Taxonomy of the *Rubus gothicus* group in south-eastern central Europe

Taxonomie okruhu *Rubus gothicus* v jihovýchodní části střední Evropy

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Rubus ser. *Subthyrsoidei* is a particularly intricate group within the sect. *Corylifolii* due to its phenologically and ecologically driven plasticity and variability. In the recent study we investigated the narrower-leaved biotypes of the series in south-eastern central Europe that represent a distinct entity often called "*Rubus gothicus* group". We recognized four stable biotypes (apomictic species) occurring in the area: (1) the north-central European *R. gothicus* s. str., which was rarely found in northern Bohemia; (2) a biotype from south-eastern Silesia that was shown to be conspecific with *R. subgothicus*, a here lectotypified, formerly overlooked species; (3) a new species from the southern part of the Czech Republic and northern Austria, *R. lobifolius*, which was included by earlier authors in *R. gothicus* s. str.; and (4) another new species, *R. scarbantinus*, which is common in the eastern foothills of the Alps. Flow cytometric measurements confirmed that all the here circumscribed species of the *R. gothicus* group are tetraploid. We provided a taxonomic and nomenclatural discussion, revised morphological description, ecological characteristics and distribution maps for the species studied.

Keywords: apomixis, cryptic species, distribution, nomenclature, *Rubus* sect. *Corylifolii*, taxonomy, typification

Introduction

Within the intricate genus *Rubus* L., the section *Corylifolii* Lindley represents a taxonomic "nightmare" with several unresolved questions in nomenclature, descriptive taxonomy, and evolutionary processes, due to existence of innumerous local morphotypes, and the phenologically and ecologically driven plasticity of recognized species (Weber 1973, 1995). Entities of this section were formed via hybridization of *R. caesius* L. (sect. *Caesii* Lej. et Court.) and biotypes of other groups of brambles (mainly sect. *Rubus*; Kurtto et al. 2010, Sochor et al. 2015). In the south-eastern part of central Europe (Austria, Czechia, and the Pannonian Basin), sect. *Corylifolii* is represented by eight series (see Kurtto et al. 2010), although their morphological delimitation is partly controversial.

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The *Rubus* ser. *Subthyrsoidei* (Focke) Focke comprises biotypes that probably originated via hybridization of ser. *Discolores* (P. J. Müller) Focke or ser. *Rhamnifolii* (Bab.) Focke, and *R. caesius* (Weber 1995). However, this series is not homogeneous, and it consists in the study area of two groups which differ both in morphology and ploidy level: pentaploid species with broad terminal leaflet close to *R. wahlbergii* A. Arrh. (incl. *R. wahlbergii* s. str., *R. grossus* H. E. Weber, *R. kuleszae* Ziel.), and tetraploids with narrow terminal leaflet (incl. *R. stohrii* H. E. Weber et Ranft, and the *R. gothicus* group); for remarks on ploidy see Krahulcová et al. (2013), Velebil et al. (2016), and Sochor et al. (2019).

Rubus gothicus Frid. et Gelert ex E. H. L. Krause is a north-central European species with some outposts reported from south-eastern central Europe (Weber 1995, Kurtto et al. 2010). Besides this species, the traditional German and Scandinavian batological approach treats another five species of northern distribution as representatives of the (morphology-based) *R. gothicus* group: *R. aureolus* Allander, *R. haesitans* Martensen et Walsemann, *R. lidforssii* (Gelert) Lange, *R. sprengeliusculus* (Frid. et Gelert) H. E. Weber, and *R. hylanderi* Martensen et A. Pedersen (Weber 1981, Martensen & Pedersen 1987, Pedersen & Martensen 1993).

During recent herbarium revisions and fieldwork on biotypes of the *Rubus gothicus* group in Czechia and northern Austria (that were treated as *R. gothicus* s. str., among others, by Holub 1995, Krahulcová & Holub 1998, Trávníček & Maurer 1998), we found a hitherto unexpected diversity. The observed individuals in this area represent beside *R. gothicus* s. str. two distinct biotypes that belong to previously overlooked species. In addition, we also discovered an additional distinct biotype south of the Danube river (far from the area ever given for the occurrence of the *R. gothicus*) that clearly falls into this morphological group. Therefore, the aims of our recent study are (i) to present a modern taxonomic and nomenclatural treatment for the unnoticed taxa of the *Rubus gothicus* group, (ii) to complement the distinctive features of the taxa circumscribed there, and (iii) to clarify their chorology in south-eastern central Europe.

Material and methods

Field studies and distribution data

The field study was carried out between 1994 and 2021 in the south-eastern part of central Europe: we visited more than 4000 localities with brambles in the Czech Republic (with adjacent parts of Polish Silesia, and northern Austria), furthermore in the Pannonian Basin (Hungary, Slovakia, with adjacent parts of southern Austria, Slovenia, Croatia, and Romania). For each locality, the geocoordinates and altitude were determined using a GPS handheld device in WGS84 projection. Nearby localities within 500 m were not considered unless they are situated in a different country or federal state. Terms used to describe range size are adopted from Weber (1996) and Weber in Kurtto et al. (2010). Distribution maps were compiled using ArcGIS software.

Herbarium studies

The following herbaria (see acronyms according to Thiers 2021) were searched for possible specimens of *R. gothicus* group in the area studied: BP, BPU, BR, BRA, BRNM, CB, DE, GJO, GZU, HOMP, JPU, LI, LJU, M, NI, OL, PECS, PR, PRA, PRC, SAMU, SAV, SLO, W, WRSL, WU, ZA, ZAHO, in addition, some specimens in private herbaria (collections of J. Čáp, P. Hrbáč, G. Király, P. Lepší, J. Velebil, and V. Žíla) were also examined. For selected names, we studied the designated type(s) or (when not yet typified) possible original material. Specimens of the *R. gothicus* group from the study area are listed in Electronic Appendix 1. The voucher specimens collected during recent studies (incl. specimens used for morphological investigations) were generally deposited in OL.

Morphological investigations

Morphological characterization of each taxon was based on the revision of at least 20 specimens in the herbaria listed above. Some characters (e.g. features of flowers) were studied on living plants growing in the field. First-year branches (primocanes) with well-developed leaves were typically examined together with intact inflorescences. Additional reference material for the comparative study of similar species was obtained from the herbaria listed above. When preparing the descriptions, we applied the term "stalked gland" for glands with a stalk at least 0.2 mm long; shorter stalked glands were classified as "subsessile".

DNA ploidy level estimation

The DNA ploidy level was assessed based on the relative fluorescence of stained nuclei, as determined by flow cytometric measurements of fresh leaves using a BD Accuri C6 (BD Biosciences, Franklin Lakes, NJ, USA) or a Partec PAS (Sysmex Partec, Görlitz, Germany) flow cytometer. Fresh leaves were preserved in moist paper napkins in plastic bags, and measurements were conducted at the Department of Botany, Palacký University in Olomouc, usually within seven days after collection. *Solanum pseudocapsicum* L. (2C=2.59 pg; Temsch et al. 2010), *Glycine max* (L.) Merr. 'Polanka' (2C =2.5 pg; Doležel et al. 1994) or *Zea mays* L. 'CE-777' (2C =5.43 pg; Lysák & Doležel 1998) were used as internal standard and staining was performed with propidium iodide. BD Accuri C6 (BD Biosciences) or FlowMax (Sysmex Partec) software was used to calculate the peak positions and coefficients of variation (CVs). For more details on the methods used, see Sochor & Trávníček (2016) and Sochor et al. (2019).

Results and discussion

We recognized four stable biotypes of the *Rubus gothicus* group in south-eastern central Europe, which differ in significant morphological features (see Table 1). The north European "true" *R. gothicus* (s. str.) was found only at few localities in northeastern Bohemia (Czech Republic), and in adjacent Polish Silesia (for the distribution in Poland outside of the area studied see Zieliński 2004). We showed that a second biotype is conspecific with *R. subgothicus* Sprib., an overlooked species of the group, which was recognized in a restricted area of south-eastern Silesia. After a careful assessment of the original material

Table 1. – Distinctive features of the species of the *Rubus gothicus* group represented in south-eastern central Europe.

