Atlas Florae Europaeae notes 31. *Sorbus javorkana* (Rosaceae), a redescribed apomictic species from the Gömör–Torna (Gemer–Turňa) Karst in Hungary and Slovakia

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A triploid and presumably apomictic species of the *Sorbus aria* group, *S. javorkana* Somlyay, Sennikov & Vojtkó, is described as new to science from Slovakia and Hungary. It occurs in the Gömör–Torna (Gemer–Turňa) Karst and probably also in the Slovak Paradise mountain range. Previously this species was known under the misapplied name *S. javorkae*, which is a synonym of *S. danubialis*.

Introduction

This work contributes to the studies on the *Sorbus aria* group in Hungary (Somlyay & Sennikov 2015, 2016, Somlyay *et al.* 2016a, 2016b), which aimed at disentangling and clarifying the taxa described in the time of classical inventories of the genus *Sorbus* in Hungary (Soó 1937, Kárpáti 1960).

The interpretation of the name *Sorbus aria* ssp. *javorkae* Soó (= *S. javorkae* (Soó) Kárpáti) has always posed serious difficulties ever since its original description by Soó (1937: 222). Soó

described this taxon as intermediate between *S. aria* ssp. *buekkensis* Soó and *S. aria* ssp. *sooi* Soó, but also compared it with the similar *S. aria* var. *danubialis* (Jáv.) Soó (= *S. danubialis* (Jáv.) Prodan). *Sorbus javorkae* was originally described from present-day Hungary and Slovakia, without an explicit type designation, and accepted as occurring in these territories (Kárpáti 1960, Kovanda 1962, Májovský 1992, Bernátová & Májovský 1998, Kliment 1999) until Somlyay and Sennikov (2016) clarified the application of this name and typified it in the sense of *S. danubialis*. Its typification was based

on the following facts: the original material of *S. aria* ssp. *javorkae* is taxonomically heterogeneous and belongs to *S. danubialis*, *S. magocsyana* Kárpáti, and a taxon that was identified as *S. carpatica* “Borbás ap. Schneider” and thus excluded from the circumscription of *S. javorkae* by Kárpáti (1960); the specimens of *S. danubialis* constitute a major component of the original material of *S. aria* ssp. *javorkae*; and the original description of *S. aria* ssp. *javorkae* and one of the illustrations in its protologue are undoubtedly indicative of *S. danubialis*. Since taxonomic circumscriptions of “*S. javorkae*” of Soó (1937) and Kárpáti (1960) were highly heterogeneous but overlapped only in the elements belonging to *S. danubialis*, which were most closely matching the original description, the name was typified in this sense.

Although Kovanda (1962: 48) emphasised the distinctive and stable morphology of leaves of the Slovak plants that he referred to this taxon, he refrained from ranking it higher than variety (as *S. aria* var. *javorkae* (Soó) Buia). The leaves of the Slovak plants portrayed in Kovanda’s work are indeed resembling the two illustrations in Soó (1937) in their subrhombic shape and rough apical serration, but Soó’s illustrations are notably different from each other and the plants are not conspecific. The first illustration in Soó (1937: 221, fig. 3), which was drawn from a specimen collected by Géza Lengyel near Stratená in Slovakia (BP 304228, BP 595245), bears closer resemblance to the plants observed and portrayed by Kovanda which may belong to the same taxon. However, that specimen was excluded from the circumscription of *S. javorkae* by Kárpáti (1960). The second illustration in Soó (1937: 221, fig. 8) actually represents *S. danubialis* from the Medves region, Hungary (see Somlyay & Sennikov 2016). The corresponding specimen was identified as “*S. sooi*” (= *S. danubialis*) and thus also excluded from *S. javorkae* by Kárpáti (1960).

According to Kovanda (1962) and our field observations, the above-mentioned Slovak morphotype occurs in the Gömör–Torna Karst and likely at Stratená (Sztracena), and represents a stable, presumably apomictic taxon. After Kovanda (1962), it was accepted as *S. javorkae* in Slovak literature (Májovský 1992, Bernátová 1998, Kliment 1999), although it remains for-

mally nameless because of the misapplication of its name. Our study of its morphological characters in native populations and measurements of its ploidy level allowed us to describe it as a new species.

