

Lorenzo Gallo

Nomenclatural adjustments and typifications in the genus *Phedimus* (*Crassulaceae*)

Published online: 16 June 2020
© Forum geobotanicum 2020

Abstract This paper deals with the taxonomical position and the nomenclature of two taxa belonging to the genus *Sedum* (*Crassulaceae*), today treated as *Phedimus*, namely *Sedum middendorffianum* Maxim. var. *diffusum* Praeger and *Sedum oppositifolium* Sims. The correct taxonomical application of names is based on the nomenclatural types designated here.

Keywords lectotype, neotype, *Phedimus middendorffianus* var. *diffusus*, *Phedimus spurius* subsp. *oppositifolius*

Dr. Lorenzo Gallo
Strada Val San Martino sup. 194
10131 Torino - Italy.
lorenzogallo1959@hotmail.it

Introduction

The genus *Phedimus* was established by Rafinesque (1817, p438) for *Sedum stellatum* L. (= *Phedimus stellatus* (L.) Raf.), although already two years earlier he published it as *nomen nudum* (Rafinesque 1815, p174). This name was long forgotten until 't Hart (1995, p168), reestablished it, adding the taxa belonging to the subsection *Spathulata* Boriss. of the genus *Sedum* ('t Hart 1984, p405), due to shared morpho-anatomical features (simultaneous presence of flat leaves and patent follicles) and the successful hybridization of *P. stellatus* with *S. stoloniferum* S. G. Gmel. The splitting of *Phedimus* from *Sedum* is now widely accepted, also because it is supported by several phylogenetic studies (Mayuzumi & Ohba 2004, Gontcharova et al. 2006, Gontcharova, & Gontcharov, 2009, Nikulin et al. 2015). After 't Hart (1995, p168), other scholars have made new combinations sub. *Phedimus* (Ohba et al. 2000, pp400-402, Son et al. 2016, p294, Bomble 2016, p29) and this work proposes two further combinations together with the typification of the basionyms.

Materials and Methods

An extensive study of the taxonomic literature concerning the taxa involved in this research (*Sedum middendorffianum* var. *diffusum* Praeger, *Sedum oppositifolium* Sims and *Sedum spurium* M. Bieb.) was performed. Original material (*exsiccata*) used for describing these taxa was reviewed in the according herbaria; also the original illustrations (published and unpublished) accompanying the text were evaluated.

Results and Discussion

Phedimus middendorffianus (Maxim.) 't Hart var. *diffusus* (Praeger) L. Gallo comb. nov.

Basionym: *Sedum middendorffianum* Maxim. var. *diffusum* Praeger (Praeger R. L. 1921. An account of the genus *Sedum* as found in cultivation: p117, footnote).

≡ *Sedum middendorffianum* Maxim. 'Diffusum' (Praeger) Hensen & Groendijk-Wilders (1986, p10 [not seen, J. Shaw comm.]).

≡ *Sedum kamtschaticum* Fisch. & C. A. Mey. var. *Middendorffianum* (Maxim.) Groendijk-Wilders & Springate (1995, p192) forma *diffusum* (Praeger) Groendijk-Wilders & Springate (1995, p192).

≡ *Phedimus diffusus* (Praeger) Bomble (2016, p29).

Recently reported in Germany as established in the wild (Bomble 2016, p29), *Sedum middendorffianum* Maxim. var. *diffusum* was described by Praeger (1921, p117 in note), from cultivated plants; it differs from var. *middendorffianum* by the decumbent habit and lanceolate leaves, which are more toothed on the margins than in the type variety (Evans 1985, p127, Stephenson 1994, p154). These features also make it very similar to *Phedimus kamtschaticus* (Fisch. & C. A. Mey.) 't Hart, in fact, Groendijk-Wilders & Springate (1995, p192; 2011, p42 [Shaw in litt.]) treat it as *Sedum kamtschaticum* var. *middendorffianum* forma *diffusum*. In view of the poor differences with respect to other taxa of the genus *Phedimus*, we propose to maintain the taxonomic rank chosen by Praeger, although an according combination in the genus *Phedimus* is still missing.

Lectotype (designated here): The original drawing for Praeger 1921, p116, fig. 59b by Eileen Barnes, extant as an unnumbered manuscript in Royal Irish Academy, Dublin, figure on left-hand side of sheet (J. Shaw, pers. comm.) (see Nelson 1993, p103).

<https://www.biodiversitylibrary.org/item/52929#page/128/mode/1up>.