Features	*R. gothicus*	*R. subgothicus*	*R. lobifolius*	*R. scarbantinus*
Number of stalked glands on first-year stem (per 5 cm of stem length)	1–10	(0–) 1–8	usually none	(0–)5–20(–40)
Sessile or subsessile glands on first-year stem	usually none	usually none	scattered to numerous	scattered when young
Number of prickles on first-year stem (per 5 cm of stem length)	5–10 (–15)	2–8 (–12)	2–8 (–10)	(2–) 4–12 (–16)
Width of the base of prickles on first-year stem (mm)	3–4 (–6)	2.5–4 (–5)	3–5 (–6)	2–3 (–4)
Ratio (%) of length of petiolule and lamina of terminal leaflets	28–38	22–32	28–39	25–35
Indumentum of leaves on first-year stem beneath	indistinctly hairy to the touch	distinctly hairy to the touch	distinctly hairy to the touch	distinctly hairy to the touch
Arrangement of leaflets	digitate to indistinctly pedate	pedate	digitate to indistinctly pedate	digitate to indistinctly pedate
Number of stalked glands per 1 cm length of the inflorescence axis	0–5 (–10)	0–2 (–4)	usually none	10–50
Number of prickles on the pedicel	3–7	(0–) 1–4	0–4	1–3 (–5)
Density of sessile and subsessile glands on the pedicel	usually none	scattered	numerous	scattered
Number of stalked glands on the pedicel	(0–) 1–10	(0–) 1–6	0–4	10–80
Colour of petals	white or a touch of pink	white to pink	white	white
Length of petals (mm)	(8–) 10–13	(7–) 8–12	8–12	12–15 (–18)

of this name, we lectotypified it with a specimen from WRSL. For the remaining two widespread biotypes, we could not find any older validly published names, therefore we describe them as new species. Various authors erroneously included *R. lobifolius* that occurs in southern Bohemia, Moravia, and northern Austria in *R. gothicus* s. str. Although *R. scarbantinus* is one of the commonest brambles on the eastern foreground of the Alps, its presence as a distinct biotype has never been recognized earlier. Flow cytometric measurements confirmed that all the here circumscribed four species of the *R. gothicus* group are tetraploid.

Synopsis of the *Rubus gothicus* group in south-eastern central Europe

Rubus gothicus Frid. et Gelert, Bot. Tidsskr. 16: 134, 1888

Type (designated by Weber 1981: 135): "Als. Mellem Sönderborg og Sönderskov" (O. Gelert, 3 VIII 1882, C 10021218! lectotype – see a remark below!) (Electronic Appendix 2)

Synonymy: Weber 1981: 135, Kurtto et al. 2010: 272.

Illustrations: Weber 1973: 350–351, 479, Stohr 1984: 54 (Tafel XI), Weber 1981: 137, Martensen & Pedersen 1987: 260, Pedersen & Schou 1989: 138, Weber 1995: 549, Zieliński 2004: 253–254, Henker & Kiesewetter 2009: 199.

Distribution maps: Weber 1995: 550, Kurtto et al. 2010: 272 (total range); for certain regions see e.g. Martensen et al. 1983: 120, Martensen & Pedersen 1987: 263, Pedersen & Schou 1989: 188, Weber 1990: 249, Pedersen et al. 1999: 101, Zieliński 2004: 255, Henker & Kiesewetter 2009: 198.

Morphology (Fig. 1, Table 1, Electronic Appendix 3)

Shrub, usually up to 80 cm tall. First-year stems low-arching or procumbent, terete to bluntly angled, 3–5 (–7) mm in diameter; sides flat, greenish or distinctly purplish when exposed to the sun, usually not pruinose, almost glabrous or with few (up to 5 per cm of stem side) simple hairs, with several (usually 1–10 per 5 cm of stem length) stalked glands 0.2–0.5 mm long, sessile or subsessile glands usually absent. Prickles green-yellowish or purplish, almost glabrous, nearly equal, 5–10 (–15) per 5 cm length of stem, situated usually on angles, patent or slightly declining, straight (exceptionally a bit curved), slender, 3–5 mm long, abruptly tapering from a 3–4 (–6) mm broad base; acicles absent or few.

Leaves usually 5-foliolate, digitate or indistinctly pedate. Lamina dull or slightly glossy, with 0–10 adpressed thin hairs per 1 cm^2 above (particularly close to and on leaf margin, sometimes also with few subsessile glands); green to greyish green and slightly hairy to the touch (with tufted hairs) beneath. Blade of the terminal leaflets usually ovate, 6–11 cm long, rounded or shallowly cordate at the base, ± abruptly narrowed into a 15–20 mm long apex; petiolule 28–38% as long as its lamina. Basal leaflets narrowly ovate or ovate, distinctly shorter than the leaf's petiole, sessile or with petiolules up to 3 mm long. Indentation indistinctly to distinctly periodically (doubly) serrate, mainly with incisions 2.0–4.0 (–5.0) mm deep, main teeth straight, as broad or broader as long, with a short, narrow apex. Petioles with ± patent simple hairs and few stalked glands, and with 7–15 slightly to distinctly curved, 1.5–2.5 mm long prickles. Stipules narrow, linear-lanceolate, usually ca. 1 mm broad, with scattered longer hairs, and stalked glands up to 0.3 mm long.

Inflorescence usually 10–20 cm long, narrowly conical, rounded at the apex, typically with erect lateral branches up to 5 (–8) cm long, mainly with 3-foliolate leaves (uppermost leaf rarely simple), basal leaflets at times lobed; distal (0–) 4–8 (–10) cm long part of the inflorescence leafless. Upper leaves of the inflorescence usually more densely hairy beneath than those of the first-year stem. Inflorescence axis sparsely to densely hairy with shorter stellate and longer tufted hairs, and with 0–5 (–10) stalked glands (0.2–0.5 mm long) per 1 cm of axis length. Prickles 4–10 per 5 cm length of axis, yellow or yellowish-violet, slightly declining, usually slightly curved, rather slender, 2.0–4.0 mm long. Inflorescence branches mostly 1–3-flowered. Pedicels 10–20 (–30) mm long, quite densely hairy, with (0–) 1–10 stalked glands ca. 0.2 mm long, and with 3–7 yellowish, slightly curved, up to 2 mm long prickles; bracts hairy, with few stalked glands. Sepals patent or reflexed after anthesis, 4–8 mm long, green-grey-felted, with short glands on the back, pricklets usually absent, apex often abruptly narrowed. Petals pure or pinkish white, (8–) 10–13 mm long, usually touching each other, broadly obovate to suborbicular, rounded or slightly emarginate at the apex. Stamens longer than the yellowish green or slightly pinkish styles; anthers glabrous, yellowish white; filaments white. Carpels glabrous or very sparsely hairy; receptacle usually with long hairs. Flowering VI–VII.

