

Currently accepted species and new combinations in *Jamesonielloideae* (Adelanthaceae, Jungermanniales)

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Abstract – Based on available molecular and morphological evidence we present a taxonomic synopsis of Jamesonielloideae. *Cryptochila*, *Jamesoniella* and *Roivainenia* are synonymized with *Syzygiella* and *Anomacaulis* is treated as a synonym of *Cuspidatula*. *Syzygiella* is divided into five subgenera. Twenty new combinations are proposed.

Jungermanniales / Adelanthaceae / Syzygiella / Cuspidatula / nomenclature / taxonomy

INTRODUCTION

Molecular phylogenetic studies of liverworts pointed at numerous incongruences of morphology-based classifications and phylogenies derived from DNA sequence data (Hentschel *et al.*, 2006; Feldberg *et al.*, 2009). Lophoziaceae subfam. Jamesonielloideae forms a separate lineage outside the Lophoziaceae (Heinrichs *et al.*, 2005). This subfamily was either treated as Jamesoniellaceae (He-Nygrén *et al.*, 2006) or included in the Adelanthaceae (Hentschel *et al.*, 2006; Heinrichs *et al.*, 2007). A comprehensive molecular phylogenetic study of Adelanthaceae (Feldberg *et al.*, 2010) based on more than one hundred accessions and five markers demonstrated the non-monophyly of the genera *Syzygiella* Spruce, *Jamesoniella* (Spruce) F. Lees, and *Cuspidatula* Steph., and extensive morphological homoplasy in Jamesonielloideae.

Here we present a taxonomic synopsis of Jamesonielloideae based on available molecular and morphological data. Based on the phylogeny of Feldberg *et al.* (2009b) we include the genera *Cryptochila* R.M. Schust., *Jamesoniella*, and

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Roivainenia Perss. in *Syzygiella*, lower *Anomacaulis* (R.M. Schust.) Grolle to a synonym of *Cuspidatula*, and propose 20 new combinations. New combinations are made only for currently accepted taxa (Inoue, 1966, 1974; Robinson, 1967; Grolle, 1971; Vána *et al.*, 1979; So & Grolle, 2003; Pócs, 2005; De Roo *et al.*, 2007); taxa treated as synonyms in the cited revisions are not moved to their respective genus. *Jamesoniella undulifolia* (Nees) Müll. Frib. is resolved outside the Adelanthaceae in a molecular study of Vilnet *et al.* (2009) and therefore not treated in this paper. Its exact position deserves a detailed study of Jungermanniales suborder Cephaloziineae.

TAXONOMIC SYNOPSIS

Jamesonielloideae Inoue, *J. Hattori Bot. Lab.* 29: 178 (1966). **Type:** *Jamesoniella* (Spruce) F. Lees, *London Cat. Brit. Moss.* 2: 25 (1881).

Plants with ventral-intercalary, often flagelliform branches, succubous, flat or recurved leaves, ovoid to cylindrical, plicate perianths with a contracted mouth, often connate bracts and bracteoles, and 4-7-stratose capsule walls.

1. *Cuspidatula* Steph., *Sp. Hepat.* (Stephani) 2: 124 (1901). **Lectotype** (designated by Grolle 1971: 91): *Jungermannia contracta* Reinw., Blume *et* Nees, *Nova Acta Phys.-Med. Acad. Caes. Leop.-Carol. Nat. Cur.* 12: 233 (1824). = *Anomacaulis* (R.M. Schust.) R.M. Schust., *Trans. Brit. Bryol. Soc.* 5: 797 (1969); *Lophozia* subg. *Anomacaulis* R.M. Schust., *Hepat. Anthocerotae N. Amer.* 2: 260, 263 (1969); **syn. nov.** **Type:** *Lophozia hamatiloba* Grolle, *J. Hattori Bot. Lab.* 28: 50 (1965) [= *Anomacaulis flaccidus* (Steph.) Grolle (Grolle, 1975)].

Female bracts irregularly toothed, bifurcate, perianth mouth densely ciliate.

