

**NEW COMBINATIONS
IN *PSEUDOCYMOPTERUS* AND *CYMOPTERUS* (APIACEAE)**

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ABSTRACT

Molecular and morphological phylogenetic analyses indicate that many of the perennial endemic genera of North American Apiaceae subfamily Apioideae are either polyphyletic or nested within paraphyletic groups. In light of these results, taxonomic changes are needed to ensure that ongoing efforts to prepare state, regional, and continental floristic treatments of Apiaceae reflect recent findings. Thus, we make two new combinations in *Pseudocymopterus* and one in *Cymopterus*: ***Pseudocymopterus beckii*** (Welsh & Goodrich) S.R. Downie, **comb. nov.**, ***Pseudocymopterus macdougallii*** (Coul. & Rose) J.F. Smith, S.R. Downie & Mansfield, **comb. nov.**, and ***Cymopterus glomeratus*** (Nutt.) DC. var. ***parvus*** (Goodrich) Mansfield & K.M. Mason, **comb. nov.**

The Perennial Endemic North American (PENA) clade of Apiaceae is a monophyletic group of 21 genera (~200 taxa) (Downie et al. 2010; Nesom 2012; Hartman and Nesom 2012). Many of these genera, such as *Cymopterus*, *Lomatium*, *Tauschia*, and *Pseudocymopterus*, have their center of diversity in the western USA and this clade as a whole represents one of the largest endemic plant radiations in North America. The PENA clade has been the focus of recent molecular studies that have shown the artificiality of many of its genera, as 10 are polyphyletic or paraphyletic and another 6 are nested within paraphyletic groups (Downie et al. 2002; Sun & Downie 2004; Sun et al. 2004, 2010a, 2010b; Feist et al. 2013; George et al. 2014). Although additional studies are needed before a well-resolved phylogenetic hypothesis of the entire PENA clade is completed, regional and continental level floristic works (such as the treatment of Apiaceae, vol. 13, for Flora of North America) are proceeding and nomenclatural changes need to be made for those species that have strong molecular phylogenetic support placing them in another genus (see also Feist et al. 2017). In some cases, future phylogenetic analyses may result in further name changes, but the nomenclatural changes proposed here represent our best current understanding of the phylogeny and morphology of these plants and are necessary to improve the utility of forthcoming works. Thus, we make two new combinations in *Pseudocymopterus* and one in *Cymopterus*.

Pseudocymopterus beckii (Welsh & Goodrich) S.R. Downie, **comb. nov.** *Cymopterus beckii* Welsh & Goodrich, Brittonia 33: 297, Fig. 4. 1981.

Phylogenetic analyses of molecular data (Sun et al. 2004; Sun & Downie 2004, 2010a) and combined morphological and molecular data (Sun & Downie 2010b) place this taxon unambiguously in the same clade as *Pseudocymopterus montanus* (A. Gray) Coul. & Rose, the type species for the genus *Pseudocymopterus*, and away from the type species of *Cymopterus* and its allies. The results of recent phylogenetic analyses of additional plastid and nuclear markers corroborate this placement (Feist et al. 2013). Cronquist (1997) suggested previously that *P. montanus* and *C. beckii* might be conspecific. We therefore propose this new combination.

Pseudocymopterus macdougallii (Coul. & Rose) J.F. Smith, S.R. Downie & Mansfield, **comb. nov.** *Aletes macdougallii* Coul. & Rose, Contr. U.S. Natl. Herb. 7: 107. 1900; *Cymopterus macdougallii* (Coul. & Rose) Tidestr.; *Oreoxis macdougallii* (Coul. & Rose) Rydb.

Phylogenetic analyses of molecular data (Sun et al. 2004; Sun & Downie 2004, 2010a; George et al. 2014) and combined morphological and molecular data (Sun & Downie 2010b) place this taxon unambiguously in the same clade as *Pseudocymopterus montanus*, the type species for the

genus *Pseudocymopterus*, and the aforementioned new combination *P. beckii*. We therefore propose this new combination.

Cymopterus glomeratus (Nutt.) DC. var. **parvus** (Goodrich) Mansfield & K.M. Mason, **comb. nov.**
Cymopterus acaulis (Pursh) Raf. var. *parvus* Goodrich, Great Basin Nat. 46: 79. 1986.

Five varieties have been long recognized under *Cymopterus acaulis*: vars. *acaulis*, *fendleri*, *greeleyorum*, *higginsii*, and *parvus*. On the basis of multivariate analysis of variance and principal component analysis of 288 specimens representing the known morphological variability and geographic distribution of the species, Sun et al. (2005) proposed that plants in this complex be recognized as one morphologically variable species, *C. glomeratus*, with no varieties. At that time the name *C. glomeratus* was used to replace the widely used but illegitimate name *C. acaulis* (Sun et al. 2005). Phylogenetic analysis of molecular data (Sun et al. 2004; Sun & Downie 2004, 2010a) and combined morphological and molecular data (Sun & Downie 2010b) supported *C. glomeratus* as monophyletic, with the addition of *Lomatium concinnum* (Osterh.) Mathias and possibly *C. newberryi* (S. Wats.) M.E. Jones. The molecular study of George et al. (2014) corroborated the placement of *L. concinnum* within a strongly supported and monophyletic *C. glomeratus*, treating it as *C. glomeratus* var. *concinnum* (Osterh.) R.L. Hartm. George et al. (2014) also made the new combination *C. glomeratus* var. *greeleyorum* R.L. Hartm. by sampling four accessions that resolved as a monophyletic infraspecific taxon within the *C. glomeratus* clade. They also substantiated the combination of *C. glomeratus* var. *fendleri* (A. Gray) R.L. Hartm. (Hartman 2006) by recovering the two sampled accessions as monophyletic within *C. glomeratus*.