Material and methods

The collections of *Sorbus* preserved at BP, BPU, CL, DE, EGR and the Herbarium of the Szent István University (Gödöllő) were examined for the taxonomically relevant material. Field research was conducted in the Hungarian and Slovak parts of the Gömör–Torna Karst.

A standardised description was compiled using available herbarium specimens, structured as in Somlyay et al. (2016a). Measurements and descriptions of leaves and flowers were made from fresh collections, although the flowers were described in an early phase of blooming. Images were produced from scanned herbarium specimens.

The measurement of the ploidy level, creation of the distribution map and measurements of the distribution area followed the procedures described in Somlyay et al. (2016a). A list of the specimens examined documenting the treatment and distribution map is provided.

Taxonomic treatment

Sorbus javorkana Somlyay, Sennikov & Vojtkó, *sp. nova* (Figs. 1 and 2)

A Sorbo danubiali (Jáv.) Prodan *foliis elongatioribus, longius angustiusque cuneatis, tenuioribus, planioribus, pallidioribus, nec non numero chromosomatum (triploideo vs. tetraploideo) differt.*

TYPE: Slovakia. Gömör–Torna (Gemer–Turňa) Karst, Zádiel (Szádielő): Zádielska dolina (Szádielői-völgy), 48°37′3.89″N, 20°49′58.70″E, 28 August 2015 L. Somlyay, G. Sramkó & A. N. Sennikov s.n. (holotype BP 744894; isotypes BP 744893, BP 744895) (Fig. 3).

ETYMOLOGY. The specific epithet honours the outstanding Hungarian botanist, Sándor Jávorka (1883–1961), the author of the influential *Flora Hungarica* and one of the pioneers in the Hungarian *Sorbus* taxonomy.

Fig. 1. Photographs of *Sorbus javorkana* (Zádiel: Zádielsky kameň and Zádielska dolina). — **A:** Young foliage (30 May 2015, photo by J. Sulyok). — **B:** Fruiting branch with ripening fruits (18 September 2015, photo by G. Sramkó). — **C:** Short sterile branch. — **D:** Short fertile branch with unripe fruits. — **E:** Habitat at Zádielsky kameň (all 28 August 2015, photo by A. Sennikov).

Fig. 2. Variability of *Sorbus javorkana*. — **A–F:** Leaves of sterile branches (BP 732735, BP 732737, BP 732738, BP 732723, BP 732722, BP 732730). — **G–I:** Leaves of fertile branches (BP 732695; BP 744789, BP 744894). Scale 1 cm.

Shrubs or small trees. Bark grey; twigs brownish grey; young shoots brown, with numerous whitish lenticels. Buds ovoid, $\pm$ acute, with sparsely tomentose scale margins. Leaves simple, rather flat, rather thin (semirigid), light-green (grass-green) and glabrous above, whitish and thin tomentose beneath, petioles 12–20(25) mm long; leaf blades on sterile short shoots 7–10(12) $\times$ 5–6.5(8) cm, narrowly elliptic-obo-

vate to obovate (length/width ratio = ca. 1.5–1.75), widest at upper half of lamina length, apex triangular with straight to slightly convex sides, acute to acuminate at top, serrate to expressly lobed (the upper side of greatest lobe 4–7 mm), base narrowly cuneate with nearly straight sides, without teeth in lower third (or even half) part, veins (7)8–9(11) on each side; leaf blades on short fertile shoots similar in shape but sometimes

Fig. 3. Holotype of *Sorbus javorkana*.

narrower and with a less profound dentation. Inflorescence compact, corymbose, branchlets tomentose. Sepals narrowly triangular, densely tomentose on both surfaces; petals white, clawed, broadly elliptic to subrotund; stamens ca. 20, filaments whitish, anthers pinkish. Fruits globose or subglobose, largest ones ca. 10–13 mm across, bright red when fully ripe, with sparse lenticels. Seeds dark reddish-brown. Flowering in late April to May, fruiting in September to October.

