A new species of the *Sempervivum marmoreum* group in Central Europe

Nový druh z okruhu *Sempervivum marmoreum* v strednej Európe

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A comparative study of material of *Sempervivum marmoreum* Griseb. from the type locality (Mt Athos, Greece) and the northern part of its distribution revealed a distinct morphotype occurring in an isolated enclave along the Slovak–Hungarian border. As its karyotype differs it is formally described here as a new species – *Sempervivum matricum* Letz. The name *Sempervivum assimile* Schott, formerly considered as a possible name for this species is here critically examined. A morphological characterization of the new species, photographs of the plant and a distribution map based on revised herbarium specimens are provided.

K e y w o r d s : *Sempervivum marmoreum*, *Sempervivum assimile*, *Crassulaceae*, new species, Hungary, Slovakia, Central Europe, taxonomy

Introduction

Sempervivum marmoreum Griseb. (*Crassulaceae*) was described by Grisebach (1843) from Mount Athos, the highest peak on the Chalkidiki Peninsula in Greece. This name is applied to populations of this species throughout its distribution extending from the Balkan Peninsula to the Carpathians. It is cited in most current floras (Soó 1966, Vălev 1970, Gajić 1972, Zahradníková 1985, Hagemann 1986, Paparisto 1988, Dostál 1989, Simon 1992, Parnell & Favarger 1993, Assyov et al. 2002, Hart 2002). Earlier authors used the name *S. schlehanii* Schott for this species. However, Turrill (1936) pointed out that the taxa *S. schlehanii* Schott and *S. marmoreum* Griseb. are conspecific and *S. marmoreum* has priority over *S. schlehanii. Sempervivum marmoreum* has not been taxonomically revised over its whole distribution area. The publication of Domokos (1936) indicates considerable variability in the region of Banatus (Romania) and Hungary, and that of Nyárády (1939), although an inadequate taxonomic treatment, variability of the plants in Transylvania (Romania).

Semperivivum marmoreum is extremely variable (Hagemann 1986, Parnell 1988), with a reticular type of variability and there is no possibility of geographically delimiting its morphotypes. The name *S. marmoreum* is used for all indumentum variants, with or without pubescence on the rosette leaves. The second edition of the Flora Europaea (Parnell & Favarger 1993) also treats the taxon *S. marmoreum* with broad circumscription. Even the densely pubescent variant with very short, velvety hairs on the leaves, *S. erythraeum* Velen., recognized in the first edition (Favarger & Zésiger 1964), is there considered to be conspecific with *S. marmoreum*. These plants from the Rila Mts in Bulgaria were previously considered to be *S. montanum* L. (Velenovský 1891: 188). Later they were described

as *S. erythraeum* Velen. (Velenovský 1898: 111). Stojanov & Stefanov (1948: 547) point out its relation with *S. marmoreum*. *Sempervivum erythraeum* is assumed to be a Bulgarian endemic (Vălev 1970, Velčev et al. 1992: 66, Assyov et al. 2002: 336).

Sempervivum erythraeum is not the only variant of the *S. marmoreum* group in which the rosette leaves have a hairy surface. In Central Europe the name *S. assimile* Schott (1852) assigned to plants from Transylvania (Romania) was used by several authors to indicate plants with hairy rosette leaves (e.g., Porcius 1878: 21–22, Prodan 1923: 530, Jávorka 1924: 456, Ungar 1925: 240). Later it was used only to indicate a variety (Domin 1933: 34) or stated to be a synonym (Berger 1930: 422). More recently it was included only as a synonym of the names *S. schlehanii* Schott or *S. marmoreum* Griseb. (Dostál 1950: 536, Soó & Jávorka 1951: 305, Răvăruţ 1956: 79, Soó 1966: 264, Zahradníková 1985: 195).

Some subspecies were recognized recently (Hart et al. 2003 following Zonneveld 1999): *S. marmoreum* Griseb. subsp. *marmoreum* (plants with glabrous rosette leaves), *S. marmoreum* subsp. *ballsii* (Wale) Zonneveld (small glabrous plants), *S. marmoreum* subsp. *erythraeum* (Velen.) Zonneveld (velvety-pubescent plants) and *S. marmoreum* subsp. *reginae-amaliae* (Heldr. & Sartori ex Boiss.) Zonneveld (strongly pubescent forms). However, these taxa are more appropriate for the cultivated forms of *Sempervivum* fanciers' collections than a comparative study of populations in the field. Nevertheless, this concept reopened the problem of how to taxonomically distinguish the morphotypes of *S. marmoreum* that have rosette leaves with a hairy surface.

Our taxonomic revision of *S. marmoreum* reflects the finding that this species consists of two cytotypes, a diploid (2n = 34) and tetraploid (2n = 68) (Letz et al. 1999). The tetraploids are restricted to isolated populations in the northern part of the distribution of *S. marmoreum*. The aim of the present study is to determine if the tetraploids are a separate species and to search for a previously published name for the taxon.

Material and methods

The results of this study are based on material from herbaria and living specimens of the *S. marmoreum* group. All the material in the following herbaria was examined: BP, BRA, BRNU, CL, KRA, KRAM, LW, LWS, PR, PRC, SAV, SIB, SLO, TAU, W, WU (acronyms of Holmgren et al. 1990). The herbarium specimens are cited as follows: year when collected, name of collector and herbarium acronym; information mostly derived from the labels on the specimens. In order to eliminate environmentally induced phenotypic variation the living material collected from selected localities was cultivated for at least one year in an experimental field at the Institute of Botany in Bratislava (Slovakia). The collection of living specimens is maintained at the Institute and voucher specimens of the material studied are deposited in herbarium SAV.

The material recognized as tetraploid and found only in the northern part of the distribution area of the *S. marmoreum* group was morphologically evaluated and compared with herbarium and living material from the type locality of *S. marmoreum* Griseb. and from selected additional localities covering the whole distribution area. During a preliminary investigation of the material significant differences in the indumentum of the rosette leaves were noted, therefore the comparison concentrated on the presence/absence and type of the indumentum on the surfaces of the rosette leaves. The hairs were measured

with the precision of 50 μm and their density evaluated by counting them along a 1 mm section of the same part of each leaf.

The morphotypes were analysed also geographically. Revised specimens (see Appendix 1) were arranged according to their localities in accordance with phytogeographical division of the relevant countries (Soó 1964, Futák 1984). A dot distribution map was produced based on the herbarium material.

The question of the proper name for the revealed taxon was solved initially by a nomenclatural analysis of the available names. This is included as taxonomic synonyms (=) and misidentifications (–) in the diagnosis of the new species. Partial misidentifications are designated "p. p." following the word "auct.". Under the heading "Ind. loc." information from the protologue on the distribution and locality of the original material is cited. When a name has not been typified, the reason why it is included in the synonymy of the taxon is presented: "Ex descr." – according to original description, "Ex loc." – according to stated locality.

Results and discussion

Material of Sempervivum marmoreum from the type locality

Although the name *S. marmoreum* Griseb. was not typified it is clear that Grisebach (1843) based this name exclusively on material collected by Friedrichsthal from Mt Athos (Chalkidiki, Greece). A lectotype should be selected from the original material based on the diagnosis "foliis glabris", which means the rosette leaves have a glabrous surface and ciliate margins. Rechinger (1943: 290) also indicates that the plants from Mt Athos have "folia rosularia in lamina glabra" and uses the name *S. schlehanii* var. *blandum* (Schott) Hayek.

