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Genome size and distribution of *Adenostyles alliariae* in Slovakia

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Abstract: Adenostyles alliariae (Gouan) A. Kerner (*Asteraceae*) represents a single species of the genus *Adenostyles* in Slovakia. In the paper it is characterized from the point of view of chromosome number, genome size, breeding systems and distribution in Slovakia. Chromosome number 2n = 38 was confirmed in this study. Flow cytometric analyses resulted showed the genome size 18,19 pg for leaves and 19,4 pg for seeds. The flow cytometric seed screen method proved, on the basis of embryo to endosperm genome size ratio, that the species reproduces sexually. The occurrence of the species is bound to all higher mountain ranges of West Carpathians, above all to the Malá Fatra Mts., the Veľká Fatra Mts., the Nízke Tatry Mts. and Tatry Mts .

Keywords: nuclear DNA amount, chromosome number, occurence, mountain flora, Carpathians.

Introduction

The genus *Adenostyles* Cass. (*Asteraceae, Senecioneae*) contains three species: *A. alliariae*, *A. alpina* (L.) Bluff & Fingerh. (with five subspecies) and *A. leucophylla* (Willd.) Rchb. which are distributed across all higher European mountain regions (Dillenberger & Kadereit 2013). Diploid chromosome number, 2n = 38 was reported for all three species (Tutin et al. 1976). The genus is represented by a single species *Adenostyles alliariae* in the territory of Slovakia.

Adenostyles alliariae is a hemicryptophyte with erect thick branched stem, 60 – 180 cm long, leaves alternate with triangular cordate to reniform blade,

leaf margin unequivocally sharply dentate. Small cylindrical capitula with 2 – 8 flowers forms corymbose inflorescence. Reddish-purple florets are bisexual, gynoecium is syncarpous with two carpels and two stigmas. Fruit is an achene of ovoid shape, about 3 mm long. Flowering period from July to August (Dostál & Červenka 1983). It grows in mountain and subalpine vegetation zone in mountain ranges of the central and the southern Europe, above all in the Alps, the Carpathians, the Pyrenées and Balkan mountains (Dillenberger & Kadereit 2013).

It occurs in mountain and subalpine tall herbaceous and fern meadows, on banks of mountain brooks, in the surrounding of forest and subalpine streams, in mountain forests, in dwarf pine undergrowth, in mountain beech forests and fern spruce forests, mainly in localities with high atmospheric moisture and soils rich in nutrients and humidity (Křísa 2004). In Slovakia it occurs mainly in the comunities of the order *Adenostyletalia alliariae* Br. – Bl. 1930 (Kliment & Valachovič 2007). Chromosome number 2n = 38 is given from the locality Zadné Meďodoly in the Belianske Tatry Mts. (Marhold et al. 2007). This paper presents (1) new data on chromosome number from Slovak population, (2) the data on genome size, which has not been studied so far, (3) the evidence of sexual reproduction mode and (4) the mapping of the occurrence of the species in the territory of Slovakia.

Material and Methods

Plant material

Living plants for flow-cytometric analyses were collected in spring and summer of the years 2014 and 2015, together in four localities in the Stolické vrchy Mts. and one locality in the Slovenský raj Mts. The plants were then cultivated in the Botanical Garden of P. J. Šafárik University in Košice. Seeds were collected in autumn 2015 from two population in the Stolické vrchy Mts. and one from the Nízke Tatry Mts. The seeds were kept in refrigerator at the temperature 4°C. Herbarium specimens of plants used for flow-cytometric analyses are deposited in KO (Herbarium of the Botanical Garden of P. J. Šafárik University, Košice, Slovakia). Complete data on collections and herbarium specimens are given in the *Appendix*.

Karyological analysis

For karyological analyses root meristems of potted plants and seedlings were used. For a pretreatment, the root tips were transferred to 0.002M aquaeous solution of 8-hydroxyquinoline at the temperature of 4°C for 16 hours. Then the root tips were fixed for 1 hour in acetic ethanol (glacial acetic acid and 96% ethanol in the ratio 1: 3), washed in distilled water and hydrolyzed for 3 minutes in 1N HCl at 60°C, then washed in distilled water. The meristems were squashed using cellophane technique (Murín 1960) and stained in 7% Giemsa stain solution in Sörensen phosphate buffer for 3 hours. The slides were then washed in distilled water, dried and observed in a drop of immersion oil. Selected c-metaphase plates were photographed (using a Leica DM 2500 microscope

equipped with camera DFC 290 HD and software Leica application suite version 3.5.0, Switzerland) and the number of chromosomes was counted.

Flow cytometry

The samples for flow cytometry analyses were prepared from leaves and seeds of *Adenostyles alliariae* by a two-step procedure, consisting of nuclear isolation and staining steps, using propidium iodide as DNA intercalator (Loureiro et al. 2007; Doležel & Göhde 1995). To keep offered maximum differences between standard and sample (Suda 2004) we used an internal reference standard: *Vicia faba* subsp. *faba* var. *equina* 'Inovec' (2C DNA content = 26,9 pg) (Doležel et al. 1992). The seeds of the standard were acquired from the Institute of Experimental Botany, Olomouc, Czech Republic and grown in the Laboratory of Taxonomy at the Institute of Biological and Ecological Sciences of P. J. Šafárik University in Košice, Slovakia. A method referred to as internal standardization was used (Doležel et al. 2007). Approximately 1 cm^2 of young leaf was chopped with a new razor blade in a Petri dish in 1 ml of ice-cold GPB (general purpose buffer: 0.5 mM spermine x 4 HCl, 30 mM sodium citrate, 20 mM MOPS [MOPS = 4-morpholine propane sulfonate], 80 mM KCl, 20 mM NaCl and 0.5% [v/v] Triton X-100, pH 7.0 according to Loureiro et al. 2007) + 3% PVP (polyvinylpyrrolidone) buffer. After the chopping, the samples were filtered through a 42 µm nylon mesh and each sample was stained with 10 µl propidium iodide (PI), 10 µl RNase and 2 µl β-mercaptoethanol. After 20 min of incubation at 4°C, each sample was measured. Three plants from each of the 5 localities were measured 3 times on 3 different days (Greilhuber & Obermayer 1997), making 9 measurements for each locality, 45 in total. Histograms of the data were displayed on a linear scale (x-axis). At least 5 000 nuclei per measurement were collected and the coefficients of variation (CV) of the G0/G1 peaks of both the samples and the internal standards did not exceed 3%.

There were some differences for the genome size analyses from seeds and for flow cytometric seed screening method compared to the genome size analyses from leaves. Ten seeds of *Adenostyles alliariae* were used for each analysis and chopped together with the standard. Five samples from each of the 3 localities were measured once, making 15 measurements in total. At least 1300 nuclei per measurement were collected and the coefficients of variations (CV) did not exceed 5%. These specifications are applicable to the genome size analysis from seeds and for flow cytometric seed screen, too. The other specifications of the analysis remain the same as above.

Absolute DNA contents were measured by Partec CyFlow ML (Partec GmbH, Münster, Germany) flow cytometer, equipped with a green solid state laser operating at 532 nm wavelength and 150 mW, in the Laboratory of Flow cytometry at the Institute of Biological and Ecological Sciences of P. J. Šafárik University in Košice, Slovakia. The data were processed by the FloMax 270 software.

The estimation of DNA amounts of the samples was based on the value of the G1 peak means: DNA amount of the sample = DNA amount of the used standard × [(the sample G1 peak mean)/(the standard G1 peak mean)] (Doležel & Bartoš 2005).

Species distribution mapping

The distribution of the species *Adenostyles alliariae* in Slovakia was completed on the basis of our field studies, studies of herbarium specimens in the following herbaria: BP, BRA, BRNM, BRNU, KO, PR, PRC, SAV, SLO (acronyms of the herbaria are according to Holmgren et al. 1990) and studies of literature data. There are also data originated from the database Comprehensive information and monitoring system (CIMS) available online at *www.biomonitoring.sk.* These data are cited in the chapter on distribution in shortened form including name of author, the year of record and abbreviation of database (=BIOM). Phytogeographical division is according to Futák (1984). Each datum is followed by the brackets with the number of basic grid cell and the letter of the quadrant of the Central European mapping (Niklfeld 1971). Based on these data a grid distribution map for *Adenostyles alliariae* in Slovakia was designed in the ArcGis program, version 9.2.

Results and Discussion

Chromosome number

From the territory of Slovakia, Uhríková (in Májovský et al., 1970) mentioned a diploid number of chromosomes in somatic cells of 2n = 38 for plants from the site Zadné Meďodoly, Belianske Tatry Mts. We confirmed the same chromosome number, 2n = 38 (Fig. 1) from plants collected from Kohút Mt., Stolické vrchy Mts. (see *Appendix).*

The results are summarized also in the karyological database Marhold et al. (2007) (available also online: http://www.chromosomes.sav.sk/main/index.php). The same number is also given in the central database of chromosome

Fig. 1 Somatic chromosomes of *Adenostyles alliariae* somatic cells, 2n = 38 (Kohút Mt., Stolické vrchy Mts.).

numbers, „Chromosome counts database“ (Rice et al. 2015, http://ccdb.tau.ac.il/home/), which summarized several further sources.

Genome size

Our measurements of *Adenostyles alliariae* genome size (2C DNA) (Tab. 1) resulted in the value 18,19 ± 0,18 pg for leaf tissues (Fig. 2). From the obtained 2C DNA the number of Mbp in 1C DNA was calculated with the result 8895 ± 88 Mbp (1 pg DNA = 978 Mbp; Doležel et al. 2003).

The analysis of 15 seed samples of *A. alliariae* resulted in genome size of 19,4 ± 0,54 pg (Tab. 1), which is equal to 9487 ± 264 Mbp. This value exceeds the genome size value for leaves by 1,21 pg. Such significant deviation may be caused by the presence of secondary metabolites in leaf tissue which can influence the binding of fluorescence stains to DNA. This can result in fluorescence intensity decrease for the measured sample and in significant distortion of the obtained results (Sliwinska et al. 2005). Further reason for the different values of 2C DNA may be seen in different chromatine structure in leaves and seeds. This can result in different binding of fluorescence stains to DNA (Baluška 1990; Biradar & Rayburn 1994).

Tab. 1 Genome size of *Adenostyles alliariae* from Slovakia from leaves (l) and seeds (s).

Locality	Type of analysis	No. of analysis	Minimum (pg)	Maximum (pg)	Average (pg)	Standard deviation
Stolica	l	9	17,91	18,46	18,16	0,201
Kohút	l	9	17,9	18,46	18,13	0,183
Ondrejisko	l	9	17,84	18,45	18,24	0,189
Trsteník	l	9	17,98	18,45	18,21	0,177
Malý Kohút	l	9	18	18,47	18,2	0,16
Total	**l**	**45**	**17,84**	**18,45**	**18,19**	**0,18**
Stolica	s	5	19,07	20,82	19,52	0,736
Kohút	s	5	18,58	19,75	19,1	0,468
Nízke Tatry	s	5	19,23	19,96	19,57	0,312
Total	**s**	**15**	**18,58**	**19,75**	**19,4**	**0,54**

Flow cytometric analysis of 15 seed samples of *Adenostyles alliariae* proved that sexual reproduction is a common reproduction mode for this species. The ratio of embryo peak median to endosperm peak median was approximately 2:3 for all measurements (Fig. 3.), which is characteristic for sexual reproduction way.

Distribution in Slovakia

Adenostyles alliariae occurs relatively frequently in the flora of the mountain and subalpine vegetation zones, less often, but not rarely it also occurs in submountain and alpine vegetation zones. It is widely spread in higher mountains in Europe, from the west in the Sierra de Gredos and the Pyrenees across the

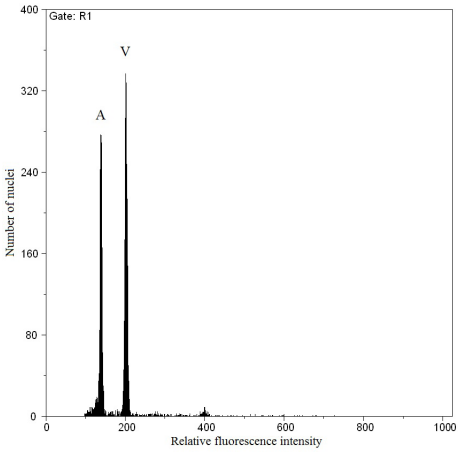

Fig. 2 Flow cytometric histogram of relative fluorescence intensity (propidium iodide) obtained after simultaneous analysis of nuclei of reference standard (*Vicia faba* subsp. *faba* var. *equina* 'Inovec' (V), 2C = 26,9 pg DNA) and *Adenostyles alliariae* (A) sample studied.

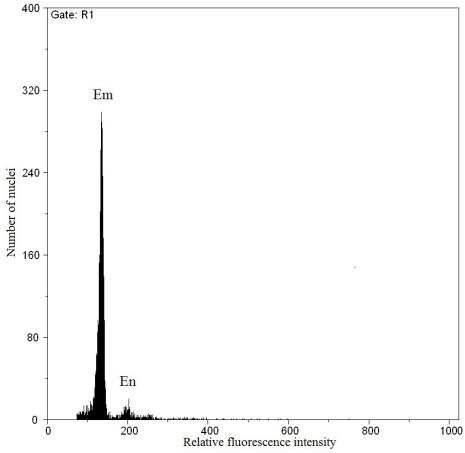

Fig. 3 Flow cytometric histogram of relative fluorescence intensity obtained by analysis of nuclei of embryo (Em) and endosperm (En) of *A. alliariae*.

central Europe, including the Massif Central, the Vosges, the entire Alps, to the south in the Apennines, the Dinarides and other minor Balkan mountains, the Sudetes as the northernmost and the Carpathians as the easternmost mountain range of its distribution (Dillenberger & Kadereit 2013). Its distribution in Slovakia is illustrated by the map of distribution (Fig. 4.) and the list of localities (see *Appendix*). It grows mainly in central and northern mountain regions of Slovakia where it forms vital populations continuously connected to those in southern Poland (Zając & Zając 2001).

The lowermost locality in Slovakia ever recorded lies near the Blatnica village in the phytogeographical district Turčianska kotlina basin. The species grows there in the altitude of 460 m a. s. l.. The altitudinal maximum reaches 2350 m a. s. l. below Mačacia veža Mt. in the Vysoké Tatry Mts. (see *Appendix*). However, there are further localities for *Adenostyles alliariae* in the Vysoké Tatry Mts. reaching at least 2000 m a. s. l. The oldest report is dated back to 1823 by Carl, the newest ones came from our field studies and from the online database *www.biomonitoring.sk* (for details see *Appendix).*

The occurrence of the species was documented from 24 phytogeographic districts and subdistricts. The centre of its distribution is located in the Central Carpathians (*Eucarpaticum*). It does not grow in the area of the Pannonian flora (*Pannonicum*) at all. Most of the records are located in the phytogeographical districts and subdistricts of the Slovenské rudohorie Mts., the Muránska planina Mts., the Kriváska Malá Fatra Mts., the Veľká Fatra Mts., the Nízke Tatry Mts., the Západné Tatry Mts., the Vysoké Tatry Mts. and the Belianske Tatry Mts. In

the Slovenské rudohorie Mts., it occurs mainly in geographical subunits Veporské vrchy Mts. and the Stolické vrchy Mts. Data are missing almost entirely from the geographical subunit Volovské vrchy Mts., where we expected rich abundance. We confirmed its absence in this region by our own field research. This condition could be caused by massive logging activity in the area in the last couple of years, as a consequence many natural habitats were destroyed.

The species has relatively rich abundance also in other phytogeographical districts, mainly in the altitudes above 1100 m a. s. l.. These are primarily the Vtáčnik Mts., the Poľana Mts., the Chočské vrchy Mts., the Spišské vrchy Mts. and the Bukovské vrchy Mts. We have expected greater abundance in the Západné Beskydy Mts., but this can be distorted by missing data and also by destroying habitats by logging activity. The species can be rarely found in the Kremnické vrchy Mts., the Slovenský raj Mts., the Pieniny Mts., the Čergov Mts., the Strážovské and Súľovské vrchy Mts. and the Podtatranské kotliny basins, where it can sporadically descend from the valleys of Tatry Mts.

The only single record of the occurrence in the Štiavnické vrchy Mts. from Sitno Mt. is old and new data are necessary to obtain.