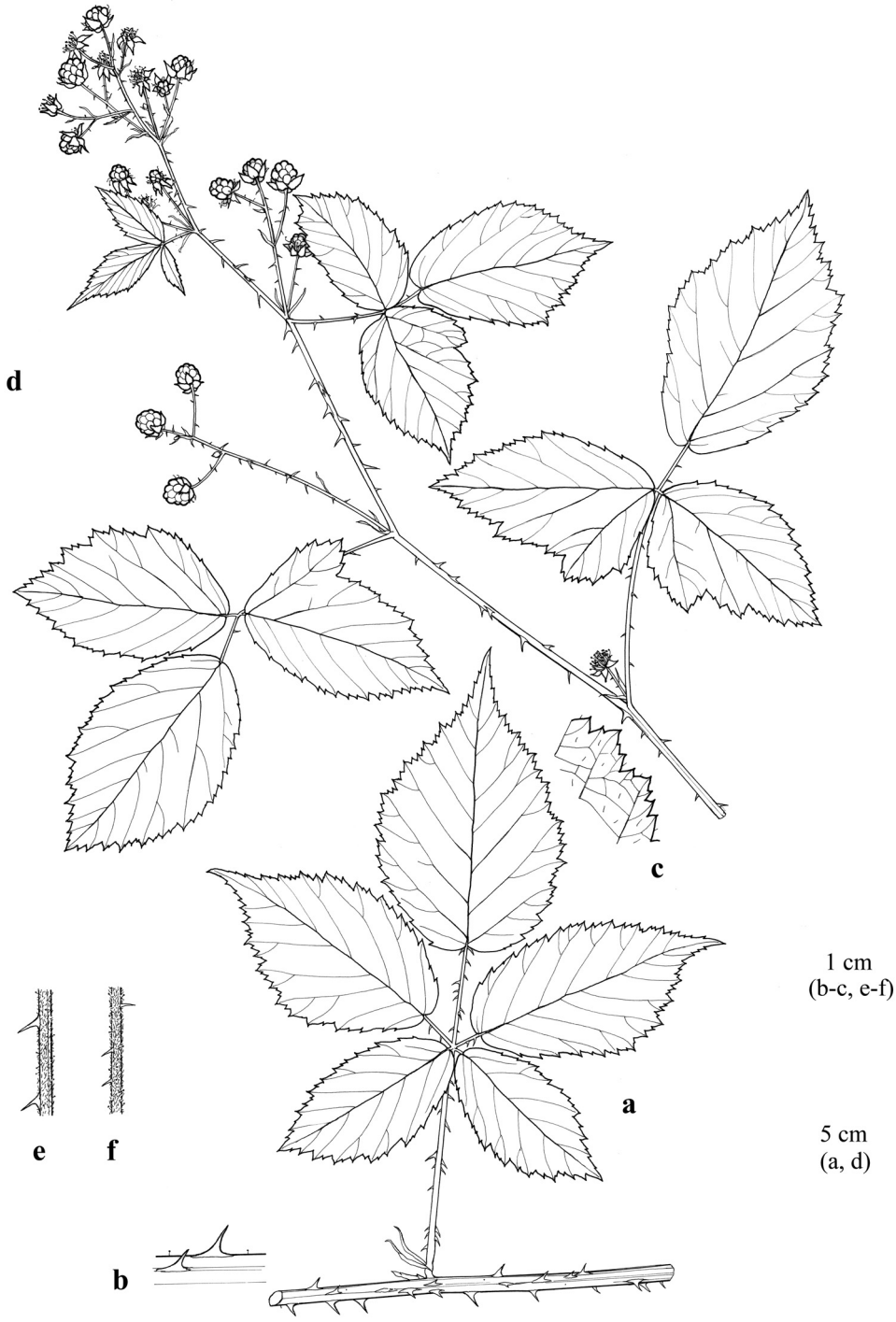

Fig. 1. – *Rubus gothicus*: a – first-year stem with a leaf, b – detail of first-year stem, c – margin of terminal leaflet, d – infructescence, e – inflorescence axis, f – peduncle. Del. A. Skoumalová.

Chromosome number 2n = 28 (4x): Krahulcová & Holub 1998 (Czech Republic: Býchory). DNA ploidy level 2n = 4x; approximate genome size 1.59–1.63 pg with *Glycine max* as a standard – Czech Republic: Březhrad (Trávníček R289/13, OL), Staré Ždánice (Trávníček R290/13, OL), Lázně Bohdaneč (Trávníček R328/13, OL).

Nomenclatural and taxonomic remarks

Weber (1981) considered *Rubus gothicus* Frid. et Gelert (Friderichsen & Gelert 1888) invalid under Art. 33.4 of the Leningrad Code (37.6 of the Shenzen Code), and he deemed *R. gothicus* Frid. et Gelert ex E. H. L. Krause (1888) as the first valid publication. However, we believe this decision of Weber (as an extreme interpretation of Art. 37.6) was incorrect, and we consider the name *R. gothicus* Frid. et Gelert valid. The specimen chosen by Weber (1981) as a neotype for the (superfluous) name of Krause is from the original material of *R. gothicus* Frid. et Gelert, however, its status is to be corrected as an error (under Art. 9.10) to lectotype.

Rubus gothicus is a type species of the series *Subthyrsoidei* (Weber 1981). It differs from *R. scarbantinus* in having stronger prickles on the first-year stem, the often pinkish (not white) petals, and the lower number of stalked glands both on the inflorescence axis and the pedicels. *Rubus gothicus* is well distinguishable both from *R. lobifolius* and *R. subgothicus* based on the arrangement of the leaflets, and the lack of the sessile and subsessile glands on the first-year stem. For a detailed comparison of the features, see Table 1, and the taxonomic notes on other species included in the present study.

Distribution and ecology

Rubus gothicus is a widely distributed northern central European species (Weber 1995, Kurtto et al. 2010). In the area studied, we only confirm its occurrence in northern Bohemia and the adjacent part of southern Poland. The occurrence of the species in Bohemia (Fig. 2) is obviously connected to the southern edge of the main range (cf. Kurtto et al. 2010). On the other hand, based on recent herbarium revisions (see Electronic Appendix 1), occurrences of *R. gothicus* reported from southern Bohemia, Moravia, and northern Austria (Holub 1995, Krahulcová & Holub 1998, Trávníček & Maurer 1998, Kurtto et al. 2010) predominantly belong to *R. lobifolius* (see its description below), or to local biotypes of no taxonomic value. *Rubus gothicus* was also reported from Slovakia by Weber (1981) based on a Holuby's specimen kept in M. However, this specimen belongs to a probably local morphotype (represented by further collections of Holuby i.e. in BP) that is not identical with *R. gothicus*, therefore we cannot confirm the occurrence of this species in Slovakia.

The elevation of revised localities of *Rubus gothicus* s. str. in Bohemia (and adjacent Poland) ranges from 200 to 500 m a.s.l. In terms of the grid system of Atlas Florae Europaeae (AFE, see Kurtto et al. 2010), its revised Bohemian occurrences belong to the following grid units: 33UVS4, 33UWR1, 33UWR2, 33UWR3, 33UWR4. The species grows in the studied area (and after Weber 1995 and Zieliński 2004 also in the main range) in thickets along roads and forest fringes, on semi-dry to mesic, sandy to loamy, neutral to weakly acidic, nutrient-rich soils.