Despite the morphological overlap of all varieties of *Cymopterus glomeratus*, except var. *concinnum* (Sun et al. 2005), the recognition of varieties within *C. glomeratus* (Hartman 2006; George et al. 2014) allows new floristic works (such as the treatment of Apiaceae, vol. 13, for Flora of North America) to treat infraspecific taxa under *C. glomeratus*. Though no evidence presented since 2005 pertains to *C. glomeratus* var. *parvus* (George et al. 2014 did not sample these taxa), this variety has been recognized under *C. acaulis*. We propose here a new combination to allow floristic authors the opportunity to recognize the formerly recognized variety of *C. acaulis* in a legitimate combination — *Cymopterus glomeratus* var. *parvus*. *Cymopterus glomeratus* var. *parvus* is a local endemic variety in western Utah.

We do not, however, make a new combination for *Cymopterus acaulis* (Pursh) Raf. var. *higginsii* (S.L. Welsh) Goodrich; rather this name is placed in synonymy under *C. glomeratus* var. *fendleri* (A. Gray) R.L. Hartm. We are in agreement with Cronquist (1997), who equated *C. acaulis* var. *higginsii* with *C. acaulis* var. *fendleri*.

LITERATURE CITED

- Cronquist, A. 1997. Apiaceae. Pp. 340–427, in A. Cronquist, N.H. Holmgren, and P.K. Holmgren (eds.). Intermountain Flora, Vol. 3, Part A. New York Botanical Garden, Bronx.
- Downie, S.R., R.L. Hartman, F.-J. Sun, and D.S. Katz-Downie. 2002. Polyphyly of the spring-parsleys (*Cymopterus*): molecular and morphological evidence suggests complex relationships among the perennial endemic genera of western North American Apiaceae. *Canad. J. Bot.* 80: 1295–1324.
- Downie, S.R., K. Spalik, D.S. Katz-Downie, and J.-P. Reduron. 2010. Major clades within Apiaceae subfamily Apioideae as inferred by phylogenetic analysis of nrDNA ITS sequences. *Plant Divers. Evol.* 128: 111–136.
- Feist, M.E., J.F. Smith, D.H. Mansfield, M. Darrach, R.P. McNeill, S.R. Downie, G.M. Plunkett, and B.L. Wilson. 2017. New combinations in *Lomatium* (Apiaceae subfamily Apioideae). *Phytotaxa* 316: 95–98.

- Feist, M.A., A. Botero, and G.M. Plunkett. 2013. The genus *Tauschia* and the perennial endemic North American clade of Apiaceae [abstract]. Presented at Botany 2013; July 27–31 2013; New Orleans. <<http://2013.botanyconference.org/engine/search/index.php?func=detail&aid=735>>
- George, E.E., D.H. Mansfield, J.F. Smith, R.L. Hartman, S.R. Downie, and C.E. Hinchliff. 2014. Phylogenetic analysis reveals multiple cases of morphological parallelism and taxonomic polyphyly in *Lomatium* (Apiaceae). *Syst. Bot.* 39: 662–675.
- Hartman, R.L. 2006. New combinations in the genus *Cymopterus* (Apiaceae) of the southwestern United States. *Sida* 22: 955–957.
- Hartman, R.L. and G.L. Nesom. 2012. Taxonomy of the genus *Vesper* (Apiaceae). *Phytoneuron* 94: 1–9.
- Nesom, G.L. 2012. *Villarrealia* (Apiaceae), a new genus from northern Mexico. *Phytoneuron* 85: 1–6.
- Sun, F.-J. and S.R. Downie. 2004. A molecular systematic investigation of *Cymopterus* and its allies (Apiaceae) based on phylogenetic analyses of nuclear (ITS) and plastid (*rps16* intron) DNA sequences. *S. African J. Bot.* 70: 407–416.
- Sun, F.-J., S.R. Downie, and R.L. Hartman. 2004. An ITS-based phylogenetic analysis of the perennial, endemic Apiaceae subfamily Apioideae of western North America. *Syst. Bot.* 29: 419–431.
- Sun, F.-J., G.A. Levin, and S.R. Downie. 2005. A multivariate analysis of *Cymopterus glomeratus*, formerly known as *C. acaulis* (Apiaceae). *Rhodora* 107: 359–385.
- Sun, F.-J., G.A. Levin, and S.R. Downie. 2008. A multivariate analysis of *Pteryxia terebinthina* (Apiaceae). *J. Torrey Bot. Soc.* 135: 81–93.
- Sun, F.-J. and S.R. Downie. 2010a. Phylogenetic relationships among the perennial, endemic Apiaceae subfamily Apioideae of western North America: additional data from the cpDNA *trnF-trnL-trnT* region continue to support a highly polyphyletic *Cymopterus*. *Pl. Divers. Evol.* 128: 151–173.
- Sun, F.-J. and S.R. Downie. 2010b. Phylogenetic analyses of morphological and molecular data reveal major clades within the perennial, endemic western North American Apiaceae subfamily Apioideae. *J. Torrey Bot. Soc.* 137: 133–156.