Cuspidatula contracta (Reinw., Blume *et* Nees) Steph., *Sp. Hepat.* (Stephani) 2: 124 (1901); *Jungermannia contracta* Reinw., Blume *et* Nees, *Nova Acta Phys.-Med. Acad. Caes. Leop.-Carol. Nat. Cur.* 12: 233 (1824); *Anastrophyllum contractum* (Reinw., Blume *et* Nees) Steph., *Hedwigia* 32: 140 (1893).

Cuspidatula flaccida (Steph.) Feldberg, Vána, Hentschel *et* Heinrichs, **comb. nov.**; *Anastrophyllum flaccidum* Steph., *Sp. Hepat.* (Stephani) 6: 105 (1917), *Anomacaulis flaccidus* (Steph.) Grolle, *J. Bryol.* 8: 483 (1975).

Cuspidatula kirkii (Steph.) Feldberg, Vána, Hentschel *et* Heinrichs, **comb. nov.**; *Jamesoniella kirkii* Steph., *Hedwigia* 34: 47 (1895).

Cuspidatula monodon Steph., *Sp. Hepat.* (Stephani) 2: 126 (1901).

2. *Syzygiella* Spruce, *J. Bot.* 5: 234 (1876). **Type:** *Jungermannia perfoliata* Sw., *Prodr.* (Swartz): 143 (1787).

= *Jamesoniella* (Spruce) F. Lees, *London Cat. Brit. Moss.* 2: 25 (1881); **syn. nov.** **Type:** *Jungermannia colorata* Lehm., *Linnaea* 4: 366 (1824).

Cryptochila R.M. Schust., *J. Hattori Bot. Lab.* 26: 284 (1963); **syn. nov.** **Type:** *Jamesoniella pseudocclusa* E.A. Hodgs., *Trans. Roy. Soc. New Zealand* 85: 583 (1958).

Roivainenia Perss., *Nova Hedwigia* 3: 43 (1955); **syn. nov.** **Type:** *Jungermannia jacquinetii* Mont., *Ann. Sci. Nat., Bot., Ser. 2*, 19: 250 (1843).

Female bracts entire to irregularly toothed, perianth mouth entire to ciliate.

2.1 Syzygiella subg. *Anomalae* (Inoue) Feldberg, Váňa, Hentschel *et* Heinrichs, **comb. et stat. nov.**; *Syzygiella* sect. *Anomalae* Inoue, *J. Hattori Bot. Lab.* 29: 183 (1966). **Type:** *Plagiochila anomala* Lindenb. *et* Gottsche, *Syn. Hepat.*: 646 (1844).

Plants procumbent or somewhat ascending, leaves more or less triangular, occasionally suborbicular, ventrally connate, dorsally alternating or connate, entire or toothed but never deeply bilobed, perianths not twisted.

Syzygiella anomala (Lindenb. *et* Gottsche) Steph., *Sp. Hepat.* (Stephani) 2: 190 (1902); *Plagiochila anomala* Lindenb. *et* Gottsche, *Syn. Hepat.*: 646 (1844).

Syzygiella bilobata Inoue, *J. Hattori Bot. Lab.* 29: 186 (1966).

Syzygiella colombiana H. Rob., *Bryologist* 70: 322 (1967).

Syzygiella concreta (Gottsche) Spruce, *J. Bot.* 5: 234 (1876); *Jungermannia concreta* Gottsche, *Mexik. Leverm.*: 82 (1867).

Syzygiella geminifolia (Mitt.) Steph., *Sp. Hepat.* (Stephani) 2: 186 (1902); *Jungermannia geminifolia* Mitt., *J. Linn. Soc., Bot.* 7: 164 (1864).

Syzygiella liberata Inoue, *Bull. Natl. Sci. Mus., Tokyo* 17: 301 (1974).

Syzygiella manca (Mont.) J.B. Jack *et* Steph., *Sp. Hepat.* (Stephani) 2: 183 (1902); *Chiloscyphus mancus* Mont., *Syll. Gen. Sp. Crypt.* 63 (1858).

Syzygiella pectiniformis Spruce, *Trans. Bot. Soc. Edinburgh* 15: 501 (1885).

Syzygiella subundulata Inoue, *J. Hattori Bot. Lab.* 29: 188 (1966).

