

## FURTHER NEW COMBINATIONS IN ANEMONASTRUM (RANUNCULACEAE) FOR ASIAN AND NORTH AMERICAN TAXA

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### ABSTRACT

Following the proposed re-circumscription of genera in the group of *Anemone* L. and related taxa of Ranunculaceae (Mosyakin 2016, Christenhusz et al. 2018) and based on recent molecular phylogenetic and partly morphological evidence, the genus *Anemonastrum* Holub is recognized here in an expanded circumscription (including *Anemonidium* (Spach) Holub, *Arsenjevia* Starod., *Tamura* Starod., and *Jurtsevia* Á. Löve & D. Löve) covering members of the “*Anemone*” clade with  $x=7$ , but excluding *Hepatica* Mill., a genus well outlined morphologically and forming a separate subclade (accepted by Hoot et al. (2012) as *Anemone* subg. *Anemonidium* (Spach) Juz. sect. *Hepatica* (Mill.) Spreng.) within the clade earlier recognized taxonomically as *Anemone* subg. *Anemonidium* (sensu Hoot et al. 2012). The following new combinations at the section and subsection ranks are validated: **Anemonastrum** Holub sect. **Keiskea** (Tamura) Mosyakin, **comb. nov.** (*Anemone* sect. *Keiskea* Tamura); **Anemonastrum** [sect. **Keiskea**] subsection. **Keiskea** (Tamura) Mosyakin, **comb. nov.**; **Anemonastrum** [sect. **Keiskea**] subsection. **Arsenjevia** (Starod.) Mosyakin, **comb. nov.** (*Arsenjevia* Starod.); and **Anemonastrum** [sect. **Anemonastrum**] subsection. **Himalayicae** (Ulbr.) Mosyakin, **comb. nov.** (*Anemone* ser. *Himalayicae* Ulbr.). The new nomenclatural combination **Anemonastrum deltoideum** (Hook.) Mosyakin, **comb. nov.** (*Anemone deltoidea* Hook.) is validated for a North American species related to East Asian **Anemonastrum keiskeanum** (T. Ito ex Maxim.) Mosyakin, **comb. nov.** (*Anemone keiskeana* T. Ito ex Maxim.). The following new combinations are also proposed for Asian taxa belonging to two sections: [sect. *Keiskea*] **Anemonastrum baicalense** (Turcz.) Mosyakin, **comb. nov.** (*Anemone baicalensis* Turcz.), **Anemonastrum flaccidum** (Fr. Schmidt) Mosyakin, **comb. nov.** (*Anemone flaccida* Fr. Schmidt), **Anemonastrum prattii** (Huth ex Ulbr.) Mosyakin, **comb. nov.** (*Anemone prattii* Huth ex Ulbr.); [sect. *Anemonastrum* subsection. *Himalayicae*] **Anemonastrum coelestinum** (Franch.) Mosyakin, **comb. nov.** (*Anemone coelestina* Franch.), **Anemonastrum geum** (H. Lév.) Mosyakin, **comb. nov.** (*Anemone geum* H. Lév.), **Anemonastrum obtusilobum** (D. Don) Mosyakin, **comb. nov.** (*Anemone obtusiloba* D. Don), **Anemonastrum obtusilobum** subsp. **megaphyllum** (W.T. Wang) Mosyakin, **comb. nov.** (*Anemone obtusiloba* subsp. *megaphylla* W.T. Wang), **Anemonastrum obtusilobum** subsp. **nepalense** (Chaudhary) Mosyakin, **comb. nov.** (*Anemone obtusiloba* subsp. *nepalensis* Chaudhary), **Anemonastrum patulum** (C.C. Chang ex W.T. Wang) Mosyakin, **comb. nov.** (*Anemone patula* C.C. Chang ex W.T. Wang), **Anemonastrum polycarpum** (W.E. Evans) Mosyakin, **comb. nov.** (*Anemone polycarpa* W.E. Evans), **Anemonastrum rockii** (Ulbr.) Mosyakin, **comb. nov.** (*Anemone rockii* Ulbr.), **Anemonastrum rupestre** (Wall. ex Hook. f. & Thoms.) Mosyakin, **comb. nov.** (*Anemone rupestris* Wall. ex Hook. f. & Thoms.), **Anemonastrum rupestre** subsp. **gelidum** (Maxim.) Mosyakin, **comb. nov.** (*Anemone gelida* Maxim.), **Anemonastrum subdivisum** (W.T. Wang) Mosyakin, **comb. nov.** (*Anemone subdivisa* W.T. Wang), **Anemonastrum subpinnatum** (W.T. Wang) Mosyakin, **comb. nov.** (*Anemone subpinnata* W.T. Wang), **Anemonastrum trullifolium** (Hook. f. & Thoms.) Mosyakin, **comb. nov.** (*Anemone trullifolia* Hook. f. & Thoms.), and **Anemonastrum yulongshanicum** (W.T. Wang) Mosyakin, **comb. nov.** (*Anemone yulongshanica* W.T. Wang).

