg. Klášterský & Deyl*, 1933 (PR) – Štúrovo, 'Kékitőpuszta', *leg. Krist*, 1934 (BRNU); *leg. Jávorka*, 1939 (BP).

7. KOŠICKÁ KOTLINA: Šaca, *leg. Hlavaček*, 1954 (SAV).

8. VÝCHODOSLOVENSKÁ NÍŽINA: Veľký Kamenec, Tarbucka, *leg. Futák*, 1943 (SLO^{x}), 1949 (SLO$^{!x}$), 1956 (SAV^{x}); *leg. Hrabětová*, 1956 (BRNU^{x}); *leg. Deyl*, 1958 (PR^{x}); *leg. Májovský*, 1961 (SLO); *leg. Manica*, 1969 (ZV) – Streda nad Bodrogom, *leg. Jurko & Šomšák*, 1959 (SLO^{x}) – Tajba, *leg. Margittai*, 1926 (BP^{x}) – Borša, 'Szölö hegy', *leg. Margittai*, 1913 (PRC) – Viničky, 'Borz hegy', *leg. Deyl*, 1938 (PR) – Černochov, *leg. Futák*, 1950 (SAV, SLO); *leg. Jurko, Peciar & Šomšák*, 1959 (SLO); *leg. Májovský*, 1960 (SLO$^{!x}$) –

[2] The regional phytogeographic division follows Futák (1984).

Černochov, 'Gyopáros', *leg. Futák*, 1955, 1962 (SAV) – Malá Tŕňa, Šimonov vrch, *leg. Jurko & Šomšák*, 1959 (SLO^x); *leg. Májovský*, 1964 (SLO) – Malá Tŕňa, *leg. Klášterský*, 1938 (PR^x) – Veľká Tŕňa, *leg. Jurko & Šomšák*, 1959 (SLO^x) – Kráľovský Chlmec, *leg. Futák*, 1949 (SLO) – Kráľovský Chlmec, Veľká Kráľovská hora, *leg. Hejný*, 1948 (PR) – Drahňov, *leg. Futák & Michalko*, 1950 (SLO).

CARPATICUM OCCIDENTALE

PRAECARPATICUM

9. BIELE KARPATY (JUŽNÁ ČASŤ): Trenčianske Bohuslavice, Turecko, *leg. Sillinger*, 1927 (PR, PRC) – Dolné Srnie, *leg. Holuby*, 1898 (BRA, PR^x, BRNU^x) – Trenčiansky Štvrtok, *leg. Holuby*, 1866 (BP^x, WRSL^x), 1871 (BRNM) – Haluzice, *leg. Holuby*, 1865 (BP^x), 1882 (BRA^x), 1886 (BRA).

10. MALÉ KARPATY: Lamač, *leg. V. Nábělek*, 1936 (BRA, SAV$^{!x}$) – Lamač – Červený most, *leg. Krist*, 1938 (BRNU) – Lamač – Klepáč, *leg. Schidlay*, 1959 (SAV^x) – Lamač E, *leg. Schidlay*, 1959 (SAV^x) – Bratislava, Vydrica river valley, *leg. Gáyer*, 1915 (BP^x) – Bratislava, Koliba, *leg. Scheffer*, 1930 (SLO^x) – Bratislava, Koliba – Dynamitka, *leg. Gajarský*, 1961 (SAV) – Bratislava, Pekná cesta, *leg. F. Nábělek*, 1940 (SAV ^{x}) – Jur pri Bratislave, *leg. Filarszky & Jávorka*, 1912 (BP^x); *leg. Scheffer*, 1919 (SLO^x) – Myslenice, *leg. Scheffer*, 1930 (SLO^x) – Pezinok, *leg. Holuby*, 1911 (PRC$^{!x}$) – Vinosady, *leg. Zigmundík*, 1914 (BRA) – Vinosady, Salcar, *leg. Scheffer*, 1926 (SLO^x), 1939 (SLO) – Modra, *leg. Scheffer*, 1927 (SLO^x) – Naháč, *leg. Scheffer*, 1929 (SLO) – Dechtice, *leg. ?*, ? (SAV) – Višňové, Čachtický hrad, *leg. Domin*, 1931 (PRC); *leg. Futák & Peniašteková*, 1973 (SAV).