There is material of *S. marmoreum* collected from Mt Athos in herbaria CL, GOET, TAU and W. It consists of specimens with glabrous rosette leaves (In regione superiori montis Athos, cca 1800–2000 m, 1862 Orphanides CL. – Athos, Kerasia – Panagia, 1996 Babalonas TAU, no. 968. – Nordseite des Athos gegen den Nadelwald, s. a. Friedrichsthal GOET, no. 1161) and one specimen with dense and very short hairs on the surface of the rosette leaves (M. Athos, s. a. Friedrichsthal W). The sample "M. Athos, s. a. Friedrichsthal W, Herb. Maced. n. 1294" consists of one glabrous and two hairy specimens. The presence of two morphotypes at the type locality was confirmed by my visit to the locality in 1997. *Sempervivum marmoreum* is common there, especially at altitudes above 1700 m a.s.l. and up to the top of the mountain (2030 m). Only the "glabrous morphotype" occurs at the higher altitudes. The "hairy morphotype" was detected only up to 1600 m. These two morphotypes meet in the vicinity of Panaghia (1500 m). Although no intermediate forms were detected, hybridization is very probable. On Mt Antiathonas (1042 m), which is lower and opposite Mt Athos, only the "hairy morphotype" is recorded (based on herbarium specimens: Athos, Antiathonas, 1996 Babalonas TAU). This fact indicates the morphotypes are associated with particular altitudes at least in the region of Athos. The "hairy morphotype" grows at a lower altitude than the "glabrous morphotype".

The taxonomic identity of the two morphotypes needs to be resolved . In the case of the "glabrous morphotype" growing at high altitudes it is clear the name *S. marmoreum* Griseb. s. str. accords with Grisebach's protologue. The taxonomic identity of the "hairy

morphotype" has to be solved in the context of the whole *S. marmoreum* group. The "hairy morphotype" is characterized by a greyish appearance caused by the presence of dense and very short indumentum on the surface of the rosette leaves. Our study of herbarium and living material of the *S. marmoreum* group revealed that this morphotype occurs at other places in the Balkan Peninsula and northwards to the Romanian Southern and Eastern Carpathians. As the "hairy morphotype" has a different chorology and ecology it is proposed to treat it as at least a subspecies. Based on the original material with the name *S. erythraeum* Velen., deposited in PRC, this name is applicable to the "hairy morphotype"of the *S. marmoreum* group.

Material from the northern part of the distribution area

Taxonomic revision of samples of the *S. marmoreum* group collected from the whole of its distribution area revealed that the northern populations are morphologically and karyologically different from the others. Unlike *S. marmoreum* Griseb. s. str. that has glabrous rosette leaves (Fig. 1), their rosette leaves are always sparsely pubescent, never glabrous, with hairs 151±55 μm long (mean±S.D.). The hairs (cilia) on the margins of the rosette leaves are 438±177 μm long and protruding (Rezešová 2005, n = 10 from eight localities). They differ from the above mentioned "hairy morphotype" (*S. erythraeum* Velen.) in the Balkans and Southern Carpathians, which have 86±14 μm long hairs on the surface of the rosette leaves and 297±151 μm long and ± oblique hairs (cilia) on the margins of the rosette leaves (Rezešová 2005, n = 2 from two localities). These measurements are similar to those of the hairs on the herbarium and living material I measured. The rosettes of the plants in populations from the northern part of the distribution area of the *S. marmoreum* group (Fig. 2) never have a greyish velvety appearance due to the high density of short hairs, typical of *S. erythraeum* Velen (Fig. 3).

The number of chromosomes is also different. The only number recorded for the *S. marmoreum* group is 2n = 34 (Uhl 1961, Favarger & Zésiger 1964, Hart & Loon 1982, Zésiger 1982). An analysis of material from the northern part of the distribution area revealed 2n = 68 (Letz & Boşcaiu in Letz et al. 1999). Material from other localities in Slovakia and Hungary also have 2n = 68.

As in the whole *S. marmoreum* group, the rosettes of the plants in the populations in the northern part of their distribution are extremely variable in size, and in the number, colour, shape and size of the rosette leaves. Even clones from same locality show special and unique combinations of these characters. Therefore, these characters have little taxonomic value and only justify taxonomic treatment at the level of a form. Some of these forms with narrow and long rosette leaves from the Zemplén Mts (Tokajense, NE Hungary) are described as varieties, e.g. *S. schlehanii* var. *dimorphum* Domokos (1936), *S. schlehanii* var. *tokajense* Domokos (1936) and *S. marmoreum* var. *angustissimum* Priszter (in Soó 1980). Although such forms may be locally abundant they form part of a continuum with other forms in the population (Dumont 2008). Unlike the variability in shape, colour and size, the indumentum on the rosette leaves is an important taxonomic character for differentiating taxa within the *S. marmoreum* group, related to geographic distribution.

The morphotype with pubescent rosette leaves and chromosome number 2n = 68 occurs along the Slovak-Hungarian border. Its distribution area extends from the Hungarian Middle Mountains in the phytogeographic district Pilisiense (Buda and Pilis Mts) in the

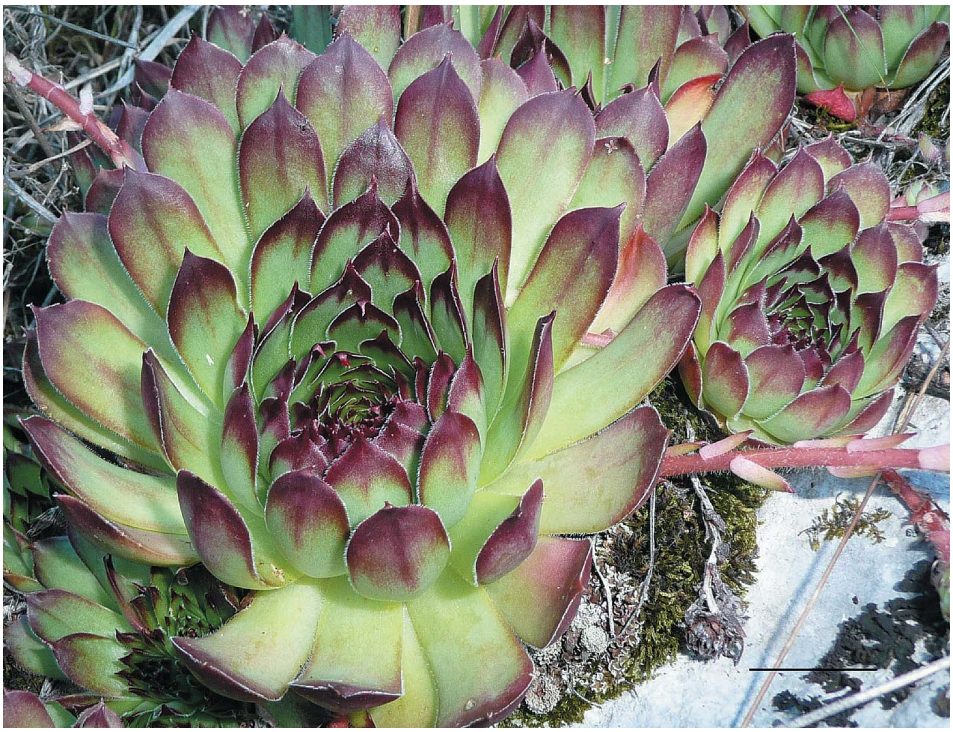

Fig. 1 – Rosettes of *Sempervivum marmoreum* s. str. Montenegro, Durmitor Mts, Crno jezero. Photo: M. Miklánek. Scale bar = 1 cm.