Syzygiella tonduzana Steph., *Sp. Hepat.* (Stephani) 6: 118 (1917).

2.2 Syzygiella subg. *Cryptochila* (R.M.Schust.) Feldberg, Váňa, Hentschel *et* Heinrichs, **comb. et stat. nov.**; *Cryptochila* R.M. Schust., *J. Hattori Bot. Lab.* 26: 284 (1963). **Type:** *Jamesoniella pseudocclusa* E.A. Hodgs., *Trans. Roy. Soc. New Zealand* 85: 583 (1958).

Plants with erect growth and alternating foliation, leaves often laterally inserted, entire, suborbicular to reniform, perianths twisted.

Grolle (1971) split *Cryptochila* in three subgenera and two sections (*Cryptochila* subg. *Nigritula* Grolle, *Cryptochila* and *Acinaria* Grolle, the latter with the sections *Acinaria* Grolle and *Spegazzinia* Grolle). This concept needs to be tested using variable molecular markers. *Syzygiella* subg. *Cryptochila* in our circumscription includes species with twisted perianths and an erect growth.

Syzygiella acinacifolia (Hook. f. *et* Taylor) Feldberg, Váňa, Hentschel *et* Heinrichs, **comb. nov.**; *Jungermannia acinacifolia* Hook. f. & Taylor, *London J. Bot.* 3: 367 (1844), *Cryptochila acinacifolia* (Hook. f. *et* Taylor) Grolle, *Feddes Repert.* 82: 29 (1971).

Syzygiella nigrescens (Steph.) Feldberg, Váňa, Hentschel *et* Heinrichs, **comb. nov.**; *Jamesoniella nigrescens* Steph., *Hedwigia* 34: 48 (1895), *Cryptochila nigrescens* (Steph.) Grolle, *Feddes Repert.* 82: 15 (1971).

Syzygiella paludosa (Steph.) Feldberg, Váňa, Hentschel *et* Heinrichs, **comb. nov.**; *Jamesoniella paludosa* Steph., *Bih. Kongl. Svenska Vetensk.-Akad. Handl.* 26 (17): 11 (1901), *Cryptochila paludosa* (Steph.) Grolle, *Feddes Repert.* 82: 26 (1971).

Syzygiella pseudocclusa (E.A. Hodgs.) Feldberg, Váňa, Hentschel *et* Heinrichs, **comb. nov.**; *Jamesoniella pseudocclusa* E.A. Hodgs., *Trans. Roy. Soc. New Zealand* 85: 583 (1958); *Cryptochila pseudocclusa* (E.A. Hodgs.) R.M. Schust., *J. Hattori Bot. Lab.* 26: 284 (1963).

Syzygiella sonderi (Gottsche) Feldberg, Váňa, Hentschel *et* Heinrichs, **comb. nov.**; *Jungermannia sonderi* Gottsche, *Linnaea* 28: 550 (1857). *Jungermannia grandiflora* Lindenb. *et* Gottsche, *Syn. Hepat.*: 673 (1847) [non *Syzygiella grandiflora* Steph., *Sp. Hepat.* (Stephani) 6: 117 (1917)]. *Cryptochila grandiflora* (Lindenb. *et* Gottsche) Grolle, *Feddes Repert.* 82: 19 (1971).

Syzygiella spegazziniana (Spruce ex C. Massal.) Feldberg, Vána, Hentschel et Heinrichs, **comb. nov.**; *Jungermannia spegazziniana* Spruce ex C. Massal., *Nuovo Giorn. Bot. Ital.* **17**: 216 (1885), *Cryptochila spegazziniana* (Spruce ex C. Massal.) Grolle, *Feddes Repert.* **82**: 31 (1971).

2.3 *Syzygiella* subg. *Pseudoplagiochila* Inoue, *J. Hattori Bot. Lab.* 29: 182 (1966).
Type: *Syzygiella subintegerrima* (Nees) Spruce

Leaves dorsally alternate or connate, ventrally connate, suborbicular to obovate or triangularly ovate.

Syzygiella kerguelensis M.L. So & Grolle is tentatively placed in this subgenus based on the similarities of its sterile gametophytes with *S. ovalifolia* Inoue (So & Grolle, 2003).