R. L. Praeger's herbarium collections are stored at BEL and DBN (Thiers 2019), but no specimens of *Sedum middendorffianum* have been found in there, and therefore, the original drawing reproduced in the protologue has been selected as a lectotype: This is morphologically consistent and was drawn from a living plant cultivated in a garden by Eileen Barnes at the request of Praeger (cf. Nelson 1993, p103).

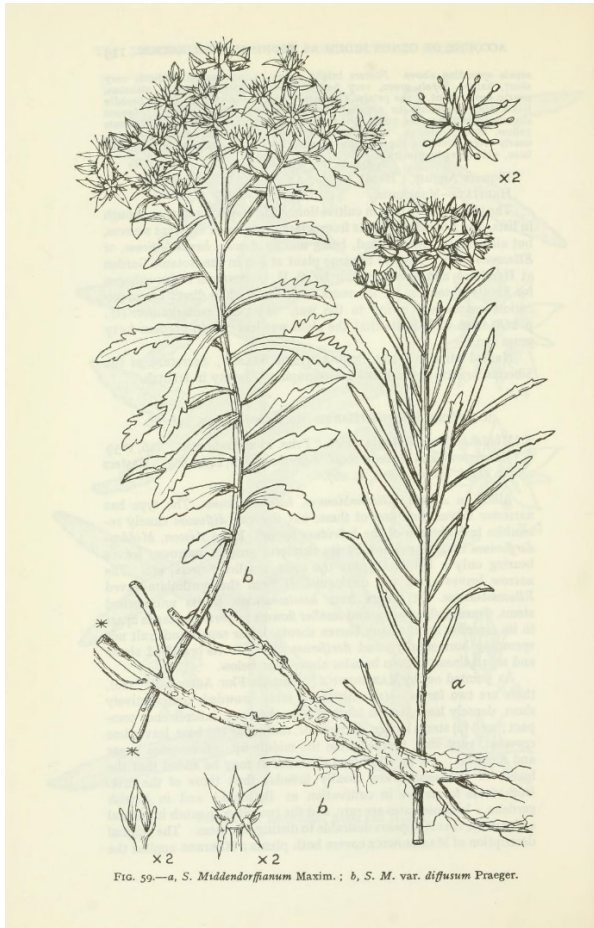


Fig. 1 Lectotype *Phedimus middendorffianus* (Maxim.) 't Hart var. *diffusus* (Praeger) L. Gallo *comb. nov.* Illustration taken from Praeger (1921).

Phedimus spurium* (M. Bieb.) 't Hart subsp. *oppositifolium* (Sims) L. Gallo *comb. et stat. nov.

Basionym: *Sedum oppositifolium* Sims, Curtis's Botanical Magazine: 43, t. 1807 (1816).

= *Sedum spurium* M. Bieb. var. *album* [sub *alba*] Trautv. (1876, p370).

≡ *Sedum spurium* M. Bieb. subsp. *oppositifolium* (Sims) R. L. Evans (1983, p200).

= *Sedum spurium* M. Bieb. 'Album' R.L. Evans (1983, p200).

≡ *Phedimus oppositifolius* (Sims) Essl & Rabitsch (2002, p128) *comb. inval.* (Art. 41.1, I.C.N. Turland et al. 2018).

Although tentatively, Sims (1816: number 1807) also included *Sedum denticulatum* Pursh in Donn (1815, p149) among the synonym *Sedum*. However this name (invalid because *nomen nudum*) is not included here, because in the protologue there are no useful data to clarify its identity; the only information available is related to its origin and life form: "M. Caucasu *Sedum* 1806 July. A. H. 24".

With regard to the year of publication of the name *Sedum oppositifolium* Sims, there are different interpretations in the literature. Some authors suggest 1815 (Borissova 1939, p60, 't Hart & Bleij 2003, p201, Marhold 2011) while I.P.N.I. (<https://www.ipni.org/>) and the Smithsonian Institution Libraries (TL-2) cite 1816

(<https://www.sil.si.edu/DigitalCollections/tl-2/search.cfm>).

Following TL-2, the latter is the year of publication of the pictures from number 1787 to 1859, therefore including *Sedum oppositifolium* (number 1807) and has been followed here.

Sims' description (Sims 1816: n. 1807) was based on plants grown in the "collection of the Comtesse de Vandes, at Bayer-Water", possibly used as a model for the illustration n. 1807 attached to the text.