In earlier articles (Mosyakin 2016, 2018; Mosyakin & de Lange 2018) we already discussed and justified the phylogenetically natural and taxonomically rational circumscription of the genus *Anemone* L. and related taxa of Ranunculaceae Juss. tribe Anemoneae DC., following interpretations

of recent molecular phylogenetic results (Hoot et al. 1994, 2012; Hoot 1995; Ehrendorfer 1995; Ehrendorfer & Samuel 2000, 2001; Schuettpelz & Hoot 2000; Schuettpelz et al. 2002; Wang et al. 2009; Meyer et al. 2010; Pfosser et al. 2011; Xie et al. 2011; Cossard et al. 2016; Lehtonen et al. 2016; Jiang et al. 2017a, 2017b, etc.) and available morphological and biogeographic evidence (Ulbrich 1905, 1906; Juzepczuk 1937; Starodubtsev 1989, 1991, 1995; Tamura 1993; 1995; Dutton et al. 1997; Lufarov 2001, 2004; Tzvelev 2001, 2012; Wang et al. 2001; Malyshev 2005, 2012; Ehrendorfer et al. 2009; Ziman et al. 2004, 2005, 2006a, 2006b, 2007, 2008; Zhang et al. 2015; Mosyakin 2016; Mosyakin & de Lange 2018, etc.). In the present article, I propose further nomenclatural transfers to *Anemonastrum* Holub, re-circumscribed to include the segregate genera *Anemonidium* (Spach) Holub, *Arsenjevia* Starod., *Tamuraia* Starod., and *Jurtsevia* Á. Löve & D. Löve. In that circumscription, *Anemonastrum* covers the taxa placed by Hoot et al. (2012) in *Anemone* subg. *Anemonidium* (Spach) Juz. sect. *Keiskea* Tamura, sect. *Anemonidium* Spach, and sect. *Omalocarpus* DC. [with subsect. *Omalocarpus* (DC.) Tamura and subsect. *Himalayicae* (Ulbr.) Tamura], all having the base chromosome number  $x=7$ . However, *Hepatica* Mill. (accepted by Hoot et al. 2012 as *Anemone* subg. *Anemonidium* sect. *Hepatica* (Mill.) Spreng.), also with  $x=7$ , is recognized here as a separate genus because it is well outlined morphologically and forms a separate subclade sister to the *Anemonastrum* subclade. In my opinion (see also discussion in Mosyakin & de Lange 2018), an alternative proposal (Jiang et al. 2017a) to recognize the whole clade with  $x=7$  as one genus, *Hepatica* sensu latissimo (including *Anemonastrum* sensu lato), should not be recommended because the resulting broadly circumscribed genus will be difficult to outline morphologically; that taxonomic decision will also disrupt the currently accepted nomenclature and will require numerous nomenclatural transfers to *Hepatica* of many taxa here recognized in *Anemonastrum* (for which far less nomenclatural changes are still needed).

Christenhusz and Byng (in Christenhusz et al. 2018) recently supported a narrow circumscription of genera in Anemoneae and proposed many nomenclatural novelties (mainly new species-rank combinations and several new names) in genera *Anemonidium*, *Eriocapitella* Nakai, and *Knowltonia* Salisb. In general, their generic concept in the group corresponds well to the generic outline proposed by Mosyakin (2016); however, they additionally recognized *Eriocapitella*, which has not been considered as a potentially separate genus (Mosyakin 2016). When making nomenclatural transfers of taxa of the subclade with  $x=7$ , Christenhusz and Byng (in Christenhusz et al. 2018), however, used the generic name *Anemonidium* (Holub 1974) and did not notice that in their circumscription this genus should be called *Anemonastrum* (Holub 1973) because they included in *Anemonidium* the species that is the type of *Anemonastrum* (*Anemonastrum narcissiflorum* (L.) Holub  $\equiv$  *Anemone narcissiflora* L.  $\equiv$  *Anemonidium narcissiflorum* (L.) Christenh. & Byng). Consequently, the taxa that they transferred to *Anemonidium* should be properly placed in *Anemonastrum*. Of their new combinations in *Anemonidium*, *A. demissum* (Hook. f. & Thomson) Christenh. & Byng and *A. tetrasepalum* (Royle) Christenh. & Byng already have relevant combinations in *Anemonastrum* — *Anemonastrum demissum* (Hook. f. & Thomson) Holub and *A. tetrasepalum* (Royle) Holub (see Holub 1973: 165).