Syzygiella kerguelensis M.L. So et Grolle, *Nova Hedwigia* 77: 358 (2003).

Syzygiella ovalifolia Inoue, *J. Hattori Bot. Lab.* 29: 191 (1966).

Syzygiella securifolia (Nees ex Lindenb.) Inoue, *J. Hattori Bot. Lab.* 46: 232 (1979); *Plagiochila securifolia* Nees ex Lindenb., *Sp. Hepat.* (Lindenberg): 58 (1840).

Syzygiella subintegerrima (Nees) Spruce; *Jungermannia subintegerrima* Nees, *Enum. Pl. Crypt. Javae* 1: 79 (1830).

Syzygiella tasmanica (Hook. f. et Taylor) Feldberg, Vána, Hentschel et Heinrichs, **comb. nov.**; *Jungermannia tasmanica* Hook. f. et Taylor, *London J. Bot.* 5: 274 (1846), *Jamesoniella tasmanica* (Hook. f. et Taylor) Steph., *Sp. Hepat.* (Stephani) 2: 100 (1901).

2.4 *Syzygiella* subg. *Roivainenia* (Perss.) Feldberg, Vána, Hentschel et Heinrichs, **comb. et stat. nov.**; *Roivainenia* Perss., *Nova Hedwigia* 3: 43 (1961). **Type:** *Roivainenia jacquinotii* (Mont.) Grolle

Leaves deeply bilobed, papillose, perianths twisted.

Syzygiella jacquinotii (Mont.) Hentschel, Feldberg, Vána, et Heinrichs, **comb. nov.**; *Jungermannia jacquinotii* Mont., *Ann. Sci. Nat., Bot., Ser. 2*, 19: 250 (1843); *Roivainenia jacquinotii* (Mont.) Grolle, *Nova Hedwigia* 3: 44 (1961).

2.5 *Syzygiella* subg. *Syzygiella*

= *Jungermannia* subg. *Jamesoniella* Spruce, *J. Bot.* 5: 230 (1876). **Type:** *Jungermannia colorata* Lehm.

Leaves alternating or connate, ovate to suborbicular, ± entire, perianths not twisted.

Syzygiella autumnalis (DC.) Feldberg, Vána, Hentschel et Heinrichs, **comb. nov.**; *Jungermannia autumnalis* DC., *Fl. Franc.* (DC. & Lamarck), ed. 3., 6: 202 (1815), *Jamesoniella autumnalis* (DC.) Steph., *Sp. Hepat.* (Stephani) 2: 92 (1901).

Syzygiella campanulata Herzog, *Rev. Bryol. Lichenol.* 11: 9 (1939).

Syzygiella colorata (Lehm.) Feldberg, Vána, Hentschel et Heinrichs, **comb. nov.**; *Jungermannia colorata* Lehm., *Linnaea* 4: 366 (1829), *Jamesoniella colorata* (Lehm.) Schiffn. *Nat. Pflanzenfam.* (Engler & Prantl) 1: 83 (1893).

Syzygiella elongella (Taylor) Feldberg, Vána, Hentschel et Heinrichs, **comb. nov.**; *Jungermannia elongella* Taylor, *London J. Bot.* 5: 274 (1846); *Jamesoniella elongella* (Taylor) Steph., *Sp. Hepat.* (Stephani) 2: 93 (1901).

Syzygiella grollei Inoue, *Bull. Natl. Sci. Mus., Tokyo* 17: 303 (1974).

Syzygiella inoueii Grolle, *Bryologist* 71: 354 (1968).

Syzygiella integerrima Steph., *Sp. Hepat.* (Stephani) 6: 117 (1917).

Syzygiella macrocalyx (Mont.) Spruce, *J. Bot.* 5: 234 (1876); *Jungermannia macrocalyx* Mont., *Ann. Sci. Nat., Bot., Ser. 2*, 19: 248 (1843).