Fig. 2. – Rosettes of *Sempervivum matricum*. Slovakia, Muránska planina Mts, Martinova dolina. Photo: M. Miklánek. Scale bar = 1 cm.

Fig. 3 – Rosettes of *Sempervivum erythraeum*. Romania, Danube Valley, near Portile de Fier. Photo: R. Letz. Scale bar = 1 cm.

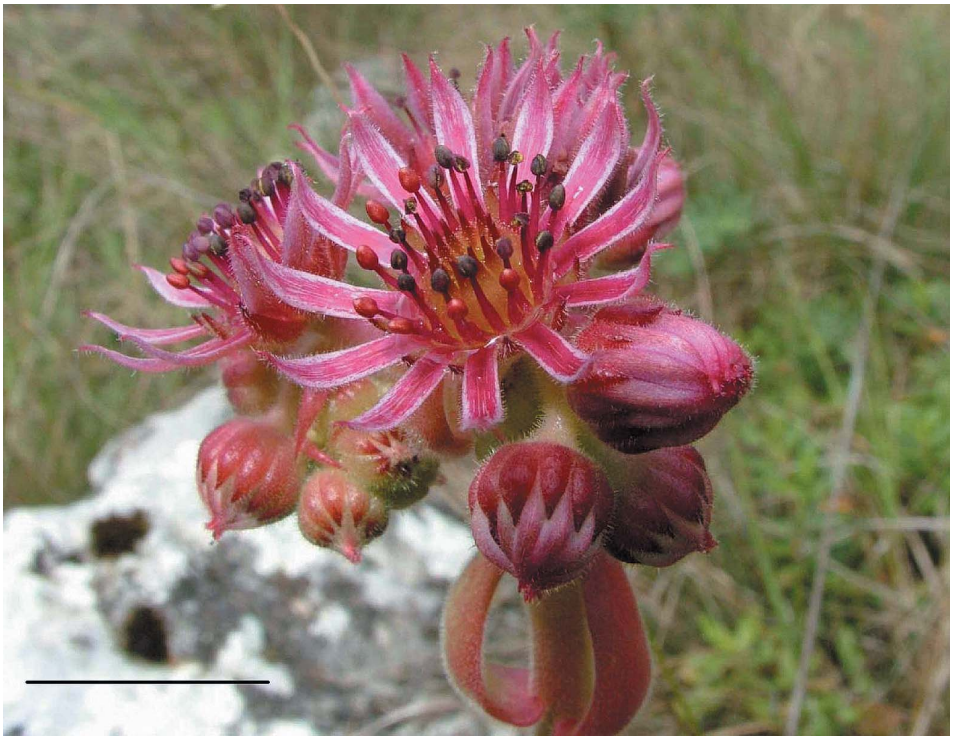

Fig. 4. – Flowers of *Sempervivum matricum*. Slovakia, Slovenský kras Karst, Kečovo. Photo: R. Šuvada. Scale bar = 1 cm.

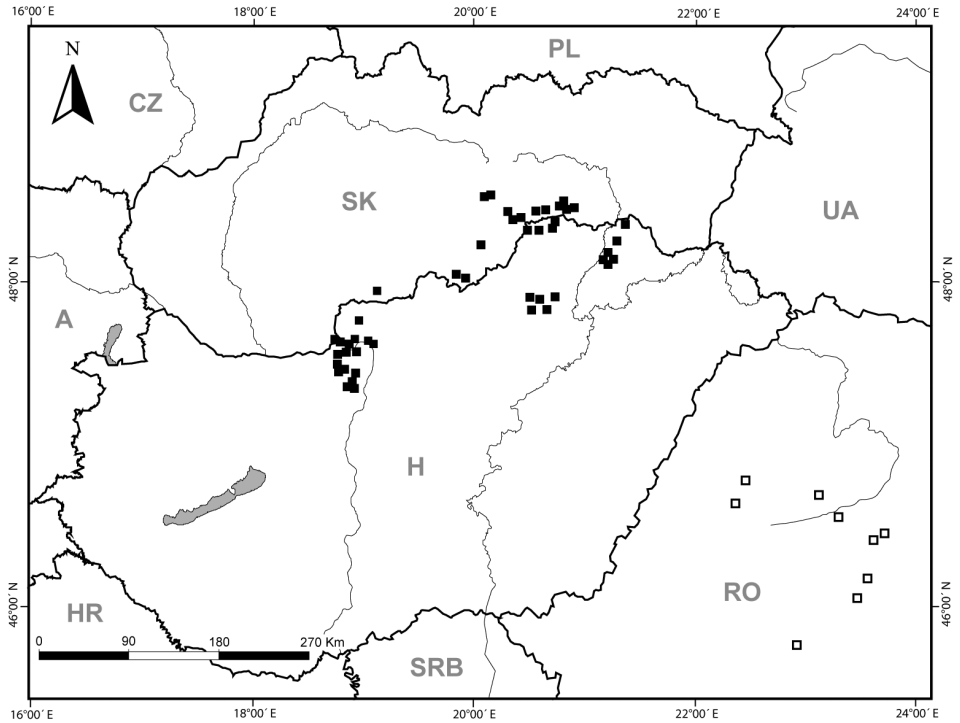

Fig. 5. – Distribution area of *Sempervivum matricum* Letz (■) with the nearest occurrence of *S. marmoreum* Griseb. s. str. (□).

west, in a north-easterly direction into the phytogeographic districts Burda, Ipeľsko-rimavská brázda and Slovenský kras on the Slovak side and districts Visegradense (Visegrád Mts), Neogradense (Börzsöny and Naszály Mts), Borsodense (Bükk Mts), Tornense (Torna Karst) and Tokajense (Zemplén Mts) on the Hungarian side. All these districts are in the phytogeographical region Matricum (hilly northern part of Pannonicum). Recently this species was found in Slovakia in the district of Muránska Planina in the Praecarpaticum region (Blanár & Letz 2005). Other specimens from this region (from the Štiavnické vrchy Mts; Zahradníková 1985: 195) were misidentified and belong to *S. carpathicum* subsp. *heterophyllum* (Hazsl.) Letz of the *S. montanum* group.