As already noted (Mosyakin & de Lange 2018: 112–113), “Judging from the available morphological, taxonomic, biogeographic, and molecular phylogenetic data, *Anemonastrum* (in the circumscription accepted here) most probably initially diversified somewhere in East Asia and/or the Beringian region. From that hypothetical center of origin and early diversification, some representatives of the genus migrated westward to western and partly southern Asia (forming secondary centers of diversity, e.g. the Himalayas: see Ziman et al. 2007; Elliott 2016) and other regions of Eurasia (Ziman et al. 2005, 2006a), while another ancestral stock migrated eastward to North America. From North America some taxon (or taxa?) dispersed to the mountains of South America, and then from southern South America to New Zealand, possibly via Antarctica.”

East Asian – North American (amphi-Beringian) disjunctions are evident in the species pairs *Anemonastrum keiskeanum* – *A. deltoideum* (see the new combinations below) and *A. dichotomum*

(L.) Mosyakin – *A. canadense* (L.) Mosyakin (see Mosyakin 2016 and references therein). The mainly North American group of *Anemonastrum canadense* and *A. richardsonii* (Hook.) Mosyakin (the latter also occurring in northeastern Asia: Starodubtsev 1991, 1995, etc.) shows the link to the southern South American species *A. antucense* (Poepp.) Mosyakin & de Lange, while the southern South America–New Zealand disjunction is manifested by *A. antucense* and *A. tenuicaule* (Cheeseman) de Lange & Mosyakin (see Mosyakin & de Lange 2018 and references therein). Further morphological and molecular studies are needed to demonstrate better the possible pathways of morphological evolution in these taxa of *Anemonastrum*. The disjunctive distribution patterns in the mainly South Hemisphere genus *Knowltonia*, as re-circumscribed in Mosyakin (2016) and Christenhusz et al. (2018), also present intriguing questions of the historical dispersal pathways and morphological evolution in that group.

In general, we may assume that the processes of evolution of some of the most morphologically distinct and geographically isolated taxa and groups of *Anemone* sensu lato, such as South African *Knowltonia* sensu stricto, South American *Barneoudia* Gay and *Oreithales* Schltldl. (now placed in *Knowltonia* sensu lato: see Christenhusz et al. 2018), Tasmanian *Anemone crassifolia* Hook. (now also placed in *Knowltonia* as *K. crassifolia* (Hook.) Christenh. & Byng; see Christenhusz et al. 2018), and the geographically outlier taxa of *Anemonastrum* discussed above, were initiated and greatly shaped by long-distance and/or step-stone dispersal events, with subsequent geographical isolation. In contrast to that, taxa and groups of taxa of *Anemonastrum* and other genera of Anemoneae occurring in their supposed centers of origin and/or primary or secondary diversification are often represented by many closely related and often intergrading entities that are taxonomically complicated and are often treated by various authors as species with numerous subspecies, varieties, or just as synonyms.

#### VALIDATION OF NEW COMBINATIONS

**Anemonastrum** Holub sect. **Keiskea** (Tamura) Mosyakin, **comb. nov.** *Anemone* sect. *Keiskea* Tamura, Sci. Rep. Coll. Gen. Educ. Osaka Univ. 16: 26. 1967. **TYPE:** *Anemone keiskeana* T. Ito ex Maxim. ≡ **Anemonastrum keiskeanum**, see below.

*Tamuria* Starod., Vetrenitsy: sist. evol.: 122. 1991.

*Anemone keiskeana* was originally included in this section by Tamura (1967), who evidently used its epithet for the name of the section.