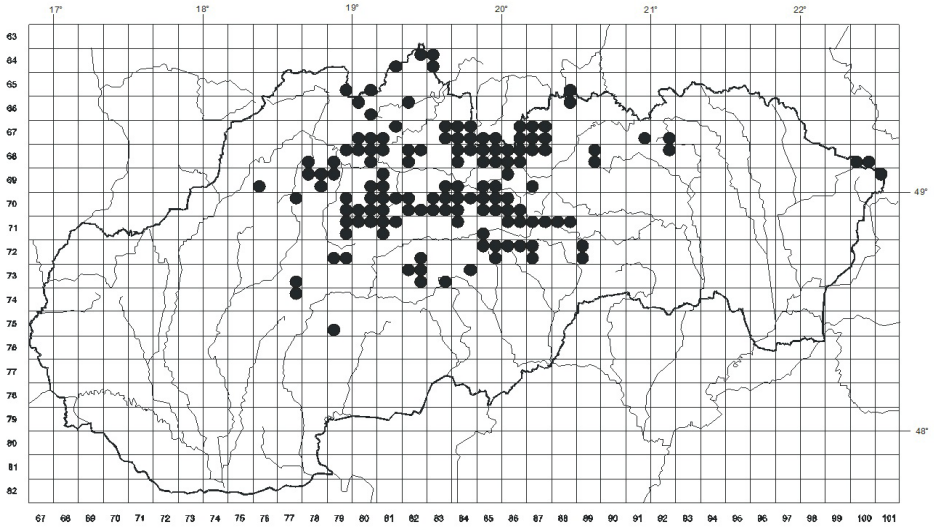

Fig. 4 Grid map of distribution of the species *Adenostyles alliariae* in Slovakia.

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system (CIMS), available also online at www.biomonitoring.sk. We would also like to thank two anonymous reviewers for their constructive criticism.

References

Baluška F. (1990): Nuclear size, DNA content, and chromatin condensation are different in individual tissues of the maize root apex. – Protoplasma 158 (1): 45–52. DOI: 10.1007/BF01323273

Biradar D. P. & Rayburn A. L. (1994): Flow cytometric probing of chromatin condensation in maize diploid nuclei. – New Phytologist 126 (1): 31–35. DOI: 10.1111/j.1469-8137.1994.tb07526.x

Dillenberger M. S. & Kadereit J. W. (2013): The phylogeny of the european high mountain genus *Adenostyles* (*Asteraceae* – *Senecioneae*) reveals that edaphic shifts coincide with dispersal events. – Am. J. Bot. 100 (6): 1171–1183. DOI: 10.3732/ajb.1300060

Doležel J. & Bartoš J. (2005): Plant DNA flow cytometry and estimation of nuclear genome size. – Ann. Bot. 95: 99–110. DOI: 10.1093/aob/mci005

Doležel J., Bartoš J., Volgmayr H. & Greilhuber J. (2003): Nuclear DNA content and genome size of trout and human. – Cytometry 51: 127–128. DOI: 10.1002/cyto.a.10013

Doležel J. & Göhde W. (1995): Sex determination in dioecious plants *Melandrium album* and *M. rubrum* using high-resolution flow cytometry. – Cytometry 19: 103–106. DOI.org/10.1002/cyto.990190203

Doležel J., Greilhuber J. & Suda, J. (2007): Estimation of nuclear DNA content in plants using flow cytometry. – Nat. Protoc. 21 (9): 2233–2244. DOI: 10.1038/nprot.2007.310

Doležel J., Sgorbati S. & Lucretti S. (1992): Comparison of three DNA fluorochromes for flow cytometric estimation of nuclear DNA content in plants. – Physiol. Plant. 85: 625–631. DOI: 10.1111/j.1399-3054.1992.tb04764.x

Dostál J. & Červenka M. (1983): Veľký kľúč na určovanie vyšších rastlín. Vol. 2. – Slovenské pedagogické nakladateľstvo, Bratislava, p. 1083.

Futák J. (1984): Fytogeografické členenie Slovenska. – In: Bertová, L. (ed.): Flóra Slovenska IV/1. – Veda, Bratislava. pp: 418–420.

Greilhuber J. & Obermayer R. (1997): Genome size and maturity group in *Glycine max* (Soybean). – Heredity 78: 547–551. DOI: 10.1038/sj.hdy.6881690

Holmgren P. K., Holmgren N. H. & Barnett L. C. (eds.) (1990): Index Herbariorum. Part I.: The Herbaria of the world. Ed. 8. – Regnum Veg. 120: 1–394.

Kliment J. & Valachovič M. (2007): Rastlinné spoločenstvá Slovenska. 4. Vysokohorská vegetácia. – Veda, Bratislava. pp: 1–388.

Křísa B. (2004): 36. *Adenostyles* Cass. – havez. – In: Slavík B. & Štěpánková J. & Štěpánek J. (eds.): Květena České republiky 7. – Academia, Praha. pp. 282–283

Loureiro J., Rodriguez E., Doležel J. & Santos C. (2007): Two new nuclear isolation buffers for plant DNA flow cytometry: A test with 37 species. – Ann. Bot. 100: 875–888. DOI: 10.1093/aob/mcm152

Marhold K., Mártonfi P., Mereďa P. & Mráz P. (2007): Chromosome number survey of the ferns and flowering plants of Slovakia. – Veda, Bratislava. pp: 1650.

Májovský J. (ed.) (1970): Index of chromosome numbers of Slovakian flora Part 2. – Acta Fac. Rer. Nat. Univ. Comen., Bot. 18: 47.

Murín A. (1960): Substitution of cellophane for glass covers to facilitate preparation of permanent squashes and smears. – Stain Technol. 35: 351–353.

Niklfeld H. (1971): Bericht über die Kartierung der Flora Mitteleuropas. – Taxon 20: 545–571. DOI: 10.2307/1218258

Rice A., Glick L., Abadi S., Einhorn M., Kopelman N. M., Salman-Minkov A., Mayzel J., Chay O., Mayrose I. (2015): The Chromosome Counts Database (CCDB) – a community

resource of plant chromosome numbers. – New Phytologist 206(1): 19–26. DOI. org/10.1111/nph.13191
Sliwinska E., Zielinska, E. & Jedrzejczyk I. (2005): Are Seeds Suitable for Flow Cytometric Estimation of Plant Genome Size? – Cytometry Part A 64A (2): 72–79. DOI:10.1002/cyto.a.20122
Suda J. (2004): An employment of flow cytometry into plant biosystematics. PhD Thesis, Charles University in Prague
Tutin T. G., Heywood V. H., Burges N. A., Moore D. M., Valentine D. H., Walters S. M. & Webb D. A. (1976): Flora Europaea 4.– Cambridge University Press, Cambridge. 534 pp.
Zając A. & Zając M. (2001): Atlas rozmieszczenia roślin naczyniowych w Polsce. Distribution Atlas of Vascular Plants in Poland. – Pracownia Chorologii Komputerowej Instytutu Botaniki Uniwersytetu Jagiellońskiego. – Krakow. XII + 716 pp.

Appendix

Revised records of *Adenostyles alliariae* distribution in Slovakia

This chapter gives documents of distribution which were localized to phytogeographical district (number and name), followed by original or shortened description of the locality from original resource, data on collector, collection year and abbreviation of the herbarium (Holmgren et al. 1990) where the specimen is deposited, or, alternatively, abbreviated literature or manuscript citation. Then the code of subsquare of the Central European grid mapping (Niklfeld 1971) is given in brackets. Abbreviations: NR – Nature reserve, NNR – National nature reserve.

***Carpaticum occidentale*. 13. Strážovské and Súľovské vrchy Mts.:** Lietavská Svinná, N valley below Skalky Mt., (Hallonová 1978 SLO) (6878c). – Ostrá Malenica Mt., 49°1'18,61'' N, 18°24'24,34'' E (Dinga 1989 BIOM) (6976c). **14b. Vtáčnik Mts.:** Handel, below Flochová Mt., 48°48'25,28'' N, 18°58'20,28'' E (Pavlišin 2014 BIOM) (7179d). – Kláštorská skala Mt. (7377d). – Vtáčnik Mt., below the top, 1325 – 1340 m (7377d). – saddle between Vtáčnik Mt. and Homôlka Mt. (all Magic Tábor ochr. prír. 15: tab. 2, 1980) (7377d). – Vtáčnik Mt. (Kmeť 1876 BRA; Futák 1931 SLO) (7377d). – Vtáčnik Mt., Kamenné vráta (7377d-7477b). – site „Maliník", NW from Kľak village (7377d-7477b). – Vtáčnik Mt., Boháčska dolina valley (all Magic TOP 15: tab. 2, 1980) (7477b). – Kľak (Kupčok 1903 PR 123477) (7477b). **14c. Kremnické vrchy Mts.:** Kremnica, Lúčky, slope near the ski-lift, cca 750 m (Šipošová 1991 SAV) (7279c). – NNW below the spot height Suchá hora, 1080 m (7279d). – Skalky Mt. – Krahulský vrch Mt., 1150 m (both Jurko & Kubíček Biológia 29/1: 10, tab. 1, 1974) (7279d). **14d. Poľana Mts.:** Hrochoťská dolina valley, W from Bátová gamekeeper's house, 620 – 660 m, 48°39'28'' N, 19°22'34'' E (7382a). – Kyslinky, 48°39'41,71'' N, 19°29'31,39'' E (Lizoň 2014 BIOM) (7382b). – Strunga meadow, close to the spot height 1240, 1230 – 1240 m, 48°38'29'' N, 19°29'30'' E (7382d). – Staré pole meadow, S slope of Zadná Poľana Mt. (1458), 1411 – 1440 m, 48°38'09'' N, 19°29'05'' E (7382d). – „Výbohove", abandoned meadows on SW slope of Zadná Poľana Mt., 1304 – 1364 m, 48°38'01'' N, 19°28'39'' E (7382d). – „Priehyba" meadows in the saddle between spot heights Predná Poľana (1367) and Zadná Poľana (1458), 1209 – 1280 m, 48°37'55'' N, 19°28'21'' E (all Janišová et al. Bull. Slov. Bot. Spoločn. 26, Suppl. 13: 26, 2004) (7382d). – Poľana Mt. (s. coll. 1926 BRA; Jalovičiarová 1986 SMBB B-00034/00014, B-00034/00015; Janišová et al. Bull. Slov. Bot. Spoločn. 26. Suppl. 13: 26, 2004) (7382d). – Poľana Mt., on the main ridge, N from the top, 1415 – 1440 m (not. Koprivý 2017) (7382d). – Poľana Mt., below a cabin, 1225 – 1250 m (Manica 1965 ZV 2625, 2626) (7382d). – Poľana Mt., cca 1200 m (Deyl 1951 PR 292182) (7382d). – Predná Poľana Mt., below the ridge, 1331 m, 48°37'56,82'' N, 19°28'7,92'' E (Kučera Bull. Slov. Bot. Spoločn. 33/2: 217, tab. 1, 2011) (7382d). – NR Vrchslatina, along Slatina brook, cca 920 m, 48°38'56'' N, 19°37'46'' E (Janišová et al. Bull. Slov. Bot. Spoločn. 26. Suppl. 13: 26, 2004) (7383d). **14e. Štiavnické vrchy Mts.:** Sitno Mt. (Cserey 1890 BRA) (7579c). **15. Slovenské rudohorie Mts.:** Skalka Mt., 1200 m (Miadok Preslia 60/3: 261, tab. 3, 1988) (7185c). – Skalka Mt., 1230 m (7185c). – N from the spot height 1286, 1220 m (both Miadok Preslia 60/3: 264, tab. 4, 1988) (7185c). – Hrb Mt., 1050 – 1254 m, 48°43'50'' N, 19°27'27'' E (7282d). – site „Veľké Pejkovo", E slope of Vepor Mt., 930 – 1030 m, 48°43'29'' N, 19°28'07'' E (7282d). – around spot height Vepor, 1200 – 1277 m, 48°42'54'' N, 19°27'29'' E (all Janišová et al. Bull. Slov. Bot. Spoločn. 26. Suppl. 13: 26, 2004) (7282d). – Vepor Mt., near Ľubietová (Májovský 1956 SLO) (7282d). – below Lešník Mt., above Prostredná dolina valley, 1300 m (7285a). – below Psica Mt., above Prostredná dolina valley, 1280 m (both Miadok

Preslia 60/3:p. 267, tab. 5, 1988) (7285a). – N from the main ridge of Lešník Mt., 1225 m (7285a). – N from the spot height 1211, on the ridge, 1250 m (both Miadok Preslia 60/3: 256, tab. 1, 1988) (7285a). – Psica Mt., 1340 m (Miadok Preslia 60/3: 267, tab. 5, 1988) (7285a). – Psica Mt., 1370 m (Miadok Preslia 60/3: 264, tab. 4, 1988) (7285a). – SSE from the spot height Psica, 1335 – 1340 m, 48°47'3'' N, 19°51'22'' E (7285a). – ENE from the spot height Javorinka, 1385 – 1390 m, 48°47'8'' N, 19°52'41'' E (both Jančovičová et al. Czech Mycol. 63/2: 229, 2011) (7285a). – Lešník Mt., above Ždiarik, 1320 m (7285a). – Malá Smrekovica Mt., E from the spot height 1319, 1310 m (7285a). – „Rovienky", N slope of Malá Smrekovica Mt., 1230 m (all Miadok Preslia 60/3: 261, tab. 3, 1988) (7285a). – between Malá Smrekovica Mt. and Fabova hoľa Mt. (Miadok Preslia 60/3: 267, tab. 5, 1988) (7285a). – Fabova hoľa Mt., below Fabova meadow, 1237 m, 48°47'4,9'' N, 19°53'8,8'' E (Hrivnák et al. Reussia 2/2: 158, tab. 1, 2005) (7285a). – Fabova hoľa Mt. (Pax 1895 BP 165536; Hendrych Acta Univ. Carol. – Biol. 1968/2: 139, 1969; Cvachová & Urbanová Stred. Slov. 4: 47-49, 1985; Burkovský Stred. Slov. 4: 84, 1985) (7285a). – Javorina Mt., cca 900 m (7286b). – Čelo Mt. – Homola Mt., on the ridge, cca 1190 m (7286b). – Šindliarky, below Chata Janka cottage, cca 1000 m (7287a). – Kyprov Mt., W slope, cca 1210 m (7287a). – above cabin in Slanská dolina valley, cca 1000 m (7287a). – Stolica Mt., all slopes around the top, 1250 – 1470 m (all Magic & Májovský Acta Fac. Rer. Natur. Univ. Comen. Bot. 22: 57, 1974) (7287a). – Slanské sedlo saddle, cca 1255 m, 48°47'06,94'' N, 20°11'55,98'' E (7287a). – NW slope of Stolica Mt., cca 400 m above Slanské sedlo saddle, cca 1350 m, 48°46'56,05'' N, 20°12'0,63'' E (both Koprivý 2015 KO) (7287a). – Stolica Mt., on the NW ridge, cca 1440 m, 48°46'33,2'' N, 20°12'14,74'' E (Králik 1972 SLO; Koprivý 2015 KO) (7287a). – Stolica Mt., on the NE ridge, cca 1455 m, 48°46'40'' N, 20°12'48'' E (Koprivý 2015 KO) (7287a). – W from the spot height Stolica, 1465 – 1470 m, 48°46'26'' N, 20°12'21'' E (Jančovičová, Mišíková, Guttová et Blanár Czech Mycol. 63/2: 229, 2011) (7287a). – sedlo Harová saddle, near the spring, cca 1380 m, 48°46'13,83'' N, 20°12'12,5'' E (Koprivý 2015 KO) (7287a). – N from sedlo Harová saddle, spring area, 48°46'19,2'' N, 20°12'1,3'' E, 1330 m (Hrivnák et al. Reussia 2/2: 158, tab. 1, 2005; not. Koprivý 2015) (7287a). – on the ridge Lehotská hoľa, cca 500 m SW from sedlo Harová saddle, cca 1370 m, 48°06'0,84'' N, 20°11'51,8'' E (not. Koprivý 2014) (7287a). – Veľká chyžňanská Mt., on the SW slope, 1200 – 1345 m (7287a). – Zdychavská hora Mt., spring area on W slope, cca 890 m (both Magic & Májovský Acta Fac. Rer. Natur. Univ. Comen. Bot. 22: 57, 1974) (7287c). – Tomesové diely, N slope of Kohút Mt., cca 1190 m, 48°44'33,6'' N, 20°11'21,9'' E (Koprivý 2015 KO) (7287c). – below chata Parajka cabin, cca 1100 m, 48°43'33,06'' N, 20°10'25,66'' E (Koprivý 2015 KO) (7287c). – above chata Parajka cabin, cca 1220 m (Magic & Májovský Acta Fac. Rer. Natur. Univ. Comen. Bot. 22: 57, 1974) (7287c). – slope between chata Parajka cabin and Kohút Mt., 1100 – 1409 m (Mihál et al. Reussia 6/1-2: 6, 2011) (7287c). – Kohút Mt., NW from the spot height 1409, 1310 m, 48°43'58,7'' N, 20°10'46,7'' E (Mihál et al. Reussia 6/1-2: 17, 2011) (7287c). – Klepaná skala, below Malý Kohút Mt., cca 1170 m (not. Koprivý 2015) (7287c). – Malý Kohút Mt., cca 1187 m, 48°43'23,88'' N, 20°10'40,87'' E (7287c). – above sedlo Kohúta saddle, cca 1210 m, 48°43'25,49'' N, 20°11'14,37'' E (both Koprivý 2015 KO) (7287c). – Kohút Mt., spruce forest, cca 1000 m (Novák, Věda přír. 7: 220 – 221, 1926) (7287c). – NW below Javorina Mt. (1212), above Dlhá dolina valley (7289a). – „Košutova jama" SW below ridge towards Stadielko cottage, cca 1150 m (7289a). – Skalisko Mt. – Baracká skala Mt., 1293 – 1224 m (all Vlčáková & Hajdúk Nat. Carp. 48: 99, 2007) (7289c). – Klenovský Vepor Mt. (Fábry 1852 BRA) (7384b). – Klenovský Vepor Mt., in NW part, 1070 m (7384b). – Klenovský Vepor Mt., W from the spot height 1137, 1150 m (both Miadok Acta Fac. Rer. Natur. Univ. Comen. Bot. 17: tab. 7, 1971) (7384b). – Klenovský Vepor Mt., NE from the spot height 1339, 1250 m (7384b). – on the top of Klenovský Vepor Mt., between two little meadows, 1210 m (7384b). – below NW edge of big meadow on Klenovský Vepor Mt.,