The localities in Slovakia and Hungary are isolated on the northern border by the Hungarian Plain from the main part of the distribution area of the *S. marmoreum* group (Fig. 5). This particular area is ca 240 × 110 km in extent and ca 230 km from the nearest population of plants of the *S. marmoreum* group in the Apuseni Mts (Romania), where, however, only the morphotype with glabrous leaves (*S. marmoreum* s. str.) occurs. Another close by enclave of *S. marmoreum* s.l. is situated in the western foothills of the Eastern Carpathians in Ukraine (1933 Deyl PR and Kobiv et al. 2007) and Romania (in the Rodna and Maramureş Mts). The taxonomic identity of the populations there with hairy rosette leaves has to be karyologically and morphologically investigated.

The different number of chromosomes (2n = 68), and unique morphology and chorology of the northern populations of the *S. marmoreum* group is a serious argument for treating them as a separate disjunct species.

Nomenclatural analysis

Of the available names only *Sempervivum assimile* Schott can be considered as a possible name for this new species.

Sempervivum assimile Schott is one of the three Schott's species in the *S. marmoreum* group (Schott 1852). Like *S. blandum* Schott this species was also described by Schott based on plants collected in 1850 by Kotschy during a field trip in Transylvania. Schott's note on the origin of *S. assimile* is only "Vorkommen in Siebenbürgen [occurring in Transylvania] (Kotschy)". Although the locality is not specified in Kotschy's detailed itinerary (Kotschy 1853), information on the localities of the new species from Transylvania collected by Kotschy are provided by Fuss (1857). For *S. assimile* there is note: "bei Hermannstadt [Sibiu] und Törzburg [Bran]". Schott's original description of *S. assimile* is in both Latin and German. The descriptions differ slightly but complement one another. According to both the Latin and German descriptions the most important differential character is the indumentum on the rosette leaves. According to the Latin description the young rosette leaves are hairy and become semiglabrous: "foliis rosularum ... juventute ubique puberulis, demum subcalvescentibus", according to the German description the rosette leaves are densely and shortly hairy: "Die Blätter der Rose graugrün, dicht-kurzbehaart, sehr kurzgewimpert." (Schott 1853: 19). The original description is not of a morphotype with glabrous rosette leaves but rather a morphotype with more or less permanently hairy leaves. Therefore, *S. assimile* Schott is not clearly conspecific with *S. marmoreum* Griseb. s. str., unlike the other two Schott's species (*S. schlehanii* Schott and *S. blandum* Schott), which have glabrous rosette leaves: "glabris" or "demum glabris" (Schott 1853: 12, 29).

This name was lectotypified by Parnell (1988: 216, BP). Based on the characteristic branching of the inflorescence, its bigger size and the glabrous rosette leaves, this specimen belongs to *S. tectorum* L. s. str. and not the *S. marmoreum* group. According to the herbarium label "Plantae Transylvaniae Herbarii Schott, 306. *Sempervivum assimile* Schott, prope Hermannstadt, 1850, legit Th. Kotschy" this lectotype is representative of the original material. The stated locality "prope Hermannstadt" [near Sibiu], corresponds to the datum in Fuss (1857: 171), could be that of the species *S. tectorum* L. s. str., which has been cultivated for a long time and frequently escapes and becomes naturalized. Furthermore, the young leaves of the daughter rosettes on the stolons of *S. tectorum* are very often sparsely hairy (ciliate) and become glabrous when fully grown. This character could correspond with the Latin description of *S. assimile* Schott "foliis rosularum juventute puberulis", although the mature rosette leaves of *S. tectorum* L. are not "subcalvescens", but totally glabrous. There are no specimens of *S. marmoreum* s.l. known from the vicinity of Sibiu.

On the same herbarium sheet (BP, no. 77392) there is also another specimen labelled "*Sempervivum*, Transylvania prope Bánffihunyad [Huedin] ad pagum Magyaro Kereke [Alunişu] in monte porphyraceo, Wolff". This specimen has glabrous rosette leaves like *S. marmoreum* Griseb. s. str. However, it does not represent the original material. Although both the labels are attached to the sheet, it is not possible to exclude the possibility of a mix-up in the past.

The second locality with which the name *S. assimile* is associated is Törzburg [Bran] (Fuss 1857). The specimen of *S. marmoreum* from the vicinity of this town (Törcsvár [Bran], in saxosis calcareis montis Maguricea – 1916 Benedek BP ut *S. assimile* Schott) is of the "Balkan hairy morphotype" – *S. erythraeum* Velen. (see above) and is as described in the German part of Schott's original description of *S. assimile*. However, in the absence of such original material this name cannot be used in this sense.

Parnell's lectotype must be accepted in accordance with the article 9.17 of the Code (McNeill et al. 2006) as there is no other original material and the discrepancy between the designated lectotype and the original description is slight and explainable (see above). Based on this lectotype the name *S. assimile* Schott should be attached to the synonymy of *S. tectorum* L. subsp. *tectorum* and cannot be used for the new species. Furthermore, a morphotype corresponding to the tetraploid populations of *S. marmoreum* s.l. does not occur in the South Carpathian region, the original localities of *S. assimile* Schott (the regions of Sibiu and Bran in Romania).

Hart et al. (2003) have used the name based on *S. reginae-amaliae* Heldreich & Sartori ex Boissier (1872) for all hairy morphotypes of *S. marmoreum,* except *S. erythraeum,* but including populations from Hungary (with incorrect note "S Hungary"). However, the name *S. reginae-amaliae* from a manuscript of Heldreich and Sartori was cited by Boissier only in the synonymy of *S. tectorum* L. (cf. Boissier 1872: 796) as he could not distinguish *S. reginae-amaliae* from *S. tectorum* (cf. Boissier 1888: 248). The name *S. reginae-amaliae* Heldr. & Sartori ex Boiss. and all the combinations based on it are therefore invalid according to Art. 34.1(c) of the Code (McNeill et al. 2006). Moreover, the hairy morphotypes from Greece, to which this invalid name was referred, are not the same as those in the populations in Hungary and Slovakia.

Sempervivum matricum Letz, **spec. nova**

H o l o t y p u s : "Flora Slovaciae, Kováčovské kopce – medzi Kováčovom a Kamendínom [Kamenínom], leg. Dr. J. Futák, 22. 8. 1948." (SLO) – Fig. 6.

D i a g n o s i s : Differt a specie *Sempervivum marmoreum* Griseb. s. str. foliis rosularum supra et subtus pubescentibus, a specie *Sempervivum erythraeum* Vel. pilis in facie foliorum rosularum longioribus (0.1–0.25 mm) et sparsioribus (5–8 pili / 1 mm). Chromosomatum numerus somaticus 2n=68.

S y n o n y m y :

= *Sempervivum schlehanii* var. *dimorphum* Domokos in Magyar Kir. Kert. Tanintéz. Közlem. 2: 38–39. 1936. Ind. loc.: "in Hungaria in montibus Tokaj–Hegyalja in rupibus andesyticis arcis Regéci vár. Legit dr. E. Goszleth. 1933". Not found (Ex loc.)

= *Sempervivum schlehanii* var. *tokajense* Domokos in Magyar Kir. Kert. Tanintéz. Közlem. 2: 39. 1936. Ind. loc.: "in Hungaria in montibus Tokaj–Hegyalja, in rupibus andesyticis arcis Regéci vár. Legit dr. E. Goszleth, 1933". Not found (Ex loc.)