**Anemonastrum** Holub sect. **Keiskea** (Tamura) Mosyakin subsect. **Keiskea** (Tamura) Mosyakin, **comb. nov.** *Anemone* sect. *Keiskea* Tamura, Sci. Rep. Coll. Gen. Educ. Osaka Univ. 16: 26. 1967. **TYPE:** *Anemone keiskeana* T. Ito ex Maxim. ≡ **Anemonastrum keiskeanum**, see below.

**Anemonastrum keiskeanum** (T. Ito ex Maxim.) Mosyakin, **comb. nov.** *Anemone keiskeana* T. Ito ex Maxim., Bull. Acad. Imp. Sci. Saint-Pétersbourg 32: 478. 1888. *Tamuria keiskeana* (T. Ito ex Maxim.) Starod., Vetrenitsy: sist. evol., 122. 1991. *Anemonidium keiskeanum* (T. Ito ex Maxim.) Christenh. & Byng, Global Fl. 4: 73. 2018.

*Anemonastrum keiskeanum* was originally described (as *Anemone keiskeana*) from the former Tosa Province (now in Kōchi Prefecture), Shikoku, Japan (Maximovicz 1888), and is now reported from the main islands of Honshu, Shikoku, and Kyushu of Japan (see Ohwi 1965; Tamura 1967; Starodubtsev 1991, etc.).

**Anemonastrum deltoideum** (Hook.) Mosyakin, **comb. nov.** *Anemone deltoidea* Hook., Fl. Bor.-Amer. 1: 6. 1829. *Tamuria deltoidea* (Hook.) Starod., Vetrenitsy: sist. evol., 122. 1991.

This North American species occurring in California, Oregon, and Washington states (also reported for British Columbia in Canada, but probably erroneously; see Dutton et al. 1997) was omitted in my earlier article dealing with North American taxa (Mosyakin 2016). It is also a member of *Anemonastrum* in its expanded circumscription, related to the East Asian *A. keiskeanum*. Starodubtsev (1991) placed these two species in *Tamura*, while Ziman et al. (2004) considered them the only two members of *Anemone* sect. *Keiskea*. For *A. deltoidea*, Ziman et al. (2004: 49) established a separate series, *Anemone* [sect. *Keiskea*] ser. *Deltoidea* Ziman, Kadota & Bulakh.

**Anemonastrum** Holub sect. **Keiskea** (Tamura) Mosyakin subsect. **Arsenjevia** (Starod.) Mosyakin, **comb. nov.** *Arsenjevia* Starod., Bot. Zhurn. (Moscow & Leningrad) 74(9): 1344. 1989. *Anemone* sect. *Arsenjevia* (Starod.) U.C. La, Fl. Coreana 2: 201. 1996. *Anemone* subgen. *Arsenjevia* (Starod.) Lufarov, Byull. Glavn. Bot. Sada (Moscow) 182: 54. 2001. *Anemone* sect. *Arsenjevia* (Starod.) Lufarov, Byull. Glavn. Bot. Sada (Moscow) 182: 54. 2001, comb. superfl. *Anemone* subsect. *Arsenjevia* (Starod.) Lufarov, Byull. Glavn. Bot. Sada (Moscow) 182: 54. 2001. **TYPE:** *Arsenjevia flaccida* (Fr. Schmidt) Starod.  $\equiv$  *Anemone flaccida* Fr. Schmidt  $\equiv$  **Anemonastrum flaccidum**, see below.

*Anemone* subsect. *Baicalensis* Lufarov, Byull. Glavn. Bot. Sada (Moscow) 182: 54. 2001. **TYPE:** *Anemone baicalensis* Turcz.  $\equiv$  **Anemonastrum baicalense**, see below.

Starodubtsev (1989: 1345) recognized in his genus *Arsenjevia* the following five species: *Arsenjevia baicalensis* (Turcz.) Starod., *A. flaccida* (Fr. Schmidt) Starod., *A. glabrata* (Maxim.) Starod., *A. prattii* (Huth ex Ulbr.) Starod., and *A. rossii* (S. Moore) Starod. (see also Starodubtsev 1991). Wang et al. (2001) and Ziman et al. (2004) applied a wider species concept to taxa of this group, which they recognized within *Anemone*. In particular, Ziman et al. (2004) recognized in this group only two species, *Anemone baicalensis* Turcz. (with five varieties) and *A. prattii* Huth ex Ulbr.