PLOIDY LEVEL: triploid, $2n = 3x$ (by Zs. Lisztes-Szabó). Voucher specimens: Slovakia. Gömör–Torna (Gemer–Turňa)

Karst, Zádiel (Szádélő): Zádielska dolina (Szádélő-völgy), $48^{\circ}37'3.89''N$, $20^{\circ}49'58.70''E$ (holotype tree), 28 August 2015 L. Somlyay, G. Sramkó & A. N. Sennikov (BP 744893–BP 744895); Zádielsky kameň (Szádélő-kő), $48^{\circ}37'3.56''N$, $20^{\circ}50'25.15''E$, 28 August 2015 L. Somlyay, G. Sramkó & A. N. Sennikov (BP 744890–BP 744892). The diploid chromosome number measured for “*S. javorkae*” collected in Slovenský kras, Slovakia (Májovský & Uhríková 1990, Marhold *et al.* 2007: 557) is unreliable (see the note by Patrik Mráz at the bottom of page 555 in Marhold *et al.* 2007). Reproduction: apomictic (inferred from ploidy level).

Comparative measurements of ploidy level in the co-occurring *Sorbus aria*. Diploid, $2n = 2x$ (by Zs. Lisztes-Szabó). Voucher specimens: Slovakia. Gemer–Turňa (Gömör–Torna) Karst, Hačava (Ájfalucska): Jelení vrch

(Szarvas-hegy), 48°40'38.0"N, 20°49'48.4"E, 29, August 2015 *L. Somlyay, G. Sramkó & A. N. Sennikov* (BP 744896–BP 744898); Zádiel (Szádelő): Zádielsky kameň (Szádelői-kő), 48°37'1.52"N, 20°50'18.73"E, 28 August 2015 *L. Somlyay, G. Sramkó & A. N. Sennikov* (BP 744889); 48°37'17.4"N, 20°50'17.0"E, 28 August 2015 *L. Somlyay, G. Sramkó & A. N. Sennikov* (BP 744888). For corresponding measurements in the co-occurring *Sorbus danubialis*, see Somlyay et al. (2016a).

SIMILAR TAXA. The species is characterised by its noticeably light-green (grass-green), elongate-obovate leaves, with a long cuneate base and a roughly serrate to profoundly lobed apical part. It is somewhat similar to the co-occurring tetraploid *S. danubialis*, with which it was confused by Soó (1937), the leaves of which are darker green, distinctly more rigid, prominently folded, less elongate, with cuneate to broadly cuneate (vs. narrowly cuneate) bases, and a greater number

((8)9–11(12) vs. 8–9) of lateral nerves. The co-occurring and triploid *S. subdanubialis* (Soó Kárpáti is easily distinguishable by its ovate to elliptic, dark green leaves with cuneate to broadly cuneate bases, shorter incisions and more numerous lateral nerves (Somlyay et al. 2016a). *Sorbus javorkana* is somewhat similar to *S. pannonica* and *S. vajdae*, which are distributed in other parts of the Carpathian Basin (the former in the eastern Bakony Mts. and Vértes, the latter in the Tokaj Mts.). Both of the latter species have more elliptic and less cuneate leaves which are darker green on the upper side. The differences among these five species are summarised in Table 1. Typical sterile shoots of *S. javorkana* and those of similar species are shown in Fig. 4.

Sorbus javorkana is superficially similar to *S. cucullifera* M. Lepš & P. Lepš, which is considered narrowly endemic to the vicinity of Hard-

Table 1. Comparison of main diagnostic characters (leaves on short sterile shoots) of *Sorbus danubialis*, *S. javorkana*, *S. pannonica*, *S. subdanubialis* and *S. vajdae*.