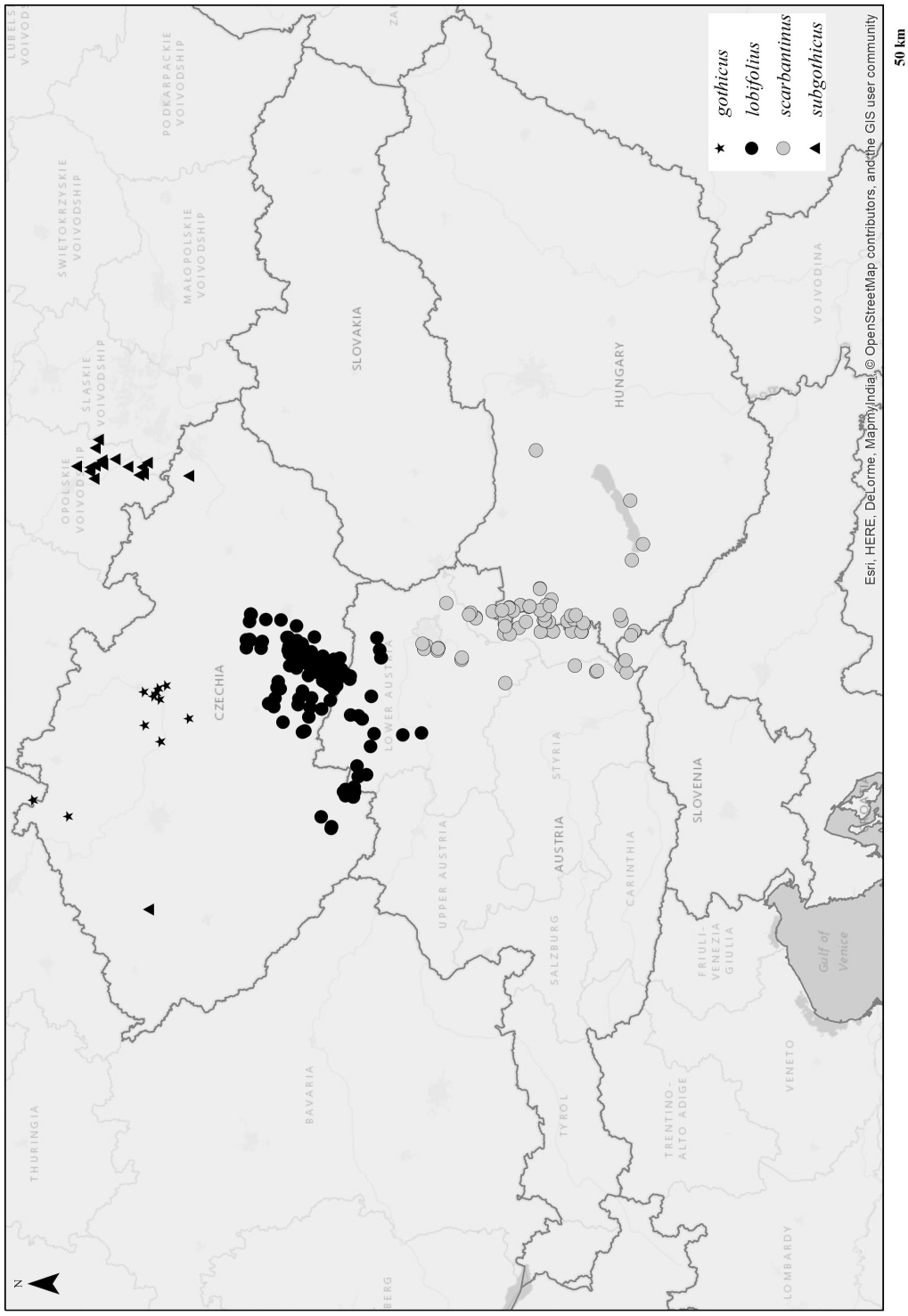

Fig. 2. – Distribution of the species of *Rubus gothicus* group in south-eastern central Europe on the basis of localities supported by herbarium vouchers. For *R. gothicus*, occurrences from Germany and Poland are excluded, and only revised localities in the Czech Republic are drawn.

Rubus subgothicus Sprib., Jahresb. Schl. Ges. Vaterl. Cult. 83: 109, ("1905") 1906 ("*subgothicus*")

Loc. typ. cit.: "Sie ist besonders im Kreise Groß-Strehlitz verbreitet, kommt aber wohl auch in den benachbarten Kreisen, wie z. B. Kreise Kosel, vor". **Lectotype (designated here)**: "Kosel: Radoschauer Wald" (F. Spribille, 7 VIII 1905, WRSL: WR SS 065046) (Electronic Appendix 2)
Illustrations: not known.

Description (Fig. 3, Table 1, Electronic Appendix 3)

Shrub, usually up to 80 cm tall. First-year stems low-arching or procumbent, terete to bluntly angled, 3–5 (–7) mm in diameter; sides usually flat, greenish or distinctly purplish when exposed to the sun, slightly to distinctly pruinose, almost glabrous or up to 5 simple or tufted long hairs per 1 cm of stem side, and usually with 1–8 stalked glands (0.2–0.5 mm long) per 5 cm of stem length, sessile or subsessile glands usually absent. Prickles yellowish green or purplish, almost glabrous, nearly equal, 2–8 (–12) per 5 cm of stem length, most often on angles, patent or slightly declining, straight or slightly curved, 2.5–4 mm long, ± abruptly tapering from a 2.5–4 (–5) mm broad base; acicles absent or few.

Leaves usually 5-foliolate, pedate. Lamina dull, with 0–3 adpressed thin hairs per 1 cm^2 above (particularly close to and on leaf margin, sometimes also with few subsessile glands); grey to greyish green and distinctly hairy to the touch (with tufted hairs) beneath. Blade of the terminal leaflet usually broadly ovate (sometimes almost orbicular), 6–11 cm long, rounded or shallowly cordate at the base, ± abruptly narrowed into an 8–15 mm long apex; petiolule 22–32% as long as its lamina. Basal leaflets oblong to obovate, shorter as the petiole of the leaf, sessile or with petiolules up to 1 mm long. Indentation indistinctly to distinctly periodically (doubly) serrate (the lamina is sometimes lobed), mainly with incisions 2.0–4.0 mm deep, main teeth straight, usually broad, with a short, narrow apex. Petioles with ± patent long simple hairs, usually with few subsessile and sometimes also with few stalked glands, and with 6–12 slightly to distinctly curved, 1.5–2.5 mm long prickles. Stipules linear-lanceolate, 1–2 mm broad, with scattered long hairs, and stalked glands up to 0.3 mm long.

Inflorescence 10–20 (–30) cm long, conical, usually rounded at the apex with erect (or in the upper part almost patent) lateral branches up to 5 (–10) cm long, mainly with 3-foliolate leaves (the uppermost leaf sometimes simple); distal (0–) 3–7 (–10) cm long part of the inflorescence leafless. Upper leaves of the inflorescence usually densely hairy beneath, with stellate and longer tufted hairs. Inflorescence axis sparsely to densely hairy with stellate and long tufted hairs, with 0–2 (–4) stalked glands (0.2–0.5 mm long, shorter than hairs) per 1 cm of axis length, at times also with few subsessile glands. Prickles 4–8 per 5 cm length of axis, yellow or yellowish violet, slightly declining or almost patent, rather slender, straight or slightly curved, 2.0–3.5 mm long. Inflorescence branches mostly 1–3-flowered. Pedicels 10–20 (–30) mm long, densely hairy, with (0–) 1–6 stalked glands and scattered subsessile glands, and with (0–) 1–4 yellowish, straight or slightly curved, up to 2 mm long prickles; bracts hairy, sometimes with few stalked glands. Sepals patent or reflexed after anthesis, 4–7 mm long, usually with an abrupt short apex, grey to whitish green felted, with subsessile and stalked glands on the back, pricklets usually absent. Petals white or slightly pinkish to pink, (7–) 8–12 mm long, touching each other,