11. POVAŽSKÝ INOVEC: Koplotovce, *leg. Feráková*, 1964 (SLO) – Ducové, Kostolec, *leg. Mucina*, 1974 (BRA) – Modrová NW, *leg. Žertová*, 1959 (PR) – Tematín, *leg. Holuby*, 1895 (BRA); *leg. Suza*, 1926 (BRNU); *leg. Májovský*, 1986 (SLO).

12. TRIBEČ: Nitra, Zobor, *leg. Scheffer*, 1923 (SLO), 1928 (SLO $^{!x}$), 1929 (SLO^x); *leg. Suza*, 1928 (BRNU$^{!x}$); *leg. Vlach*, 1932 (PRC); *leg. Klášterský*, 1934 (PR); *leg. Deyl*, 1935, 1952 (PR); *leg. Futák*, 1942, 1943 (SLO); *leg. Pilát*, 1949 (PR^x); *leg. Grebenščikov*, 1953 (SAV); *leg. Browicz*, 1959 (KOR); *leg. F. & J. Meyer*, 1975 (JE); *leg. Wójcicki*, 1981 (KRAM$^{!x}$) – Ploská, *leg. Kováčiková*, 1972 (SLO) – Veľký Lysec, *leg. Kováčiková*, 1972 (SLO).

13. STRÁŽOVSKÉ A SÚĽOVSKÉ VRCHY: Oslany, Veľký vrch, *leg. Scheffer*, 1920, 1939 (SLO); *leg. Futák*, 1944 (SLO$^{!x}$), 1948 (SLO), 1960 (SAV) – Dolné Vestenice, *leg. Futák*, 1960 (SAV) – Bojnice, Kalvária, *leg. Májovský*, 1962 (SLO) – Šútovo – Timoradza, *leg. Futák*, 1956 (SAV) – Timoradza, Smradľavý vrch, *leg. Futák*, 1943 (SLO) – Trenčín, *leg. Brancsik*, 1899 (BRA), 1900 (BP, GZU), 1901 (GZU); *leg. Schidlay*, 1952 (SAV) – Trenčín – Soblahov, Brezina, *leg. Schidlay*, 1935 (SAV), 1944 (BRA, SAV, SLO).

14a. POHRONSKÝ INOVEC: Hronský Beňadik, Klíča, *leg. Krist*, 1938 (BRNU).

14c. KREMNICKÉ VRCHY: Zvolen, Veľká Stráž, *leg. Manica*, 1953, 1962 (ZV).

14d. POĽANA: Zvolen E, *leg. Futák*, 1847 (SLO) – Vigľaš, Rohy, *leg. Futák*, 1947 (SLO), 1958 (SAV); *leg. Činčura*, 1967 (SLO); *leg. Zahradníková*, 1970 (SAV).

14e. ŠTIAVNICKÉ VRCHY: Hronský Beľadik, Krásna skala, *leg. Klášterský & Deyl*, 1933 (PR) – Pukanec, Klčovanina, *leg. Kupčok*, 1894 (PR) – Prenčov, *leg. Kmet*; 1876, 189? (BRA) – Banská Štiavnica, Holík, *leg. Mikyška*, 1956 (PR); *leg. Hostička & Zelený*, 1957 (PRC); *leg. Greštiak*, 1963 (ZV); *leg. David*, 1986 (LTM) – Banská Štiavnica, Počúvadelské jazero, *leg. Brižický & Červeňová*, 1940 (SLO) – Hodruša, *leg. Hlaváček*, 1955 (SAV) – Banská Belá, 'Ptáčnik', *leg. Cserey*, 1890 (BRA^x).

15. SLOVENSKÉ RUDOHORIE: Pokorádzske skaly, *leg. Blattny*, 1946, 1955 (BRA) – Myslava pri Košiciach, *leg. Michalko*, 1960 (SAV).

17. SLOVENSKÝ RAJ: Hrabušice – Letanovce, prielom Hornádu, *leg. Sillinger*, 1932 (PRC); *leg. Májovský*, 1955 (SLO); *leg. Staszkiewicz & Tyszkiewicz*, 1973 (KRAM) – Ihrík, *leg. Hubová*, 1966 (SAV) – Spišské Tomášovce, *leg. Májovský*, 1955 (SLO).