= *Sempervivum marmoreum* var. *angustissimum* Priszter in Soó, Magyar fl. veg. 6: 184. 1980. Ind. loc.: "Tokajense: Regéc". Holotypus: "1976, HHBp", not found (Ex loc. et descr.)

= *Sempervivum marmoreum* f. *longirameum* Priszter in Priszter, Magyar fl. veg. 7: 42. 1985. Ind. loc.: "Borsodense, ad praed. Szarvaskő." Holotypus: "1977, HHBp", not found (Ex loc.)

– *Sempervivum assimile* auct. non Schott: Feichtinger, Esztergom fl.: 294. 1899; Jáv., Magyar Fl. 2: 456. 1924 (p. p.).

– *Sempervivum schlehanii* var. *assimile* auct. non (Schott) Domin: Domin in Rozpr. České Akad. Věd, Tř. 2, Vědy Mat. Přír. 42/29: 34. 1933.

– *Sempervivum marmoreum* auct. non Griseb.: Favarger & Zésiger in Tutin et al., Fl. Eur. 1: 355. 1964 (p. p.); Soó, Magyar fl. veg. 2: 264–265. 1966; Zahradn. in Bertová, Fl. Slov. 4/2: 193–195. 1985; Dostál, Nová květ. ČSSR 1: 386. 1989; Dostál & Červenka, Veľký kľúč vyšš. rast. 1: 385. 1991; J. Parn. & Favarger in Tutin et al., Fl. Eur. (ed. 2) 1: 427. 1993 (p. p.).

Fig. 6. – Holotype of *Sempervivum matricum* Letz, spec. nova, deposited in SLO. Scale bar = 5 cm.

– *Sempervivum schlehanii* auct. non Schott: A. Berger in Engl. & Prantl, Nat. Pflanzenfam. (ed. 2.) 18a: 422. 1930 (p. p.); Domokos in Magyar Kir. Kert. Tanintéz. Közlem. 1: 26–29. 1935 (p. p. max.); Dostál, Květ. ČSR 2: 536. 1950; Soó & Jáv., Magyar Növényv. Kéz. 1: 305. 1951.

D e s c r i p t i o n : Root long, corded, 3–8 mm thick. Sterile rosettes of leaves open, flattish, (3–) 5–10 (–13) cm across. Rosette leaves (15–) 25–80 mm long, 5–15 (–20) mm broad, (1.5–) 2–4 (–5) mm thick, obovate-spathulate to oblong, mostly broader above, abruptly mucronate, often rounded below apex, adaxial surface flat to concave, abaxial surface convex, green, often with red-purple tip or flushed red over whole upper part, to the naked eye ± not conspicuously pubescent, never glabrous, hairs on surface 0.10–0.25 mm long and relatively sparse (5–8 hairs per 1 mm), and bearing a small terminal gland; marginal hairs like cilia, mostly ± projecting, 0.3–0.7 long. Offsets horizontal, 5–8 cm long, 2–3 mm thick, fine hairy, with sparse ovate hairy leaves. Flowering plants with (12–) 18–25 (–35) cm stems, terete, finely glandular-hairy, in upper part branched at ± one place. Cauline leaves oblong lanceolate, acuminate, 2–5 cm long, 3.5–15.0 mm broad, at least partly flushed red, surface glandular hairy, margins cilate. Inflorescence (12–) 30–60 (–65)-flowered, composed of (2–) 3 main branches usually divided into two terminal coils, flowers with small linear lanceolate bracts. Peduncles 1.5–2.0 mm long, green to red-purple, glandular hairy. Flowers with 12-parts, 1.5–2.5 cm across. Calyx bowl-shaped, sepals linear lanceolate, sessile broadest at the base, with merging bases 6–8 mm long. Petals 8–12 mm long, 1–2 mm broad, linear to linear-lanceolate, with glandular hairs on the underside and margins, whitish to pale pink, with a broad darker median band formed by minute longitudinal purple lines. Stamens 5–7 mm long, purple-violet; filaments dilated and sparsely glandular hairy at the base; anthers ovate, purple, later dark violet, with deep yellow pollen. Nectary scales minute, rounded, greenish. Carpels 6–7 mm long, 1–2 mm broad, curved, with narrow outward bent stylodium, green to red-purplish, glandular hairy. Follicles brown; seeds minute, pear-shaped, brown. – Fig. 2, 4.

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Súhrn

Štúdium materiálu druhu *Sempervivum marmoreum* Griseb. z jeho typovej lokality (vrch Athos, Grécko) a jeho porovnanie s materiálom zo severnej časti jeho areálu odhalilo odlišný morfotyp, ktorý sa vyskytuje v izolovanej arele pozdĺž slovensko-maďarskej hranice. Po zohľadnení karyologickej odlišnosti je tu tento morfotyp opísaný ako nový druh – *Sempervivum matricum* Letz. Uvedené je tiež kritické preverenie mena *Sempervivum assimile* Schott, ktoré bolo pôvodne zvažované ako možné meno pre tento druh. Práca prináša tiež morfologickú charakteristiku nového druhu, ako aj jeho fotografie a mapu rozšírenia vypracovanú na základe revidovaných herbárových položiek.

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Appendix 1. – Material studied (see Material and methods for details).