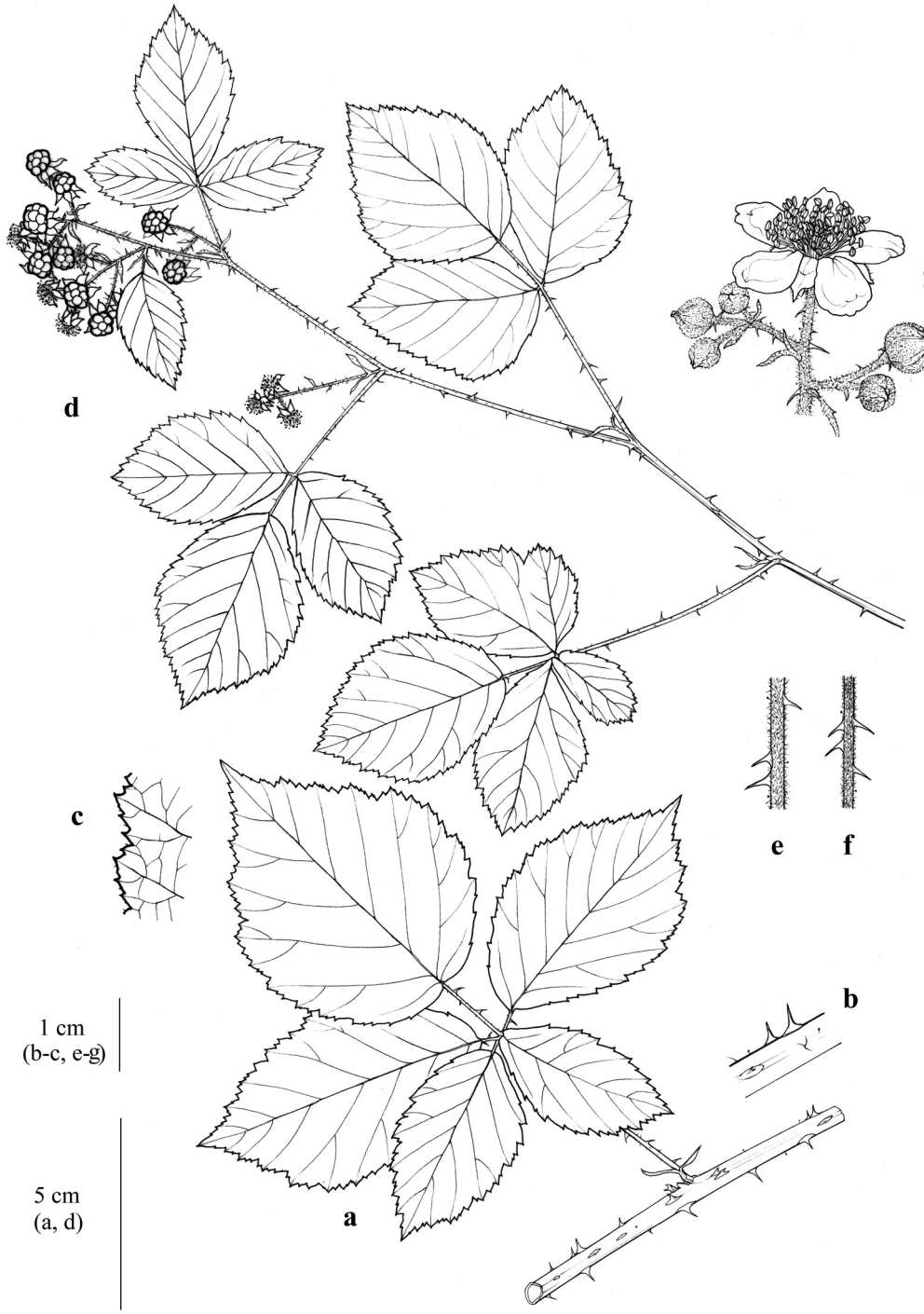

Fig. 3. – *Rubus subgothicus*: a – first-year stem with a leaf, b – detail of first-year stem, c – margin of terminal leaflet, d – infructescence, e – inflorescence axis, f – peduncle, g – part of the inflorescence.
Del. A. Skoumalová.

broadly obovate to suborbicular, rounded or slightly emarginate at the apex. Stamens as long as or slightly longer than the yellowish green or slightly pinkish styles; anthers glabrous, yellowish white to pinkish; filaments white to pinkish. Carpels glabrous or very sparsely hairy; receptacle without or with few long hairs. Flowering VI–VII.

Chromosome number: not yet reported. DNA ploidy level 2n = 4x; approximate genome size 1.41 and 1.43 pg with *Solanum pseudocapsicum* as a standard – Czech Republic: Hrabyně (Trávníček R105/19, OL); Poland: Kamień Śląski (Trávníček R167/19, OL).

Taxonomic remarks

Rubus subgothicus differs from *R. gothicus* by the relatively short apex of terminal leaflets (which also have somewhat shorter petiolules), the more densely hairy leaves beneath, and the distinctly pedate leaves on first-year stems (see Table 1). *Rubus lobifolius* usually lacks stalked glands on the stem, the inflorescence axis, and the pedicels. *Rubus scarbantinus* normally has digitate leaves, and significantly more stalked glands on the pedicels and inflorescence axis. Another similar taxon is *R. lidforssii* Gelert, a species extending to central Poland (Zieliński 2004), that can be distinguished from *R. subgothicus* by the lack of stalked glands on the first-year stem and inflorescence axis, the relatively long (10–20 mm) apex of terminal leaflets, and the pure white petals.

Distribution and ecology

Spribille (1906) described *Rubus subgothicus* from Polish Silesia in an area of about 40 km in diameter, that is why it probably was omitted as a local type in the treatment of the Polish *Rubus* flora (Zieliński 2004). This area has been widened by recent studies (e.g. with two neighbouring localities in Czech Silesia near Hrabyně), and, according to current knowledge, it is a regional species with the longest axis of range of about 85 km (Fig. 2). Besides the Silesian "core" area, the species was found (maybe synanthropic?) at a remote site in western Bohemia (Podbořanská kotlina Basin). The known localities range from 200 to 370 m a.s.l. In terms of the grid system of AFE it is present in the following units: 33UUR3, 33UYR2, 34UCA1, 34UCB2.

Rubus subgothicus grows in thickets, most often along paths and roads, in semi-ruderal places, on forest margins, sometimes also in forest clearings and openings, especially in mixed or coniferous woods. It is found on moderately wet to semi-dry, slightly acidic to neutral soils, moderately rich in mineral nutrients or sometimes slightly eutrophic.

***Rubus lobifolius* Trávn. et Király, spec. nova**

Holotype: Czech Republic, 68. Moravské podhůří Vysočiny, distr. Blansko, Obora village, forest margin at the road towards Bořitov village, 385 m s. m., 49°26'47"N, 16°35'40"E 6565da, 27 VI 2020, leg. B. Trávníček, OL 38008 (Electronic Appendix 2). Isotypes: BRNM 828662, OL 38043 – OL 38055, PR 973717 – PR 973720, WU.
– *R. gothicus* auct. non Frid. et Gelert: Holub 1995: 190 (pro max. parte); Krahulcová & Holub 1998: 48 (pro max. parte); Trávníček & Maurer 1998: 89; Trávníček & Havlíček 2002: 375; Danner & Fischer 2008: 516.

– *R. austrogothicus* Trávn. nom. invalid. in schedis, *R. subgothicus* Trávn. nom. invalid. in schedis (non *R. subgothicus* Sprib.!)

Illustration: Holub 1995: 191 (as "*R. gothicus*").

Description (Fig. 4, Table 1, Electronic Appendix 3)

Shrub, usually up to 80 cm tall. First-year stems low-arching or procumbent, terete to bluntly angled, 3–5 (–7) mm in diameter; sides flat, greenish or distinctly purplish when exposed to the sun, usually slightly pruinose, glabrous (very rarely with few short, tufted hairs), with scattered sessile to subsessile glands (1–15 per 1 cm of stem side), stalked glands (longer than 0.2 mm) usually absent. Prickles yellowish green or purplish, glabrous, nearly equal, 2–8 (–10) per 5 cm of stem length, situated usually on angles, declining, straight (rarely a bit curved), 3–4 (–5) mm long, abruptly tapering from a 3–5 (–6) mm broad base; acicles absent.

Leaves usually 5-foliolate (or rarely 6–7-foliolate if the terminal leaflet divided into 2–3 segments), indistinctly to distinctly pedate. Lamina dull, with 0–3 adpressed thin hairs per 1 cm^2 above (particularly close to and on leaf margin, often also with scattered sessile to subsessile glands), usually grey green pubescent (with tufted hairs) and distinctly hairy to the touch beneath. Blade of the terminal leaflet usually ovate to broadly ovate, 6–11 cm long, rounded or indistinctly cordate at the base, abruptly or gradually narrowed into a 10–15 mm long apex, sometimes shallowly to deeply lobed; petiolule 28–39% as long as its lamina. Basal leaflets oblong or oblong-obovate, usually shorter than the leaf's petiole, sessile or with petiolules up to 2 mm long. Indentation distinctly periodically (doubly) serrate, with incisions 2.0–5.0 (–6.0) mm deep, main teeth straight, broad, with short narrow apex. Petioles sparsely hairy with ± patent simple hairs, and scattered sessile to subsessile glands, and with 7–13 slightly to distinctly curved, 1.5–2.0 (–2.5) mm long prickles. Stipules narrow, linear-lanceolate, 1–2 mm broad, with scattered hairs and with subsessile (rarely with few stalked) glands.

