

New combinations in Jungermanniales: transfer of 32 taxa to *Solenostoma* Mitt.

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Abstract – *Solenostoma* Mitt. represents an independent lineage of jungermannioid liverworts with peryginia terminated by perianths or with plicate perianths that are abruptly constricted to the mouth and form a tubular beak. Species with the generic features of *Solenostoma* have often been included in a broadly circumscribed genus *Jungermannia* L. or in *Plectocolea* Mitt. In the present paper thirty two taxa, recently placed in *Jungermannia* subg. *Solenostoma* (Mitt.) Amakawa and subg. *Plectocolea* (Mitt.) Amakawa, are transferred to *Solenostoma*.

Jungermanniales / *Solenostoma* / *Jungermannia* / nomenclature

Jungermannia L. was originally proposed to include all leafy liverworts (Linnaeus, 1753). Later authors separated numerous genera from *Jungermannia s. l.*, and inter alia erected the genera *Liochlaena* Nees (Gottsche *et al.*, 1844-1847), *Solenostoma* Mitt. (Mitten, 1865), and *Plectocolea* Mitt. (Mitten, 1871) that differ from *Jungermannia s. str.* by perianth shape or the presence of perigynia. These genera were once again treated as elements of *Jungermannia* by Amakawa (1959, 1960) and several other recent authors (Váňa, 1973; Paton, 1999; Crandall-Stotler & Stotler, 2000; Grolle & Long, 2000; Damsholt, 2002).

Molecular phylogenetic studies demonstrated the presence of three independent lineages (Hentschel *et al.*, 2007; Feldberg *et al.*, 2009) and supported a classification into the genera *Jungermannia s. str.*, *Liochlaena* and *Solenostoma* (including *Plectocolea*), a treatment already advocated by Schuster (2002) based on morphological evidence. In the circumscription of Schuster (2002) and Hentschel *et al.* (2007), *Solenostoma* includes "jungermannioid" species with

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perigynia that are terminated by perianths as well as species with plicate perianths that are suddenly constricted to the mouth and form a tubular beak. Bakalin (2008), Schäfer-Verwimp & Pócs (2009) and Váňa & Long (2009) transferred numerous taxa (55) of *Jungermannia s. l.* to *Solenostoma* and Crandall-Stotler *et al.* (2009) erected a new family Solenostomataceae to include *Solenostoma* and *Nardia* Gray. Feldberg *et al.* (2009) provided evidence for the inclusion of *Scaphophyllum* Inoue and several species of *Gottschelia* Grolle in *Solenostoma*.

Despite these attempts to establish a natural classification of jungermannioid liverworts, several taxa with *Solenostoma*-morphology have not yet been transferred to this genus.

With the objective of a monophyletic supraspecific classification of jungermannioid liverworts, we propose 32 new combinations and transfer 29 *Jungermannia* binomials and three varieties to *Solenostoma*:

Solenostoma amoenum (Lindenb. *et* Gottsche) R.M. Schust. [*Nova Hedwigia, Beih.* 119: 379, nom. inval., Art. 33.4] *ex* Váňa, Hentschel *et* Heinrichs, **comb. nov.**
Basionym: *Jungermannia amoena* Lindenb. *et* Gottsche in Gottsche *et al.*, *Syn. Hepat.*: 674, 1847.

Solenostoma balfourii (Váňa) Váňa, Hentschel *et* Heinrichs, **comb. nov.**
Basionym: *Jungermannia balfourii* Váňa, *Folia Geobot. Phytotax.* 9: 279, fig. 1: 1-9, 1974.

Solenostoma borneense (Amakawa) Váňa, Hentschel *et* Heinrichs, **comb. nov.**
Basionym: *Jungermannia borneensis* Amakawa, *J. Hattori Bot. Lab.* 33: 160, fig. 29, 1970.

Solenostoma caeleste (Inoue *et* Váňa) Váňa, Hentschel *et* Heinrichs, **comb. nov.**
Basionym: *Jungermannia caelestis* Inoue *et* Váňa in Inoue, *Stud. Crypt. Papua New Guinea*: 16, fig. 3, 1979.

Solenostoma bilobum (Amakawa) Váňa, Hentschel *et* Heinrichs, **comb. nov.**
Basionym: *Plectocolea biloba* Amak., *J. Jap. Bot.* 32: 216, fig. 7, 1957.

Solenostoma comatum var. ***novae-guineae*** (Váňa) Váňa, Hentschel *et* Heinrichs, **comb. nov.**
Basionym: *Jungermannia comata* var. *novae-guineae* Váňa, *J. Hattori Bot. Lab.* 37: 187, fig. 1, 1973.