1250 m (7384b). – Klenovský Vepor Mt., above Čierna dolina valley, between spot heights 1339 and 1301, 1230 m (7384b). – Klenovský Vepor Mt., above Čierna dolina valley, below spot height 1301, 1180 m (7384b). – Klenovský Vepor Mt., between spot heights 1301 and 1032 in Čierna dolina valley, 1070 m (all Miadok Biológia 24: 324, tab. 1, 1969) (7384b). **16. Muránska planina Mts.:** Malá Stožka Mt. (Hendrych Acta Univ. Carol. – Biol. 1968/2: 196, 1969) (7285b). – Veľká Stožka Mt. and Mochnatá (Májovský 1952 SLO) (7285b). – Veľká Stožka Mt. (Hendrych Acta Univ. Carol. – Biol. 1968/2: 196, 1969; Cvachová & Urbanová Stred. Slov. 4: 64, 1985; Burkovský Stred. Slov. 4: 102, 1985) (7285b). – site „Zadné hory", ENE from Veľká Stožka Mt., 1240 m, 48°46'51'' N, 19°57'18'' E (Jančovičová et al. Czech Mycol. 63/2: 229, 2011) (7285b). – site „Zadné hory" (7285b). – site „Hlinačka" (7285b). – site „Mochnatá" (all Hendrych Acta Univ. Carol. – Biol. 1968/2: 196, 1969) (7285b). – site „Mochnatá", slope to Klátna dolina valley (not. Futák 1970) (7285b). – site „Mochnatá", couloir E from Zbojnícka jaskyňa cave, 1080 m (7285b). – couloir above Teplá dolina valley, 950 – 980 m (7285b). – couloir above Suchá dolina valley, 1240 m (all Kliment & Turis Výsk. a ochr. prír. Murán. planiny: 76, 2002) (7285b). – N from the spot height Kľak, 1320 – 1325 m, 48°46'57'' N, 19°57'55'' E (Jančovičová et al. Czech Mycol. 63/2: 229, 2011) (7285b). – Kľak Mt. (Fábry 1872 BRA; Hendrych Acta Univ. Carol. – Biol. 1968/2: 196, 1969) (7285b). – Kľak Mt., 1385 m, 48°46'43,2'' N, 19°57'52,44'' (Kučera Reussia 5/1–2: 37, 2009) (7285b). – Okrúhla Mt. (Hendrych Acta Univ. Carol. – Biol. 1968/2: 111, 1969) (7285b). – between Mochnatá and Studňa, cca 1230 m (Hendrych Acta Univ. Carol. – Biol. 1968/2: 112, 1969) (7285b). – above gamekeeper's house Studňa, cca 1300 m (Nábělek 1940 SLO) (7285b). – Ostrica Mt. (Hendrych Acta Univ. Carol. – Biol. 1968/2: 196, 1969) (7285d). – Voniaca Mt. (Vraný 1926 BRA; Hendrych Acta Univ. Carol. – Biol. 1968/2: 196, 1969) (7285d). – gamekeeper's house Studňa, cca 1140 m (Hendrych 1947 PR 292200, 292209) (7285b-7286a). – around Studňa (7285b-7286a). – Veľký Cigán Mt. (7286a). – from Maretkiná to Tesná skala (all Hendrych Acta Univ. Carol. – Biol. 1968/2: 196, 1969) (7286a). – site Maretkiná (Šoltés, Acta Fac. Rer. Natur. Univ. Comen. Bot. 24: tab. 3, 1976) (7286a). **17. Slovenský raj Mts.:** NE slope of Trsteník Mt., above Spišský potok brook, below the forest road, cca 1090 m, 48°51'31,7'' N, 20°14'23,7'' E (Koprivý 2015 KO) (7187a). – Ondrejisko Mt. (Mikoláš 1962 KO 13566) (7187b). – Borovniak Mt., cca 150 m below the top, cca 1230 m, 48°51'33,71'' N, 20°15'35,63'' E (not. Koprivý 2015) (7187b). – in the saddle between Ondrejisko Mt. and spot height 1222, cca 1170 m, 48°51'09,8'' N, 20°15'16,8'' E (Koprivý 2015 KO) (7187b). – Dobšinská ľadová jaskyňa ice cave, near the cave (Chyzer 1879 BP 731290; Richter 1898 BP 165569, 731279, 731285; Gesell 1901 BP 165573) (7187b). – area of todays dam, between villages Dedinky and Dobšinská Maša, gorge on S slope (Hajdúk Acta Rer. Natur. Mus. Slov. 5: 113, 1959) (7188a). – Knola Mt., 49°9'31,11'' N, 19°59'18,95'' E (Leskovjanská 2015 BIOM) (7188b). **21a. Lúčanská Malá Fatra Mts.:** Veterné hole, Flochová chata cottage (Brižický 1941 SLO) (6879c-6979a). – Martinské hole (Brižický 1942 SLO) (6879c-6979a). – Martinské hole, on mountain meadows (Dočolomanský 1961 BRA) (6879c-6979a). – Usypaná skala Mt., 49°3'7,64'' N, 18°44'10,89'' E (Vyšinský 2014 BIOM) (6978a). – Martinské hole, Veľká lúka Mt. (Brižický, Futák & Nábělek 1942 SLO) (6978b). – Prieslopská dolina valley, spot height Veterné, 1120 m, 49°4'27,87'' N, 18°48'14,56'' E (6978b). – Prieslopská dolina valley, Grúň, 1310 m, 49°4'21,14'' N, 18°49'36,5'' E (6978b). – Prieslopská dolina valley, Žiariky, 1230 m, 49°4'18,7'' N, 18°49'27,5'' E (6978b). – Prieslopská dolina valley, Záložná, 1300 m, 49°4'13,07'' N, 18°49'15,18'' E (6978b). – Prieslopská dolina valley, spot height Humience, 1328 m, 49°3'57,6'' N, 18°49'0,3'' E (6978b). – Bystričská dolina valley, spot height Horná lúka, 1255 m, 49°3'58,3'' N, 18°47'7'' E (6978b). – Bystričská dolina valley, spot height Veľký Úplaz, 200 m E from cabin, 1250 m, 49°03'50.08'' N, 18°47'36,17'' E (6978b). – Bystričská dolina valley, Hlboké, 1260 m, 49°3'51,67'' N, 18°49'4,82'' E (all Hederová et al. Bull. Slov. Bot. Spoločn. 37/1: 127, 2015)

(6978b). – Kýčera Mt., Blatné, 49°2'25,43'' N, 18°45'2,21'' E (Rizman 2015 BIOM) (6978d). – Kľak Mt. (Carl 1823 PRC; Brancsik 1900 BRA; Urbanová Botanika: 11, 2007) (7077b). – Kľak Mt., 48°58'55,22'' N, 18°38'22,38'' E (Pavlišin 2014 BIOM; Duchoň 2015 BIOM; Fekiač 2015 BIOM) (7077b). – Kukutová, below Kľak Mt., 48°58'41,21'' N,18°38'14,41'' E (Pavlišin 2014 BIOM) (7077b). – NNR Kľak, 48°58'37,05'' N, 18°38'22,93'' E (Pietorová 1997 BIOM) (7077b). – above Horná lúka meadow, 48°57'51,64'' N, 18°38'18,22'' E (Pavlišin 2014 BIOM) (7077b). – Reváň Mt. (Valenta 1937 BRA; Schidlay 1949 BRA; Dýlik 1963 ZAM) (7077b). **21b. Krivánska Malá Fatra Mts.:** Veľká Bránica valley – Príslopská dolina valley, 49°13'37,99'' N, 19°0'40,16'' E (Vnuk 2014 BIOM) (6780c). – Vrátna, Kraviarska dolina valley, 49°12'4,43'' N, 19°1'20,95'' E (Rizman 2015 BIOM) (6780c). – Poludňový grúň Mt., 49°12'58,46'' N, 19°3'30,57'' E (Sviteková 2013 BIOM; Pavlišin 2015 BIOM; Šibík 2018 BIOM) (6780c). – Vrátna valley, slope near ski-lift, 49°12'1,47'' N, 19°2'27,11'' E (Uhrin 2015 BIOM) (6780c). – Poludňový Grúň Mt., towards Stohové sedlo saddle, 1390 m, 49°12'46,4'' N, 19°04'16,7'' E (Šibík et al. Bull. Slov. Bot. Spoločn. 30: 79, tab.1, 2008) (6780c). – below Stoh Mt., 49°13'10,3'' N, 19°4'57,74'' E (Pavlišin 2015 BIOM) (6780c). – Steny ridge, 49°12'2,68'' N, 19°3'40,59'' E (Vyšinský 2015 BIOM) (6780c). – Vrátna dolina valley, fir forest, 680 m (Domin Věda přír. 4: 33, 1923) (6780c). – Vrátna dolina valley, Kriváň Mt. (Brancsik 1898 BRA) (6780c-6880a). – Vrátna dolina valley, Malý Kriváň Mt. (Brancsik 1901 BRA) (6780c-6880a). – Vrátna dolina valley, cca 1200 m (Domin Věda přír. 4: 35-36, 1923) (6780c-6880a). – Kriváň Mt., up to cca 1300 m (Domin Věda přír. 4: 35, 1923) (6780c-6880a). – Malý Rozsutec Mt. (Švestka Preslia 37/3: 330, 1965) (6780d). – Rozsutec Mt., cca 1000 m (Pax 1893 BP 165517) (6780d). – Veľký Rozsutec Mt., N slope, 1500 m, 49°13'59,4'' N, 19°05'58,6'' (Šibík et al. Bull. Slov. Bot. Spoločn. 30: 79, tab.1, 2008) (6780d). – Veľký Rozsutec Mt., E slope (Fajmonová Biológia 33/7: 558, tab. 2, 1978) (6780d). – Zázrivá – Biela, Hlboké valley, 49°14'30,67'' N, 19°6'54,73'' E (Dobošová 2010 BIOM) (6780d). – Stoh Mt., N slope, 49°13'4'' N, 19°5'15,43'' E (Sviteková 2013 BIOM; Šibík 2018 BIOM) (6780d). – Párnica, aside of Ostrô Mt., 49°13'28,5'' N, 19°7'37,08'' E (Pavlišin 2014 BIOM) (6780d). – above sedlo Osnice saddle, 49°13'29,55'' N, 19°7'16,48'' E (Pavlišin 2014 BIOM) (6780d). – Dolina Bystrička valley (Jávorka 1907 BP 165571) (6780d). – Stratenec Mt. – Suchý Mt., below sedlo Vráta saddle, 1372 m, 49°10'40,4'' N, 18°57'53,4'' E (Šibík et al. Bull. Slov. Bot. Spoločn. 30: 79, tab.1, 2008) (6879b). – Malý Kriváň Mt., NW slope, end of Belianska dolina valley, 1373 m, 49°11'15,7'' N, 18°59'44,1'' E (Šibík et al. Bull. Slov. Bot. Spoločn. 30: 73, 2008) (6879b). – Malý Kriváň Mt., towards sedlo Priehyb saddle, 1503 m, 49°11'0,0'' N, 18°59'14,5'' E (6879b). – Malý Kriváň Mt., Markušov žľab couloir, end of Belianska dolina valley, 1519 m, 49°11'09,1'' N, 18°59'44,2'' E (6879b). – Malý Kriváň Mt., NW slope, between Markušov žľab couloir and Svinský žľab couloir, 1364 m, 49°11'15,2'' N, 18°59'39,4'' E (6879b). – Malý Kriváň Mt., NW slope, Svinský žľab couloir, 1580 m, 49°11'09,8'' N, 18°59'55'' E (all Šibík et al. Bull. Slov. Bot. Spoločn. 30: 79, tab.1, 2008) (6879b). – Malý Kriváň Mt. (Bohatsch 1874 BP 731291; Szépligeti 1889 BP 165539) (6879b). – Malý Kriváň Mt. – Prípor Mt., 49°11'14,29'' N, 18°59'21'' E (Šibík 2015 BIOM) (6879b). – Prípor I Mt., 49°11'19,23'' N, 18°59'36,04'' E (Figura 2015 BIOM) (6879b). – Michalove dolinky, 49°9'21,21'' N, 18°57'30,5'' E (Pirchala 2013 BIOM) (6879b). – Malý Kriváň Mt., couloir above Studenec valley, 49°11´02'' N, 19°00´08'' E (Krajčiová-Šibíková et al. Bull. Slov. Bot. Spoločn. 27: 201, 2005; Šibíková et al. Bull. Slov. Bot. Spoločn. 29: 165, 2007) (6880a). – Malý Kriváň, 49°11'16,09'' N, 19°0'0,87'' E (Figura 2015 BIOM) (6880a). – forest in Studenec valley, below Malý Kriváň Mt. (Holuby 1896 BRA) (6880a). – Studenec valley, below Kopa Mt. (Holuby 1896 BRA) (6880a). – sedlo Koniarky saddle, below rocky formation called „Sviňa", 49°11'34,88'' N, 19°0'12,10'' E (Sviteková 2013 BIOM) (6880a). – Malý Kriváň Mt., couloir below rocky formation called „Sviňa", 1522 m, 49°11'15,6'' N, 19°00'04,1'' E (Šibík et al. Bull. Slov. Bot. Spoločn. 30: 79, tab.1, 2008) (6880a). – Chrapáky,