Herbarium specimens of *Sempervivum matricum*

S l o v a k i a. **Matricum: Burda**: Burda nad Dunajom (1936 Valenta BRA). – Kováčovské kopce (1936 Nábělek SAV, 1951 Kneblová PR, 1968 Chrtková PR, 1969 Hodoval BRA, 1972 Zahradníková SAV). – Parkáň [Štúrovo], in saxis supra pag. Kamenica nad Hronom (1935 Weber BRA). – Mt. Skala apud oppidum Parkáň [Štúrovo], cca 130 m (1921 Novák PRC). – Štúrovo, Skaly, Kamenica nad Hronom (1960 Smejkal & Marvan BRNU). – Kováčovské kopce, Skaly (s. a. Fabianková & Peniašteková SAV). – Kováčovské kopce, medzi Kováčovom a Kamendínom [Kameníom] (1948 Futák SLO). – Skalní step při vrchu strání nad tratí mezi Kováčovem a nádražím Kamenica nad Hronom, cca 300 m (1956 Soják PR). – Skaly ad Kováčov prope Parkáň (1928, 1929 Domin PRC; 1930 Sillinger & Deyl PRC). – Prope Kováčov, 130–200 m (1929 Suza BRNU, 1933 Klášterský & Deyl PR, 1934 Skřivánek BP). – Kováčovské kopce, skaly nad bývalým hotelom, 200 m (1954 Šourek PR). – Montis Királyi hegy [Kráľova hora] prope pag. Kamenica nad Hronom, andezit, J svahy 150 m (1957 Hlavaček SAV). – **Ipeľsko–rimavská brázda**: Ipeľské Šahy, in rupibus andesiticis vallis Čelovská dolina prope vicum Nekyje [Vinica], 350 m (1932 Domin & Sillinger PRC). – Čelovská dolina pri Vinici, okres Šahy (1994 Letz SLO). – Cerová vrchovina, Soví hrad (1993 Letz SLO). – Hajnáčka, Tiličˇ (1958 Pilous PR). – Hajnáčka, Ragačské kopce, čadič (1956 Šourek PR ut *S. montanum* subsp. *carpathicum*). – Rimaszombat [Rimavská Sobota] megye, Felsö Pokorágy [Vyšná Pokoradz], sziklákon (1863 s. coll. BRA, 1884 Richter CL). – Vyšná Pokoradz (1981 Zahradníková SAV). – **Slovenský kras**: Šomovská plateau, na skalách J svahu (1933 Brym PR, PRC). – Koňart [Koniarska planina] u Plešivca (1956 Michalko & Popovič SAV). – Plešivecká planina in declivibus calcareis inter vicum Vidová et oppidum Plešivec (1961 Deyl PR). – Silická planina, nad Vidovou, Z svah (1955 Popovič & Ščepko SAV). – Skaly okraja Silickej planiny, locis apertis et fruticosis inter kotis 677–663 prope Brzotín (1933 Klášterský PR). – Domica u Plešivce (1936 Nábělek SAV). – Stráne nad Jablonovom (1949 Futák SLO). – Stráne nad Hrušovom (1949 Futák SLO). – Vápencové skaly pri Jablonovskom priesmyku (1956 Michalko & Popovič SAV). – In plateau supra pag. Zádiel, solo calcareo, 600 m (1927 Dostál PRC). – Luňáčkovy skalky nad Zádielskou dolinou, 560 m (1932 Dostál PR). – Zádielský kameň (Szádeloikő) supra Turňa (Torna), 630 m (Jávorka 1907 BP, BPU; 1932 Dostál PRC). – Loco "Vyhliadka" in valle Zádielská dolina apud opp. Turňa nad Bodvou, 600 m (1934 Dostál PRC). – In declivi septentr. vallis Zádielská dolina inter casa Turistická útulňa et vicum Barka, cca 550 m (1933 Deyl PR). – Rupibus calcareis jugi Nižný Breh prope oppidum Turňa nad Bodvou, cca 250 m (1935 Dostál PRC). – U hradu Turňa (1926 Hajný PRC). – Turňa nad Bodvou, saxa sub Turňanský hrad (1961 Pouzar PR). – In declivi austro–orientali collis Turňa, 300–350 m (1978 Vašák BRA). – Gyúr tetö (494 m) ad Torna (1880 Sivotský LW). – In monte Gyúr apud Somogyi [Drienovec] (1882 Sivotský PRC). **Praecarpaticum: Muránska planina:** Martinova dolina, JV svah kóty 1151,2 (2004 Blanár SAV). – Javorníčková dolina, dolné vyústenie (2005 Blanár SAV).

H u n g a r y. **Matricum: Tokajense**: Tálya kőbánya (s. a. Hazslinszky BP ut *S. tectorum*). – In rupibus montium ad oppidum Tálya, comitatus Zemplén (1871 Simkovics BP, 1936 Hulják BP). – Szokolya, sziklákon, Tálya (1936 Kiss BP). – Abaujszántó, Fehérhegy (1937 Kiss BP). – In saxosis decliv. montis Sátor prope pag. Abaujszántó (1948 Soó BP). – Várhegy ad pagum Bodóköváralja (1909 Thaisz BP). – Abauj m., Arka ...köivölgy (s. a. Hazslinszky BP ut *S. tectorum*). – In arce Regéci vár (1934 Glossleth BP). – Hegyalja, in rupibus arcis Regéc ad pag. Regécke (1936 Jávorka BP). – Regécvárhegy, 600 m (1932 Hulják BP). – Abauj: Mogyoróska – Regéc, Eperjes–Tokaji Hegylám. A Várhegy (1932 Hulják BP). – Mt. Sátorhegység, rupibus andesiticis montis Vár–hegy prope pag. Füzér, 400–500 m (1947 Boros BP, 1951 Kárpáti BP). – Mt. Füzér, Sátoraljaujhely felett erdei köves hegyoldalak Pusztafalu felé (1933 Jávorka BP). – **Tornense**: Aggtelek (1888 Szépligeti BP). – Mt. Ostromos prope pag. Bódvarákó (1951 Jakucs BP). – Gömör–Tornai Karszt, a "Vecsemforrás" baloldali részemlevő kőbánya főlötti hegyoldalom, mészsziklás, 300–400 m (1933, 1935 Hulják BP). – **Borsodense**: Bükk, Sengyet novenyei (1927 Kozłowska KRAM). – Szarvaskő, Pirker diabáz (1905 Prodan BP). – Prope pag. Szarvaskő, 350 m (1966 Károlyi BP). – Mt. Belkő prope Bélapátfalva, calc., 500–780 m (1934 Boros BP). – Montibus Bükk, in cacumine montis Bélkő (1947 Lengyel BP). – Felső Tárkány, Tarkó a mészsziklákon (1867 Vrabelyi BP). – Bükk hg., Tarkó (1947 Baksay BP). – Bükk Mts, Cserépfalu, Alsó–Csakány, 640 m (1985 Dobolyi BP). – Bükk hg., Kis Győr, Galyahegy (Galyatető) (1903 Budai BPU; 1907, 1908 Budai BP; 1929 Hulják BP). – **Neogradense**: Rupibus merid. montis Teufelsberg prope pag. Nagymaros, 150–400 m (1918 Boros BP). – In trachytis montis Elestetö inter pag. Zebegény et Nagymaros (1926 Szepesfalvy BP). – Mt. Naszály prope (supra) oppidum Vác, 400 m (1948 Horávszky? BPU, 1949 Károlyi BP). – In rupibus calcareis jugi montis Kopasztető prope Kosd, 500–530 m (1949 Boros BP). – Felsen am Kamosi bei Diós–Jenő (1865 Dorner BP). – **Bakonyicum: Visegradense**: Strázsahegy prope Esztergom, supra "Sátorkő" tanya, 250–300 m (1919 Boros BP). – Ad "Prédikálószék" montis Keserüs prope pag. Dömös, solo andesitico, 400–500 m (1921 Boros BP). – Visegrád, mt. Várhegy (1862 Jurányi BPU; 1903 Jávorka BP; 1912, 1920 Lengyel BP). – In saxosis ad arum Visegrád (1925 Degen BP). – **Pilisense**: Rupibus dolomiticis montis Ujlaki–hegy prope Pesthidekut, 400 m (1930 Boros BP). – Budapest,

Hármashatárhegy (1916 Filarszky & Kümmerle BP, 1922 Gossleth BP, 1952 Csapody BP). – Budapest, in rupibus dolomiticis (auf Kalkfelsen) Remetehegy (Einsiedlerberg) bei Remete–Mária (Maria–Einsiedel) (1887 Czakó SAV, 1887 Szépligeti WU, 1888 Thaisz BP, 1890 Schilberszky WU, 1917 Boros BP, 1920 Degen BP, 1920 Trautmann BP, 1924 Jávorka BP). – Comitatus Esztergom, rupibus calcareis montis Öreg–szirt prope Kesztölc, 500 m (1946 Boros BP). – Comitatus Esztergom, mt. Nagy Somlyó prope Leányvár (1920 Degen BP). – Pilishegy supra Pilisszántó, 500–700 m (1908 Kümmerle BP; 1913 Degen BP; 1914 Kümmerle & Timkó BP, BPU; 1918 Andrasovszky BP; 1925 Degen BP; 1925 Vajda BP; 1932, 1948 Jávorka BP; 1937 Andreánszky BP, BPU; 1960 Pénzes BP). – Comit. Pest. In saxis calcareis montis Pilis, versus Pilisszántó, 450 m (1933 Kárpáti BP). – Comit. Pest, in summa montis Pilis pr. Pilisszentkereszt (1980 Hegedüs BP). – Comitatus Pest, in rupibus trachyticis montis Köhegy ad pag. Pomáz (1912 Laus BRNU, 1925 Jávorka BP, BRNU).