The infrageneric names *Anemone* subsect. *Stoloniferae* Ulbr. (1905, as “*Stolonifera*”, pro parte, excl. typo) and *Anemone* sect. *Stolonifera* (Ulbr.) Juz. (1937, pro parte, excl. typo) were occasionally applied to taxa of this group. Ziman et al. (2004: 48) elevated the rank of Ulbrich's subsection to the subgenus level, *Anemone* subg. *Stolonifera* (Ulbr.) Ziman, Kadota & Bulakh (as “*Stoloniferae* (Ulbr. **ex Juz.**) Ziman, Kadota & Bulakh”) and indicated its type as *Anemone baicalensis* Turcz. (as “lectotype”). However, according to Art. 10.8 of the *ICN* (Turland et al. 2018) “When the epithet in the name of a subdivision of a genus is identical with or derived from the epithet in one of the originally included species names, the type of the higher-ranking name is the same as that of the species name, unless the original author of the higher-ranking name designated another type.” Consequently, the type of *Anemone* subsect. *Stoloniferae* is *Anemone stolonifera* Maxim. (which was originally included in that group by Ulbrich 1905), a member of the clade that houses taxa of *Anemone* sensu stricto, having  $2n=16$  (Yang 2002). Thus, infrageneric names based on *Anemone* subsect. *Stoloniferae* Ulbr. should not be used in *Anemonastrum*, and the different type designation in Ziman et al. (2004: 48, 49, 294) has no standing.

**Anemonastrum baicalense** (Turcz.) Mosyakin, **comb. nov.** *Anemone baicalensis* Turcz., Bull. Soc. Imp. Naturalistes Moscou 15(1): 40. 1842. *Anemonoides baicalensis* (Turcz.) Holub, Folia Geobot. Phytotax. 8(2): 166. 1973. *Arsenjevia baicalensis* (Fisch. ex Turcz.) Starod., Bot. Zhurn. (Moscow & Leningrad) 74(9): 1345. 1989.

*Anemone baicalensis* ver. *glabrata* Maxim., Prim. Fl. Amur., 18. 1859. *Anemone glabrata* (Maxim.) Juz., Fl. URSS 7: 254. 1937. *Anemone baicalensis* subsp. *glabrata* (Maxim.) Kitag., Rep. Inst. Sci. Res. Manchoukuo 4: 81. 1940. *Anemonoides glabrata* (Maxim.) Holub, Folia Geobot. Phytotax. 11(1): 81. 1976. *Arsenjevia glabrata* (Maxim.) Starod., Bot. Zhurn. (Moscow & Leningrad) 74(9): 1345. 1989.

*Anemone kansuensis* W.T. Wang, Acta Phytotax. Sin. 12: 163. 1974. *Anemone baicalensis* var. *kansuensis* (W.T. Wang) W.T. Wang, Fl. Reipubl. Popularis Sin. 28: 20. 1980.

*Anemone rossii* S. Moore, J. Linn. Soc., Bot. 17: 376, tab. 16, fig. 1, 2. 1879 [“1880”, publ. 1879]. *Anemone baicalensis* var. *rossii* (S. Moore) Kitag., Lin. Fl. Manshur., 213. 1939. *Anemonoides rossii* (S. Moore) Holub, Folia Geobot. Phytotax. 8(2): 166. 1973. *Anemone baicalensis* subsp. *rossii* (S. Moore) Starod., Bot. Zhurn. (Moscow & Leningrad) 68(8): 1018. 1983. *Arsenjevia rossii* (S. Moore) Starod., Bot. Zhurn. (Moscow & Leningrad) 74(9): 1345. 1989.

*Anemone saniculiformis* C.Y. Wu ex W.T. Wang, Acta Phytotax. Sin. 12: 164. 1974. *Anemone baicalensis* var. *saniculiformis* (C.Y. Wu ex W.T. Wang) Ziman & B.E. Dutton, Fl. China 6: 312. 2001.

The epithet of this species was occasionally cited in *Anemone* and *Arsenjevia* as “*baikalensis*” (e.g., Starodubtsev 1989: 1345, etc.). However, Turczaninow (1842, 1845) in both versions (journal issue and book) of his *Flora Baicalensi-Dahurica* used the original spelling “*baicalensis*,” which should be followed (Art. 60.1 of the ICN: Turland et al. 2018).

The following varieties were accepted in *Anemone baicalensis* by Ziman et al. (2004): var. *baicalensis*, var. *glabrata*, var. *kansuensis*, var. *saniculiformis*, and var. *rossii* (see above the list of heterotypic synonyms). Here *Anemonastrum baicalense* is accepted in a wide sense. Further nomenclatural transfers in *Anemonastrum* will be needed if some of those entities are formally recognized as infraspecific taxa or separate species.