Solenostoma decolor (Schiffn.) R.M. Schust. [*Nova Hedwigia, Beih.* 119: 379, nom. inval., Art. 33.4] *ex* Váňa, Hentschel *et* Heinrichs, **comb. nov.**
Basionym: *Jungermannia decolor* Schiffn., *Leberm., Forschungsr. Gazelle*: 10, tab. 3, fig. 6-7, 1890.

Solenostoma dusenii (Steph.) Váňa, Hentschel *et* Heinrichs, **comb. nov.**
Basionym: *Nardia dusenii* Steph., *Hedwigia* 30: 209, 1891.

Solenostoma emarginatum (Amakawa) Váňa, Hentschel *et* Heinrichs, **comb. nov.**
Basionym: *Plectocolea emarginata* Amakawa, *J. Jap. Bot.* 33: 340, fig. 14, 1958.

Solenostoma hattorianum (Amakawa) Váňa, Hentschel *et* Heinrichs, **comb. nov.**
Basionym: *Plectocolea hattoriana* Amakawa, *J. Jap. Bot.* 33: 341, fig. 15, 1958.

Solenostoma hewsoniae (Amakawa *et* Grolle) R.M. Schust. [*Nova Hedwigia, Beih.* 119: 377, nom. inval.] *ex* Váňa, Hentschel *et* Heinrichs, **comb. nov.**
Basionym: *Jungermannia hewsoniae* Amakawa *et* Grolle, *J. Hattori Bot. Lab.* 31: 108, fig. 21 a-i, 1968.

Solenostoma hirticalyx (Steph.) R.M. Schust. [*Nova Hedwigia, Beih.* 119: 377, nom. inval., Art. 33.4] ex Váňa, Hentschel et Heinrichs, **comb. nov.**

Basionym: *Jungermannia hirticalyx* Steph., *Spec. Hepat.* (Stephani) 6: 87, 1917.

Solenostoma hokkaidense (Váňa) Váňa, Hentschel et Heinrichs, **comb. nov.**

Basionym: *Jungermannia hokkaidensis* Váňa, *J. Hattori Bot. Lab.* 35: 314, 1972.

Solenostoma horikawanum (Amakawa) Váňa, Hentschel et Heinrichs, **comb. nov.**

Basionym: *Plectocolea horikawana* Amakawa, *J. Jap. Bot.* 32: 219, fig. 8, 1957.

Solenostoma infusum var. *ovalifolium* (Amakawa) Váňa, Hentschel et Heinrichs, **comb. nov.**

Basionym: *Plectocolea infusca* var. *ovalifolia* Amakawa, *J. Hattori Bot. Lab.* 34: 115, fig. 17 j-p, 1959.

Solenostoma infusum var. *ovicalyx* (Steph.) Váňa, Hentschel et Heinrichs, **comb. nov.**

Basionym: *Solenostoma ovicalyx* Steph., *Spec. Hepat.* 6: 82, 1917.

Solenostoma lignicola (Schiffn.) Váňa, Hentschel et Heinrichs, **comb. nov.**

Basionym: *Nardia lignicola* Schiffn., *Ann. K. K. Naturh. Hofmus.* 23: 137, tab. 7, fig. 1-10, 1909.

Solenostoma mamatkulovii (Váňa et Zerov) Váňa, Hentschel et Heinrichs, **comb. nov.**

Basionym: *Jungermannia mamatkulovii* Váňa et Zerov, *Preslia* 49: 181, fig. 4, 1977.

Solenostoma micranthum (Mitt.) Váňa, Hentschel et Heinrichs, **comb. nov.**

Basionym: *Plectocolea micrantha* Mitt., *Fl. Vit. [Seeman]*: 405, 1871.

Solenostoma niveum (Grolle) R.M. Schust. [*Nova Hedwigia, Beih.* 119: 377, nom. inval., Art. 33.4] ex Váňa, Hentschel et Heinrichs, **comb. nov.**

Basionym: *Jungermannia nivea* Grolle, *Misc. Bryol. Lichénol.* 6: 1, fig. 1, 1971.

Solenostoma onraedtii (Váňa) Váňa, Hentschel et Heinrichs, **comb. nov.**

Basionym: *Jungermannia onraedtii* Váňa, *Folia Geobot. Phytotax.* 9: 282, fig. 3-4:1, 1974.