49°11'40,72'' N, 19°1'7,77'' E (Flajs 2006 BIOM; Figura 2015 BIOM; Šibík 2017 BIOM) (6880a). – Chrapáky, end of couloir below sedlo Bublen saddle, 1468 m, 49°11'40,4'' N, 19°00'53,6'' E (Šibík et al. Bull. Slov. Bot. Spoločn. 30: 79, tab.1, 2008) (6880a). – rocky formation between Veľký Kriváň Mt. and Pekelník Mt., 1415 m, 49°11'22,3'' N, 19°01'28,2'' E (6880a). – Veľký Kriváň Mt. – Pekelník Mt., N slope, near tourist pathway, 1488 m, 49°11'35,7'' N, 19°01'51,8'' E (both Šibík et al. Bull. Slov. Bot. Spoločn. 30: 79, tab.1, 2008) (6880a). – couloir above Studenec valley, between Pekelník Mt. and Veľký Kriváň Mt., 1425 m, 49°11'23,5'' N, 19°01'28,4'' E (Šibíková et al. Bull. Slov. Bot. Spoločn. 29:p. 163, 2007) (6880a). – Vrátna dolina valley (Domin Věda přír. 4: p. 36-37, 1923) (6880a). – Veľký Kriváň Mt., E, 49°11'23,69'' N, 19°2'9,77'' E (Šibík 2015 BIOM) (6880a). – Veľký Kriváň Mt., S, 49°11'15,42'' N, 19°1'35,98'' E (Šibík 2015 BIOM) (6880a).– Veľký Kriváň Mt., cca 1400 m (spruce and dwarf pine) (Domin Věda přír. 4: p. 37-38, 1923) (6880a). – Veľký Kriváň Mt., E slope, couloir above Révayovská dolina valley, 1507 m, 49°11'15,4'' N, 19°02'14,2'' E (6880a). – Snilovské sedlo saddle, 49°11'36,52'' N, 19°2'10,63'' E (Uhrin 2013 BIOM; Figura 2015 BIOM) (6880a). – Kriváňska Mulda, 49°11'28,22'' N, 19°2'14,97'' E (Uhrin 2013 BIOM) (6880a). – Oštiepková Mulda, 49°11'42,68'' N, 19°2'43,57'' E (Uhrin 2013 BIOM) (6880a). – in front of Javorina, 49°11'2,58'' N, 19°0'7,64'' E (Figura 2015 BIOM) (6880a). – Chleb Mt. (Urbanová Botanika: 11, 2007) (6880a). – Chlebské kotle cirque, 49°11'25,37'' N, 19°2'59,63'' E (Dobošová 2015 BIOM; Figura 2015 BIOM) (6880a). – couloir in cirque below Chleb Mt., 1570 m, 49°11'25,1'' N, 19°03'07,2'' E (6880a). – Hromové sedlo saddle, wide couloir above Vrátna dolina valley, 1470 m, 49°11'25,8'' N, 19°03'11,3'' E (all Šibík et al. Bull. Slov. Bot. Spoločn. 30: 79, tab. 1, 2008) (6880a). – below Hromové sedlo saddle, couloir above Vrátna dolina valley, 1500 m, 49°11'24,4'' N, 19°03'13,1'' E (Šibíková et al. Bull. Slov. Bot. Spoločn. 29:, p. 163, 2007) (6880a). – LHC Párnica, 49°10'54,3'' N, 19°5'53,02'' E (Dupkala 2014 BIOM) (6880b). **21c. Veľká Fatra Mts.:** LHC Kantor, „pod Štítom“, 49°8'19,71'' N, 19°7'44,75'' E (Dupkala 2014 BIOM) (6880d). – Kľak Mt., 49°2'53,27'' N, 19°6'58,57'' E (Duchoň 2015 BIOM; Maršalek 2015 BIOM; Šibík 2017 BIOM) (6980d). – Kľak Mt., cca 1000 m (Margittai 1912 BP 483921) (6980d). – Dolina Nižná Lipová valley (Červenka 1966 PRC) (6980d). – „Čierňavy“, below „Tokanisko“, 49°1'20,39'' N, 19°7'18,79'' E (Pavlišin 2014 BIOM) (6980d). – Horné vôdky valley, „Kráľová“, 49°0'9,4'' N, 19°6'10,24'' E (Vnuk 2014 BIOM) (6980d). – „Hubová“, 49°3'16,95'' N, 19°13'3,19'' E (Daniel-Szabó 2015 BIOM) (6981a). – Šiprúň Mt. (Vraný 1899 PRC) (6981c). – cca 100 m from the spot height Kozia skala, on the ridge (Bernátová & Hajdúk Zborn. Slov. Nár. Múz. Prír. Vedy 75: 18, 1981) (7079b). – in the valley above Blatnica (Borbás 1892 BP 165574) (7079b-d). – Blatnický hrad castle, 48°56'48,84'' N, 18°56'49,73'' E (7079d). – Plešovica Mt., 48°56'7,42'' N, 18°55'56,16'' E (7079d). – near the memorial in Blatnica, 48°55'54,81'' N, 18°56'15,11'' E (7079d). – Vápenná dolina valley, 48°56'28,190'' N, 18°57'11,47'' E (7079d). – „Mažarná“, 48°56'27,88'' N, 18°57'39,73'' E (7079d). – Sokolovo valley, 48°56'45,34'' N, 18°58'6,05'' E (7079d). – Ľubená dolina valley, 48°56'39,99'' N, 18°59'10,15'' E (7079d). – above spring in Ľubená dolina valley, 48°56'14,07'' N, 18°59'8,74'' E (7079d). – ridge between Malá Hubná valley and Ľubená dolina valley, 48°56'14,07'' N, 18°59'8,74'' E (7079d). – Gaderská dolina valley, between Ľubená and Dedošová valleys, 48°56'50,43'' N, 18°59'51,5'' E (7079d). – Malá Hubná valley, 48°56'37,06'' N, 18°59'27,47'' E (all. lit. Bernátová 1976 BIOM) (7079d). – Tlstá Mt. (Margittai 1908 BP 483925, 1908 BRA, 1912 BP 483924; Mikeš 1936 PRC; Hrivnáková 1954 SLO) (7079d). – Tlstá Mt., cca 1300 m (7079d). – Tlstá Mt., above Ľubená dolina valley, cca 1300 m (both Uhlířová 1994 BRA) (7079d). – Tlstá Mt. – Bágľov kopec Mt., NW slope, cca 1400 – 1414 m (Horváthová 1966 BRA) (7079d). – Tlstá Mt., 48°56'24,17'' N, 18°58'22,21'' E (lit. Bernátová 1976 BIOM; Rizman 2015 BIOM) (7079d). – Konský dol valley, 48°55'49,24'' N, 18°57'5,69'' E (7079d). – Kačárová Mt., pathway, 48°55'35,76'' N, 18°56'35,54'' E (7079d). – Rovná dolina valley, 48°55'8,88'' N,

18°57'11,03'' E (7079d). – Muráň Mt., 48°55'37,5'' N, 18°58'13,72'' E (7079d). – on the ridge Ostrá Mt. – Bágľov kopec Mt., 48°55'37,95'' N, 18°58'39,49'' E (7079d). – Ostrá Mt., above Konský dol valley, 48°55'12,3'' N, 18°58'7,38'' E (7079d). – Ostrá Mt., topmost parts, 48°55'7,32'' N, 18°58'0,21'' E (all lit. Bernátová 1976 BIOM) (7079d). – Ostrá Mt. (Jávorka 1907 BP 165568; Deyl 1951 PR 292183) (7079d). – Horná Hlboká valley, 48°56'1,31'' N, 18°58'4,43'' E (Dupkala 2014 BIOM) (7079d). – Tmavá valley, 48°55'20,7'' N, 18°58'54,32'' E (Vyšinský 2014 BIOM) (7079d). – Ďurďášová dolina valley, W from Chládkové úplazy Mt., 48°54'33,57'' N, 18°58'13,86'' E (7079d). – Suchý Jasienok Mt., topmost parts, 48°54'13,85'' N, 18°58'42,89'' E (7079d). – valley between Suchý Jasienok Mt. and Mohošov grúň Mt., 48°54'2,42'' N, 18°58'37,22'' E (all lit. Bernátová 1976 BIOM) (7079d). – Selenec valley, NW part of NNR Padva, 1009 m, 48°54'5,6'' N, 18°59'56,5'' E (7079d). – Belianska dolina valley, Štefanová Mt., 30 m below the rigde, 1188 m, 48°58'31,2'' N, 19°5'43'' E (7080b). – Belianska dolina valley, Javorina Mt., 30 m below the pathway, 1120 m, 48°57'50,5'' N, 19°6'52,7'' E (7080b). – Javorina Mt. – „Belá“, 48°57'28,6'' N, 19°7'5,03'' E (7080b). – „Čierňavy“ – Javorina Mt., 48°57'44,86'' N, 19°7'5,26'' E (all Vnuk 2014 BIOM) (7080b). – „Čierňavy“, below Rakytovské sedlo saddle, 48°57'35,07'' N, 19°9'25,77'' E (Pavlišin 2014 BIOM) (7080b). – Kráľova koruna ridge, 48°56'38,59'' N, 19°1'42,55'' E (7080c). – Dedošová valley, 48°56'49,77'' N, 19°0'46,82'' E (7080c). – Dedošová dolina valley, lower third, 48°56'18,05'' N, 19°1'24,93'' E (7080c). – Selenec valley, 48°56'11,44'' N, 19°0'29,92'' E (7080c). – between Dedošová dolina valley and Plavá Mt., 48°56'35,46'' N, 19°1'2,13'' E (7080c). – Plavá Mt., 48°56'41,8'' N, 19°1'41,19'' E (7080c). – Kráľova koruna ridge, 48°55'59,82'' N, 19°0'59,86'' E (all lit. Bernátová 1976 BIOM) (7080c). – Gaderská dolina valley, „Veterné“, 48°54'14,38'' N, 19°3'48,56'' E (Pirchala 2014 BIOM) (7080c). – Sviniarka valley, 48°55'45,1'' N, 19°2'25,19'' E (7080c). – above „Uhliská“, 48°56'10,95'' N, 19°2'22,95'' E (both lit. Bernátová 1976 BIOM) (7080c). – Belianska dolina valley, NNR Borišov, 500 m E from the spot height Prirastlé, 1180 m, 48°56'48,1'' N, 19°4'29,1'' E, (7080c). – Belianska dolina valley, NNR Borišov, Dolné Štrochy, 1129 m, 48°56'51,6'' N, 19°4'44,7'' E (7080c). – Belianska dolina valley, NNR Borišov, above the valley, 1170 m, 48°56'50,3'' N, 19°4'48'' E (all Ujházyová et al. Bull. Slov. Bot. Spoločn. 35/2: 182-183, 2013) (7080c). – spot height 1123 between „Uhliská“ and Biela skala Mt., 48°55'40,1'' N, 19°3'4,68'' E (7080c). – Skalná dolina valley, 48°54'35,46'' N, 19°0'48,47'' E (7080c). – between mouth of Skalná dolina valley and Padva valley, 48°54'25,12'' N, 19°0'12,06'' E (7080c). – Škap, gamekeeper's house, 48°55'21,5'' N, 19°2'17,52'' E (all lit. Bernátová 1976 BIOM) (7080c). – Vrátna dolina valley, 48°54'38,13'' N, 19°3'49,88'' E (lit. Bernátová 1976 BIOM; Pirchala 2014 BIOM) (7080c). – Strapatá skala Mt., 48°54'22,39'' N, 19°0'41,63'' E (7080c). – Drobková dolina valley, 48°54'21,61'' N, 19°2'17,41'' E (7080c). – between „Škap“ and „Drobkov“, 48°54'44,34'' N, 19°2'21,43'' E (7080c). – Skalná Mt., on the top, 48°54'20,19'' N, 19°1'41,87'' E (all lit. Bernátová 1976 BIOM) (7080c). – Dedošová dolina valley, Predný Drobkov, 750 m E from the spot height Skalná, 1105 m, 48°54'16,1'' N, 19°2'5,2'' E (7080c). – Dedošová dolina valley, 250 m below the spot height Skalná, 1199 m, 48°54'16,3'' N, 19°1'43,6'' E (both Ujházyová et al. Bull. Slov. Bot. Spoločn. 35/2: 182-183, 2013) (7080c). – Biela skala Mt., 48°55'6,5'' N, 19°4'15,98'' E (lit. Bernátová 1976 BIOM) (7080c). – Biela skala Mt., on the top (7080c). – Biela skala Mt., small peak near the top (both Bernátová & Kliment Tábor ochr. prír. 18: 78, 1983) (7080c). – Biela skala Mt., E small peak near the top, end of shalow rocky couloir, 1370 m (Kliment Bull. Slov. Bot. Spoločn. 20: 163, tab. 1, 1998) (7080c). – Ostredok Mt., topmost parts, 48°54'7,11'' N, 19°4'45,28'' E (lit. Bernátová 1976 BIOM) (7080c). – Necpalská dolina valley, Ploská Mt. (Májovský 1971 SLO) (7080c-d). – Belianska dolina valley, NNR Borišov, 600 m NE from the saddle below Borišov Mt., 1263 m, 48°56'37,6'' N, 19°6'19,8'' E (7080d). – Necpalská dolina valley, from Chata pod Borišovom chalet towards dolina Balcierovo valley, 1115 m, 48°55'57,8'' N, 19°5'47,5'' E (both Ujházyová et al. Bull.

Slov. Bot. Spoločn. 35/2: 182-183, 2013) (7080d). – Necpalská dolina valley, below Borišov, 48°56'11,04'' N, 19°5'13,51'' E (Dupkala & Vnuk 2014 BIOM) (7080d). – Minčol Mt., 48°56'38,97'' N, 19°9'20,53'' E (Dupkala 2014 BIOM) (7080d). – „Úplazy", 48°56'10,98'' N, 19°6'29,84'' E (Vyšinský 2014 BIOM) (7080d). – „Stádlisko", 48°55'56,56'' N, 19°6'14,77'' E (Vyšinský 2014 BIOM) (7080d). – Ploská Mt., 48°56'2,97'' N, 19°7'37,97'' E (Němec 2015 BIOM) (7080d). – Ploská Mt., cca 1100 m (Margittai 1912 BP 483932) (7080d). – Ľubochnianska dolina valley, below Čierny Kameň Mt. (Králik 1973 SLO) (7080d). – Čierny Kameň Mt., 48°56'16,72'' N, 19°8'51,08'' E (Bernátová 2003 BIOM; Šibík 2015 BIOM) (7080d). – Čierny Kameň Mt., 1350 – 1400 m (Suza Věda přír. 12: 20, 1931) (7080d). – Čierny Kameň Mt., 1400 m (Šoltés Acta Fac. Rer. Natur. Univ. Comen. Bot. 24: tab. 3, 1976) (7080d). – N slope of Čierny Kameň Mt., 1420 m (Šoltésová Acta Fac. Rer. Natur. Univ. Comen. Bot. 23: tab. 3, 1974) (7080d). – Čierny Kameň Mt., cca 1470 m (Valenta 1940 BRA) (7080d). – Necpalská dolina valley, Rakytníky, W slope below Chyžky, 1175 m, 48°55'40,5'' N, 19°6'3,5'' E (7080d). – Necpalská dolina valley, Chyžky, cca 100 m below the rigde, 1239 m, 48°55'33,3'' N, 19°6'4,9'' E (7080d). – Necpalská dolina valley, Koniarky, 1256 m, 48°55'3'' N, 19°5'52,9'' E (all Ujházyová et al. Bull. Slov. Bot. Spoločn. 35/2: 182-183, 2013) (7080d). – below Suchý vrch Mt., 48°54'43,77'' N, 19°5'30,17'' E (Dupkala 2014 BIOM) (7080d). – Suchý vrch Mt. (lit. Bernátová 1976 BIOM; Chilová 2015 BIOM) (7080d). – Skalná dolina valley, 48°55'53,98'' N, 19°6'7,34'' E (Vyšinský 2014 BIOM) (7080d). – Skalná Alpa Mt., 48°59'11,42'' N, 19°11'45,19'' E (Bernátová 2003 BIOM; Duchoň 2015 BIOM; Šibík 2015 BIOM) (7081a). – NNR Skalná Alpa (Zrak & Saniga Acta Fac. For. Zvolen 52/1: 56, 2010) (7081a). – Tanečnica Mt., N slope (Bělohlávková & Fišerová Folia Geobot. Phytotax. 24/1: 18, tab. 4, 1989) (7081a). – Tanečnica Mt., humid, steep couloir, 1420 m (Sillinger Věda přír. 11: 133-134, 1930) (7081a). – Tanečnica Mt., W slope below rocky walls, 1435 m (Kliment Bull. Slov. Bot. Spoločn. 20: 163, tab. 1, 1998) (7081a). – Rakytov Mt., NW slopes, 48°57'54,67'' N, 19°10'52,59'' E (Duchoň 2015 BIOM) (7081a). – Rakytov Mt., 48°57'40,78'' N, 19°10'31,12'' E (Vantarová 2015 BIOM) (7081a). – valley below Smrekovica Mt., above Vyšné Javoriská, 650 – 700 m (Manica 1963 ZV 223) (7081b). – dolina Mohošov valley, 48°53'58,04'' N, 18°59'4,4'' E (7179b). – Mohošov grúň Mt., topmost parts, 48°53'59,56'' N, 18°59'44,84'' E (7179b). – Rakytovská dolina valley, 48°53'39,69'' N, 18°58'33,23'' E (7179b). – Drieňok Mt., topmost parts, 48°53'24,23'' N, 18°57'42,31'' E (7179b). – below saddle between Drieňok Mt. and Malý Rakytov Mt., 48°53'8,44'' N, 18°58'5,04'' E (7179b). – end of Rakytovská dolina valley, 48°53'11,26'' N, 18°58'27,02'' E (7179b). – Pražená dolina valley, 48°53'14,37'' N, 18°59'6,16'' E (7179b). – Malý Rakytov Mt., topmost parts, 48°52'26,61'' N, 18°58'19'' E (all lit. Bernátová 1976 BIOM) (7179b). – „Horná Ramžiarka", 48°51'15,73'' N, 18°58'14,41'' E (Pavlišin 2014 BIOM) (7179b). – Selenec valley, NNR Padva, 20 m above valley, 48°53'28,9'' N, 19°0'39,6'' E, 1045 m (7180a). – Dedošová dolina valley, Veterné, 1097 – 1175 m (7180a). – Dedošová dolina valley, Zadný Drobkov, 1251 m, 48°53'51'' N, 19°1'19,7'' E (7180a). – Dedošová dolina valley, Kráľovský Grúň – Košariská, 1169 m, 48°53'12,4'' N, 19°3'10,1'' E (7180a). – Dedošová dolina valley, Krišnianske, Košariská, 1257 m, 48°53'3,9'' N, 19°4'19,8'' E (all Ujházyová et al. Bull. Slov. Bot. Spoločn. 35/2: 182-183, 2013) (7180a). – below „Žiarec", 48°53'2,66'' N, 19°1'8,28'' E (Pavlišin 2014 BIOM) (7180a). – Dedošová dolina valley, above Veľké studienky (7180a). – Smrekov Mt., end of Horné Lopaty valley, cca 60 m below the saddle (both Bernátová & Hajdúk Zborn. Slov. Nár. Múz. Prír. Vedy 75: 18, 1981) (7180a). – Smrekov Mt., 48°53'8,58'' N, 19°1'18,92'' E, (Bernátová 2003 BIOM) (7180a). – Smrekov Mt., Kráľova studňa Mt., 48°52'57,98'' N, 19°1'57,23'' E (Duchoň 2015 BIOM) (7180a). – Kráľova Studňa Mt., 1380 m (Šoltés Acta Fac. Rer. Natur. Univ. Comen. Bot. 24: 151, tab. 3, 1976) (7180a). – „Košariská", 48°53'18,41'' N, 19°3'11,25'' E (Dupkala 2014 BIOM) (7180a). – end of Bystrická dolina valley, near Kráľova studňa lodge (Bohúňová 1956 SMBB