Sedum oppositifolium, may have come from the Caucasus ("[...] it seems that it is a native of Mount Caucasus") (Sims 1816: n. 1807). Its morphological resemblance to *Sedum spurium* M. Bieb. (= *Phedimus spurium* (M. Bieb.) 't Hart), has always made its taxonomic interpretation difficult and contradictory: Many scholars have treated them as distinct taxa (species or subspecies) (Meyer 1831, p151; Ledebour 1846, p184; Boissier 1872, p778; Borissova 1939, p60; Grossheim 1950, p266; Evans 1985, p300); however for other botanists they are merely synonyms (Hamet 1908, p15; Praeger 1921, p194; Fröderström 1932, 7 suppl., p10; J alas et al. 1999, p106; 't Hart, Bleij 2003, p201). Borissova (1939, 9, pp58-61) sets out a detailed morphological account of the two taxa and a synoptic table to compare the differences between them is proposed here (Tab. 1).

Tab. 1 Comparison of morphological characters between *Sedum oppositifolium* Sims and *Sedum spurium* M. Bieb. (from Borissova 1939)

Characters	<i>Sedum oppositifolium</i>	<i>Sedum spurium</i>
Bracts	Not surpassing the inflorescence	Surpassing the inflorescence ¹
Sepals	Light green	Green or reddish
Petals	Acuminate, white or pale yellowish cream-colored	Acute, pink or purple [in the key p. 39]
Filaments	Whitish	Red
Anthers	Yellow later dark	Orange-red
Follicles	Green [white cf. Sims]	Reddish

¹ = Morphological feature attributed by the author at *Sedum involucreatum* M. Bieb., treated by 't Hart & Bleij (2003, p201) as synonymous of *Sedum spurium*.

The distribution of *Phedimus spurium* subsp. *oppositifolius* may include the eastern part of the *Phedimus spurium* s.l. area (Caucasus), and more precisely: Armenia (Takhtadjan 1958, p356) Georgia (Boissier 1872, p778, Nakhutsrishvili 1999, p118, p133), Iran (Boissier 1872, p778, Parsa 1948, p663, Jansson & Rechinger 1970, p10, sub *Sedum spurium*) and

probably also Azerbaijan (Batsatsashvili *et al.* 2016 sub *Sedum spurium*). The collections pertaining to Anatolia ('t Hart & Bleij 2003, p201) would instead be referred to *Phedimus spurium* s.s. From an ecological point of view, *Sedum oppositifolium* is a more xerophilous plant than *Sedum spurium* (Borissova 1939/9, p61); the species is "usually

located in poor thin soils, even in rock crevices" (Batsatsashvili *et al.* 2016, p3) and on rocks in the high-altitude pastures (Nakhutsrishvili 1999, p118 and p133). *Sedum oppositifolium* was furthermore found to be naturalized in Germany (Vollrath & Lauerer 2005, p299). To summarize, this taxon is sufficiently morphologically distinct and geologically separate from *Phedimus spurium* to deserve a subspecific rank. Its taxonomic relationship with *Crassula crenata* Desf. (= *Phedimus crenatus* (Desf.) V. Byalt has yet to be evaluated (cfr. Borissova 1939, p58; Byalt 2001, p284). The subspecific combination under *Phedimus* has been lacking up to now (see also Essl & Rabitsch 2002, p128), and is provided here, together with the typification.



Fig. 2 Neotype of *Phedimus spurium* (M. Bieb.) 't Hart subsp. *oppositifolius* (Sims) L. Gallo comb. et stat. nov. Illustration taken from Sims (1816).

Neotype (designated here): Curtis's Botanical Magazine, 43, t. 1807 (1816)

[<https://www.biodiversitylibrary.org/item/14327#page/103/mode/lup>].

The search for specimens on which the protologue relied did not lead to any results; more specifically, no original material was found at BON, where the Sims collection is kept, and at Kew under :

(<http://apps.kew.org/herbcat/refineQuery.do?queryId=25&sessionId=176FDD70393D7FD7E49ED4CDFB1D3B74>).

The picture attached to the protologue could be designated as

lectotype, because it was possibly drawn from the same cultivated plant used for the description (see above) but this is not sure. Therefore, in order to be safe, we prefer to designate it as neotype. The plate is in excellent agreement with the protologue and with Borissova (1939, p60), showing opposite leaves and white petals and, above all, bracts not surpassing the inflorescence, filaments white, anthers yellow and follicles white [in accordance with Sims] or green.

Acknowledgements

The author is very grateful to J. Shaw (Royal Horticultural Society, London) who reviewed the manuscript, improving it. Thanks also to Michael Simms (BEL) who provided me with informations on Praeger's collections at his institution.