***Anemonastrum flaccidum*** (Fr. Schmidt) Mosyakin, **comb. nov.** *Anemone flaccida* Fr. Schmidt, Mém. Acad. Imp. Sci. St.-Pétersbourg, Sér. 7, 12(2): 103. 1868 [alternative title: Reis. Amurland., Bot., 103. 1868; see Schmidt 1868]. *Anemone baicalensis* Turcz. subsp. *flaccida* (Fr. Schmidt) Ulbr., Bot. Jahrb. Syst. 37(2): 232. 1905. *Anemonoides flaccida* (Fr. Schmidt) Holub, Folia Geobot. Phytotax. 8(2): 166. 1973. *Arsenjevia flaccida* (Fr. Schmidt) Starod., Bot. Zhurn. (Moscow & Leningrad) 74(9): 1345. 1989. *Anemonidium flaccidum* (Fr. Schmidt) Christenh. & Byng, Global Fl. 4: 73. 2018.

*Anemone anhuiensis* Y.K. Yang, N. Wang, & W.C. Ye, J. Wuhan Bot. Res. 7: 327. 1989. *Anemone flaccida* var. *anhuiensis* (Y.K. Yang, N. Wang, & W.C. Ye) Ziman & B.E. Dutton, Fl. China 6: 311. 2001.

*Anemone hofengensis* W.T. Wang, Acta Phytotax. Sin. 29: 463. 1991. *Anemone flaccida* var. *hofengensis* (W.T. Wang) Ziman & B.E. Dutton, Fl. China 6: 311. 2001.

*Anemone tagawae* Ohwi, Bot. Mag. (Tokyo) 45: 387. 1931. *Anemone flaccida* var. *tagawae* (Ohwi) Tamura, Acta Phytotax. Geobot. 46(2): 210. 1996.

Ziman et al. (2004) recognized the following varieties within *Anemone flaccida*: var. *flaccida*, var. *hirtella* W.T. Wang, var. *hofengensis*, and var. *anhuiensis* (see the list of heterotypic synonyms above). If those entities are preferred to be recognized taxonomically, further nomenclatural transfers in *Anemonastrum* will be needed.

***Anemonastrum prattii*** (Huth ex Ulbr.) Mosyakin, **comb. nov.** *Anemone prattii* Huth ex Ulbr., Bot. Jahrb. Syst. 36(3, Beibl. 80): 4. 1905. *Arsenjevia prattii* (Huth ex Ulbr.) Starod., Bot. Zhurn. (Moscow & Leningrad) 74(9): 1345. 1989.

According to Ziman et al. (2004), this species is closely related to *A. baicalense*.

Another species, *Anemone delavayi* Franch. (including *A. oligocarpa* C. Pei  $\equiv$  *A. delavayi* var. *oligocarpa* (C. Pei) Ziman & B.E. Dutton), most probably also belongs to *Anemonastrum*, but its relationships and proper taxonomic (subsectional) placement within the genus remain problematic (more closely related to *A. flaccidum* or to *A. baicalense*? See Wang et al. 2001: 311, and especially discussion in Ziman et al. 2004: 299–300). Earlier it was transferred by Holub (1973: 166) to *Anemonoides*, as *A. delavayi* (Franch.) Holub. However, because of the remaining uncertainty in its phylogenetic position, I refrain here from any nomenclatural actions affecting this taxon.

#### **Anemonastrum** Holub sect. **Anemonastrum** subsect. **Anemonastrum**

This subsection houses taxa earlier placed mainly in *Anemone* sect. *Omalocarpus* DC. (in the strict sense). Corresponding nomenclatural combinations in *Anemonastrum* for almost all species and several infraspecific entities of that group already exist (see Holub 1973, 1974; Löve & Löve “1975” [published 1976]; Starodubtsev 1989, 1991; Ziman et al. 2005, 2006a; Raus 2011a, 2011b; Tzvelev 2012; Mosyakin 2016, etc.). Additional new combinations (mostly for infraspecific taxa) can be expected in the future following further research.