B-00002/00019) (7180a). – Krížna Mt., 1280 m (Šoltés Acta Fac. Rer. Natur. Univ. Comen. Bot. 24: 151, tab. 3, 1976) (7180a). – Krížna Mt. (Truchlý 1889 BRNU 137472; Truchlý 1889 SMBB B-00001/00295; Lengyel 1913 BP 274761; Maloch 1920 KO 13879) (7180a). – Krásny kopec Mt., cca 1200 m (Margittai 1915 BP 483927) (7180a). – Krásny kopec Mt., on the ridge (Michalko 1953 SAV) (7180a). – Bystrická dolina valley (s. coll. 1911 BRA; Mitske 1963 PR 256755) (7180a). – forest near cabin below Úplaz (Činčura 1968 SLO) (7180a). – Ostré Brdo Mt., on the forest limit, cca 1393 m (Michalko 1953 SAV) (7180b). – Prašnické sedlo saddle, 48°53'8,41'' N, 19°7'53,86'' E (Pavlišin 2015 BIOM) (7180b). – Krížna Mt., Majerova skala Mt. (Truchlý 1889 BRA; Nábělek 1936 SAV) (7180b). – Majerova skala Mt., 1000 – 1200 m (Greštiak 1963 ZV 11704) (7180b). **21d. Chočské vrchy Mts.:** Šíp Mt. (Simonkai 1908 BP 165565) (6881a). – Choč Mt. (Pantocsek 1868 SAV) (6882a-c). – Choč Mt., cca 1300 m (Margittai 1914 BP 483929, 483930) (6882a-c). – Veľký Choč Mt., 49°9'3,09'' N, 19°20'43,37'' E (Šibík 2014 BIOM; Vyšinský 2014 BIOM) (6882a). – Veľký Choč Mt., 1380 m (Šoltés Acta Fac. Rer. Natur. Univ. Comen. Bot. 24: tab. 3, 1976) (6882a). – valley below Bukov Mt., towards Choč Mt. (Domin 1919 PRC; Domin Věda přír. 3: 196, 1922) (6882a-c). – from Bukov Mt. towards Choč Mt., 1150 – 1368 m (Domin Věda přír. 3: 197, 1922) (6882a-c). – Prosiek, „Senná“, 49°10'32,65'' N, 19°28'41,3'' E (Pavlišin 2015 BIOM) (6882b). – below Choč Mt., 49°8'49,23'' N, 19°21'59,95'' E (Rizman 2015 BIOM) (6882c). **22. Nízke Tatry Mts.:** Poludnica Mt. (Hodoval 1963 BRA) (6983d). – Jánska dolina valley, Poludnica Mt., cca 1300 m (Fott 1928 PRC) (6983d). – below Iľanovské sedlo saddle, 49°0'7,52'' N, 19°36'34,78'' E (Pavlišin 2014 BIOM) (6983d). – Biela skala Mt., 49°0'33,16'' N, 19°37'34,19'' E (Pavlišin 2015 BIOM) (6983d). – Jánska dolina valley, Smrekovica Mt., NE slope, 1270 m (Fajmonová Preslia 58/1: 44, tab. 1, 1986) (6984c). – Michalovská dolina valley (Kautmanová Príroda Nízkych Tatier 1: 124, 2004) (6984c-7084a). – below hydro-electric plant Čierny Váh (Vartíková Ochr. Prírody 1: 66, 1980) (6985c-d). – Svarín settlement, below spot height Vysoké, 1000 m (Vartíková Rig. práca, Msc., depon. in PrF UK Bratislava, 1975) (6985c-7085a). – „Vlčkovie grúň“, 48°54'18,5'' N, 19°13'18,68'' E (Pavlišin 2014 BIOM) (7081c). – Liptovská Osada, Zvolen Mt. (Lengyel 1931 BP 274759) (7081c). – Salatín Mt., N slope (Bělohlávková & Fišerová Folia Geobot. Phytotax. 24/1: 18, tab. 4, 1989) (7082a). – Salatín Mt., 48°58'42,31'' N, 19°21'41,69'' E (Šibík 2015 BIOM) (7082a). – Pánska hoľa Mt., 48°55'17,72'' N, 19°24'33,49'' E (Kliment 2013 BIOM) (7082c). – „Magurka“, 48°56'14,77'' N, 19°25'59,41'' E (Vyšinský 2014 BIOM) (7082d). – Chabenec Mt., cca 1800 m (Scheffer 1931 SLO) (7082d). – Chabenec Mt., cca 50 m W, 1900 m (7082d). – slope below Chabenec Mt., 1775 m (both Pekarovič Dipl. práca, Msc., depon. in VŠLD Zvolen: 23a, 30b, 1975) (7082d). – Siná Mt., W slope (7083a). – Siná Mt., SE slope (both Fajmonová Biológia 33/7: 558, tab. 2, 1978) (7083a). – Siná Mt., E slope, 1480 m (Fajmonová Preslia 58/1: 44, tab. 1, 1986) (7083a). – Zadná voda brook, 1230 m (7083a). – Demänovka brook, near turning to Krčahovo, 1083 m (both Jarolímek & Kliment Príroda Nízkych Tatier 1: 153, tab. 2, 2004) (7083b). – Demänovská dolina valley, Pusté Mt., N slope, below the top, 1480 m (7083b). – Demänovská dolina valley, ridge between Pusté Mt. and sedlo pod Krakovou hoľou saddle, E slope, 1450 m (both Fajmonová Preslia 58/1: 44, tab. 1, 1986) (7083b). – Krakova hoľa Mt., 48°59'19,92'' N, 19°38'11,58'' E (Šibík 2014 BIOM) (7083b). – NNR Ďumbier, near N boundary, Bystrá brook, 1191 m (7083b). – Demänovka brook, 50 m above turning to Luková, 1417 m (Jarolímek & Kliment Príroda Nízkych Tatier 1: 150, tab. 1, 2004) (7083b). – below sedlo Poľany saddle, 48°56'31,63'' N, 19°31'29,89'' E (Zajac 2014 BIOM) (7083c). – Poľana Mt., NE cirque, 1611 m (Jarolímek & Kliment Príroda Nízkych Tatier 1: 150, tab. 1, 2004) (7083c). – Dolina Zadnej vody valley, 1425 m, 1600 m (Lepš et al. Preslia 57/4: 303, tab. 1, 1985) (7083c). – Žiarska hoľa Mt., 48°55'8,35'' N, 19°30'34,94'' E (7083c). – Vajskovská skalka Mt., 48°55'18,44'' N, 19°32'25,34'' E (both Jánošík 2014 BIOM) (7083c). – Dereše Mt., S slope, 1580 m (Šoltésová, Acta Fac. Rer. Natur.

Univ. Comen. Bot. 23: tab. 2, 1974) (7083c). – below Dereše Mt., 48°56'11,66'' N, 19°34'25,46'' E (Jánošík 2014 BIOM) (7083d). – Chopok Mt., Široký žľab couloir, 1900 m (Treskonová Dipl. práca, Msc., depon. in PrF UK Bratislava, 1972) (7083d). – below Chopok Mt., between tourist signposts „Odbočka na Chopok" and „Kosodrevina", cca 1520 m, 48°55'56,14'' N, 19°35'28,05'' E (not. Koprivý 2014) (7083d). – Krúpova hoľa Mt., W slope, 1640 m (Šoltésová Acta Fac. Rer. Natur. Univ. Comen. Bot. 23: tab. 2, 1974) (7083d). – below Krúpova hoľa Mt., 48°56'31,63'' N, 19°36'45,9'' E (Jánošík & Zajac 2014 BIOM) (7083d). – between Krúpova hoľa Mt. and spot height 1778 (Soják 1958 PR 230490, 288352) (7083d). – Ďumbier Mt. (Pax 1905 BP 165597) (7083d). – Ďumbier Mt., 48°55'51,82'' N, 19°36'12,46'' E (Vaško 2015 BIOM) (7083d). – below Ďumbier Mt. (Trapl 1922 PRC) (7083d). – Bystrá dolina valley, from Trangoška towards Chata gen. M. R. Štefánika chalet, cca 1170 – 1620 m (7083d). – behind Chata gen. M. R. Štefánika chalet, cca 1730 m, 48°55'37,31'' N, 19°38'58,63'' E (both not. Koprivý 2014) (7083d). – Veľký Gápeľ Mt., N slope, 1580 m (Šoltésová Acta Fac. Rer. Natur. Univ. Comen. Bot. 23: tab. 3, 1974) (7083d). – Veľký Gápeľ Mt., 48°55'11,97'' N, 19°38'5,74'' E (Jánošík 2014 BIOM) (7083d). – Zelenská Mlynná valley (Kupčok 1898 PR 123476) (7083d). – Zelenská Mlynná valley, below Králičká Mt., cca 1400 – 1500 m (Štěpánek 1990 PR) (7083d). – Králičká Mt., 48°55'37,43'' N, 19°39'13,97'' E (Duchoň 2015 BIOM) (7083d). – Jánska dolina valley, Slemä Mt., NE slope, 1400 m (Fajmonová Preslia 58/1: 44, tab. 1, 1986) (7084a). – Jánska dolina valley, Slemä Mt., NE slope (7084a). – Jánska dolina valley, Ohnište Mt., E slope (both Fajmonová Biológia 33/7: 558, tab. 2, 1978) (7084a). – Jánska dolina valley, Ohnište Mt., cca 1300 m (Fott 1928 PRC) (7084a). – Ohnište Mt., 48°59'7,36'' N, 19°43'29,55'' E (Vyšinský 2014 BIOM) (7084a). – from Rovná hoľa Mt. towards saddle before Svidovské sedlo saddle (Mikoláš 1984 KO 19069) (7084a). – Malužiná, Hradovica Mt. (Vlachý 1936 PRC) (7084a). – Jánska dolina valley, riverside of Ludárov potok brook, 1275 m (Jarolímek &Kliment Príroda Nízkych Tatier 1: 150, tab. 1, 2004) (7084a). – Skribňovská dolina valley (Kautmanová Príroda Nízkych Tatier 1: 124, 2004) (7084b). – Čertovica saddle (s. coll. 1869 SMBB B-00001/00296) (7084c). – Svarínka valley, 850 – 1100 m (Fajmonová Biológia 39/9: 880, tab. 1, 1984) (7085a). – Chmelinec Mt., 900 – 1100 m (Vartíková Rig. práca, Msc., depon. in PrF UK Bratislava, 1975) (7085a). – Chmelinec Mt., below the top of sideward ridge, 1340 m (Kliment Príroda Nízkych Tatier 1: 140, tab. 1, 2004) (7085a). – upper part of Torysa valley (7085a). – Mačacia Mt., E slope, cca 150 m above brook (Fajmonová Biológia 38/9: 885, tab. 1, 1983) (7085a). – Mačacia Mt., scree below rocky wall, above forest, 1300 m, 48°57'33,5'' N, 19°52'35,7'' E (Kliment et al. Thaiszia – J. Bot. 14: 114-115, 2004) (7085a). – Mačacia Mt., end of shallow couloir, below rocky walls, 1320 m (Kliment Príroda Nízkych Tatier 1: 140, tab. 1, 2004) (7085a). – Toryska valley, towards Holica Mt., cca 900 – 1100 m (Vartíková 1972 SLO) (7085a). – Holica Mt., N and NE slope, 1300 – 1420 m (not. Sillinger 1933) (7085b). – Hodruša brook, 1120 m (Jarolímek & Kliment Príroda Nízkych Tatier 1: 156, tab. 3, 2004) (7085c). – Svarinka, Veľký Bok Mt., 48°56'47,66'' N, 19°53'18,4'' E (Rizman 2015 BIOM) (7085c). – Veľký Bok Mt., spot height 1616, 48°56'3,22'' N, 19°52'47,51'' E (Duchoň 2015 BIOM) (7085c). – „Priehyba", 48°54'38,21'' N, 19°57'59,71'' E (Školek 2000 BIOM; Vaško 2013 BIOM) (7085d). – Veľká Vápenica Mt. (Lengyel 1926 BP 274766) (7085d). – Veľká Vápenica Mt., 48°54'56,76'' N, 19°58'33,3'' E (Jánošík 2014 BIOM) (7085d). – „Javorinka", below Vápenica Mt., 48°55'27,35'' N, 19°59'43,85'' E (Pavlišin 2015 BIOM) (7085d). – Benkovo, Košariská, 49°10'4,16'' N, 19°53'6,37'' E (Pirchala 2015 BIOM) (7086a). – Zbojnícka dolina valley, 48°55'30,51'' N, 20°3'13,8'' E (Pavlišin 2014 BIOM) (7086c). – spring below Andrejcová Mt., cca 1300 – 1400 m (Štěpánek 1992 PR) (7086c). – Andrejcová Mt., 48°54'35,84'' N, 20°0'2,27'' E (Pavlišin 2014 BIOM) (7086c). – Staníkovo valley, 48°54'36,31'' N, 20°5'2,78'' E (Vnuk 2014 BIOM) (7086d). – „Holičná", 48°54'29,65'' N, 20°6'17,79'' E (Pirchala 2014 BIOM) (7086d). – Veľký Brunov valley, 48°54'20,64'' N, 20°8'17,46'' E (Pirchala