Living material of *Sempervivum matricum*

S l o v a k i a: Burda: Kováčovské kopce Mts, Skaly (1993 Letz & Hajnalová). – Ipeľsko-rimavská brázda: Vinica, Čelovská dolina (1994 Letz). – Revúcka vrchovina, Vyšná Pokoradz, Pokoradzské jazierka – Kamenný Janko (2005 Blanár). – Cerová vrchovina: Tilič (1993 Letz, 2005 Blanár). – Soví hrad (1993 Letz). – Slovenský kras: Turniansky hradný vrch (1993 Letz). – Zádiel Canyon, Cukrová homola (2002 Mlynárčik). – Jelšavský kras, Slovenská skala at Jelšava (2005 Blanár). – Muránska planina: Zadná Šarkanica, SE slope above Martinova dolina (2004 Blanár & Letz). – Javorníčková dolina (2005 Blanár). H u n g a r y: Budai hegység Mts: Máriaremete near Budapest, Remete–hegy – Szurdok (1995 Letz). – Nagymaros (s. a. Priszter). – Szárvaskő (s. a. Priszter). – Zemplényi hegység Mts: Füzér (2001 Letz). – Mogyoroska, Regéc (2003 Letz) – Tállya (2005 Perný & Hodálová).

Herbarium specimens of *Sempervivum marmoreum* s. str.

R o m a n i a: In monte calcareis Öcsem Teteje [Ecem] prope Sz. Domokos [Sîndominic] Transsilv., cca 1500 m (1853 Schur LW) – Montibus Bucegi, in declivibus petrosis sub vama Strunga, solo calcareo, 1700–1900 m (1930 Nyárády CL). – In mt. Bucegi, in valle Valea Cerbului sub cacumine montis Omul, solo calacareo, 1800–1900 m (1931 Domin & Krajina PRC). – In rupibus Kronstadt [Braşov], 1200 m (1896 Barth BP, LW). – Burzenlander Gebirge [Munţii Bîrsei], Felsen am Gipfel des Schuler [Piatra Christianului], 1800 m (1896 Pax BP). – Burzenlander Gebirge, Kalkfelsen am Gipfel der Zinne [Pe Tămpă] bei Kronstadt [Braşov] (1900 Pax BP). – In mt. Czenk [Pe Tămpă] ad Brassó [Braşov] (1886 Simonkai BP, 1905 Moesz BP, 1915 Kümmerle & Jávorka BP). – Königstein (Királykő) [Piatra Craiului] (1868 Winkler BP, 1904 Gugler BPU). – In alpe Királykő, 1800–1900 m (1883 Simkovics BP). – In monte Nagy Királykő [Piatra Craiului Mare] supra Zernest [Zărneşti] (1904 Degen BP). – Valea Brezeloarei prope pag. Breaza (1961 Vicol CL). In rupibus calcareis in decl. orientalis montis Coasta Lui Rusu, cca 2150 m (1956 Pócs BP ut *S. montanum*). – In valle Rîu Mare ad Klopotivam (1907 Lengyel BP). – Rupibus graniticis vallis Rîu Mare supra pag. Gurény [Gura Zlata] (1910 Jávorka BP). – Felsen bei Rîu Mare Thale, 700 m (1911 Pax BP). – In valle Rîu Mare, 550–900 m (1924 Nyárády CL, 1925 Nyárády CL, KRA, SIB). – In saxosis trachyticis montis Szárhegy ad Deva (1884 Simkovics BP). – Hatszeger Beckenthal, trachyt, Orliaberges bei Hátszeg [Haţeg], 320 m (1901 Pax BP). – Kecskekő [Piatra Caprii], in rupibus calcareis (s. a. s.coll. BP, s. a. Schur W, 1879 Barth BP). – In montibus Kecskekő et Csáklyakő [Piatra Ceţii] (1882 Simkovics BP). – Felsen an der Piatra Ceţii bei Csaklya [Cetea], 1230 m (1915 Pax BP). – In cacumine montis Piatra Ceţii (Csáklyakő), 1000–1233 m (s. a. Nyárády CL). – Ad oppidum Toroczkó [Rimetea] (1878 Csató BP). – Mt. Székelykő [Piatra Secuiului] ad oppidum Toroczkó (1878 Csató BP, 1905 Kümmerle BP, 1906 Degen BP). – In saxosis calcareis montis Colţii Trăscăului prope pag. Rimetea (s. a. Gergely CL). – Mt. Gyalui havasok [Munţii Gilăului], in rup. merid. vallis Lonkavölgy inter pag. Magyarkiskapus [Căpuşu Mic] et Bedecs [Bedeciu] (1943 Ujvárosi BP, CL). – Valea Ierii, aval de Surduc (1981 Marcu CL). – In rupibus Surduc, 1000 m (1901 Barth PRC). – Ad Torda [Turda] (1852 Haynald CL, 1883 Schur CL, 1890 Wolff BP, 1892 Wolff CL). – Cheia (Cheile) Turzii (Thordaer Schlucht, Torda hasadék) (1858 Haynald BP, 1878 Simkovics BP, 1891 Hora PRC, 1904 Gugler BPU, 1912 Borza CL, 1933 Nyárády SIB, 1937 Pawłowski KRAM, 1940 Nyárády CL, 1985 Groza CL). – Turda, saxis ubi Ferula crescit et ultra, apud fissuram Cheia Turzii, 600 m (1933 Nyárády CL). – Turda, in herbidis, dumetosis et margine querceti declivitatis Vitis viniferae (Vapa) ad fissuram Cheia Turzii, 500–600 m (1933 Nyárády CL). – Turda, in cacumine rupium "Nagy pillér" supra specum "Porlic" fissurae Cheia Turzii, calc., 700 m (1933 Nyárády CL). – In fissura Cheia Turzii, Câmpul Borbás, 750 m (1938 Nyárády CL, SIB). – Distr. Turda, in declivibus apricis "Clina copiilor" fissurae Cheia Turzii, cca 650 m (1936 Buia & Nyárády CL, KRA, SIB) – Bihor, Balnaca, Piatra Roşia, calc. (1989 Groza CL). – Crişana, district Aleşd, in muris calcareis angustiarum Vadul Crişului (s. a. Groza CL). – Bihor, Crişana, Valea Mişid (1985 Groza CL). C r o a t i a: Auf der Plješevica (1898 Beck PRC). – Velebit, in cacumine montis Visočica prope Počitelj, 1500 m (1904 Degen WU, 1906 Degen BP). – Velebit, m. Ljubicko brdo ad Ostarijam, 1200 m (1906 Lengyel BP). – Velebit, cacumen montis Sladovaca