#### **Anemonastrum** Holub sect. **Anemonastrum** subsect. **Himalayicae** (Ulbr.) Mosyakin, **comb. nov.**

*Anemone* ser. *Himalayicae* Ulbr., Bot. Jahrb. Syst. 37(2): 201. 1905. *Anemone* sect. *Himalayica* (Ulbr.) Juz., Fl. URSS 7: 256. 1937. *Anemone* subsect. *Himalayicae* (Ulbr.) Tamura, Sci. Rep. Coll. Gen. Educ. Osaka Univ. 16: 27. 1967. *Pulsatilloides* (DC.) Starod. sect. *Himalayica* (Ulbr.) Starod., Vetretnitsy: sist. evol., 124. 1991. **TYPE:** *Anemone obtusiloba* D. Don  $\equiv$  ***Anemonastrum obtusilobum***, see below.

Starodubtsev (1991) placed this group in the genus *Pulsatilloides* (DC.) Starod., together with *Pulsatilloides capensis* (L.) Starod. (which should be now recognized as *Knowltonia tenuifolia* (L. f.) Mosyakin = *K. pulsatilloides* Christenh. & Byng; see Mosyakin 2018), *P. glaucifolia* (Franch.) Starod. (*Anemone glaucifolia* Franch.  $\equiv$  *Pulsatilla glaucifolia* (Franch.) Huth, now properly accepted as *Anemoclema glaucifolium* (Franch.) W.T. Wang; see Zhang et al. 2015a, Lehtonen et al. 2016, Jiang et al. 2017b), and *P. begoniifolia* (H. Lév. & Vaniot) Starod. (which is *Anemone begoniifolia* H. Lév. & Vaniot; see Zhang et al. 2015b). This motley arrangement of taxa is very unnatural phylogenetically and has not been confirmed by molecular, morphological, and karyological evidence.

In the present circumscription, the subsection *Himalayicae* houses taxa geographically restricted to mountain regions of Asia, mainly in the Himalayas: from Pakistan through Nepal, northern India, and Bhutan to several regions of China (Ziman et al. 2007). One species (*Anemone obtusiloba*  $\equiv$  ***Anemonastrum obtusilobum***, see below) is also reported from a few scattered localities in eastern Kyrgyzstan, eastern Afghanistan, northernmost Myanmar, and southwestern Mongolia (Ziman et al. 2007). Phylogenetically this group is sister to the “core” subclade of *Anemonastrum* (subsect. *Anemonastrum*) (Hoot et al. 2012; Jiang et al. 2017a, etc.). Additional information on morphology, geography, and nomenclature of taxa of *Anemonastrum* subsect. *Himalayicae* (including extensive synonymy) can be found in Ziman et al. (2007) and in references cited in that publication. The known chromosome numbers of the species listed below are mainly summarized in Ziman et al. (2007) and Goldblatt & Johnson (1979–onward).

The taxonomic circumscription of species placed here in this subsection mainly follows the *Flora of China* (Wang et al. 2001) and our treatment (Ziman et al. 2007). I decided not to transfer here to *Anemonastrum* the numerous infraspecific entities (except three subspecies) described and/or recognized by various authors (see an overview in Ziman et al. 2007) because the status and rank of many such taxa, especially those treated as varieties, remain disputable. Three series (ser. *Obtusilobae* Ziman, Ehrend. & Bulakh, ser. *Trullifoliae* Ziman, Ehrend. & Bulakh, and ser. *Rupestres*

Ziman, Ehrend. & Bulakh) were recognized by Ziman et al. (2007) within sect. *Himalayica* (as “*Himalayicae*”). Further transfers of additional species and infrageneric and infraspecific taxa will be possible following additional research. The species below are listed alphabetically.

**Anemonastrum coelestinum** (Franch.) Mosyakin, **comb. nov.** *Anemone coelestina* Franch., Bull. Soc. Bot. France 32: 4. 1885. *Anemone obtusiloba* D. Don subsp. *coelestina* (Franch.) Brühl, Ann. Roy. Bot. Gard. Calcutta 5: 78. 1896. *Anemone trullifolia* Hook. f. & Thoms. var. *coelestina* (Franch.) Finet & Gagnep., Bull. Soc. Bot. France 51: 61. 1904.

**Anemonastrum geum** (H. Lév.) Mosyakin, **comb. nov.** *Anemone geum* H. Lév., Bull. Géogr. Bot. 25: 25. 1915. *Anemone bonatiana* H. Lév. var. *geum* (H. Lév.) H. Lév., Cat. Pl. Yun-Nan: 219. 1917.