Character (leaf)	<i>S. danubialis</i>	<i>S. javorkana</i>	<i>S. pannonica</i>	<i>S. subdanubialis</i>	<i>S. vajdae</i>
Shape	rhombic, elliptic-rhombic, deltoid, widest above or at middle of lamina	narrowly elliptic-obovate to obovate, widest above middle of lamina	narrowly elliptic-obovate to almost elliptic, widest above or at middle of lamina	ovate to elliptic, widest at or below middle of lamina	elliptic, widest at middle of lamina
Thickness	thick	rather thin	rather thick	rather thick	rather thick
Lamina	prominently folded, rugose, with prominently impressed veins	moderately folded, with impressed veins	moderately folded with impressed veins	moderately folded, with impressed veins	moderately folded, with impressed veins
Colour	dark-green, dull	light green (grass-green), somewhat shiny	dark-green, rather dull	dark-green, rather dull	dark-green, rather dull
Apex (upper third of blade)	triangular to subrotund with straight to almost convex sides	triangular with straight to slightly convex sides	subrotund with slightly convex sides, triangular at the top	triangular with straight to convex sides	triangular to subrotund with almost straight to convex sides
Base (lower third of blade)	cuneate to subrotund	narrowly cuneate	narrowly cuneate to cuneate	cuneate to broadly cuneate	cuneate to broadly cuneate
Margin	roughly serrate to irregularly lobed apically	serrate to expressly lobed apically	serrate to slightly lobed	regularly serrate, sometimes double serrate or fairly lobed apically	serrate to expressly lobed apically
Depth of incision of greatest lobe (mm)	3–6	4–7	4–5	2–4	3–6
Number of lateral veins	(8)9–11(12)	(7)8–9(11)	(8)9–11(12)	(9)10–12(13)	(7)8–9(11)

Fig. 4. Typical sterile shoots of *Sorbus javorkana* and similar taxa. — **A:** *S. pannonica* (Vérteskozma: Fáni-völgy, BP 300029). — **B:** *S. subdanubialis* (Zádiel: Zádielska dolina, BP 744768). — **C:** *S. javorkana* (Zádiel: Zádielsky kameň, BP 744891). — **D:** *S. danubialis* (Pilisborosjenő: Ezüst-Kevély, BP 728905). — **E:** *S. vajdae* (Füzér: Várhegy, BP 712104). Scale 2 cm.

egg city at the Czech-Austrian border (Lepší *et al.* 2015), but the latter differs from *S. javorkana* in its leathery leaves with a lesser degree of incisions, and the special habit of its short shoots at insolated sites (the leaves are held upright and overlap each other).

HABITAT AND DISTRIBUTION. *Sorbus javorkana* occurs in cliffy habitats of various exposures, both in open sites and somewhat shaded rocky (Tilio-Acerion) forests. According to the voucher specimens traced in BP, DE, and our own collections, this species is known with certainty in the Hungarian and Slovak parts of the Gömör–Torna Karst (Gemér–Turňa Karst) (Fig. 5). The species probably also occurs in other parts of the Slovenské Rudohorie Mts. (Gömör–Szepesi-érchegység) in Slovakia, as it is suggested by Lengyel's specimen collected near Stratená in the Slovak Paradise mountain range. The identity of this specimen is not completely certain; in our previous study (Somlyay & Sennikov 2016) we supposed that it might belong to a hybrid between *S.*

aria and *S. aucuparia*, morphologically close to the former. However, its leaf characters are close to *S. javorkana*, in which we tentatively include this specimen here.

The presently known distribution is apparently incomplete and more localities can be found further east in Slovakia, possibly up to Košice. The diameter of the known distribution area of *S. javorkana* (including the locality at Stratená) is ca. 25 km. The known extent of occurrence, calculated on the basis of available collections, is approximately 590 km². The estimated area of occupancy is 40 km².

ADDITIONAL SPECIMENS EXAMINED (paratypes): **Hungary.** Gömör–Torna Karst: Bódvaszilas: Dusa-oldal, 24 August 2000 A. Vojtkó (BP 732730, BP 732737, as *S. umbellata*, rev. Vojtkó as *S. javorkae*); ridge of Dusa-oldal, 22 August 2000 A. Vojtkó (BP 732739, as *S. umbellata*, rev. Vojtkó as *S. javorkae*); same locality, 23 August 2000 A. Vojtkó (BP 732736, as *S. umbellata*, rev. Vojtkó as *S. javorkae*); same locality, 29 August 2000 A. Vojtkó (BP 732701, as *Sorbus*, rev. Vojtkó as “*S. danubialis* ×”); Jósaváő: “versus Verőtető montis Nagyoldal”, 16 June 1953 Á. Boros (BP

Fig. 5. Known distribution area of *Sorbus javorkana*.

