

## Notes on the Czechoslovak species of the genus *Hylotelephium*

### Poznámky k československým druhům rodu *Hylotelephium*

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This paper deals with some taxonomic and chorological problems of the genus *Hylotelephium*. On the basis of a new analyse of description, the name *Sedum telephium* L. is rejected. To five Czechoslovak autochthonous species nomenclatural, taxonomic, chorological and ecological notes are added, a new sect. *Anacampseros* is described and four nomenclatural changes are made.

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The recently described genus *Hylotelephium* OHBA (OHBA 1977) is a group of evidently related species within a taxonomically obscure complex *Sedum* s.l. It includes primitive, predominantly hemicryptophytic types, characterized by short subterraneous rootstocks, large flat leaves and unreduced floral veinlets (OHBA 1978). The development of root tubers, chamaephytism and viviparity of some species contribute to the evolutionary trends of this genus. The evolutionary centre of the genus *Hylotelephium* occurs in East Asia, where the greatest number of species and features may be found. The above mentioned territory is also an evolutionary centre of the related genus *Orostachys* (DC.) FISCH. Another related genus *Perrierosedum* (BERGER) OHBA occurs in Madagascar.

The migration to Europe probably took place at the end of the Tertiary period. There a new evolutionary centre arose, where European species were formed during the Glacial period. An independent line is presented by *Hylotelephium anacampseros* (L.) OHBA, which is a paleoendemic type occurring in the mountains of SW. Europe.

Tab. 1. — Dependence of quantitative values of some features on ploidy

Species	Length of		
	stomata ( $\mu\text{m}$ )	pollen grains ( $\mu\text{m}$ )	fruits (mm)
2n = 24			
<i>H. argutum</i>	(24–) 26–34 (–38)	(20–) 23–27 (–28)	(1.8–) 2.2–3.4 (–3.6)
<i>H. maximum</i>	(22–) 26–36 (–40)	(20–) 22–26 (–28)	(1.6–) 2.2–3.4 (–3.8)
2n = 30, 36, 48			
<i>H. purpureum</i>	(28–) 32–44 (–50)	(27–) 28–32 (–35)	(3.2–) 3.6–4.6 (–5.0)
<i>H. jullianum</i>	(28–) 32–42 (–48)	(26–) 29–33 (–35)	(2.6–) 3.0–4.0 (–4.4)
<i>H. scherfelii</i>	(30–) 32–42 (–46)	(27–) 28–32 (–34)	(2.6–) 2.8–3.8 (–4.2)

Tab. 2. — Variability of leaf position on stem.

Species	Number of leaves in node					No. nodes	Number of plants with n-leaved nodes					No. plants
	1	2	3	4	5		1	2	3	4	var.	
<i>H. argutum</i>	3932	.	.	.	.	3932	80	.	.	.	.	80
<i>H. purpureum</i>	6491	.	124	.	.	6615	129	.	6	.	5	140
<i>H. jullianum</i>	1936	686	1998	151	13	4784	12	6	65	5	72	160
<i>H. maximum</i>	399	3474	329	.	.	4202	6	229	13	.	32	280
<i>H. scherfelii</i>	53	637	94	15	.	799	.	47	8	1	4	60

Hibernating sterile rosettes and unbranched stems in *Hylotelephium anacampseros* (L.) OHBA distinguish it from the sect. *Populisedum* (BERGER) OHBA.

The other species are very similar and morphologically indistinctly delimited. *Hylotelephium telephioides* (MICHX.) OHBA of North America is closely related to European species and it came to America via the continental bridge from North Europe.

The correlation between different features is rather overshadowed by a great intraspecific variability. Species with purple flowers and predominantly alternate leaves with cuneate base are probably more primitive (uniformity of species, rather disjunct distribution areas, ecologically primitive diploid species). In the species with yellowish flowers and predominantly opposite or verticillate leaves with cordate or cuneate base the polyploidy played a greater role in the processes of speciation.

The quantitative values of sizes of stomata, pollen grains and fruits reflect distinctly the differences between diploid and polyploid species (see Tab. 1).

### *Sedum "telephium"*

The interpretation of the Linnean name *Sedum telephium* is very difficult. Webb's solution (WEBB 1961) does not fulfil the requirement of critical analysis of the variability and is rather of an arbitrary character. The new revision is based on revaluation of the pre-Linnean names, especially on the interpretation of old drawings.