- Syzygiella nipponica* (S. Hatt.) Feldberg, Vána, Hentschel et Heinrichs, **comb. nov.**; *Jamesoniella nipponica* S. Hatt., *J. Jap. Bot.* 19: 350 (1943).
- Syzygiella oenops* (Lindenb. et Gottsche) Feldberg, Vána, Hentschel et Heinrichs, **comb. nov.**; *Jungermannia oenops* Lindenb. et Gottsche, *Syn. Hepat.*: 673 (1847); *Jamesoniella oenops* (Lindenb. & Gottsche) Steph., *Sp. Hepat.* (Stephani) 2: 91 (1901).
- Syzygiella perfoliata* (Sw.) Spruce, *J. Bot.* 5: 234 (1876); *Jungermannia perfoliata* Sw., *Prodr.* (Swartz): 143 (1787).
- Syzygiella purpurascens* (Steph.) Feldberg, Vána, Hentschel et Heinrichs, **comb. nov.**; *Jamesoniella purpurascens* Steph., *Bull. Soc. Roy. Bot. Belgique* 30: 200 (1891).
- Syzygiella riclefii* Pócs, *Cryptog., Bryol.* 26: 42 (2005).
- Syzygiella rubricaulis* (Nees) Steph., *Sp. Hepat.* (Stephani) 2: 187 (1902); *Jungermannia rubricaulis* Nees, *Fl. Bras.* (Martius) 1: 344 (1833).
- Syzygiella setulosa* Steph., *Sp. Hepat.* (Stephani) 2: 188 (1902).
- Syzygiella undata* (Mont.) Feldberg, Vána, Hentschel et Heinrichs, **comb. nov.**; *Jungermannia undata* Mont., *Ann. Sci. Nat., Bot., Ser. 4*, 14: 183 (1860); *Jamesoniella undata* (Mont.) Steph., *Sp. Hepat.* (Stephani) 2: 102 (1901).

EXCLUDED TAXA

According to a molecular study of Vilnet *et al.* (2009) *Jamesoniella undulifolia* belongs to Scapaniaceae *sensu* Heinrichs *et al.* (2005) and Crandall-Stotler *et al.* (2009) rather than to Adelanthaceae. This species stands out on account of its undulate, rounded, only weakly furcate female bracts and 2-3 antheridia per male bract (Grolle, 1971). Its exact systematic position is still unclear.

INCERTAE SEDIS

The following species have not yet been included in a molecular phylogenetic study. Their morphology does not allow for a placement in one of the above supraspecific taxa without much doubt. Grolle (1971) placed *Jamesoniella flexicaulis* (Nees) Schiffn., *J. orbicularis* Grolle, *J. kirkii*, and *J. robusta* (Austin) Steph. in *J. sect. Robustae* Grolle. *Jamesoniella kirkii* has been identified as a member of the *Cuspidatula* clade (Feldberg *et al.*, 2010) and is moved to this genus in this paper. Transfer of the other species to this genus should be based on molecular data in addition to morphology. The position of the other species remains also unclear.

- Jamesoniella flexicaulis* (Nees) Schiffn., *Consp. Hepat. Arch. Ind.*: 78 (1898); *Jungermannia flexicaulis* Nees, *Linnaea* 6: 604 (1831).
- Jamesoniella orbicularis* Grolle, *Feddes Repert.* 82: 42 (1971).
- Jamesoniella robusta* (Austin) Steph. *Sp. Hepat.* (Stephani) 2: 98 (1901); *Jungermannia robusta* Austin, *Proc. Acad. Nat. Sci. Philadelphia* 21: 219 (1870).

Protosyzygiella pseudoconnexa (Herzog) R.M. Schust., *Hepat. Anthocerotae N. Amer.* 4: 334 (1980), *Plagiochila pseudoconnexa* Herzog, *Rev. Bryol. Lichénol.* 21: 259 (1952).

Syzygiella contigua Steph., *Sp. Hepat.* (Stephani) 2: 189 (1902).

Syzygiella eatonii (Austin) Inoue, *J. Jap. Bot.* 37: 359 (1962); *Plagiochila eatonii* Austin, *Trans. Connecticut Acad. Arts* 8: 257 (1891).

Syzygiella uleana Steph., *Sp. Hepat.* (Stephani) 6: 118 (1917).

Syzygiella virescens Steph., *Sp. Hepat.* (Stephani) 2: 188 (1902).

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