Solenostoma obliquifolium (Schiffn.) R.M. Schust. [*Nova Hedwigia, Beih.* 119: 378, nom. inval., Art. 33.4] ex Váňa, Hentschel et Heinrichs, **comb. nov.**

Basionym: *Nardia obliquifolia* Schiffn., *Denkschr. Kaiserl. Akad. Wiss. Wien, Math.-Naturwiss. Kl.*, 67: 191, 1898.

Solenostoma parviperianthum (C. Gao et X.L. Bai) Váňa, Hentschel et Heinrichs, **comb. nov.**

Basionym: *Jungermannia parviperiantha* C. Gao et X.L. Bai, *Philipp. Scientist* 38: 129, fig. 3: 1-9, 2001.

Solenostoma pocsii (Váňa) Váňa, Hentschel et Heinrichs, **comb. nov.**

Basionym: *Jungermannia pocsii* Váňa, *Folia Geobot. Phytotax.* 10: 365, fig. 6-7, 1975.

Solenostoma renauldii (Steph.) Váňa, Hentschel et Heinrichs, **comb. nov.**

Basionym: *Jungermannia renauldii* Steph., *Bull. Soc. Roy. Bot. Belgique* 30: 201, 1891.

Solenostoma schusterianum (S.D. Godfrey et G. Godfrey) Váňa, Hentschel et Heinrichs, **comb. nov.**

Basionym: *Jungermannia schusteriana* J.D. Godfrey et G. Godfrey, *J. Hattori Bot. Lab.* 46: 109, fig. 1-3, 1979.

Solenostoma shimizuanum (S. Hatt. ex Váňa) Váňa, Hentschel *et* Heinrichs, **comb. nov.**

Basionym: *Jungermannia shimizuana* S. Hatt. ex Váňa, *J. Hattori Bot. Lab.* 35: 315, 1972.

Solenostoma strictum (Schiffn.) Váňa, Hentschel *et* Heinrichs, **comb. nov.**

Basionym: *Aplozia stricta* Schiffn., *Denkschr. Kaiserl. Akad. Wiss. Wien, Math.-Naturwiss. Kl.* 67: 194, 1898.

Solenostoma tuberculiferum (Herzog) Váňa, Hentschel *et* Heinrichs, **comb. nov.**

Basionym: *Haplozia tuberculifera* Herzog, *Ann. Bryol.* 5: 84, fig. 1, 1932.

Solenostoma unispire (Amakawa) Váňa, Hentschel *et* Heinrichs, **comb. nov.**

Basionym: *Plectocolea unispiris* Amakawa, *J. Jap. Bot.* 29: 178, fig. 1, 1954.

Solenostoma vulcanicola (Schiffn.) Váňa, Hentschel *et* Heinrichs, **comb. nov.**

Basionym: *Nardia vulcanicola* Schiffn., *Denkschr. Kaiserl. Akad. Wiss. Wien, Math.-Naturwiss. Kl.* 67: 191, 1898.

Solenostoma wattsonianum (Steph.) R.M. Schust. [*Nova Hedwigia, Beih.* 119: 378, nom. inval., Art. 33.4] ex Váňa, Hentschel *et* Heinrichs, **comb. nov.**

Basionym: *Jungermannia wattsi* Steph., *Spec. Hepat.* 6: 96, 1917.

Not included possible *Solenostoma* species:

The following two *Jungermannia* species are not transferred to the genus *Solenostoma* because of their unclear identity:

Jungermannia submersa (Horik.) S. Hatt., *Bull. Tokyo Sci. Mus.* 11: 32, 1944, nom. illeg. (Art. 53.1), non *J. submersa* Kremer, *Monogr. Hep. Moselle*, ed. 1: 36, 1837. Syn.: *Haplozia submersa* Horik., *J. Sci. Hiroshima Univ., Ser. B, Div. 2, Bot.* 1: 121, tab. 14, fig. 1-3, 193, 1932.

This taxon is known only from the holotype (HIRO) consisting of sterile, submerged, extremely modified plants that could represent either *Jungermannia* or *Solenostoma*, or could belong to a third genus.

Jungermannia viridis Kashyap *et* R. Chopra, *Liverworts West. Himalayas Panjab Plain* 2: 87, 1932, nom. illeg. (Art. 53.1), non *J. viridis* Spreng., *Syst. Veg.*, ed. 16, 4(1): 232, 1827.

This taxon is probably a heterotypic synonym of *S. truncatum* (Nees) R. M. Schust. ex Váňa *et* D.G. Long (cf. Váňa, 1975: 374), however, the sketchy description does not allow for a definite conclusion. The type specimen has not been available for study.

Further dubious taxa that could belong to *Solenostoma* were listed by Váňa & Long (2009).

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