432543, as *Sorbus*, rev. Felföldy as *S. javorkae*); Szögliget: N of Bene-bérc, 23 August 2000 A. Vojtkó (BP 732695, as *Sorbus*, BP 732735, BP 732738, as *S. umbellata*, rev. Vojtkó as *S. javorkae*); N of Községi-legelő, 24 August 2000 A. Vojtkó (BP 732723, as *S. umbellata*). **Slovakia.** Gemer-Turňa Karst: Háj (Áj): Hájska dolina (Áji-völgy), 6 June 1909 L. Thaisz (BP 595248, as *S. aria* pr. *typica*, rev. Kárpáti as *S. javorkae*) [?]; same locality, 12 July 1911 J. Hulják (BP 259466, as *Sorbus*, rev. Felföldy as *S. graeca* var. *cuneifolia*); between Hájska dolina (Áji-völgy) and Zádielska dolina (Szádélői-völgy), 6 August 1942 S. Jávorka (BP 595252, as “*S. aria* ssp. *javorkae* – ssp. *sooi*”, rev. Kárpáti as *S. javorkae*); Zádielsky kameň (Szádélői-kő), 48°37′6.8″N, 20°51′7.8″E, 29 May 2015 L. Somlyay, J. Sulyok & A. Vojtkó (BP 744775–BP 744777); Hrhov (Tornagörgő): Nižný vrch (Alsó-hegy), 4 July 2000 A. Vojtkó (BP 732722, as *S. umbellata*, rev. Vojtkó as *S. javorkae*); Turňa nad Bodvou (Torna): Turniansky hradný vrch (Tornai Várhegy), 11 July 1932 V. Csapody (BP 595242, as *S. aria*, rev. Soó as “typus ad var. *carpaticam* verg”, and Kárpáti as *S. javorkae*); same locality, 9 June 1940 R. Soó (DE s.n., as *S. aria* var. *longifolia* “(ad *S. austriaca* verg.)”, rev. Kárpáti as *S. javorkae*); same locality, 48°36′39.8″N, 20°52′28.2″E, 29 May 2015 L. Somlyay, J. Sulyok & A. Vojtkó (BP s.n., DE s.n.); same locality, 48°36′39.3″N, 20°52′29.5″E, 29 May 2015 L. Somlyay, J. Sulyok & A. Vojtkó (BP 744785–BP 744787); between Turniansky hrad (Tornai vár) and Zádielsky kameň (Szádélői-kő), 48°36′55.3″N, 20°51′39.3″E, 29 May 2015

L. Somlyay, J. Sulyok & A. Vojtkó (BP 744788–BP 744790); Zádiel (Szádélő): Zádielska dolina (Szádélői-völgy), 48°37′2.8″N, 20°50′0.9″E, 30 May 2015 L. Somlyay, J. Sulyok & A. Vojtkó (BP 744778–BP 744780); same locality, 48°37′6.3″N, 20°50′3.7″E, 30 May 2015 L. Somlyay, J. Sulyok & A. Vojtkó (BP 744781–BP 744782); Zádielsky kameň (Szádélői-kő), 48°37′3.56″N, 20°50′25.15″E, 28 August 2015 L. Somlyay, G. Sramkó & A. N. Sennikov (BP 744890–BP 744892). Slovak Paradise: Stratená (Sztracena): “in valle Gölnic ad Sztracenam”, 15 August 1931 G. Lengyel (BP 304228, BP 595245) [?].

Conclusions

With the typification of the name *S. javorkae* (Somlyay & Sennikov 2016) and the description of *S. javorkana* herein, the reports of “*S. javorkae*” from Hungary and Slovakia have been clarified and resolved. The occurrence of the species at Stratená should be verified by modern sampling. The only locality of “*S. javorkae*” reported from Romania, on Mt. Piatra Ceții (Csáklyakő) in the Apuseni Mts., Transylvania (Buia 1956: 250) is situated over 300 km from the distribu-

tion area of *S. javorkana* and is highly unlikely to belong to the same taxon. Its taxonomic identity is to be clarified in the future.

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