2014 BIOM) (7086d). – Stredná hoľa Mt., 48°54'2,23" N, 20°7'6,45" E (Jánošík 2014 BIOM) (7086d). – „Škutová", 48°54'11,1'' N, 20°9'33,21'' E (Dupkala 2014 BIOM) (7086d). – from Veľký Brunov lodge up to the top of Kráľova hoľa Mt. (Vartíková 1975 SLO) (7086d-7186b). – sedlo veľký Šturec saddle, N slope of the ridge E from the saddle, 1000 m (Manica Záver. správa Msc., Zvolen: 61, 1973) (7181a). – Veľká Sútecká dolina valley, 48°53'56,29'' N, 19°12'7,33'' E (Pirchala 2014 BIOM) (7181a). – Zvolen Mt. (Trapl 1922 PRC) (7181a). – Nová hoľa Mt., Donovaly (Bačkor 2017 BIOM) (7181a). – Donovaly, 48°53'11,34'' N, 19°14'1,92'' E (Vyšinský 2014 BIOM) (7181a). – Kozí chrbát Mt., E slope, 1150 – 1200 m (Procházka & Krahulec Preslia 54: 171, 1982) (7181b). – Prašivá Mt., 48°52'53,68'' N, 19°18'34,34'' E (Vyšinský 2014 BIOM) (7181b). – Prašivá Mt. (Hazslinszky 1865 BP 41045, 165566; Margittai 1909 BP 483922, PR 123472; Májovský 1951 SLO) (7181b). – abandoned village Kalište (Textorisová 1885 BRA) (7181c). – Čertovica saddle, Čertova skala Mt. (7184a). – Čertovica saddle, Čertova svadba Mt. (both Májovský 1957 SLO) (7184a). – Ždiarske sedlo saddle, 48°53'50,48'' N, 20°3'13,53'' E (Němec 2015 BIOM) (7186a). – Veľký Brunov cirque, W slope in upper part (7186b). – Veľký Brunov cirque, E slope in upper part (7186b). – Kráľova hoľa Mt., 48°53'26,16'' N, 20°7'19,04'' E (Šibík 2014 BIOM) (7186b). – Čierny Váh river, near W spring, 1400 – 1550 m (7186b). – Čierny Váh river, E spring area, 1600 – 1700 m (7186b). – Tri kopce Mt., Martalúzka cirque, near waterfall of Hnilec river (7186b). – NW slope of Kráľova hoľa Mt., below the top (all Hrouda et al. Preslia 62/2: 146, 1990) (7186b). – Kráľova hoľa Mt. (Lengyel 1911 BP 274770, 1913 BP 274765; Dostál 1929 PRC) (7186b). – Kráľova hoľa Mt., E slope, above 1700 m (Hejný 1931 PRC) (7186b). – NNR Martalúzka, 48°52'29,68'' N, 20°9'33,41'' E (Jánošík 2014 BIOM) (7186b). – Kráľova skala Mt., NR Martalúzka (Šibík 2018 BIOM) (7186b). – Kráľova skala Mt., spruce forest on SE slope, 1250 – 1550 m (7186b-7187a). – Tri kopce Mt., E from Martalúzka cirque, 1300 – 1450 m (both Hrouda et al. Preslia 62/2: 146, 1990) (7187a). **23a. Západné Tatry Mts.:** in the forest near Brestová settlement, above Zuberec village, cca 900 m (Dostál 1952 PRC) (6783b-d). – NNR Úplazíky (Valachovič & Jarolímek Bull. Slov. Bot. Spoločn. 10: 16, 1988) (6783d). – Biela skala Mt., 1250 m (6783d). – Sivý vrch Mt., 1200 m, 1350 m (both Šoltés Acta Fac. Rer. Natur. Univ. Comen. Bot. 24: tab. 3, 1976) (6783d). – Sivý vrch Mt., 1600 m, 1680 m (Šoltésová Acta Fac. Rer. Natur. Univ. Comen. Bot. 23: tab. 3, 1974) (6783d). – Sivý vrch Mt., S slope (6783d). – Sivý vrch Mt., Malá Ostrá Mt. (both Bělohlávková & Fišerová Folia Geobot. Phytotax. 24/1: 18, tab. 4, 1989) (6783d). – Suchá dolina valley, below Osobitá Mt., 1000 m (Pax 1913 BP 165515) (6784a). – Osobitá Mt., below Radové skaly rocks, (Bělohlávková & Fišerová Folia Geobot. Phytotax. 24/1: 18, tab. 4, 1989) (6784a). – Osobitá Mt. (Futák 1949 SLO; Bělohlávková & Fišerová Folia Geobot. Phytotax. 24/1: 6, tab. 1, 1989) (6784a). – „Korytiny", 49°15'14,53'' N, 19°44'16,75'' E (Pirchala 2015 BIOM) (6784a). – slope above springs of Juráňov potok brook (Fajmonová Biológia 33/7: 558, tab. 2, 1978) (6784b-d). – valley of Roháčsky potok brook, above 1040 m (Kopecký Preslia 43: 350, 360, 1971) (6784c). – Roháčska dolina valley, cca 1460 m (Dostál 1926 PRC) (6784c). – Roháčska dolina valley, Spálený žľab couloir, cca 1500 m (Hajdúk 1983 BRA) (6784c). – Látaná dolina valley, cca 1300 – 1400 m (Dostál 1925 PRC) (6784c). – Salatínska dolina valley, couloir below Salatín Mt., 49°12'49,86'' N, 19°41'28,51'' E (Duchoň 2015 BIOM) (6784c). – below Predný Salatín Mt., 49°14'11,94'' N, 19°42'25,31'' E (Pavlišin 2015 BIOM) (6784c). – Salatínska dolina valley, 49°13'23,52'' N, 19°41'51,96'' E (Duchoň 2015 BIOM) (6784c). – Salatín Mt. – „Skriniarky", 49°12'36,19'' N, 19°41'50,20'' E (Duchoň 2015 BIOM) (6784c). – Pachoľa Mt. – Salatín Mt. (Školek 2002 BIOM) (6784c). – Spálená dolina valley (Školek 2002 BIOM) (6784c). – Smutná dolina valley (Školek 1976 BIOM) (6784c). – Smutná dolina valley, below the pathway to Roháčske pleso tarn (Šeffer & Šefferová Biológia 44/1: 47, tab. 1, 1989) (6784c). – Smutná dolina valley, 49°12'23,52'' N, 19°44'44,23'' E (Sedláková & Špulerová 2015 BIOM) (6784c). – Roháčske plesá tarns (Jávorka

1911 BP 165567; Dostál 1926 PRC) (6784c). – site Zelenô, slope to the 1st Roháčske pleso tarn, 1635 m (6784c). – site Zelenô, NW slope, 1710 m, 1955 m (Komárková Dipl. práca, Msc., depon. in PrF UK Bratislava: tab. 32, 1964) (6784c). – Smutná dolina valley, couloir below Ostrý Roháč Mt., 1725 m, 49°12'2,3'' N, 19°44'52,8'' E (Ballová Bull. Slov. Bot. Spoločn. 38/1: 94, 2016) (6784c). – Rákoň Mt. – Predná Zábrať Mt. (Školek 2002 BIOM) (6784d). – Smutná dolina valley, avalanche couloir on SW slope of Rákoň Mt., 1540 m (Komárková Dipl. práca, depon. in PrF UK Bratislava: tab. 32, 1964) (6784d). – Volovec Mt. (Školek 1976 BIOM) (6784d). – Smutná dolina valley, below Ostrý Roháč Mt. (Školek 2002 BIOM; Sedláková 2017 BIOM) (6784d). – Smutná dolina valley, slope below Jamnícke sedlo saddle, 1605 m (Komárková Dipl. práca, depon. in PrF UK Bratislava: tab. 32, 1964) (6784d). – near Jamnické pleso tarn (Školek 1976 BIOM) (6784d). – Račkova dolina valley, end, 49°12'2,62'' N, 19°48'12,20'' E (Duchoň 2015 BIOM) (6874d). – Ostrý Roháč Mt., 1600 m (Pax 1905 BP 165596) (6784d-6884b). – Kresanica Mt., 49°13'55,11'' N, 19°54'41,29'' E (Duchoň 2013 BIOM) (6785c). – Tomanova dolina valley, N slope of Poľská Tomanová Mt., cca 1790 m (Sedláčková 1958 BRNU 610181) (6785c). – below Tomanové pleso tarn, 49°13'6,33'' N, 19°54'44,28'' E (Kicková 2015 BIOM) (6785c). – Rozpadlý hrebeň ridge [Rozpadlý Grúň] (Radwanska-Paryska 1946 TNP 2431) (6785d). – Zadná Tichá dolina valley, „Tarišková“, 49°13'38,22'' N, 19°58'56,02'' E (Duchoň 2015 BIOM) (6785d). – Jalovecká dolina valley, below Baníkov Mt., 1200 – 1250 m (Dostál Věda přír. 12: 154, 1931) (6884a). – Parichvost valley, 49°11'46,34'' N, 19°42'18,55'' E (Sedláková 2015 BIOM) (6884a). – Pachoľa Mt. (Sedláková 2018 BIOM) (6884a). – Baníkov Mt. (Školek 1976 BIOM) (6884a). – Smutná dolina valley, below the ridge of Nohavica Mt., 1870 m (Komárková Dipl. práca, depon. in PrF UK Bratislava: tab. 32, 1964) (6884a). – Žiarska dolina valley, Ráztoka Mt. – Príslop Mt. (Školek 1976 BIOM) (6884a). – Holý vrch Mt., 49°9'46,55'' N, 19°44'1,29'' E (Vyšinský 2015 BIOM) (6884a). – Račkove plesá tarns (Školek 1976) (6884b). – Račkové plesá tarns, 1590 m a (Horák Acta scient. Nat. acad. Scient. Bohemoslov. 1971/5) (6884b). – Račkova dolina valley, Klin Mt. (Mikoláš 1956 KO 11513) (6884b). – Račková dolina valley, below „Michalova lúka“, 49°9'57,61'' N, 19°49'3,12'' E (Pavlišin 2015 BIOM) (6884b). – Gáborova dolina valley (Školek 1976 BIOM) (6884b). – Jamnická dolina valley, below Baranec Mt., 49°10'12,02'' N, 19°45'59,86'' E (Celerová 2015 BIOM) (6884b). – Malý Baranec Mt. (Školek 1976 BIOM) (6884b). – Nižná Magura Mt. (6884b). – Račková dolina valley, SW slope of Ježová Mt., 1570 m (both Horák Acta scient. Nat. acad. Scient. Bohemoslov. 1971/5) (6884b). – below the ridge of Holý vrch Mt., 1230 m (Domin Carpatica 2b: 7, 1940) (6884c). – Bystrá dolina valley, 49°10'34,11'' N, 19°50'39,52'' E (Duchoň 2015 BIOM) (6885a). – Bystrá dolina valley, Kotlová Mt. (Školek 1976 BIOM) (6885a). – couloir below the ridge Bystrá Mt. – Kotlová Mt., 1760 m (Dúbravcová Dipl. práca, Msc., depon. in PrF UK Bratislava, 1974) (6885a). – Kamenistá dolina valley, 49°10'4,16'' N, 19°53'6,37'' E (Vyšinský 2015 BIOM) (6885a). – Tichá dolina valley, Suchý žľab couloir, 1300 m (Šoltés Dipl. práca, Msc., depon. in PrF UK Bratislava, 1969) (6885a). – Krížna dolina valley, 49°10'46,3'' N, 19°57'12,65'' E (Duchoň 2013 BIOM) (6885b). – Malé Krížne Mt., 1520 m, 1550 m (6885b). – Všiváky Mt., 1555 m, 1565 m (6885b). – Kudrová dolina valley, left side, 1600 m (6885b). – above locality called Kvasničné, 1570 m, 1580 m (all Vidličková Biológia 44/1: 64, tab. 1, 1989) (6885b). – Bystrá dolina valley, bottom (Školek 1976 BIOM) (6885c). **23b. Vysoké Tatry Mts.:** Široká dolina valley (Šoltés 2002 BIOM) (6786d). – Žabia Bielovodská dolina valley (Šeffer & Šefferová Biológia 44/1: 47, tab. 1, 1989) (6786d). – Nižné Bielovodské Žabie pleso tarn (Filarszky & Kümmerle 1909 BP 483933) (6786d). – Javorová dolina valley, 49°12'4,76'' N, 20°9'20,91'' E (Šefferová Stanová 2015 BIOM) (6786d). – „Rozpadliny“, 49°13'26,12'' N, 20°6'29,5'' E (Maršalek 2015 BIOM) (6786d). – „Temnice“, 49°13'42,19'' N, 20°6'53,36'' E (Lipták 2015 BIOM) (6786d). – Dolina Žabích plies valley, 49°12'31,67'' N, 20°5'40,06'' E (Duchoň 2015 BIOM) (6786d). – Litvorový žľab couloir (Kyslová 2002

BIOM) (6786d). – Zelená Javorová dolina valley, above upper dwarf pine limit (Šoltés 2002 BIOM) (6786d). – Žabia Javorová dolina valley (Šoltés 2002 BIOM) (6786d). – waterfall from Žabia Javorová dolina valley, 49°12'11,95'' N, 20°9'17,24'' E (6786d). – Zelené Javorové pleso tarn, 49°12'24,4'' N, 20°8'33,62'' E (both Sedláková 2015 BIOM) (6786d). – Javorová dolina valley, cca 1800 m (Dočolomanský 1962 BRA) (6786d). – Javorová dolina valley (Krajina 1924 PRC) (6786d-6787c-6886b). – Čierna Javorová dolina valley (Kyselová, Šoltés 2002 BIOM) (6787c). – below the ridge of Jahnence Mt. (Šoltés 2001 BIOM) (6787c). – Kolové pleso tarn, 49°13'12,88'' N, 20°11'32,94'' E (Sedláková 2014 BIOM) (6787c). – below Kolový štít Mt. (Sedláková 2017 BIOM) (6787c). – Dolina Bielych plies valley, below Jahňací štít Mt. (Šeffer & Šefferová Biológia 44/1: 47, tab. 1, 1989) (6787c). – Biele plesá tarns (Krajina Věda přír. 6: 137, 1925) (6787c). – in growth of dwarf pines near Biele plesá tarns (Krajina 1924 PRC) (6787c). – between Brnčalka chalet and Kežmarská chata chalet, 1600 m (Šoltésová Acta Fac. Rer. Natur. Univ. Comen. Bot. 23: tab. 2, 1974) (6787c). – Červená kotlinka valley (Šoltés 2002 BIOM) (6787c). – below Červená dolinka valley, above Zelené pleso tarn, 49°12'45,74'' N, 20°13'12,78'' E (Sedláková 2014 BIOM) (6787c). – near Zelené pleso tarn, 49°12'32,65'' N, 20°13'14,86'' E (Zajac 2014 BIOM) (6787c). – in growth of dwarf pines near Zelené pleso tarn (Krajina 1924 PRC) (6787c). – Dolina Zeleného plesa valley, 49°13'16,39'' N, 20°13'42,14'' E (Šibík 2015 BIOM) (6787c). – Ľadové dolinky valleys, 49°12'31,85'' N, 20°10'37,96'' E (Sedláková 2015 BIOM) (6787c). – Veľká Zmrzlá dolina valley (Lengyel 1931 BP 274757) (6787c). – Dolina Zeleného plesa valley (Šoltés 2000 BIOM) (6787c). – valley of Biely potok brook, below Veľká Svišťovka Mt. (Jílek 1929 PRC) (6787d). – Dolina Kežmarskej Bielej vody valley, upper part (Filarszky 1903 BP 165493, 165494) (6787d). – Dolina Kežmarskej Bielej vody valley (s. coll. 1892 BRA; Greschik 1918 SLO) (6787d-6887b). – Dolina Kežmarskej Bielej vody valley, 1075 – 1150 m (Šoltés Acta Fac. Rer. Natur. Univ. Comen. Bot. 24: tab. 4, 1976) (6787d-6887b). – Kôprová dolina valley, cca 1000 m (Filipi 1933 BRNU 251977) (6885b). – Nefcerka valley, 49°10'30,45'' N, 19°59'26,32'' E (Šibík 2014 BIOM) (6885b). – Nefcerka valley, above first treshold (Šoltés 2002 BIOM) (6885b). – Grúnik Mt., below Kriváň Mt., 49°9'25,18'' N, 19°58'35,65'' E (Sedláková 2015 BIOM) (6885b). – Vyšná Priehyba Mt., 49°9'31,11'' N, 19°59'18,95'' E (Šibík 2015 BIOM) (6885b). – Nefcerka valley, below Veža Mt. (Šeffer & Šefferová Biológia 44/1: 47, tab. 1, 1989) (6885b-6886a). – below Kriváň Mt., cca 1600 m (Hendrych 1947 PR 292208) (6885b-6886a). – Tri studničky, 1250 m (Šoltés Acta Fac. Rer. Natur. Univ. Comen. Bot. 24: 151, 1976) (6885d). – Temnosmrečinská dolina valley, boundary ridge, 49°11'32,03'' N, 20°2'38,43'' E (Sedláková 2014 BIOM) (6886a). – Temnosmrečinská dolina valley, Liptovské múry ridge (6886a). – Hrubý štít Mt. (6886a). – Hrubý štít Mt. – Čubrina Mt. (6886a). – Temnosmrečinská dolina valley, above Nižné Temnosmrečinské pleso tarn (all Šoltés 2002 BIOM) (6886a). – above Nižné Temnosmrečinské pleso tarn (Šeffer & Šefferová Biológia 44/1: 47, tab. 1, 1989) (6886a). – Temnosmrečinská dolina valley, below Piargova dolinka valley (Šoltés 2002 BIOM) (6886a). – Piargová dolina valley, 49°11'14,05'' N, 20°2'49,20'' E (Sedláková 2016 BIOM) (6886a). – Hlinská dolina valley, cca 1300 m (6886a). – Hlinská dolina valley, cca 1700 m (both Dostál 1936 PRC) (6886a). – Hlinská dolina valley, 49°11'46,34'' N, 19°42'18,55'' E (Šibík 2014 BIOM; Sedláková 2015 BIOM) (6886a). – Hlinská dolina valley, below Nefcerská veža Mt. (Šoltés 2002 BIOM) (6886a). – Hlinská dolina valley, slope between „Malá Záhradka“ and „Veľká Záhradka“, 1890 m, 49°10'32,2'' N, 20°2'13,5'' E (Šibík Bull. Slov. Bot. Spoločn. 37/1: 143–144, 2015) (6886a). – Hlinská dolina valley, below Kôprovský štít Mt. (6886a). – Nefcerka valley, below Nižné Terianske pleso tarn (both Šoltés 2002 BIOM) (6886a). – Važecká dolina valley, Malý Kriváň Mt. (Školek 2001 BIOM) (6886a). – Važecká dolina valley, 49°9'16,81'' N, 20°0'24,69'' E (Celerová 2015 BIOM) (6886a). – Dolina Suchej vody valley (Školek 2001 BIOM; Sedláková 2017 BIOM) (6886a). – below Ostrá veža Mt., 49°9'18,37'' N, 20°1'21,64'' E (6886a). –