Inflorescence 10–20 (–30) cm long, narrowly conical, usually rounded at the apex with erect lateral branches up to 5 (–8) cm long, mainly with 3-foliolate leaves (the uppermost one usually simple, the lower ones rarely 4–5-foliolate), basal leaflets of lower leaves sometimes lobed; distal (0–) 2–6 (–10) cm long part of the inflorescence leafless. Upper leaves of the inflorescence usually more densely (greyish) hairy beneath than those of the first-year stem. Inflorescence axis sparsely to densely hairy with stellate and longer tufted hairs, with 10–25 sessile to subsessile glands per 1 cm of axis length, stalked glands usually absent. Prickles 3–8 per 5 cm of axis length, yellow or yellowish violet, declining, rather slender, slightly curved or almost straight, 2.0–3.5 (–4.0) mm long. Inflorescence branches mostly 1–3-flowered. Pedicels 10–20 (–30) mm long, densely (whitish grey) hairy, with 50–200 sessile to subsessile glands (stalked glands usually absent), and with 0–4 yellowish, straight or slightly curved prickles up to 2 mm long; bracts hairy, with subsessile (and sometimes few stalked) glands. Sepals reflexed after anthesis, 4–7 mm long, usually with a short, abruptly narrowed apex, whitish grey felted, with sessile to subsessile glands on the back, pricklets usually absent. Petals white, 8–12 mm long, usually not touching each other, broadly obovate, ± rounded at the apex (sometimes slightly emarginate). Stamens slightly longer than the yellowish green styles; anthers glabrous, yellowish white; filaments white. Carpels glabrous or very sparsely hairy; receptacle glabrous or with few long hairs. Flowering VI–VII.

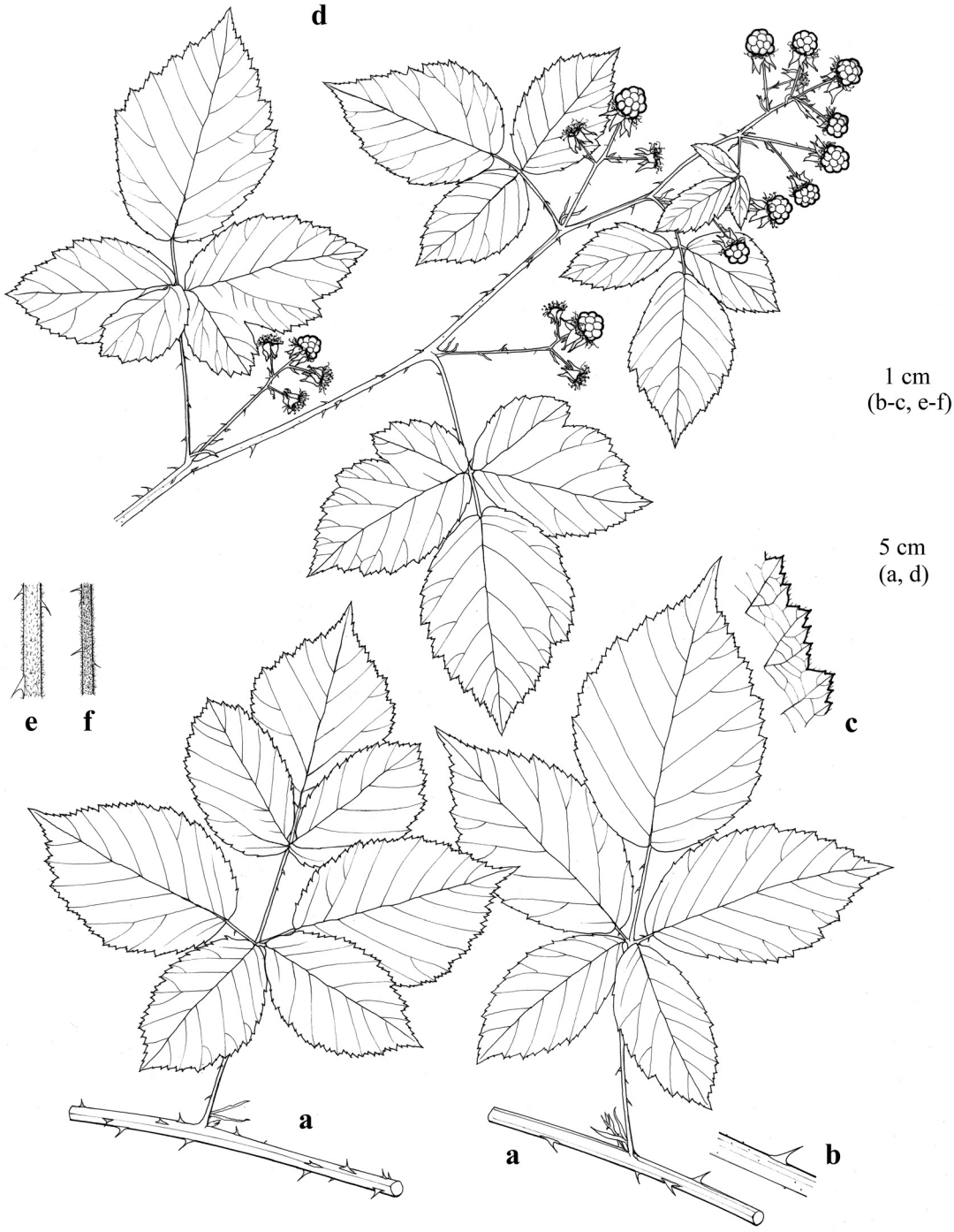

Fig. 4. – *Rubus lobifolius*: a – first-year stem with a leaf, b – detail of first-year stem, c – margin of terminal leaflet, d – infructescence, e – inflorescence axis, f – peduncle. Del. A. Skoumalová.

Chromosome number 2n = 28 (4x): Krahulcová & Holub 1998, as "*R. gothicus*" (Czech Republic: Popice, Slavětice, Ketkovice; specimens collected by J. Holub, PRA).

Etymology

The name of *Rubus lobifolius* is derived from a morphological feature of this species: the terminal leaflet of the leaf on the first-year stem is often lobed.

Taxonomic remarks

Rubus lobifolius has, compared to *R. gothicus*, several sessile or subsessile glands on the first-year stem. In addition, the apex of terminal leaflets on the first-year stem is shorter, and the leaves are more densely hairy beneath than in the latter species. *Rubus lobifolius* can be distinguished from *R. subgothicus* and *R. scabrantinus* by the lack of stalked glands on the first-year stem and inflorescence axis, and the proportionally somewhat longer petiolule of terminal leaflets (Table 1). *Rubus lobifolius* was reported from south-western Moravia and adjacent part of Austria (Weber 1981, Holub 1995, Krahulcová & Holub 1998, Trávníček & Maurer 1998) under the name "*R. gothicus*". However, already Trávníček & Maurer (1998) mentioned that Austrian and Moravian "*R. gothicus*" is different from the plant occurring in northern Bohemia (which was shown by the recent study to be identical with *R. gothicus* s. str.).

Distribution and ecology

Rubus lobifolius belongs to the bramble species of regional distribution; the longest axis of its range is about 160 km (Fig. 2). Most of the localities lie in the Czech Republic, where it has a compact area in south-western Moravia and south-eastern Bohemia; furthermore, it is scattered north of the Danube in Lower Austria. The known localities range from 200 to 780 m a.s.l. In terms of the grid system of AFE, it is present in the following units: 33UVP3, 33UVQ4, 33UWP1, 33UWP2, 33UWP3, 33UWQ1, 33UWQ2, 33UWQ3, 33UWQ4, 33UXQ1, 33UXQ2.