18. STREDNÉ POHORNÁDIE: Košice, Hradová, *leg. Wołoszczak*, 1894 (W); *leg. Thaisz*, 1908 (BP^x) ; *leg. Klika*, 1937 (PR^x); *leg. Jurko*, 1950 (SLO^x) – Malá Vieska, *leg. Wołoszczak*, 1894 (W).

19. SLANSKÉ VRCHY: Slanec, Hradisko, *leg. Klášterský*, 1938 (PR) – Nižná Hutka, Holica, *leg. Michalko*, 1960 (SAV) – Prešov, Surdok, *leg. Májovský*, 1949 (SLO^x) – Kapušany, Kapušiansky hrad, *leg. Suza*, 1930 (BRNU); *leg. Májovský*, 1948 (SLO$^{!x}$) – Fintice, *leg. Májovský*, 1948 (SLO$^{!x}$), 1949 (SLO).

20. VIHORLATSKÉ VRCHY: Humenné, Krivošťanka, *leg. Domin & Krajina*, 1937 (PRC^x) – Vihorlat, Sokol, *leg. Michalko*, 1955 (SAV^x) – Vinné, *leg. Michalko*, 1949 (SLO) – Vinné, Šutová, *leg. Michalko*, 1950 (SLO^x) – Vinné, Veľká Senderová, *leg. Kmeťová*, 1984 (SAV); *leg. Májovský*, 1984 (SLO) – Vinné, Malá Senderová, *leg. Michalko*, 1950 SLO^x). – Klokočov, *leg. Margittai* 1926 (BP^x).

EUCARPATICUM

21a. MALÁ FATRA (LÚČANSKÁ FATRA): Horeňovo, Ráztočno, *leg. Jičínský* 1932 (ZMT).

22. NÍZKE TATRY: Kvetnica, Zámčisko, *leg. Sillinger*, 1931 (PRC^x) – Kráľova Lehota, *leg. Futák*, 1956 (SAV).

INTERCARPATICUM

26a. LIPTOVSKÁ KOTLINA: Liptovský Hrádok – Kráľova Lehota, *leg. Hajdúk* 1961 (SAV).

26b. SPIŠSKÉ KLOTLINY: Dreveník, *leg. Greschik*, 1890 (SLO), 1891 (SLO, BRA); *leg. Futák*, 1958 (SAV) – Spišský hrad, *leg. Kitaibel*, ? (BP) – Spišský Hrhov, *leg. Greschik* 1894 (BP) – Klčov W, Brusník, *leg. Greschik*, 1889, 1910, 1911 (SLO).

BESCHIDICUM ORIENTALE

30a. ŠARIŠSKÁ VRCHOVINA: Prešov, *leg. Hazslinszky*, ? (BRA) – Prešov, Kalvária, *leg. Simkovics*, 1868 (BP); *leg. Hazslinszky*, ? (BP) – Prešov, 'Czigany hegy', *leg. Hazslinszky*, ? (BP) – Veľký Šariš, Bikoš, *leg. L. Dostál*, 1973 (SAV) – Dúbrava, *leg. Májovský*, 1949 (SLO[!x]) – Šarišský hrad, *leg. Veselský*, 1856 (PR[x], PRC[x]); *leg. Májovský*, 1949 (SLO) – Drienica, *leg. Májovský*, 1949 (SLO[!x]).

30c. NÍZKE BESKYDY: Štefanovce, *leg. Michalko*, 1961 (SAV).

P. fruticosa x P. avium

SLOVAKIA

PANNONICUM

MATRICUM

3. SLOVENSKÝ KRAS: Plešivec, *leg. Lengyel*, 1924 (BP).

CARPATICUM OCCIDENTALE

PRAECARPATICUM

14e. ŠTIAVNICKÉ VRCHY: Banská Štiavnica, Holík, *leg. Klášterský*, 1928 (PR).

REFERENCES

ABBOTT, J. A. 1992. Plant invasions, interspecific hybridization and the evolution of new plant taxa. *Trends in Ecology & Evolution* **7**(12): 401–405.