Webb supposes that the *Telephium album* of FUCHSIUS (1512), on which the typification of *Sedum telephium* L. is based, represents an albinotic form of *Sedum purpureum* (L.) SCHULT. However, the colour of flowers belongs to the basic features, which normally do not change, while on the other hand the density and placing of leaves on the stem and the form of the leaf base are variable features often appearing in the same plant (see Tab. 2, 3). Fuchsius' drawing and likewise the drawing of *Telephium vulgare sive secundum* by CLUSIUS (1601), are conspicuously reminiscent the undistinguished *Hylotelephium jullianum* (BOREAU) GRULICH. The name of *Sedum telephium* L. having been the cause of misunderstandings till now, and because of the impossibility of typifying it on the basis of the original material, I recommend that the above mentioned name be rejected.

### *Hylotelephium argutum* (HAW.) HOLUB

Nomen: *Hylotelephium argutum* (HAW.) HOLUB, Preslia 51 : 281, 1979.

Bas.: *Anacampseros arguta* HAW., Revis. Pl. Succul. 24, 1821

Syn.: *Sedum argutum* (HAW.) SWEET, Hort. Brit. ed. 1, 179, 1826. — *S. fabaria* KOCH, Syn. Fl. Germ. ed. 1, 258, 1835, excl. syn. — *S. fabaria* auct. et KOCH, Syn. Fl. Germ., ed. 2, 284, 1843, p. p. — *S. telephium* L. subsp. *fabaria* (KOCH) KIRSCHL., Fl. Alsace 1 : 284, 1852, p. p. — *S. carpaticum* REUSS, Květ. Slov. 162, 1853. — *Hylotelephium telephium* (L.) OHBA subsp. *fabaria* (KOCH) OHBA, Bot. Mag. Tokyo 90: 53, 1977, p. p. — *H. carpaticum* (REUSS) SOJÁK, Čas. Nár. Muz., ser. natur., 148 : 77, 1979. — *Sedum vulgare* auct. p. p., non *Anacampseros vulgaris* HAW.

Tab. 3. — Variability of leaf base

Species	Leaves petiolate		Leaves sessile		No. leaves
	base cuneate	base cuneate	base rounded	base cordate	
<i>H. argutum</i>	150	.	.	.	150
<i>H. purpureum</i>	277	21	2	.	300
<i>H. jullianum</i>	.	16	441	693	1150
<i>H. maximum</i>	2	7	90	601	700
<i>H. scherfelii</i>	.	.	2	98	100

*Hylotelephium argutum* is the correct name of a diploid ( $2n = 24$ ) red flowering species from the Carpathian Mts., which is not conspecific with the plants from Schwarzwald and from the mountain range of the Middle Rhinlands. Koch himself, in the second edition of his Synopsis (KOCH 1843), was the first to misidentify both taxa. Uechtritz (sec. BORBÁS 1878) noted the differences between them (smaller, less pronouncely dentate leaves in plants found in Germany). *Hylotelephium argutum* is an endemic species of the Carpathians.

This species is clearly delimited and it is characterized by the absence of pruinosity, by slightly tuberate roots and large, petiolate, lanceolate, strongly dentate leaves. All reports concerning the occurrence of *H. argutum* outside the Carpathians seem to be erroneous.

*Hylotelephium argutum* is a species of mountain forests, streamsides and shaded damp rocks, and grows from the submontane to the alpine zone. It is a member of the communities of the alliance *Fagion sylvaticae* and the order *Vaccinio-Piceetalia*, alliance *Epilobion angustifolii*, class *Betulo-Adenostyletea* and it also enters the alliance *Seslerion tatrae*.

#### *Hylotelephium purpureum* (L.) HOLUB

Nomen: *Hylotelephium purpureum* (L.) HOLUB, Preslia 51 : 281, 1979.

Bas.: *Sedum telephium* L. (var.)  $\beta$  *purpureum* L., Sp. Pl. 430, 1753.

Syn.: *Sedum purpureum* (L.) SCHULT., Oester. Fl., ed. 2, 686, 1814, p. p. — *S. purpurascens* KOCH, Syn. Fl. Germ., ed. 2, 284, 1843. — *Hylotelephium telephium* (L.) OHBA subsp. *telephium*, Bot. Mag. Tokyo 90 : 53, 1977. — *Sedum telephium* auct. p. p., nom. amb.