Rubus lobifolius grows in thickets at roads, fringes, clearings and openings of coniferous plantations and mixed forests, usually in open or semi-shady places. It is usually found on permeable, semi-dry to humid soils, which are neutral to slightly acidic.

***Rubus scarbantinus* Király et Trávn., spec. nova**

Holotype: Hungary, Győr-Moson-Sopron County, Sopron, Hidegvíz Valley, 0.3 km W-NW of the ruined "Népfőiskola", 392 m s. m., 47°40'26"N, 16°28'03"E 8364bd, 7 VI 2020, leg. G. Király, OL 38010 (Electronic Appendix 2). Isotypes: WU 0120285, WU 0120286, W 0102235.

Description (Fig. 5, Table 1, Electronic Appendix 3)

Shrub, usually up to 100 (–150) cm tall. First-year stems low-arching or procumbent, bluntly angled, 3–5 (–7) mm in diameter; sides flat, greenish or slightly purplish when exposed to the sun, glabrous (rarely with very few simple hairs), with several sessile glands when young. Stalked glands and (few) acicles 0.2–0.7 mm long, (0–) 5–20 (–40)

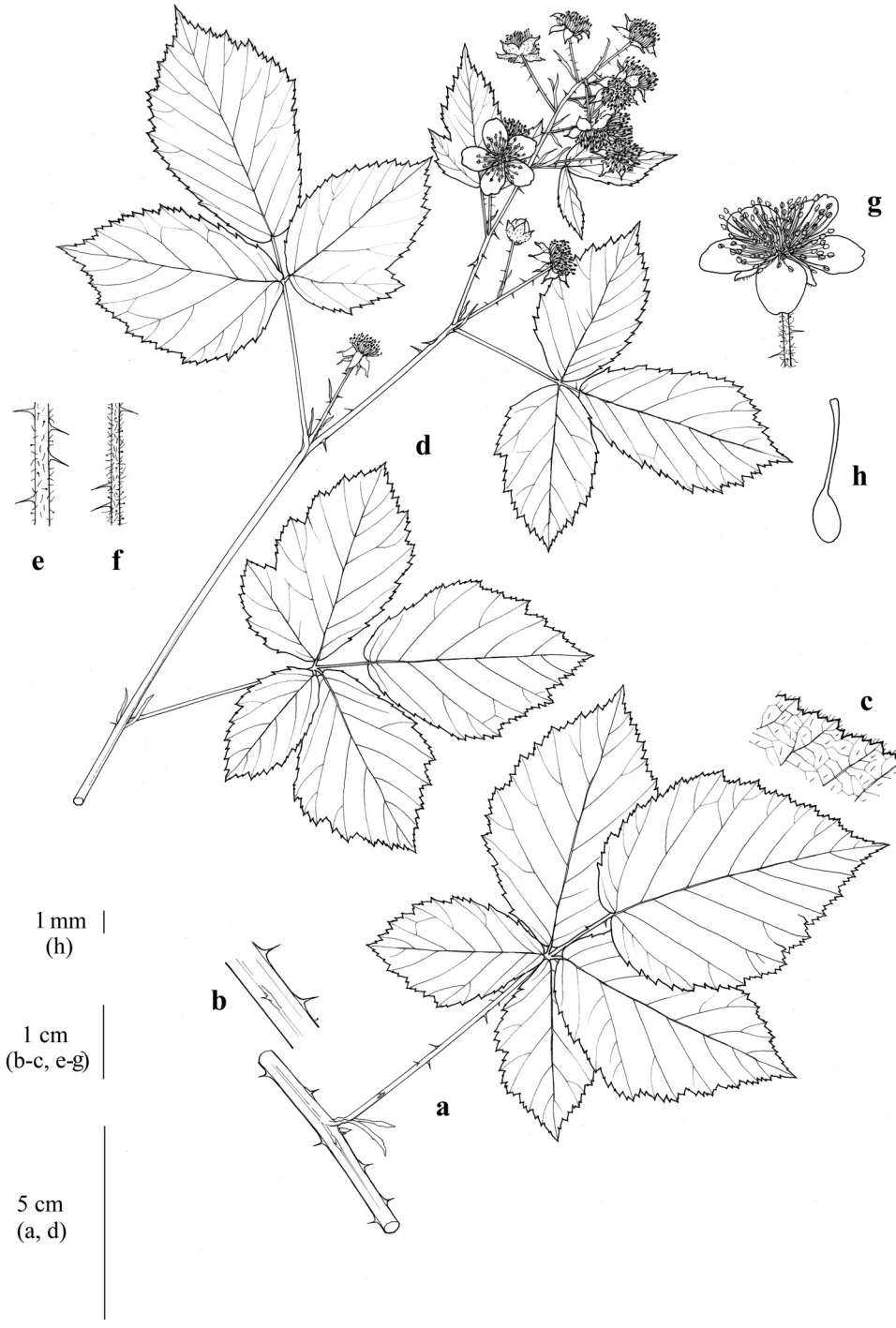

Fig. 5. – *Rubus scarbantinus*: a – first-year stem with a leaf, b – detail of first-year stem, c – margin of terminal leaflet, d – inflorescence, e – inflorescence axis, f – peduncle, g – flower, h – carpel. Del. A. Skoumalová.

per 5 cm length of stem side. Prickles nearly equal, yellowish or purplish, (2–) 4–12 (–16) per 5 cm of stem length, glabrous, usually on angles, patent or slightly declining, straight (exceptionally slightly curved), slender, 3–4 (–5) mm long (normally shorter than the stem diameter), abruptly tapering from a 2–3 (–4) mm broad base.

Leaves usually 5-foliolate, digitate (or rarely indistinctly pedate), venation rather strong, veins ± depressed into the leaf's upper surface. Lamina dull, often slightly flaccid when older, light green, ± hairy to the touch above when young (but often losing the hairs later), with 30–200 appressed, 0.1–0.4 mm long thin hairs per 1 cm^2, and with 0.2–0.4 mm long hairs on the leaf margin. Leaves light to greyish green and softly hairy to the touch beneath, with many 0.2–0.5 mm long appressed or erect hairs on veins, and with fewer similar hairs not covering the entire surface among veins. Blade of the terminal leaflet ovate to broadly obovate, 7–11 cm long, rounded or shallowly cordate at the base, gradually narrowed into a 10–15 (–20) mm long apex; petiolule 20–35 mm long (25–35% as long as its lamina). Basal leaflets narrowly ovate or ovate, 0.6–0.9 (–1.0)× as long as the petiole, sessile or with petiolules up to 2 mm long. Indentation distinctly doubly serrate, with incisions 1.5–4 (–6) mm deep (rarely with deeper irregular incisions or even lobes), teeth ± as long as broad, with short, narrow apex. Petioles with few erect, simple hairs and subsessile and stalked glands, and with (5–) 8–15 slightly curved, 2–3 mm long slender prickles. Stipules narrowly lanceolate, 2–3 mm broad, with scattered hairs and stalked glands.

Inflorescence 10–15 (–20) cm long, few-flowered, loosely paniculate, usually rounded at the apex, with erect or patent lateral branches up to 5 cm long, with leaves 3-foliolate (basal leaflets often lobed); distal 5–10 (–15) cm long part of the inflorescence leafless. Inflorescence axis hairy with many appressed and fewer erect hairs up to 0.5 (–1) mm long, and with numerous stalked glands (10–50 per 1 cm of axis length) 0.2–0.4 (–0.6) mm long. Prickles 5–15 per 5 cm of axis length, yellow, slightly declining, rather slender, straight or very slightly curved, 1.5–4 mm long. Inflorescence branches mostly 1–2 (–3)-flowered. Pedicels 10–20 (–30) mm long, densely hairy, with 10–80 stalked glands, and with 1–3 (–5), yellowish, slender patent prickles 0.5–2 mm long; bracts hairy, with few shorter stalked glands. Sepals reflexed after anthesis, 5–8 mm long, with an abruptly narrowed apex, whitish-felted, with many sessile and few stalked glands on the back, pricklets absent. Petals white, 12–15 (–18) mm long, not (or just slightly) touching each other, broadly elliptic, rounded or slightly emarginate at apex. Stamens longer than the green styles, anthers glabrous, light green or yellowish (later brownish); filaments white. Carpels glabrous; receptacle hairy. Flowering (V–) VI–VII.