near Nižné Wahlenbergovo pleso tarn, 49°9'38,35'' N, 20°1'28,66'' E (6886a). – above Nižné Wahlenbergovo pleso tarn, 49°9'33,34'' N, 20°1'38,67'' E (all Školek 2000) (6886a). – Furkotská dolina valley, Štrbské Solisko Mt., scree below rocky wall, cca 2080 m (Dúbravcová 1991 SLO) (6886a). – Mlynická dolina valley, above Capie pleso tarn (Hodoval 1970 BRA) (6886a). – Mlynická dolina valley, below Capie pleso tarn, 49°9'58,36'' N, 20°2'36,65'' E (Šoltés 2000 BIOM). (6886a). – Mlynická dolina valley, Kozie plesá tarns, 49°10'0,3'' N, 20°2'29,02'' E (Celerová 2014 BIOM) (6886a). – Mlynická dolina valley, below Nižné Kozie pleso tarn, 49°9'34,35'' N, 20°2'30,64'' E (Šoltés 1999 BIOM, 2001 BIOM) (6886a). – Mlynická dolina valley, from vodopád Skok waterfall to Nižné Kozie pleso tarn, cca 1700 – 1920 m (not. Koprivý 2014) (6886a). – Mlynická dolina valley, below Satan Mt. (Šeffer et Šefferová Biológia 44/1: 47, tab. 1, 1989) (6886a). – Mlynická dolina valley, above vodopád Skok waterfall (Weber 1925 BRA, Dostál 1936 PR 36236) (6886a). – Mlynická dolina valley, tarn above Skok waterfall, 49°9'21,33'' N, 20°2'47,31'' E (Šoltés 1999 BIOM; Šibík 2015 BIOM) (6886a). – Mlynická dolina valley, vodopád Skok waterfall (Hulják 1917 BP 95686; Jílek 1929 PRC; Moldvai 1963 BP 295790) (6886a). – Mlynická dolina valley, below Skok waterfall, 49°9'14,34'' N, 20°2'45,66'' E (Šoltés 1999 BIOM) (6886a). – Predná Bašta Mt., 49°10'17,93'' N, 20°3'10,41'' E (Sedláková 2016 BIOM) (6886a). – Mengusovská dolina valley, below Hlinská veža Mt., 49°10'18,34'' N, 20°3'13,66'' E (Šoltés 2002 BIOM) (6886a). – Mengusovská dolina valley, above Veľké Hincovo pleso tarn, 49°10'43,36'' N, 20°3'53,65'' E (Šoltés 2001 BIOM) (6886a). – Mengusovská dolina valley, below S ridge of Kôprovský štít Mt. (6886a). – Mengusovská dolina valley, near Žabie pleso tarn outflow (6886a). – Mengusovská dolina valley, below Kôpky Mt. (all Šeffer & Šefferová Biológia 44/1: 47, tab. 1, 1989) (6886a). – Mengusovská dolina valley, below Mengusovský Volovec Mt., 49°10'18,34'' N, 20°3'53,65'' E (Šoltés 2001 BIOM) (6886a). – Žabie pleso tarn, below Rysy Mt., 1900 m (Pax 1898 BP 165514) (6886a). – near Malé Žabie pleso tarn, 49°10'38,36'' N, 20°4'38,64'' E (Šoltés 2002 BIOM) (6886a). – below Žabie plesá tarns, 49°10'19,30'' N, 20°4'20,89'' E (Šoltés 2002 BIOM; Sedláková 2015 BIOM) (6886a). – below Kôpky Mt., 49°9'58,37'' N, 20°3'53,65'' E (Šoltés 2002 BIOM) (6886a). – Mengusovská dolina valley, 1500 – 1700 m (Perlaky 1907 BP 52675) (6886a). – Mengusovská dolina valley, Hincov potok brook, 1580 m (Šoltésová Acta Fac. Rer. Natur. Univ. Comen. Bot. 23: tab. 2, 1974) (6886a). – Mengusovská dolina valley, Hincov potok brook, 49°10'8,34'' N, 20°3'48,64'' E (Šoltés 2001 BIOM) (6886a). – between Popradské pleso tarn and Žabie plesá tarns (Galisová 1956 SLO) (6886a). – Popradské pleso tarn (Klein s. dat. BRA; Švestka 1924 BRNU 038624; Ptačovský 1929 SAV) (6886a). – Popradské pleso tarn, 49°9'10,12'' N, 20°4'41,12'' E (Lipták 2015 BIOM) (6886a). – between Popradské pleso tarn and Rysy Mt., cca 1700 m (Tuzson 1906 BP 539779) (6886a-b). – Furkotská dolina valley, below Sedielko Mt. (Šeffer & Šefferová Biológia 44/1: 47, tab. 1, 1989) (6886a-c). – Mlynická dolina valley (Margittai 1915 PRC; Krajina 1926 PRC; Jílek 1929 PRC; Krajina 1931 PR) (6886a-c). – Mengusovská dolina valley (Perlaky 1907 BP 274767; Vajda 1916 BP 280537; Lengyel 1928 BP 274758) (6886a-c). – Nižné Bielovodské Žabie pleso tarn, Rysy Mt. (Filarszky & Kümmerle 1909 BP 165492, 539777) (6886b). – Bialčanská [Žabia Bielovodská] dolina valley, below Žabia kopa Mt. (Šoltés 2002 BIOM) (6886b). – Bielovodská dolina valley, between Mlynár Mt. and Gánok Mt., 1425 – 1450 m, pathway to Ťažké pleso tarn (Domin Věda přír. 6: 194-195, 1925) (6886b). – Rovienky valley, bottom (Šoltés 1983 BIOM) (6886b). – Ťažká dolina valley, 49°11'24,37'' N, 20°6'27,94'' E (Šibík 2015 BIOM) (6886b). – Česká [Ťažká] dolina valley, between tarns (Šoltés 2002) (6886b). – Ťažký štít Mt., Kôpky Mt. (Šoltés 1999 BIOM) (6886b). – above Ťažké pleso tarn, 49°11'10,97'' N, 20°6'15,11'' E (Sedláková 2015 BIOM) (6886b). – Svišťová dolina valley (Šoltés 2002 BIOM) (6886b). – Kačacia dolina valley (6886b). – Kačacia dolina valley, near tarn (both Šoltés 2000 BIOM) (6886b). – Kačacia dolina valley, above Kačacie pliesko tarn (Šeffer & Šefferová Biológia 44/1: 47, tab. 1, 1989)

(6886b). – Litvorová dolina valley (Šoltés 2000 BIOM) (6886b). – Zadná Javorová dolina valley (6886b). – Rumanová dolinka valley (both Šoltés 2002 BIOM) (6886b). – Zlomisková dolina valley, Dračia dolinka valley, cca 1850 m (6886b). – Dračia dolinka valley, cca 2000 m (6886b). – Zlomisková dolina valley, cca 1700 m (all Krajina 1928 PRC) (6886b). – Zlomisková dolina valley, 49°9'51,06'' N, 20°6'14,10'' E (Celerová 2015 BIOM) (6886b). – Zlomisková dolina valley, below Zlomisková veža Mt. (Šoltés 2001 BIOM) (6886b). – Zlomisková dolina valley, below Tupá Mt. (Šoltés 2002 BIOM) (6886b). – „Zlomisková roveň" (Šoltés 2001 BIOM) (6886b). – Zlomisková dolina valley, near Ľadový potok brook (Šeffer & Šefferová Biológia 44/1: 47, tab. 1, 1989) (6886b). – Zlomisková dolina valley, Ľadové pleso tarn (Futák 1943 SLO) (6886b). – Tupá Mt., S slope, cca 2000 – 2100 m (Dostál, 1935 PRC) (6886b). – Batizovská dolina valley, slope of Končistá Mt. (Šoltés 2001 BIOM) (6886b). – Batizovská dolina valley, below Kostolík Mt., 1900 m (6886b). – Batizovská dolina valley, the base of Dromedár Mt. slope, 1955 m (both Háberová & Šoltésová Biológia 44/1: 56, tab. 3, 1989) (6886b). – slope of Gerlachovský štít Mt., 2100 m (Maloch 1923 KO 13880) (6886b). – mountainside of Gerlachovský štít Mt., below Dlhé pleso tarn (Šeffer & Šefferová Biológia 44/1: 47, tab. 1, 1989) (6886b). – Velická dolina valley, below Guľatý kopec Mt. (Šeffer & Šefferová Biológia 44/1: 47, tab. 1, 1989; Šoltés 2000 BIOM) (6886b). – above Dlhé pleso tarn, 49°10'9,07'' N, 20°8'14,21'' E (Sedláková 2015 BIOM) (6886b). – Velická dolina valley, couloir below Bradavica Mt. (Šeffer & Šefferová Biológia 44/1: 47, tab. 1, 1989) (6886b). – below Kvetnicová veža Mt. (Švestka 1932 BRNM, Šeffer & Šefferová Biológia 44/1: 47, tab. 1, 1989) (6886b). – Velická dolina valley, below Granátova veža Mt. (Šoltés 2002 BIOM) (6886b). – Kvetnica (in Velická dolina valley) (Czakó 1887 BP 165535; s. coll. 1985 BRA; Šeffer & Šefferová Biológia 44/1: 47, tab. 1, 1989; Sedláková 2015 BIOM; not. Dudáš 2016) (6886b). – Kvetnica, 1780 m , on the bottom of the cirque (in Velická dolina valley) (not. Michalko 1971) (6886b). – Velická dolina valley, surroundings of Kvetnicové pleso tarn (Šoltés 2001 BIOM) (6886b). – Velické pleso tarn, near waterfall at rocky wall hillside, 1850 m (not. Michalko 1970) (6886b). – above Velické pleso tarn, mountainside of Gerlachovský štít Mt., 1690 m (Šoltésová Acta Fac. Rer. Natur. Univ. Comen. Bot. 23: tab. 3, 1974) (6886b). – Velická dolina valley, above Velické pleso tarn, cca 1750 m (Fabianková 1974 SAV; Šoltés 2001 BIOM; Šibík 2014 BIOM) (6886b). – Velické pleso tarn (Grodkovszky 1935 BRA) (6886b). – Velické pleso tarn, surroundings of pathway, in dwarf pine (not. Dudáš 2016) (6886b). – Velická dolina valley, herbaceous meadow in upper part (Sillinger 1925 PR 123473) (6886b). – Velická dolina valley, 1750 m (Krajina 1925 PRC) (6886b). – Velická dolina valley, cca 1600 m (Margittai 1920 BP 483935) (6886b). – „Velická Poľana", near pathway (not. Dudáš 2016) (6886b). – Velická dolina valley (Kováts 1973 BP 702897) (6886b). – Veľká Studená dolina valley, „Zbojnícky spád", 49°11'2,27'' N, 20°9'55,68'' E (Celerová 2014 BIOM; Šibík 2018 BIOM) (6886b). – „Slavkovská vyhliadka", Granátové veže Mt., 49°10'6,45'' N , 20°9'30,69'' E (Sedláková 2016 BIOM) (6886b). – Važecká dolina valley (Thaisz 1912 BP 165531) (6886c). – Važecká dolina valley, „Zadný Handel" (Školek 2001 BIOM) (6886c). – Važecká dolina valley, „Handel", 49°8'45,46'' N, 20°0'15,64'' E (Sedláková 2015 BIOM) (6886c). – Važecká dolina valley, mouth of Suchá voda valley (Školek 2001 BIOM) (6886c). – Ostrá Mt., 49°8'36,18'' N, 20°1'13,21'' E (Lipták 2015 BIOM) (6886c). – Furkotská dolina valley, near tourist signpost „Škutnastá poľana", next to Furkotský potok brook, cca 1770 m (not. Koprivý 2014) (6886c). – „Škutnastá poľana", 49°8'24,71'' N, 20°1'58,28'' E (Maršalek 2015 BIOM) (6886c). – between tourist signpost „Škutnastá poľana" and Chata pod Soliskom chalet, cca 1800 m , 49°08'42,9'' N, 20°02'13,78'' E (not. Koprivý 2014) (6886c). – below Predné Solisko Mt., 49°8'58,36'' N, 20°1'43,68'' E (Školek 2000 BIOM) (6886c). – Furkotská dolina valley, cca 1300 m (Nyárády 1911 PR 123474) (6886c). – Mlynická dolina valley, cca 1600 m (Margittai 1915 BP 483923) (6886c). – Patria Mt., 49°8'45,09'' N, 20°4'6,47'' E (Maršalek 2015 BIOM) (6886c). – above

Štrbské pleso tarn, cca 1700 m (Širjaev 1925 BRNU 058933) (6886c). – Trigan Mt., 49°8'44,62'' N, 20°4'8,42'' E (Maršalek 2015 BIOM) (6886c). – crossroads towards Popradské pleso tarn, 49°7'0,03'' N, 20°4'51,81'' E (Figura 2015 BIOM) (6886c). – towards Popradské pleso tarn (Domin 1919 PRC) (6886c). – Nové Štrbské pleso tarn (Gombocz 1929 BP 165528) (6886c). – Štôlska dolina valley, 49°8'50,47'' N, 20°6'35,59'' E (Šibík 2014 BIOM) (6886d). – Štôlska dolina valley, slope of Tupá Mt. (6886d). – bottom of Batizovská dolina valley (both Šoltés 2001 BIOM) (6886d). – ridge between Velická dolina valley and Batizovská dolina valley, 1520 m (Manica Záver. správa Zvolen: 81, 1973) (6886d). – below Mačacia veža Mt., cca 2350 m (Kümmerle 1928 BP 165530) (6887a). – Slavkovská dolinka valley (Lengyel 1930 BP 274756; Paclová 1954 TNP 10077) (6887a). – below Slavkovský štít Mt. (Polívka 1938 PR 292189) (6887a). – mountainside of Slavkovský štít Mt., 1650 m (Šoltésová Acta Fac. Rer. Natur. Univ. Comen. Bot. 23: tab. 3, 1974) (6887a). – Veľká Studená dolina valley (Sztehlo 1876 BP 165495; Nyárády 1906 BP 462062; Lengyel 1913 BP 274769) (6887a). – Javorový štít Mt. – Prostredný hrebeň ridge (Šoltés 2001 BIOM) (6887a). – Veľká Studená dolina valley, below Ostrý štít Mt. (Šoltés 2001 BIOM) (6887a). – Veľká Studená dolina valley, above Studené plesá tarns (Šoltés 2001 BIOM) (6887a). – Zbojnícka chata chalet, 49°10'36,6312'' S, 20°10' 4,547892'' V (Celerová 2015 BIOM) (6887a). – Dlhé pleso tarn, 49°10'35,2'' N, 20°10'3,33'' E (Celerová 2014 BIOM, Šibík 2018 BIOM) (6887a). – Veľká Studená dolina valley, 49°10'34,93'' N, 20°11'13,51'' E (Lipták 2015 BIOM; Šibík 2015 BIOM) (6887a). – Veľká Studená dolina valley, below Prostredný hrot Mt. (Šoltés 2001 BIOM) (6887a). – Veľká Studená dolina valley, ridge on left side towards Zbojnícka chata chalet, 1420 m (Šoltésová Acta Fac. Rer. Natur. Univ. Comen. Bot. 23: tab. 2, 1974) (6887a). – Veľká Studená dolina valley, 1430 m, 1460 m. (Šoltés Acta Fac. Rer. Natur. Univ. Comen. Bot. 24: tab. 4, 1976) (6887a). – Malá Studená dolina valley (Haynald 1866 BP 731288; Schneider 1880 BP 165510; Simonkai 1888 BP 165563; Róth 1890 BRA; Thaisz 1908 BP 165532, 1908 BRA; Pax 1909 BP 165511; Schidlay 1929 BRA; Grodkovszky 1931 BRA; Boros 1938 BP 462050; Šefferová Stanová 2015 BIOM; Šibík 2015 BIOM) (6887a). – Malá Studená dolina valley, below Baranie rohy Mt. (Šoltés 2002 BIOM) (6887a). – Malá Studená dolina valley, below Päť Spišských plies tarns (Šoltés 2002 BIOM) (6887a). – Malá Studená dolina valley, below „Žltá stena“ (Šoltés 2002 BIOM; Sedláková 2013 BIOM). (6887a). – Malá Studená dolina valley, above Chata kpt. Nálepku [= Zamkovského chata] chalet (Soják 1955 PR 562904) (6887a). – Studená dolina valley (Kržišch 1859 BP 165529; Greschik 1886 SLO; Winkler 1899 BP 165599; Brym 1923 PRC; Švestka 1925 BRNM; Tetmayer 1961 BP 366947) (6887a). – Lievikový kotol cirque, 49°11'34,62'' N, 20°13'25,03'' E (Šibík 2015 BIOM) (6887a). – Skalnatá dolina valley, above Skalnaté pleso tarn (Šoltés 2001 BIOM) (6887a). – Huncovský štít Mt. (Šoltés 1999 BIOM) (6887a). – Skalnaté pleso tarn, 49°11'20,15'' N, 20°13'37,05'' E (Šibík 2015 BIOM) (6887a). – Obrovský vodopád waterfall (Maloch 1923 KO 13878) (6887a). – waterfalls of Studený potok brook (Kiss 1931 BP 539775) (6887a). – Hrebienok, below ski-lift, 1294 m, 49°9´33,3'' N, 20°13´26,6'' E (Podroužková Medvecká Bull. Slov. Bot. Spoločn. 33/1: 113 2011) (6887a). – towards Skalnaté pleso tarn, cca 1 km from Štart, 1155 m (Šoltés Dipl. práca, depon. in PrF UK Bratislava, 1969) (6887b). – Tatranská Lomnica settlement (s. coll. 1925 PRC) (6887b). **23c. Belianske Tatry Mts.:** Kýčera Mt., 49°16'21,29'' N, 20°9'48,45'' E (Lipták 2015 BIOM) (6786b). – below Kôň Mt., 49°15'32,44'' N, 20°9'35,87'' E (Maršalek 2015 BIOM) (6786b). – Holica Mt., 49°14'43,70'' N, 20°7'9,54'' E (Maršalek 2015 BIOM) (6786d). – „Genšia šija“, 49°14'26,05'' N, 20°7'43,99'' E (Lipták 2015 BIOM) (6786d). – Podspády settlement, ridge of Havran Mt., 1030 m (Šomšák Biol. Práce 32/4: 79, tab. 7, 1986) (6787a). – Javorinka Mt., near Podspády settlement (Domin & Krajina 1925 PRC) (6787a). – near Biela brook, 900 – 950 m (Vašák 1967 PR 292192) (6787a). – between Muráň Mt. and Nový vrch Mt., cca 1100 m (Domin Věda přír. 3: 98, 1922) (6787a). – valley between Muráň Mt. and Nový vrch Mt.,