ANDERSON, E. 1956. Introgression of *Salvia apiana* and *Salvia mellifera*. *Annals of the Missouri Botanical Garden* **41**: 329–338.

CHRTEK, J. 1992. Amygdalaceae D. Don. In: S. HEJNY & B. SLAVÍK (eds), *Květena České Republiky*. **3**: 435–462. Academia, Praha.

DEPAMPHILIS, C. W. & WYATT, R. 1989. Hybridization and introgression in buckeys (*Aesculus*: Hippocastanaceae): a review of the evidence and hypothesis to explain long-distance gene flow. *Systematic Botany* **14**(4): 593–611.

FUTÁK, J. 1947. La végétation xérothermique du groupe du Kňažny Stôl (Slovaquie Occidentale). Spolok Sv. Vojtecha, Trnava (in Slovak with French and Russian summary).

FUTÁK, J. 1984. Phytogeographical division. In: L. BERTOVÁ (ed.), *Flóra Slovenska* **4**(1), Map. Veda, Bratislava.

GRANT, V. 1981. Plant speciation (second edition). Columbia University Press, New York.

HAJDÚK, J. 1965. Výskyt *Cerasus fruticosa* (Pall.) Woronow a iných teplomilných rastlín pri Liptovskom Hrádku. *Biológia, Bratislava* **20**(1): 59–61.

HINTON, W. F. 1975. Natural hybridization and extinction of a population of *Physalis virginiana* (Solanaceae). *American Journal of Botany* **62**: 198–202.

HINTON, W. F. 1976. Hybridization: a threat to the survival of small populations of endangered species. *Environmental Conservation* **3**(2): 148.

HOLMGREN, W. F., HOLMGREN, N. H. & BARNETT, L. C. 1990. Index herbariorum. Part. I. The herbaria of the world. *Regnum Vegetabile* **120**: 1–693.

HRABĚTOVÁ-UHROVÁ, A. 1958. Über Vegetationsverhältnisse des Bezirkes Hustopeče mit besonderer Berücksichtigung einiger Straucharten. *Acta Academiae Scientiarum Czechoslovenicae Basis Brunensis* **30**(6): 221–279 (in Czech with German summary).

JURKO, A. 1964. Feldheckengesellschaften und Uferweidengebüsche des Westkarpatengebietes. *Biologické Práce* **10**(6): 1–100.

KORNAŠ, J. 1983. Man's impact upon the flora and vegetation in Central Europe. In: W. HOLZNER, M. J. A. WERGER & I. IKUSIMA (eds), *Man's impact on vegetation*. Junk, The Hague/Boston/London.

KÁRPÁTI, Z. 1944. Untersuchungen an *Prunus*-arten der Untergattung *erasus*. *Magyar Kertészeti és Szölészeti Föiskola Közleményei* **10**: 66–80.

KUBÁT, K. 1970. Rozšíření některých druhů rostlin v Českém středohoří. Fytogeografická studie. Litoměřice.

KUBÁT, K., BĚLKOVÁ, J., CIGÁNKOVÁ, J., FALK, P., JEHLÍK, V., KUNCOVÁ, J., MAREK, A., RIVOLA, M., ROUBÍNKOVÁ, O., SKOŘEPA, J., VÍCHOVÁ, .A., VONDRÁČEK, M. & WAGNER, B. 1972. Dokumentační výzkum území budoucí radovesické výsypky. *Severočeskou přírodou, Litoměřice* **3**: 1–160.

KUTA, E. 1990.Biosystematic studies on *Viola* sect. *Plagiostigma*: III. Biometrical analysis of Polish populations of *V. epipsila*, *V. palustris* and their spontaneous hybrids. *Fragmenta Floristica et Geobotanica* **35**(1–2): 5–34.

KUTA, E. 1991. *Viola epipsila* Ledeb., a vanishing species in Poland. In: K. ZARZYCKI, E. LANDOLT & J. J. WÓJCICKI (eds), *Contributions to the knowledge of flora and vegetation of Poland. Vol. I. Veröffentlichungen des Geobotanischen Institutes der ETH, Stiftung Rübel, Zürich* **106**: 257–265.

MAGLOCKÝ, S. 1971. *Chrysopogon gryllus* (Torn) Trin. and *Cleistogenes serotina* (L.) Keng. in the Považský Inovec. *Biológia, Bratislava* **26**(7): 557–561 (in Slovak with English summary).