*Hylotelephium purpureum* is based nomenclaturally on the name *Sedum telephium*  $\beta$  *purpureum* L., which is established on *Telephium purpureum majus* by BAUHINIUS (1623), syn.: *Telephium purpurascens* (FUCHSIUS 1512), *Telephium quintum purpureo flore* (CLUSIUS 1601); the drawings are evidently of *H. purpureum*.

*Hylotelephium purpureum* is a triploid and tetraploid ( $2n = 36, 48$ ) red flowering species. It produces robust clusters of many erect stems with dense imbricately arranged leaves. The root tubers are great, ovoid, and abruptly contracted; the leaves are mostly alternate and cuneate.

The determination of flowering plants is easy, because the red flowering species have purple petals, stamens (excl. mature anthers) and carpels. There are never any yellowish or greenish tinges in buds and flowers. Other species have yellowish or greenish petals, often with rose spots on the keels, but filaments and young carpels are always yellowish.

The different cytotypes of the Czechoslovak material of *H. purpureum* do not show any morphological differences.

*Hylotelephium purpureum* is restricted to Central and West Europe, but it probably occurs in the Soviet Baltic region — TABAKA (1974) distinguishes two red flowering taxa in Latvia — and has been introduced in to North America. In Czechoslovakia it is found only in SW., W. and N. Bohemia, where its eastern boundary of distribution may be found. In our country, as well as in other marginal parts of its distribution area, it prefers roadsides, railway embankments, and wood and field edges.

Reports of occurrence *H. purpureum* in NE. Europe refer to *H. maritimum* (BOHUSLAV in RUPR.) GRULICH; plants from Siberia, Far East and Japan probably belong to the group of *H. pallescens* (FREYN) OHBA. Plants of SE. Europe need further study.

*Hylotelephium jullianum* (BOREAU) GRULICH, comb. nova

Bas.: *Sedum jullianum* BOREAU, Mém. Soc. Acad. Angers 20 : 117, 1866.

Syn.: *Sedum maximum* auct. p. p., non (L.) HOFFM. — *S. telephium* auct. p. p., nom. amb.

*Hylotelephium jullianum* is a glaucous polyploid ( $2n = 30, 36$ ) species with yellowish flowers, which differs from related taxa with greater, more or less globular, abruptly contracted tubers, clubshaped blunt hibernating buds of flowering stems, and ascending, robust stems with imbricate and often verticillate leaves.

Pollen grains of *H. jullianum*, similarly in *H. purpureum* (cf. also SORSA 1968), are mostly defective; in two populations of *H. jullianum* of West Bohemia (Příkosice near Rokycany and Otročin near Toužim) some plants with aborted anthers were found. All cultivated plants of both (taxa also from localities mentioned above) produced fully germinating seeds. The populations of *H. jullianum* are formed by small, separate topodemes, which are morphologically uniform and reminiscent of clones. The existence of triploid and aneuploid cytotypes also supports the clonal character of these populations.

Boreau's description of *Sedum jullianum* (BOREAU 1866) comprehends very well the shape and arrangement of leaves of some glaucous Czechoslovak morphotypes. However, taxonomic evaluation of various cytotypes and their comparison with microspecies described from France (BOREAU 1866, cf. ROUY et CAMUS 1901) need further study.

*Hylotelephium jullianum* occurs in West and Central Europe. In Czechoslovakia, it is abundant as far as West and North Moravia, predominantly from the supracolline to the submontane zone. *Hylotelephium jullianum* is confined to the same ecological conditions as *H. purpureum*.

*Hylotelephium maximum* (L.) HOLUB

Nomen: *Hylotelephium maximum* (L.) HOLUB, Severočes. Přír. 8—9 : 114, 1978.

Bas.: *Sedum telephium* L. (var.)  $\epsilon$  *maximum* L., Sp. Pl. 430, 1753.

Syn.: *Sedum maximum* (L.) HOFFM., Deutschl. Fl. 1 : 146, 1791 et auct. p. p. — *Anacampseros maxima* (L.) HAW., Syn. Pl. Succul. 121, 1812. — *Sedum latifolium* BERTOL. Moenit. 336, 1819. — *Hylotelephium telephium* (L.) OHBA subsp. *maximum* (L.) OHBA, Bot. Mag. Tokyo 90 : 53, 1977. — *Sedum telephium* auct. p. p., nom. amb.

