NOMENCLATURAL ADJUSTMENTS IN NORTH AMERICAN *ARABIS*, CHINESE *HILLIELLA*, AND SOUTH AMERICAN *NEUONTOBOTRYS* (BRASSICACEAE)

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Abstract. The new combinations *Arabis adpressipilis, Hilliella rupidcola* subsp. *shuangpaiensis*, *H. sinuata* subsp. *qianwuensis*, and *Neuontobotrys amplexicaulis* are proposed. The distinguishing characters of *A. adpressipilis* from *A. pycnocarpa* are discussed and evaluated. The new combinations in *Hilliella* were previously recognized in *Yinshania* when the genera were united but now recognized in different tribes. The basionym of the long-neglected *Hesperis amplexicaulis* predates that of *Sisymbrium grayanum*, and therefore becomes the basis for the new combination in *Neuontobotrys*. *Sisymbrium amplexicaule* and *S. amplexicaule* var. *tenuicaule* are lectotypified.

Keywords: *Arabis,* Brassicaceae, Cruciferae, Neuontobotrys, new combinations

Ongoing research on the family Brassicaceae (Cruciferae) for the worldwide Brassicaceae database or BrassiBase (https://brassibase.cos.uni-heidelberg.de/) and the World Flora Online (http://www.worldfloraonline.org/) showed that the nomenclature of a North American species of *Arabis* L., two Chinese subspecies of *Hilliella* (O.E.Schulz) Y.H.Zhang, and a South American *Neuontobotrys* O.E.Schulz needed updating to bring them in line with accounts of other genera of the family, and they are dealt with herein.

Arabis

North American *Arabis* was so broadly delimited by various authors (e.g., Hopkins, 1937; Rollins, 1941, 1993; Mulligan, 1996) that it included species currently assigned to eight genera in six different tribes. These include *Arabidopsis* Heynh. (tribe Camelineae), *Arabis* (Arabideae), *Pennellia* Nieuwl. (Halimolobeae), *Streptanthus* Nutt. (Thelypodieae), *Turritis* L. (Turritideae), and *Boechera* Á.Löve & D.Löve, *Borodinia* N.Busch, and *Yosemitea* P.J.Alexander & Windham (Boechereae). For updated literature on the transfer of species from *Arabis* to the above genera and tribes, the reader is advised to consult Al-Shehbaz (2010), Alexander et al. (2013), and references therein.

The species dealt with here is *Arabis pycnocarpa* M.Hopkins and its var. *adpressipilis* M.Hopkins, both of which taxa were described by Hopkins (1937). Four years after their description, Rollins (1941) treated them as varieties of *A. hirsuta*, a position he held for the following five decades (Rollins, 1993). By contrast, Mulligan (1996) reduced *A. pycnocarpa* to a variety of *A. hirsuta* and placed var. *adpressipilis* in its synonymy. As shown by Karl et al. (2010), and later confirmed by Karl and Koch (2013, 2014), *A. hirsuta* is strictly an Eurasian species. The differences between these two species in morphology, chromosome numbers, and molecular data strongly support the distinctness of *A. hirsuta* from *A. pycnocarpa*. As a result, Al-Shehbaz (2010) followed Hopkins (1937) in excluding *A. hirsuta* from the Flora of North America and in maintaining both *A. pycnocarpa* and var. *adpressipilis*, though he suggested that they should perhaps be recognized at least at the subspecific rank.

The question that has not yet been fully resolved is whether or not to maintain the plants of "*adpressipilis*" as a variety of *Arabis pycnocarpa*, to recognize it as a subspecies instead of variety, or to treat it as a distinct species. As discussed below, the evidence at hand supports the recognition of var. *adpressipilis* as a distinct species, and a detailed description of it is provided for the first time.

Arabis adpressipilis (M. Hopkins) Al-Shehbaz, *comb. et stat. nov.*

Basionym: *Arabis pycnocarpa* var. *adpressipilis* M.Hopkins, Rhodora 39: 117. 1937. TYPE: UNITED STATES. Missouri: Shannon Co., Montier, 13 May 1894, *Benjamin F. Bush 32* (Holotype: GH-00018780; Isotypes: MO-142240 [as MO-2112399 in JSTOR], NDG-04352, NY-0172645).