Chromosome number: not yet reported. DNA ploidy level 2n = 4x; approximate genome size 1.49 and 1.57 pg with *Zea mays* and *Glycine max* as standards, respectively – Hungary: Sopron (G. Király, OL), and Tömörd (herb. Király), see Sochor et al. (2019).

Taxonomic and nomenclatural remarks

Rubus scarbantinus differs clearly from all other species in this study by the higher number of stalked glands on the first-year stem, the inflorescence axis, and the pedicels, in addition, by the white petals usually longer than 12 mm (see also Table 1). Due to its relatively short and weak prickles, it shows some similarity with the ser. *Sepincoli* (Weihe ex Focke) E. H. L. Krause. *Rubus scarbantinus* is common in regions of intensive batological

research in the past. We found two names originating from the area studied, which cannot be separated from *R. scarbantinus* merely based on their protologues. However, we can show that they are not identical to *R. scarbantinus*:

Rubus grandifrons (Borbás ex Sabr.) Sabr. was described as a variety from the Little Carpathians (Slovakia) by Sabransky (1886) and was raised to species rank by Sabransky (1892). We do not know any original material for this name, but we found two specimens collected by Sabransky in 1890, which correspond to the protologue and represent a (presumably pentaploid) local biotype of ser. *Subthyrsoidei* that significantly differs from *R. scarbantinus* as having broader leaflets and stronger prickles. We therefore designate a neotype for this name as follows:

Rubus corylifolius var. *grandifrons* Borbás ex Sabr., Verh. K. K. Zool.-Bot. Ges. Wien 36: 96, 1886.

≡ *R. grandifrons* (Borbás ex Sabr.) Sabr., Oest. Bot. Zeitschr. 42: 172, 1892.
Loc. typ. cit.: [Kleine Karpathen]. **Neotype** (**designated here**): "Steiergrund bei Pressburg", VII 1890, H. Sabransky (WU 0125660, in herb. "Halácsy Europaeum"). Isoneotype: WU 0125661, in herb. "Halácsy Europaeum".

The name *Rubus semicinereus* Sabr. 1886: 96 is invalid (it was cited only in the synonymy of "*R. corylifolius* var. *tomentosa*"); therefore, the valid name based on this epithet is *R. semicinereus* Borbás 1887: 305. In accordance with Art. 40.3., Note 2, there are no obvious syntypes for the latter name because Borbás did not indicate specimens, but merely a handful of toponyms from the neighbourhood of Kőszeg, and he also referred to the invalid name "*R. semicinereus* Sabr." in Sabransky (1886), which is connected to plants growing near Bratislava (in those days: Pozsony / Pressburg). The original material is therefore composed of potential specimen(s) of Borbás from the neighbourhood of Kőszeg, or those of Sabransky collected in 1886 or earlier near Bratislava (if it can be shown that they had been investigated by Borbás prior to his publication).

There are two extant specimens from the original material: A specimen of Borbás from Kőszeg ("in montibus ad Günsium, WU, "Halácsy Europaeum", consisting of the apical part of a young primocane and a fragmented inflorescence), which is, however, taxonomically dubious. A second specimen (collected by Sabransky near Bratislava) had been determined in the handwriting of Borbás as follows: "*R. semicinereus* Borb. Flor. com. Castriferr. ined.", which underlines that Borbás had seen this specimen prior to describing *R. semicinereus* in 1887. This specimen consists of an inflorescence, and a fragment of a leaf. At least the inflorescence is typical for *R. mollis* J. Presl et C. Presl (ser. *Subcanescentes* H. E. Weber); therefore, it is recommended to choose this inflorescence as lectotype, because we hereby establish a solid taxonomic basis for the name *R. semicinereus* Borbás (as later heterotypic synonym of *R. mollis*):

Rubus semicinereus Borbás, Geogr. Enum. Pl. Comit. Castriferrei 305, 1887.

Lectotype (**designated here**): "Posonii, in Sylv. Steyergrund", 14 VII 1884, H. Sabransky (W, Acqu. Nr. 6885: inflorescence on the left side).
= *R. mollis* J. Presl et C. Presl, Delic. Prag. 218, 1822.

Etymology

The epithet "*scarbantinus*" refers to "Scarbantia", the ancient Roman name of Sopron (Hungary), where the species is especially frequent.

Distribution and ecology

Rubus scarbantinus is a bramble of regional distribution with a tendency to a wide distribution (the range is as broad as 180 km north-south and 200 km east-west). The centre of the range is the eastern foothills of the Alps in south-eastern Lower Austria and Burgenland in Austria, and west of the Fertőd – Sárvár – Zalalövő line in Hungary. In this area, the species is often abundant and dominant (especially around Sopron and Kőszeg towns in Hungary, and Leitha Mts in Austria). Outside of this "core" region isolated occurrences are recorded in the hills south of Lake Balaton and in the Vértes Mts (Central Hungary). The northernmost outposts are known in the Wienerwald Mts near Vienna, the southernmost ones in the Goričko region in northern Slovenia, and south-eastern Styria in Austria (Fig. 2). In terms of the grid system of AFE, it is present in the following units: 33TWM3, 33TWN3, 33TWN4, 33TXM1, 33TXM3, 33TXN1, 33TXN2, 33TYM1, 33TYN1, 33UXP2, 33UWP4, 34TCT1.

The species occurs in hilly regions and is rare above 500 m a.s.l. (the recorded localities range from 120 to 600 m). It is present on variable bedrocks from moderately acidic to quite alkaline types (also on limestone e.g. in the Leitha Mts) but missing on strongly acidic soils. It occurs both in forest fringes and inside the forests, preferring semi-dry to mesic stands with favourable light conditions, in various sessile or Turkey Oak-rich associations of *Carpinion betuli* and *Quercion petraeae* alliances, more rarely in *Fagion sylvaticae* forests, often also in degraded stands with black locust or conifers.

See www.preslia.cz for Electronic Appendices 1–3

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Souhrn

Rubus ser. *Subthyrsoidei* (sect. *Corylifolii*) je obzvláště záludná skupina ostružiníků kvůli fenologicky a ekologicky modulované plasticitě a variabilitě. Předložená studie je zaměřena na biotypy této série z jihovýchodu střední Evropy zahrnované pod neformální souhrnné jméno *R. gothicus* agg. Ve studovaném regionu (Panonská nížina, Česko a přilehlé oblasti Polska) byly vylišeny čtyři stabilní (apomiktické) druhy: 1) *R. gothicus* s. str. zasahuje do střední Evropy ze severu, a ve studovaném území tak byl zaznamenán jen vzácně v severní části; 2) biotyp z jihovýchodního Slezska, který se ukázal být konspecifický s *R. subgothicus* Sprib., zde lekto-

typifikovaným, dříve přehlíženým druhem; 3) *R. lobifolius,* nový druh z jižních Čech, jihozápadní Moravy a severního Rakouska, který byl dřívějšími autory zahrnován pod *R. gothicus* s. str.; a 4) *R. scarbantinus*, další nový druh hojný ve východním podhůří Alp. Cytometrické analýzy potvrdily, že všechny čtyři zmíněné druhy jsou tetraploidní. V článku je diskutována taxonomie a nomenklatura skupiny, součástí jsou i doplněné morfologické popisy, ekologické charakteristiky a rozšíření zmíněných druhů.

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