Literature

- Batsatsashvili K *et al* (2016) *Sedum caucasicum* (Grossh) Boriss. *Sedum spurium* M Bieb *Crassulaceae*, pp 1-7. In Bussmann (Ed). *Ethnobotany of the Caucasus*, European Ethnobotany. Springer Int Publ Berlin, Heidelberg
- Boissier E (1872) *Flora Orientalis*, 2: 778. Apud H Georg, Bibliopolam, Genevae et Basileae
- Bomble, FW (2016) Kultivierte und verwildernde Arten von *Phedimus* subgen *Aizoon* im Aachener Raum und im Ruhrgebiet. *Jahrb Bochumer Bot Ver* 7 (3/4): 17-36
- Borissova AG (1939) *Crassulaceae* DC, pp 8-105. + Addenda (Diagnoses plantarum novarum in tomo IX florae URSS commemoratarum) pp 357-372. In Komarov VL & Yuzepchuk SV (Eds). *Flora of the U.S.S.R. (Flora SSSR)*. Volume IX. *Rosales* and *Sarraceniales*. Moskva-Leningrad. Bot Inst Acad Sc USSR, Izdatel'stvo Akademii Nauk SSSR
- Byalt VV (2001) *Crassulaceae*, pp 250-285. In Tzvelev (Ed). *Flora Europae Orientalis*. Tomus X. *Magnoliophyta* (= *Angiospermae*) *Magnoliopsida* (= *Dicotyledones*). Acad Chem-Pharm Petropol, Petropoli, Mir I Semia
- Essl F, Rabitsch, W. (2002) *Neobiota in Österreich*. Manz Crossmedia, Wien. 432 pp
- Evans RL (1985) *Handbook of Cultivated Sedums*. Northwood. Science Reviews Lim, 345 pp
- Fröderström H (1932) The genus *Sedum* L. A systematic essay. Part 3. *Acta Horti Gothob* 7 (suppl): 3-119
- Gontcharova SB, Artyukova, EV & Gontcharov, AA (2006) Phylogenetic Relationship among Members of the Subfamily *Sedoideae* (*Crassulaceae*) Inferred from the ITS Region Sequences of Nuclear rDNA. *Russian J Genet* 42 (6): 654-661
- Gontcharova SB, Gontcharov, AA (2009) Molecular Phylogeny and Systematics of Flowering Plants of the Family *Crassulaceae* DC. *Molec Biol* 43 (5): 794-803
- Groendijk-Wilders N, Springate L (1995) *Sedum*. In Cullen J *et al* (Eds) *European Garden Flora* [1st edition] 4: 186-200. Cambridge, Cambridge University Press
- Groendijk-Wilders, N, Springate L (2011) *Sedum*. In Cullen J, Knees, SG, Cubey, HS, *European Garden Flora* [2nd edition] 3: 36-50. Cambridge, Cambridge, University Press [not seen]