49°15'11,65'' N, 20°10'49,91'' E (Sedláková 2014 BIOM) (6787a). – Havran Mt., N slope, cca 1600 – 2150 m (Klášterský & Měsíček 1959 PR 292180) (6787a). – below the saddle between Nový vrch Mt. and Havran Mt. (Domin Věda přír. 3: 166-167, 1922; Domin Tatranská květena: 15, 1928) (6787a). – Tristárska dolina valley, 1600 – 1650 m (Mikoláš 2009 W) (6787a). – Belanská Javorinka Mt., 1150 – 1210 m (6787b). – Belanská Javorinka Mt., towards Tokárska dolina valley, oppostite to Solnisko, 1200 – 1100 m (both Domin Carpatica 2b: 13, 1940) (6787b). –Tokáreň (Simonkai 1890 BP 165562) (6787b). – below Tokáreň, 970 m (Šomšák Biol. Práce 32/4: 53, tab. 4, 1986) (6787b). – Čuba Mt. [= Kýčera Mt.], NW slope, cca 1100 m (Domin & Krajina 1925 PRC) (6787b). – below Muráň Mt., S slope, 49°14'50,47'' N, 20°10'58,63'' E (Šibík 2014 BIOM) (6787c). – Nový vrch Mt., 49°14'59,82'' N, 20°11'15,09'' E (Sedláková 2014 BIOM) (6787c). – cirque between Havran Mt. and Ždiarska Vidla Mt., 1485 – 1495 m, 1665 – 1710 m (Domin Rozpr. 2. Tř. čes. Akad. 34/19: 9, 1925) (6787c). – Ždiarska vidla Mt., 1950 – 2000 m (Mikoláš 2006 W) (6787c). – Predné Koperšady valley [= Predné Meďodoly] and Zadné Koperšady valley [= Zadné Meďodoly] (Krajina Věda přír. 6: 137, 1925) (6787c). – Monkova dolina valley, „Široký úplaz", cca 1500 m (not. Dudáš 2014) (6787c). – Malý Čosek Mt., 49°14'56,35'' N, 20°14'13,77'' E (Lipták 2015 BIOM) (6787c). – Javorinská dolina valley, 1550 m (Domin Věda přír. 3: 94, 1922) (6787c). – Kopa Mt., grasslands near upper limit of spruce forest (Domin Věda přír. 3: 51, 1922) (6787c). – S slope of Veľký Košiar Mt. and Malý Košiar Mt. (Krajina Věda přír. 6: 137, 1925) (6787c). – Bujačí vrch Mt., 1550 m (Šoltésová Acta Fac. Rer. Natur. Univ. Comen. Bot. 23: tab. 3, 1974) (6787d). – Bujačí vrch Mt., N slope, 49°13'56,12'' N, 20°16'1,17'' E (6787d). – Bujačí vrch Mt., S slope, 49°13'48,93'' N, 20°15'43,64'' E (both Šibík 2014 BIOM) (6787d). – Rakúsky chrbát ridge, 1440 m, 1450 m (Šoltés Acta Fac. Rer. Natur. Univ. Comen. Bot. 24: 151, tab. 4, 1976) (6787d). – „Veľký Ovčí komín", 49°13'33,89'' N, 20°16'16,21'' E (Duchoň 2014 BIOM) (6787d). – „Ovčie komíny", 49°13'45,55'' N, 20°16'13,96'' E (Šibík 2014 BIOM) (6787d). – Lavínový žľab couloir, 49°13'41,93'' N, 20°16'24,58'' E (Duchoň 2014 BIOM) (6787d). – Skalné vráta Mt. (Rosemberszky 1915 BP 462063; Futák 1946 SLO; Šoltésová Acta Fac. Rer. Natur. Univ. Comen. Bot. 23: tab. 3, 1974) (6787d). – Skalné vráta Mt., 49°13'52,63'' N, 20°16'26,71'' E (Šibík 2014 BIOM) (6787d). – Suchá dolina valley, 1130 m, 1150 m (Šoltés Acta Fac. Rer. Natur. Univ. Comen. Bot. 24: tab. 3, tab. 4, 1976) (6787d). – Faixová skala Mt., above 1450 m (Domin Rozpr. 2. Tř. čes. Akad. 34/19: 9, 1925) (6787d). – Faixova lúka meadow, on N slope of the spot height 1605, cca 1550 m (Müller 1946 BRNU 335844) (6787d). – site Červená hlina, spruce forest, cca 1270 m (Futák 1961 SAV) (6787d). – Dolina Siedmich prameňov valley (Hazslinszky s. dat. BP 165526; Filarszky 1900 BP 165558; Paclová & Rybárska 1969 SLO) (6787d). – Tatranská Kotlina settlement (Greschik 1891 BRA; Jávorka 1955 BP 234598) (6787d). – Tatranská Kotlina settlement, towards the cave (Galisová 1956 SLO) (6787d). – Suchá dolina valley near Tatranská Kotlina settlement (Futák 1953 SLO) (6787d). **24. Pieniny Mts.:** mountainside of Holica Mt., above Dunajec river (6588d). – below Vápeník rock (both Benčaťová Cievnaté rastliny Pienin: 12, 2001) (6688b). **25. Turčianska kotlina basin:** humid meadows 2 km NW from the Blatnica village, 48°56'53,49'' N, 18°55'53,02'' E (lit. Bernátová 1976 BIOM) (7079d). **26a. Liptovská kotlina basin:** between Kokavský most bridge and Hrdovo settlement, cca 855 m (Vrlíková 1975 SLO) (6885c). **26b. Spišské kotliny basins:** Nižné Hágy settlement, 900 m (not. Michalko 1970) (6886d). – Štrba village (Černý 1924 BRA) (6986a). – Spišská Teplica village (Odložilíková 1956 TNP 1435) (6987c). **28. Západné Beskydy Mts.:** below Pilsko Mt., above „Tajch", 49°31'47,43'' N, 19°18'15,6'' E (Pavlišin 2013 BIOM) (6481d). – Babia hora Mt., near Bystrá brook, cca 995 m, 980 m (Migra 1974 SLO) (6482b-6483a-c). – Babia hora Mt., in lower mountain degree (6482b-6483a-c). – Babia hora Mt., in subalpine zone (Migra Dipl. práca, Msc., depon in. PrF UK Bratislava 1977) (6483a). – Veľká Rača massif., ridge near ski-lift (Magic Spr. z výsk. a invent. prác. na 13. TOPe: 8, 9, 1978) (6579d). – Veľká Rača Mt.,

49°25'30,84'' N, 18°59'12,64'' E (Vnuk 2014 BIOM; Rizman 2015 BIOM) (6579d). – Rycierova hora Mt., 49°24'53,71'' N, 19°5'31,62'' E (Rizman 2015 BIOM) (6580d). – Veľká Rača massif, near the spot height Bednárová (1093 m) (6580d). – Veľká Rača massif, spot height Bugaj (1139 m) (both Magic Spr. z výsk. a invent. prác. na 13. TOPe: 8, 9, 1978) (6680a). – NR Javorinka, 49°18'53,99'' N, 19°8'27,49'' E (Pietorová 2010 BIOM) (6680d). – Lokca village, 49°22'32,93'' N, 19°22'50,05'' E (Rizman 2015 BIOM) (6682a). – Kubínska hoľa Mt., valley W from the cottage (Michalko 1954 SAV) (6781b). – Hrčova Kečka Mt., 49°14'42,38'' N, 19°10'46,42'' E (Vyšinský 2015 BIOM) (6781c). **29. Spišské vrchy Mts.:** Tatranská Javorina settlement, SE part of Chovancov vrch Mt., 960 m (Šomšák Biol. Práce 32/4:p. 103, tab. 9, 1986) (6786b). – SW from Repisko Mt., 950 m (6787a). – below Príslop Mt. (6787a). – Ždiar village, Belá brook, S from the spot height 1086, 830 m (all Šomšák Biol. Práce 32/4: 79, tab. 7, 1986) (6787b). – Pálenica Mt., near Belanské kúpele spa (Klášterský 1925 PR 292190) (6787d). – Pálenica Mt., 900 m (Šomšák Biol. Práce 32/4: 53, tab. 4, 1986) (6787d). – Ihla Mt. (Vraný 1885, 1887, BRA; Simonkai 1908 BP 165561) (6889b). – Jankovec Mt. (Greschik 1929 SLO) (6889b). – Kačky Mt., 1241 m (Greschik 1915 SLO) (6889d). **30b. Čergov Mts.:** Livovská Huta, spot height 1127,2, NE slope (Kliment Ochrana prírody 16: 110, 1998) (6791d). – between Majdan settlement and spot height Priehyba (822m) (6792d). – Drienica, 1,2 km SW from Lysá Mt., near the stream, 780 m (both Sofron Zbor. Východoslov. Múz., ser. AB, prír. vedy XVI: 66, 1975) (6892b). Carpaticum orientale. **31. Bukovské vrchy Mts.:** abbandoned village Ruské, NR Pľaša (Dostál Zborn. Východoslov. Múz. 20: 248, 1979) (68100c). – below the ridge of Pľaša Mt. (Dostál Zborn. Východoslov. Múz. 27: 34, 35, 1986) (68100c). – Pľaša Mt., 1070 – 1125 m (Hadač, Terray et al. Kvet. Bukov. vrchov: 127, 1991) (68100c). – spot height 1112 between Pľaša Mt. and Ďurkovec Mt. (Soják Preslia 31/3: 308, 1959; Soják 1962 PR 561265; Hadač, Terray et al. Kvet. Bukov. vrchov: 127, 1991) (68100c). – ridge between Pľaša Mt. and Ďurkovec Mt. (Hadač, Terray et al. Kvet. Bukov. vrchov: 127, 1991) (68100c-d). – Riaba skala Mt., 1130 – 1160 m (Hadač, Terray et al. Kvet. Bukov. vrchov: 127, 1991; Kliment, Jarolímek & Kochjarová Bull. Slov. Bot. Spoločn. 26: 140, 2004) (68100d). – upper rocky part of Riaba Skala Mt. (Soják Preslia 31/3: 308, 1959) (68100d). – meadow on Kýčera Mt., spot height 855 (Soják 1957 PR 561264; Soják Preslia 31/3: 308, 1959) (69101a). – near cabin below Kýčera Mt. (Hadač, Terray et al. Kvet. Bukov. Vrchov: 127, 1991) (69101a).

General data (not mapped)

15. Slovenské rudohorie Mts.: very rare species of Volovské vrchy Mts. (Mráz & Mikoláš Bull. Slov. Bot. Spoločn. 18: 166, 1996). **21b. Krivánska Malá Fatra Mts.:** Krivánska Malá Fatra Mts. (Bělohlávková & Fišerová Folia Geobot. Phytotax. 24/1:p. 6, tab. 1, 1989*).* **21c. Veľká Fatra Mts.:** Veľká Fatra Mts. (Bělohlávková & Fišerová Folia Geobot. Phytotax. 24/1: 6, tab. 1, 1989). **22. Nízke Tatry Mts.:** Nízke Tatry Mts. (Bělohlávková & Fišerová Folia Geobot. Phytotax. 24/1: 6, tab. 1, 1989*).* **23. Tatry Mts.:** Tatry Mts. (Borbás 1878 BP 731294; Faustusi 1888 PRC; Studnička 1888 PR; Hazslinszky s. dato BP 165560, 165572). **23b. Vysoké Tatry Mts.:** Vysoké Tatry Mts. (Greschik 1884 SLO; Ginzery 1904 BRA; Greschik 1910 SLO; s. coll. s. dato BRA). **23c. Belianske Tatry Mts.:** Belianske Tatry Mts. (Bělohlávková & Fišerová Folia Geobot. Phytotax. 24/1: 6, tab. 1, 1989). – Belianske Tatry Mts., in 2050 m (Domin Naše Tatry II: 131, 1931). – spruce forest in the valley, cca 1000 m (Domin Tatranská květena: 11, 1928). **24. Pieniny Mts.:** Pieniny Mts. (Domin 1920 PRC). **28. Západné Beskydy Mts.:** in fir-beech forest in flysch parts of Orava region (Vološčuk Acta Botanica Slovaca 4: 112, 1978). **29. Spišské vrchy Mts.:** in subalpine forests of Levoča (Greschik 1889 SLO). – on glades in subalpine forests of Levočsko – Ľubovnianske vrchy Mts. (Greschik 1894

BP 165513). – Spišská Magura Mts., below the ridge, cca 900 m (Hajdúk 1969 BRA). **30b. Čergov Mts.:** Čergov Mts., in cold valleys (Šomšák Biol. Práce 32/4: 126, 1986).

Plant material for cytometric analyses:

1. Central Slovakia, Stolické vrchy Mts., Stolica Mt., 48°46'40'' N, 20°12'48'' E, 5 July 2014, leg. Koprivý, KO 32196-32198 (3 accessions); 2. Central Slovakia, Stolické vrchy Mts., Kohút Mt., 48°44'33,6'' N, 20°11'21,9'' E, 21 July 2014, leg. Koprivý, KO 32202-32204 (3 accessions); 3. Central Slovakia, Stolické vrchy Mts., Malý Kohút Mt., 48°43'23,88'' N, 20°10'40,87'' E, 23 May 2015, leg. Koprivý, KO 32199-32201 (3 accessions); 4. Central Slovakia, Stolické vrchy Mts., Trsteník Mt., 48°51'31,7'' N, 20°14'23,7'' E, 24 May 2015, leg. Koprivý, KO 32193-32195 (3 accessions); 5. Central Slovakia, Slovenský raj Mts., Ondrejisko Mt., 48°51'9,8'' N, 20°15'16,8'' E, 24 May 2015, leg. Koprivý, KO 32190-32192 (3 accessions).

Seed material from natural populations:

1. Central Slovakia, Stolické vrchy Mts., Stolica Mt., 48°46'33,2'' N, 20°12'14,74'' E, 6 August 2015, leg. Koprivý (5 accessions); 2. Central Slovakia, Nízke Tatry Mts., Trangoška, 48°55'33,61'' N, 19°37'12,15'' E, 21 August 2015, leg. Koprivý (7 accessions); 3. Central Slovakia, Stolické vrchy Mts., Kohút Mt., 48°44'33,6'' N, 20°11'21,9'' E, 23 August 2015, leg. Koprivý (7 accessions).

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