ad Ostrija, solo calcareo, 1280 m (1911 Filarszky & Kümmerle BP). – Velebit, Malovan (1906 Degen WU). Bosnia and Herzegovina: Auf der Zer Planina, Schiefer (1894 Schwarz PRC). – Auf der Velež Planina, Kalk (1892 Beck PRC). – In der Alpenregion der Maglić (1888 Beck PRC). – Auf der Vranica Planina (1894 Schwarz PRC). – Vranica Planina, rupibus schistaceis in cacumine ipso, 1939 m (1957 Pawłowski KRAM). – Vranica Planina, auf dem Matorac, Schiefer, cca 1800 m (1892 Beck PRC). – Vranica Planina, auf der Vitruša, Kalk (1892 Beck PRC). – In der Alpenregion der Treskavica, Kalk (1888 Beck PRC). – Bezirk Petrovac, Klekovača Planina (1891 Fiala PRC). – West Bosnien, Mala Klekovača, 1760 m (1904 Handel–Mazzetti WU). – Auf der Osječenica bei Petrovac, cca 1600 m (1892 Beck PRC). – Auf dem Činčer, 1400 m (1894 Beck PRC). – Čabulja Planina (s. a. Handel–Mazzetti WU). Serbia: Midžor, 1500–1700 m (1892 s.coll. PRC). – Mt. Leskovik (1892 Formánek PRC). – Ozren Planina (1892 Formánek PRC). – Todor (s. a. Vandas PR). – Jaram (s. a. Vandas PR). – Husar (s. a. Vandas PR). Montenegro: Montes Komovi, in lapidosis calcareis ad declivia ad septentriones montis Vasojevićki Kom, cca 2300 m (1932 Novák PRC). – Durmitor (s. a. Rohlena PRC). – Bogojeva glava ad Njeguši (1924 Rohlena PRC). – In monte Lovčen, loco Ivanov laz (1913 Rohlena PRC). – In monte Lovčen (1911 Pejov PRC, 1922 Rohlena PRC). – Maglić (1905 Rohlena PRC). Bulgaria: Dragoman (1930 Nábělek SAV). – Dupnica (s. a. Urumov PRC). – Mt. Karlovski balcan (1927 Urumov BP). – In saxosis montis "Čatal Kaje" prope Slivno (1893 Wagner BP). – In rupibus sumi montis Kam supra Bukovica (1887 Velenovský PRC). – Jumrukčal (1929 Nábělek SAV, *S. erythraeum* admixt.). Greece: In regione superiori montis Athos, cca 1800–2000 m (1862 Orphanides CL). – Athos, Kerasia – Panagia (1996 Babalonas TAU, no. 968). – Mt. Lailia (Serres), on granite rocks, 1500–1850 m, summit Ali Baba (1850 m), Katiga (1520 m) (1964 Voliotis TAU).

Living material of *Sempervivum marmoreum* s. str.

Romania: Torda, Cheile Turzii (1996 Letz & Mock). – Retezat, Rîu Mare, Gura Zlata (1996 Mock & Letz). – Moldova Veche (2006 Letz). – Sviniţa (2006 Letz). Croatia: Biokovo, Mt. Sv. Jure (2003 Letz). Greece: Chalkidiki, Athos, Mt. Athos (1997 Letz & Radovanovič).

Herbarium specimens of *Sempervivum erythraeum*

Romania: In rupibus subalpinis Kronstadt [Braşov], 1000 m (1895 Barth PRC, 1888 Barth LW). – Brassó [Braşov] vidéke, Czenken [Pe Tămpă] (1897 Walz CL). – Csernavölgy [Valea Cernei], Herkulesfürdő [Băile Herculane] felett (1908 Scholz BP). – Herkulesfürdő, Domogled (1900 Richter BP). – In monte (cacumine) Domugled supra thermas Herculis (Băile Herculane), cca 1000 m (1874 Simkovics BP, 1886 Degen BP, 1931 Domin & Krajina PRC). – Domogled, Kalkfelsen am Gipfel, 1100 m (1912 Pax BP). – In rupibus calcareis montis Strazuc ad Mehadiam in Banatu (1873 Borbás BP). – Alduna, Trikule mellet gyüjtötte Dr. Degen A. Kertészeti tanintézet (1934 Jávorka BP). – Alduna, Banatus, saxo rhyolitico Treszkovacz prope Szvinica (1942 Jávorka BP). Bosnia and Herzegovina: Vlašić plateau (bei Travnik), 1700 m (1890 Brandis BRA, 1893 Brandis PRC, 1907 Brandis CL, PR, PRC). Serbia: Serbia meridionalis, Montes Šar planina, in rupibus verticis Bistra, 2600 m (1934 Hrubý et al. PRC). – Montes Šar planina, mt. Kobilica, 2100–2200 m (1934 Hrubý et al. PRC). Bulgaria: Vitoša (1893 Slabý PRC). – Rila planina, Kobylino branište (1929 Nábělek SAV). – Rila planina, in saxorum graniticorum fissuris supra tugurium Skakavica, 2200 m (1923 Novák PRC). – Skakavica (1929 Nábělek SAV). – In rupestribus syeniticis m. Rilo (1889 Velenovský PRC). – In m. Rilo ad Čamkurije (s. a. Milde PRC). – Rila planina, in saxosis apud Rilski Monastir, cca 1850 m (1923 Novák PRC). – In saxosis montis Rila ad "Sachotoje See" prope pag. Rila-kolostor (1956 Máthé BP). – Stara Planina, Sopot, Muravy, calc., 700–1500 m (1978 Pawlus KRAM). – Mt. Pirin, Kamkatin Poljana, 1800–2400 m (1938 s.coll. BP). – Pirin planina, mt. Ali Botuš (1916 s.coll. PRC). – In decliv. mt. Lilin planina supra Kuárcen? (1887 Velenovský PRC ut S. ruthenicum). In m. Lilin planina (1903 Mrkvička PRC). – In mt. Musalla (1901 Tošav PRC). – Trogan Balkan (1894 Urumov PRC). – In rupibus montis Simta Kanony ad Slivem (1886 Velenovský PRC). Albania: Montes Albaniae boreali–orientalis inter opp. Prizren et Debra jacentes, montes nivales Korab, in lapidosis graminosis declivium occidentalium in cacumine aliques ad limites Macedoniae supra pagum Žužen, solo calcareo, 2400 m (1918 Kümmerle BP ut *S. montanum*). Greece: Mt. Oeta (Iti) Sterea Hellas (s. a. Zaganiaris TAU). – Litochoron (foots of Mt. Olympus, cca 400 m (s. a. Zaganiaris TAU). – Athos, Antiathonas (1996 Babalonas TAU).

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Romania: Băile Herculane, Domugled (1996 Letz & Mock). – Sviniţa (s. a. Domokos sec. Priszter). – Gura Văii, W of Portile de Fier (2006 Letz). Bulgaria: Pirin Mts, Mt. Banderica (2005 Miklánek). – Rila Mts, Mt. Goljam Mramorec (2005 Miklánek). – Rila Mts, Rila Monastery. Greece: Chalkidiki, Athos – Panaghia (1997 Letz & Radovanovič).