**Anemonastrum obtusilobum** (D. Don) Mosyakin, **comb. nov.** *Anemone obtusiloba* D. Don, Prodr. Fl. Nepal.: 194. 1825. *Pulsatilloides obtusiloba* (D. Don) Starod., Vetrenitsy: sist. evol., 124. 1991. *Anemonidium obtusilobum* (D. Don) Christenh. & Byng, Global Fl. 4: 73. 2018.

**Anemonastrum obtusilobum** (D. Don) Mosyakin subsp. **megaphyllum** (W.T. Wang) Mosyakin, **comb. nov.** *Anemone obtusiloba* D. Don subsp. *megaphylla* W.T. Wang, Fl. Reipubl. Popul. Sin. 28: 350. 1980.

**Anemonastrum obtusilobum** (D. Don) Mosyakin subsp. **nepalense** (Chaudhary) Mosyakin, **comb. nov.** *Anemone obtusiloba* D. Don subsp. *nepalensis* Chaudhary, Bot. Zhurn. (Moscow & Leningrad) 73: 1188. 1988.

**Anemonastrum patulum** (C.C. Chang ex W.T. Wang) Mosyakin, **comb. nov.** *Anemone patula* C.C. Chang ex W.T. Wang, Acta Phytotax. Sin. 12: 169. 1974.

**Anemonastrum polycarpum** (W.E. Evans) Mosyakin, **comb. nov.** *Anemone polycarpa* W.E. Evans, Notes Roy. Bot. Gard. Edinburgh 13: 154. 1921. *Anemone rupestris* subsp. *polycarpa* (W.E. Evans) W.T. Wang, Fl. Reipubl. Popul. Sin. 28: 43. 1980.

**Anemonastrum rockii** (Ulbr.) Mosyakin, **comb. nov.** *Anemone rockii* Ulbr., Notizbl. Bot. Gart. Berlin-Dahlem 10: 876. 1929. *Anemone obtusiloba* D. Don subsp. *rockii* (Ulbr.) Lauener, Notes Roy. Bot. Gard. Edinburgh 23: 188. 1960.

**Anemonastrum rupestre** (Wall. ex Hook. f. & Thoms.) Mosyakin, **comb. nov.** *Anemone rupestris* Wall. ex Hook. f. & Thoms., Fl. Ind. 1: 21. 1855. [*Anemone rupestris* Wall., Numer. List (Wallich) n. 4696. 1831, nom. inval.] *Anemonidium rupestre* (Wall. ex Hook. f. & Thoms.) Christenh. & Byng, Global Fl. 4: 73. 2018.

**Anemonastrum rupestre** (Wall. ex Hook. f. & Thoms.) Mosyakin subsp. **gelidum** (Maxim.) Mosyakin, **comb. nov.** *Anemone gelida* Maxim., Acta Hort. Petropol. 11: 21. 1890. *Anemone rupestris* Wall. ex Hook. f. & Thoms. subsp. *gelida* (Maxim.) Lauener, Notes Roy. Bot. Gard. Edinburgh 23: 199. 1960. *Pulsatilloides gelida* (Maxim.) Starod., Vetrenitsy: sist. evol., 124. 1991.

**Anemonastrum subdivisum** (W.T. Wang) Mosyakin, **comb. nov.** *Anemone subdivisa* W.T. Wang, Acta Phytotax. Sin. 12: 173. 1974.

***Anemonastrum subpinnatum*** (W.T. Wang) Mosyakin, **comb. nov.** *Anemone subpinnata* W.T. Wang, Acta Phytotax. Sin. 12: 170. 1974.

***Anemonastrum trullifolium*** (Hook. f. & Thoms.) Mosyakin, **comb. nov.** *Anemone trullifolia* Hook. f. & Thoms., Fl. Ind. 1: 22. 1855. *Anemone obtusiloba* D. Don subsp. *trullifolia* (Hook. f. & Thoms.) Brühl, Ann. Bot. Gard. Calcutta 5: 78. 1896. *Pulsatilloides trullifolia* (Hook. f. & Thomson) Starod., Vetrenitsy: sist. evol., 124. 1991. *Anemonidium trullifolium* (Hook. f. & Thomson) Christenh. & Byng, Global Fl. 4: 73. 2018.

***Anemonastrum yulongshanicum*** (W.T. Wang) Mosyakin, **comb. nov.** *Anemone yulongshanica* W.T. Wang, Bull. Bot. Res., Harbin 16(2): 159. 1996

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