Herbs, biennial. *Stems* 2.5–7.5 dm, erect, usually single at base, simple or sometimes few branched above, often exclusively pubescent proximally with appressed, malpighiaceous or minutely stalked submalpighiaceous trichomes, rarely glabrescent. *Basal leaves* rosulate; petiole obsolete or 0.5–1.5 cm, not ciliate; leaf blade oblanceolate to oblong, 1–5 cm × 3–8 mm, pubescent with sessile, forked and/or stellate trichomes, margin entire or repand, apex obtuse or acute; cauline leaves 15–46, overlapping or not, sessile, oblong to lanceolate or linear, middle ones 1–5.5 cm × 2–8 mm, usually sparsely pubescent on both surfaces or adaxially glabrescent, base auriculate, margin entire, apex acute or obtuse. *Racemes* often simple; fruiting pedicels

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erect to erect-ascending, appressed to rachis, 3–7 mm, slender, usually glabrous. *Sepals* oblong, 2.5–3.5 mm, base of lateral pair not saccate; petals white, linear-oblanceolate, 3–4.5 × 1–2 mm, apex obtuse; filaments slender, 2.5–3.5 mm; anthers oblong, 0.7–1 mm; ovules 60–72 per ovary. *Fruit* linear, (4–)4.5–6(–6.5) cm × 0.8–1(–1.2) mm, erect to erect-ascending, often appressed to rachis, flattened; valves glabrous, torulose, often with obscure midvein; style slender, 0.5–1.3 mm. *Seeds* brown, ovate, 1–1.4 × 0.8–1 mm, uniseriate, narrowly winged all around, wing to 0.2 mm wide distally.

Phenology: flowers March–June.

Habitat: the species grows in dolomite glades, rich woods, ravines, and pastures, as well as on cliffs, calcareous talus, bluffs, and rocky ledges at elevations to 300 m.

Distribution: Canada (Ontario) and the United States (Illinois, Indiana, Iowa, Kansas, Missouri, New York, Ohio, Pennsylvania, Tennessee, and Virginia).

Distinguishing characters: *Arabis adpressipilis* is closely related to *A. pycnocarpa* under which (Hopkins, 1937; Al-Shehbaz, 2010) or under *A. hirsuta* (Rollins, 1941, 1993; Mulligan, 1996) it was recognized for the past 80 years as a variety or a synonym. These authors placed more emphasis on the overall morphology of the plant and placed less value on trichome morphology. The lower stems of *A. adpressipilis* are almost always exclusively pubescent proximally with appressed, malpighiaceous or minutely stalked submalpighiaceous trichomes and are rarely glabrescent, and the basal leaves are pubescent with sessile, forked and/or stellate trichomes and their margins are always not ciliate. By contrast, the lower stems of *A. pycnocarpa* are hirsute with simple trichomes, and the basal leaves are pubescent with simple and distinctly stalked forked trichomes and their margins are ciliate. Both species are consistently and readily distinguishable, and of the hundreds of specimens I examined over the past three decades from throughout their ranges, I have seen only three plants that have the lower stems with a mixture of forked and simple trichomes, instead of exclusively simple (*A. pycnocarpa*) or exclusively malpighiaceous or submalpighiaceous (*A. adpressipilis*). These plants are *Herman 8790* (GH) from Jo Davies Co. (Illinois), *Friesner 19072* (GH) from Elkhart Co. (Indiana), and *Cody et al. 9454* (DAO) from West Bay of Manitoulin Island, Ontario (Canada). It is not known if they represent intermediates of hybrid origin, but without full-scale experimental crossing and molecular studies, I prefer not to place extra weight on them at least for now. Although both species are distributed in parts of the states of Iowa, Kansas, New York, Ohio, Pennsylvania, and Virginia, as well as in Ontario Province, it does not seem, at least for now, that they grow sympatrically. It would a good idea for local botanists in those regions to survey the distribution of both species. Furthermore, about a dozen chromosome counts were published for *A. pycnocarpa* (see Warwick & Al-Shehbaz, 2006), and all except for an erroneous count consistently show that the species is tetraploid with $2n=32$. However, no counts have been made thus far for *A. adpressipilis*, and cytological studies on this species may shed some light on possible lack of gene flow between it and *A. pycnocarpa*.

Hilliella

Hilliella was originally proposed by Schulz (1923) as a section of *Cochlearia* L. and later raised by Zhang and Li in Zhang (1986) to the rank of genus. Seven additional species were later described by Zhang (1987, 1995, 1997), and she (Zhang, 2003) revised the genus together with *Yinshania* Ma & Y.Z.Zhao. *Hilliella* was subsequently united by Al-Shehbaz et al. (1998) with the earlier-published *Yinshania* Ma & Y.Z.Zhao, and the combined genus was maintained by Zhou et al. (2001) and placed in the monogeneric tribe Yinshanieae by Warwick et al. (2010). However, recent molecular phylogenetic studies by Chen et al. (2016) have shown that *Hilliella* should be maintained as distinct genus assigned to the Hillielleae, a tribe remotely related to the Yinshanieae. All names in *Hilliella* at the species rank are available and pose no problem. However, two subspecies, which were recognized by Al-Shehbaz et al. (1998) in *Yinshania,* remained in this genus while their species are currently placed in *Hilliella*. Therefore, the following two new combinations are proposed.

Hilliella sinuata subsp. **qianwuensis** (Y.H.Zhang) Al-Shehbaz & D.A.German, *comb. nov.*

Basionym: *Hilliella sinuata* var. *qianwuensis* Y.H.Zhang, Acta Bot. Yunnan. 8: 405. 1986. TYPE: CHINA. Jiangxi, Qianwu, 700 m, 8 May 1958, *Q. M. Hu & Q. H. Li 1761* (Holotype: LBG (as HLG); Isotype: PE).