*Hylotelephium maximum* is a yellowish flowering non-glaucous diploid ( $2n = 24$ ) species with fusiform tubers, cylindrical acute hibernating buds and slender erect stems with patent, predominantly opposite, ovate, elliptic or obovate leaves.

Linnaeus' original material does not exist, but the drawing of *Telephium*

*hispanicum primum*, made by CLUSIUS (1601), on which the description of LINNAEUS (1753) is based, fully corresponds to the diploid taxon.

*Hylotelephium maximum* occurs in Central and South Europe, diploid yellowish flowering species (cytotypes) are known also from South Scandinavia (sec. JALAS et RÖNKÖ 1959). In Czechoslovakia it appears in low and middle altitudes, where it prefers rocky places, dry grassy and shrubby slopes and dry light forests. Roadsides and embankments are colonized only in warmer districts (e.g. South Moravia). The occurrence of this species and other thermophilous species in Krkonoše and Hrubý Jeseník Mts. (app. 1200 m above sea level), is exceptional.

*Hylotelephium maximum* grows in communities of alliance *Androsacion multiflorae* and *Galeopsidion*, class *Festuco-Brometea*, alliance *Prunion fruticosae* and in the forest communities of order *Quercetalia pubescentis* and alliance *Quercion robori-petraeae*.

*Hylotelephium scherfelii* (BORBÁS) GRULICH, comb. et stat. nov.

Bas.: *Sedum maximum* (L.) HOFFM. var. *scherfelii* BORBÁS, Pótfüz. Term.-Tudom. Közl. 28 : 58, 1896.

Syn.: *Sedum maximum* auct. p. p., non (L.) HOFFM. — *S. telephium* auct. p. p., nom. amb.

*Hylotelephium scherfelii* is a yellowish flowering species closely related to *H. maximum*. It is characterized by robust, strongly lignified stems and cochleariform leaves with parallel sides; stomata, pollen grains and fruits are of larger size.

*Hylotelephium scherfelii* is probably a tetraploid ( $2n = 48$ ). This count was published by BANACH-POGAN (1958) from the Pieniny Mts., where *H. scherfelii* was collected several times, e.g. DEYL PR, FUTÁK SAV, MÁJOVSKÝ SLO. Tetraploid *Sedum* "telephium" was published by MÁJOVSKÝ et al. (1970) to be found also in the Belanské Tatry Mts. Considering that *H. scherfelii* occurs abundantly in East Slovakia, tetraploid plants found by PÓLYA (1949) in the vicinity of Debrecen are also of the same species.

This species occurs in Central and probably also in East Europe. In Czechoslovakia it is known only from Central and East Slovakia. *Hylotelephium scherfelii* has ecological requirements similar to those of *H. maximum*.

A very problematic question is the relationship of *H. scherfelii* to the taxa distinguished in the European part of the Soviet Union (*Sedum telephium* and *S. maximum* sensu BORISOVA 1939), part of which certainly belongs to *Sedum polonicum* BŁOCKI (cf. JALAS 1954).

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#### Supplement 1.

List of cytologically investigated populations.

*Hylotelephium argutum* (HAW.) HOLUB

$2n = 24$  C. Slovakia, Muráňská planina plateau, calcareous rocks on the entrance of the cave Muráňská ľadová jama, 1140 m

Note: BANACH-POGAN (1958) published this count from 11 localities in the Tatra Mts.

*Hylotelephium purpureum* (L.) HOLUB

$2n = 36$  W. Bohemia, distr. Klatovy, grassy slope on Zaječí vrch hill near Čínov, 460 m

2n = 48 W. Bohemia, distr. Rokycany, roadsides S. of Příkosice, 530 m  
Note: Triploids (2n = 36) are known from North America (CLAUSEN 1975)

*Hylotelephium jullianum* (BOREAU) GRULICH

2n = 30 N. Moravia, distr. Bruntál, grassy place near railway embankment N. of Valšov, 540 m

NW. Moravia, distr. Ždár, grassy slope at Zichův rybník pond near Nové Město na Moravě, 610 m