- Grossheim, AA (1950) Flora Kavzaka. Tom IV. *Nymphaeaceae-Platanaceae*. Pp. 258-271 + 310-311. Emia. Nauk SSSR, Moskva, Leningrad
- Hamet, R (1908) Revision des *Sedum* du Caucase. Trd Bot Sada Tijli 8 (12): 1-37
- Hart 't H (1984) The white-flowered European *Sedum* species. 3. The systematic position of *S. stellatum* L. Proc Kon Ned Akad Wetensch C, 87 (4): 401-411
- Hart 't H (1995) Intrafamilial and generic classification of the Crassulaceae, pp 159-172. In Hart 't, Eggli (Eds). Evolution and Systematics of the *Crassulaceae*. Backhuys Publishers. Leiden
- Hart 't H, Bleij B (2003) *Phedimus*, pp 196-203. In Eggli (Ed). Illustrated Handbook of Succulent Plants: *Crassulaceae*. Springer-Verlag, Berlin, Heidelberg
- Hensen KJW, & Groendijk-Wilders N (1986) An account of some *Sedums* cultivated in Europe. *The Plantsman* 8(1): 1-20 [not seen, J Shaw comm.]
- I.P.N.I. (The International Plant Names Index). (2012). Available from <http://www.ipni.org> [accessed 10/11/2019]
- Jalas J, Suominen J, Lampinen R, Kurtto A (Eds) (1999) Atlas Florae Europaeae. Distribution of vascular plants in Europe. 12 Resedaceae to Platanaceae. The Committee for Mapping the Flora of Europe & Societas Biologica fennica Vanamo, Helsinki. 250 pp (maps 2928-3270)
- Jansson CA, Rechinger KH (1970) Crassulaceae. In K.H. Rechinger (Ed). Flora Iranica. Flora des Iranischen Hochlandes und der umrahmenden Gebirge. Persien, Afghanistan, Teile von West-Pakistan, Nord-Iraq, Azerbaidjan, Turkmenistan. N 72. Akad Druck u Verlagsanstalt, Graz
- Ledebour CF (1846) Flora Rossica sive enumeratio plantarum in totius Imperii Rossici provinciis Europaeis, Asiaticis et Americanis hucusque observatarum. Vol II. Sumpt libr. E Schweizerbart, Stuttgartiae. 938 pp
- Marhold K (2011) *Crassulaceae*. – In Euro+Med Plantbase - the information resource for Euro-Mediterranean plant diversity. Available from <http://www2.bgbm.org/EuroPlusMed/query.asp> [accessed 10/11/2019]
- Mayuzumi S, Ohba H (2004) The phylogenetic position of Eastern Asian *Sedoideae* (*Crassulaceae*) inferred from chloroplast and nuclearDNA sequences. Syst Bot 29 (3): 587-598
- Meyer CA (1831) Verzeichniss der Pflanzen welche während der, auf Allerhöchsten Befehl, in den Jahren 1829 und 1830 unternommenen Reise im Caucasus und in den Provinzen am westlichen Ufer des Caspischen Meeres. gefunden und eingessammelt worden sind. Gedruckt in der Buchdruckerei der Kaiserl Akademie der Wissenschaften, St. Petersburg. 241 pp
- Nakhutsrishvili G (1999) The Vegetation of Georgia (South Caucasus). Springer-Verlag, Berlin-Heidelberg, 235 pp
- Nelson EC (1993) Robert Lloyd Praeger's *Crassulaceae*: a commentary on possible type specimens in the National Botanic Gardens, Dublin, and on illustrations in the Royal Irish Academy, Dublin. *Bradleya* 11: 91-106
- Nikulin AYU., Nikulin Vyu, Gontcharov AA (2015) On the phylogenetic structure of the tribe *Telephieae* (*Sempervivoideae*, *Crassulaceae*) on the base of rDNA sequence comparisons. Bot Zhurn 100: 1030-1040
- Ohba H, Bartholomew BM, Turland NJ, Fu K (2000) New combinations in *Phedimus* (*Crassulaceae*). *Novon* 10: 400-402
- Parsa A (1948). Flore de l'Iran. Vol II Pp 656-670. Impr Mazaheri, Teheran
- Praeger RL (1921) An account of the genus *Sedum* as found in cultivation. J Roy Hort Soc 46 : 1-314
- Pursh F (1815) *Hortus cantabrigiensis* [Donn J]. 8° ed: 149. R & A Taylor. London, 355 pp
- Rafinesque CS (1815) Analyse de la Nature. Palerme, Italy
- Rafinesque CS (1817). *Neogenytum Siculum* or Descriptions of four genera of Dicotyle Sicilian Plants. Amer Monthly Mag & Crit Rev 1: 438
- Sims J (1816) *Sedum oppositifolium*. Opposite-leaved *Sedum*. Curtis's Bot Mag 43: n.1807
- Smithsonian Institution Libraries. Taxonomic Literature II (TL-2) <https://www.sil.si.edu/DigitalCollections/tl-2/index.cfm> [Last access: 12/12/2019]
- Son DC, Kim H-J, Moon A-R, Jang C-G, Chang K-S (2016) A new combination in *Phedimus* (*Crassulaceae*), with neotypification of *Sedum latiovalifolium*. Phytotaxa 278 (3): 294-296
- Stephenson R (1994) *Sedum*. Cultivated Stonecrops. Portland Timber Press 335 pp
- Takhtadjan AL (1958) Flora Armenii. Tom 3. *Platanaceae-Crassulaceae*, pp 342-371. Inzdatel'stvo Akademii nauk Armjanskoj SSR, Erevan
- Thiers B [continuously updated]. Index Herbariorum: A global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. Available from <http://sweetgum.nybg.org/science/ih/> [accessed 10/11/2019]
- Trautvetter ER (1876) Plantas a Dre G Raddein Isthmo Caucasic anno 1875 lectas. Acta Horti Petropolitani, 4: 343-406
- Turland NJ, Wiersema JH, Barrie FR, Greuter W, Hawksworth DL, Herendeen PS, Knapp S, Kusber W-H, Li D-Z, Marhold K, May TW, McNeill J, Monro AM, Prado J, Price MJ, Smith GF (Eds) 2018: International Code of Nomenclature for algae, fungi, and plants (Shenzhen Code) adopted by the Nineteenth International Botanical Congress Shenzhen, China, July 2017. Regnum Vegetabile 159. Glashütten: Koeltz Botanical Books. DOI <https://doi.org/10.12705/Code.2018>
- Vollrath H, Lauerer M (2005) *Sedum oppositifolium* in Oberfranken. Hoppea 66: 299-304