Homotypic synonym: *Yinshania sinuata* subsp. *qianwuensis* (Y.H.Zhang) Al-Shehbaz, G.Yang, L.L.Lu & T.Y.Cheo, Harvard Pap. Bot. 3: 89. 1998.

Hilliella rupicola subsp. **shuangpaiensis** (Z.Y.Li) Al-Shehbaz & D.A.German, *comb. nov.*

Basionym: *Hilliella shuangpaiensis* Z.Y.Li, Acta Bot. Yunnan. 10: 117. 1988. TYPE: CHINA. Hunan, Shuangpai, Ma Jiang, Tong-zhi Shan, 1000 m, 22 Sep 1986, *C. L. Liao 1439* (Holotype: HUTM, as HNMI).

Homotypic synonym: *Yinshania rupicola* subsp. *shuangpaiensis* (Z.Y.Li) Al-Shehbaz, G.Yang, L.L.Lu & T.Y.Cheo, Harvard Pap. Bot. 3: 92. 1998.

Heterotypic synonym: *Hilliella xiangguiensis*, Y.H.Zhang, Acta Bot. Yunnan. 19: 139. 1997. TYPE: CHINA. Hunnan, Suining, Huangshuangxiang, Chibancun, Laolongta, 1700 m, 17 Jul 1985, *C. Z. Yuan 319* (Holotype: HUTM).

Neuontobotrys

Neuontobotrys is a genus of 14 South American species distributed from southern Peru and Bolivia south into Argentinean and Chilean Patagonia (Al-Shehbaz, 2004, 2006; Al-Shehbaz et al., 2013). The majority of species in the genus were previously placed in *Sisymbrium* L. and *Eremodraba* O.E.Schulz, and the nomenclature of all except one is straightforward. The basionym of one of the Peruvian species was incorrectly accepted by Al-Shehbaz (2006), and the new combination below addresses that unfortunate mistake.

Neuontobotrys amplexicaulis (Kuntze) Al-Shehbaz, *comb. nov.*

Basionym: *Hesperis amplexicaulis* Kuntze, Revis. Gen. Pl. 2: 934. 1891. TYPE: PERU. Andes, between Caball [Caballos] and Obrajillo, *Capt. Wilkes Expedition 1838-1842* (Lectotype designated here: GH-00312582; Isolectotypes: K-000485117, P-02272632, US-00099947).

Homotypic synonyms: *Sisymbrium amplexicaule* A.Gray, U.S. Expol. Exped., Phan. Pacific N. Amer., 15(1): 61. 1854, non *S. amplexicaule* Desf., Fl. Atlant. 2: 81. 1798, nec *S. amplexicaule* Phil., Fl. Atacam. 8: 10. 1860; *Sisymbrium grayanum* Baehni & J.F.Macbr., Candollea 7: 295. 1937; *Neuontobotrys grayanus* (Baehni & J.F.Macbr.) Al-Shehbaz, Darwiniana 44: 351. 2006.

Heterotypic synonyms: *Sisymbrium amplexicaule* A.Gray var. *tenuicaule* O.E.Schulz in Engler, Pflanzenreich IV. 105(Heft 86): 58. 1924; *S. grayanum* Baehni & J.F.Macbr. var. *tenuicaule* (O.E.Schulz) Baehni & J.F.Macbr., Candollea 7: 296. 1937. TYPE: PERU. Western slopes of the Andes, between 13° and 14°S, above Pisco, between Huauyanga and Pampano, May 1910, 1000-1200 m, *A. Weberbauer 5378* (Lectotype designated here: B; Isolectotypes: F-0092989, G-00371894, GH-00312581).

Baehni & Macbride (1937) proposed the new name *Sisymbrium grayanum* to replace the illegitimate later homonym *S. amplexicaule* A.Gray, and they listed *Hesperis amplexicaulis* Kuntze as a synonym. However, in recognizing the species in *Neuontobotrys*, Al-Shehbaz (2006) should have taken Kuntze's (1891) epithet, which predates that of Baehni & Macbride by 46 year, and recognized it as a new name following Article 58 of the International Code of Nomenclature for Algae, Fungi, and Plants (McNeill et al., 2012).

Neither Baehni and Macbride (1937) nor Macbride (1938) typified *Sisymbrium amplexicaule* A.Gray or *S. amplexicaule* var. *tenuicaule*. Both names needed lectotypification because Asa Gray annotated the duplicates of the former name at GH and US, and Schulz annotated those at B and F of the latter name. The mere listing by Al-Shehbaz (2006) of GH and B as the holotypes of *S. amplexicaule* and var. *tenuicaule*, respectively, does not constitute valid lectotypifications of both names because the phrase "designated here" or its equivalent was not indicated (see Article 9, note 6 in McNeill et al., 2012; McNeill 2014).

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