2n = 36 C. Moravia, distr. Olomouc, railway embankment near Červenka, 240 m

*Hylotelephium maximum* (L.) HOLUB

2n = 24 C. Moravia, distr. Vyškov, granite rocks of Hlavní skála in Rakovec valley near Ruprechtov, 500 m

S. Moravia, distr. Brno, granite rocks below Brněnská přehrada dam, 250 m

S. Moravia, Pavlovské vrchy Mts., calcareous steppe slope below Sirotějí hrádek ruins near Klentnice, 250 m

Note: MÁJOVSKÝ et al. (1974) published this count from the vicinity of Bratislava

## Supplement 2.

### New names in *Hylotelephium*

*Hylotelephium* OHBA sect. *Anacampseros* GRULICH, sect. nova

Caules floriferi simplices, hibernantes, e gemmis ad apicem rhizomatis subterranei aestate formantes, hieme rosulas foliorum ferrentes.

Typus sectionis: *Hylotelephium anacampseros* (L.) OHBA.

*Hylotelephium maritimum* (BOHUSLAV in RUPR.) GRULICH, comb. nova. —

Bas.: *Sedum maritimum* BOHUSLAV in RUPR., Fl. Samojs. 2 : 10, 1845.

*Hylotelephium mugodsharicum* (BORISOVA) GRULICH, comb. nova. —

Bas.: *Sedum mugodsharicum* BORISOVA in KOMAROV, Fl. SSSR 9 : 479, 1939.

## SOUHRN

Nedávno popsáný rod *Hylotelephium* OHBA představuje velmi jasně vymezenou příbuzenskou skupinu, která si oprávněně zaslouhuje v taxonomicky nejjasném okruhu *Sedum* s. l. hodnocení na úrovni rodu. Vývojovým centrem rodu (podobně jako blízkce příbuzného rodu *Orostachys*) je východní Asie. Migrace do Evropy proběhla na sklonku terciéru, v kvartéru se v Evropě zformovalo samostatné vývojové centrum.

Velká variabilita jednotlivých druhů znesnadňuje taxonomické hodnocení. Základní otázkou byla typifikace jména *Sedum telephium* L. Vzhledem k tomu, že toto jméno bylo doposud používáno v různých významech, že neexistuje originální Linnéův materiál a že kresby, z nichž vychází předchozí pokus (WEBB 1961), nápadně připomínají nerozlišované *H. jullianum*, je doporučeno jméno *S. telephium* L. zahrnout jako nomen ambiguum.

Oproti dosavadní literatuře je z Československa uváděno celkem 5 autochtonních druhů. Z červenokvětých jsou to: *H. argutum* (HAW.) HOLUB, karpatský diploid, vázaný na horské lesy a stinné skály, a *H. purpureum* (L.) HOLUB, tri- a tetraploid, představující výrazný prvek západního migroelementu, vyskytující se pouze v západních a severních Čechách, především na sekundárních stanovištích.

Problematika žlutokvětých druhů je složitější, rozdíl mezi nimi komplikuje mnohem větší vnitrodruhová variabilita. Přesto je možno odlišit tři druhy: *H. jullianum* (BOREAU) GRULICH, *H. maximum* (L.) HOLUB a *H. scherfelii* (BORBÁS) GRULICH. Rozdíly jsou patrné zejména ve tvaru pupenů, tvaru a postavení listů, v ojínění a v některých kvantitativních znacích. Ekologicky se odlišuje především *H. jullianum*, vázané nejčastěji na silniční příkopy a násypy, zatímco ostatní se vyskytují převážně na přirozených skalnatých, travnatých a lesostepních stanovištích. Geograficky je *H. jullianum* omezeno na západní část státu a *H. scherfelii* na střední a východní Slovensko, *H. maximum* je rozšířeno po celém území.

Potíže při determinaci může činit přítomnost růžové skvrnky na korunách žlutokvětých druhů, nitky tyčinek však vždy zůstávají žlutavé. Červenokvěté druhy vždy postrádají jakýkoli žlutavý nebo zelenavý nádech na poupatech i květech.

Tvorba deformovaných pylových zrn u *H. purpureum* a *H. jullianum* má pravděpodobně spojitost s výskytem triploidie a aneuploidie. Prostorově oddělené topodémy s konstantními morfologickými kombinacemi napovídají klonovému charakteru populací.

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