MARHOLD, K. & WÓJCICKI, J. J. 1992. *Cerasus* Miller. In: L.

BERTOVÁ (ed.), *Flóra Slovenska* **4**(3): 509–533. Veda, Bratislava.

MICHALKO, J. & DŽATKO, M. 1965. Phytocoenologische und oekologische Charakteristik der Pflanzengesellschaften des Waldkomplexes Dubník bei der Gemeinde Sereď. *Biologické Práce* **11**(5): 47–113 (in Slovak with German summary).

MIREK, Z. 1990. Polish herbaria. *Polish Botanical Studies, Guidebook Series* **2**: 3–73.

OLDEN E. J. & NYBOM N. 1968. On the origin of *Prunus cerasus* L. *Hereditas* **59**(2–3): 327–345.

PITONIAK, P., PETRÍK, A., DZUBINOVÁ, L., UHLÍŘOVÁ-ŠIMEČKOVÁ, J. & FAJMONOVÁ, E. 1978. Flora and vegetation of the protected landscape area Slovenský Raj (Slovak Paradise). *Biologické Práce* **26**(6): 1–136 (in Slovak with English summary).

RIESEBERG, L. H. 1991. Hybridization in rare plants: insights from case studies in *Cercocarpus* and *Helianthus*. In: D. A. FALK & K. E. HOLSINGER (eds), *Genetics and conservation of rare plants*, pp. 171–181. Oxford University Press, New York, Oxford.

SLAVÍK, B. 1988. Phytogeographical characteristics. In: S. HEJNÝ & B. SLAVÍK (eds), *Květena České Socialistické Republiky*. **1**: 65–102. Academia, Praha (in Czech with English summary by M. KOVANDA).

SKALICKÝ, V. 1988. Regional phytogeographical division. In: S. HEJNÝ & B. SLAVÍK (eds), *Květena České Socialistické Republiky*. **1**: 103–121. Academia, Praha (in Czech with English summary by M. KOVANDA).

ŠMARDA, J. 1970. Flora and vegetation of the Slovenský raj (Slovak Paradise). *Ochrana Prírody, Séria II* **4**: 1–41 (in Slovak with Russian, German and English summary).

ŠMARDA, J. 1963. Rozšíření xerotermních rostlin na Moravě a ve Slezsku. *Zprávy o vědecké činnosti, Brno* **1**: 1–170 and 277 maps.

STACE, C. A. (ed.) 1975. Hybridization and the flora of the British Isles. Academic Press, London/New York/San Francisco.

STASZKIEWICZ, J. & WÓJCICKI, J. J. 1992. *Betula x oycoviensis* Besser in the environs of Kraków. In: K. ZARZYCKI, E. LANDOLT & J. J. WÓJCICKI (eds), *Contributions to the knowledge of flora and vegetation of Poland. Vol. 2. Veröffentlichungen des Geobotanischen Institutes der ETH, Stiftung Rübel, Zürich* **107**: 94–97.

WÓJCICKI, J. J. 1988. Variability of *Prunus fruticosa* Pallas. Ph.D. Thesis, Istitute of Botany, Polish Academy of Sciences, Kraków (in Polish).

WÓJCICKI, J. J. 1991a. Variability of *Prunus fruticosa* Pall. and the problem of an anthropohybridization. In: K. ZARZYCKI, E. LANDOLT & J. J. WÓJCICKI (eds), *Contributions to the knowledge of flora and vegetation of Poland. Vol. 1. Veröffentlichungen des Geobotanischen Institutes der ETH, Stiftung Rübel, Zürich* **106**: 257–265.

WÓJCICKI, J. J. 1991b. *P.* x *stacei* (Rosaceae), a new spontaneous threefold hybrid of *P. fruticosa*, *P. cerasus* and *P. avium*. *Fragmenta Floristica et Geobotanica* **35**(1–2): 139–142.

WOODELL, S. R. J. 1969. Natural hybridization in Britain between *Primula vulgaris* Huds. (the primrose) and *P. elatior* (L.) Hill (the oxlip). *Watsonia* **7**(3): 115–127.

Received 06 March 1993