

A SYNOPSIS OF THE GENUS *BRAYA* (BRASSICACEAE)

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Abstract. Synonymy, typification, distribution, and key to the 23 species of *Braya* are given, along with an updated generic description. The new species *B. sichuanica* is described and illustrated. The new combinations *B. fengii*, *B. parvia*, *B. piasezkii*, *B. qingshuiheense*, and *B. stigmatosa* are proposed. A list of taxa excluded from *Braya* is given, along with their current generic and tribal placements. The following taxa are lectotypified: *Beketowia tianschanica*, *Braya aenea* var. *multicaulis*, *B. aenea* var. *simplicior*, *B. pectinata*, *B. purpurascens* var. *longisiliquosa*, *B. rosea* var. *angustifolia*, *B. tibetica* var. *breviscapa*, *B. versicolor*, *Erysimum pamiricum*, *E. stigmatosum*, *Pilosella richardsonii*, *Sisymbrium nanum* var. *leiocarpum*, and *Torularia humilis* prol. *venusta*. Previous designations are narrowed for *Arabis sinuata*, *Braya aenea*, *B. rosea*, *B. thomsonii*, and *B. tibetica*.

Keywords. Cruciferae, Euclidieae, *Neotorularia*, Eurasia, North America, typification

Braya Sternb. & Hoppe (Brassicaceae or Cruciferae) is distributed primarily in the alpine and subarctic regions of Eurasia and North America. There is a lack of agreement among various authors on the total number of species in the genus, and estimates within the past decade varied from six (Appel & Al-Shehbaz, 2003), to 17 (Harris, 2010), to 25 species (Al-Shehbaz, 2012). This major discrepancy reflects the lack of a comprehensive study of the genus. Except for the long-outdated account of Schulz (1924), the genus has not previously been studied on a worldwide basis. The North American species were subjected to more studies (e.g., Fernald, 1918; Abbe, 1948; Rollins, 1953; Böcher, 1956, 1973; Harris, 1985, 2006a, 2006b, 2010) than were their congeners of the Old World, especially Asia.

Perhaps one source of taxonomic difficulty in *Braya* is the excessive recognition of taxa, and the International Plant Names Index (IPNI) lists some 105 unique records at the species, subspecies, and varietal ranks. Of these, 16 are accepted herein as species, 37 are excluded and currently placed in 18 genera of ten tribes (see below), 51 are synonymized in *Braya*, and three (discussed under *B. humilis*) are considered of doubtful status. Another factor is the difficulty in delimiting *Braya* from its closest relative *Neotorularia* Hedge & J. Léonard due to substantially overlapping characters. Although molecular data (Warwick et al., 2004; German et al., 2009) showed that the two genera are distinct members of the tribe Euclidieae, more work is needed to resolve the boundaries of polyphyletic *Neotorularia*.

Half of the species of *Braya* have silicles, and this fruit type is a reliable feature that readily distinguishes the

genus from *Neotorularia*, which exclusively has siliques fruits. However, *Braya* species that produce siliques can be separated from *Neotorularia* by their usually perennial (vs. annual) duration, slender and relatively long (vs. usually short and stout) fruiting pedicels narrower than (vs. usually as wide as) the fruit, usually basally bracteate (vs. ebracteate) racemes, straight or slightly curved (vs. often twisted or strongly curved) fruits, and 2-lobed or less often entire (vs. entire) stigmas.

The present synopsis accounts for all names in *Braya* (excluding forms), and also provides the basis for two major works currently in progress, the World Flora Online and the Brassicaceae database (BrassiBase) in Heidelberg University (see Koch et al., 2012; Kiefer et al., 2014).

The taxonomic status of all infraspecific taxa, including 16 not listed in IPNI and excluding all forms, are dealt with and typified, and an updated generic description and key to all species are given.

Unless otherwise indicated, type specimens and/or images of all taxa included in this work were examined by one or both of us.

***Braya* Sternb. & Hoppe**, Denkschr. Königl.-Baier. Bot. Ges. Regensburg 1(1): 65. 1815. Type species: *Braya alpina* Sternb. & Hoppe.

Synonyms: *Platypetalum* R. Br., Chlor. Melvill. 8. 1823.

Type species: *P. purpurascens* R. Br. (Lectotype designated by Grant, 1994: 251).

Beketowia Krasn., Scripta Bot. Hort. Univ. Petrop. 2(1): 12. 1887. Type species: *B. tianschanica* Krasn.

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Herbs perennial or rarely annual, with simple to many-branched caudices, sometimes scapose and/or forming cushions. *Trichomes* simple and/or stalked to sessile, submalpighiaceous, forked, subdendritic, or stellate. *Multi-cellular glands* absent. *Stems* erect to ascending or rarely decumbent, simple or branched basally, leafy or leafless, unarmed. *Basal leaves* petiolate, rosulate, simple, margin entire or dentate, rarely pinnately lobed, pinnatisect, or subpectinate, petiolar bases persistent; cauline leaves absent or few to several, sessile or nearly so, not auriculate at base, margin similar to basal leaves. *Racemes* few to many flowered, ebracteate or bracteate basally or throughout, corymbose, elongated or not elongated in fruit; rachis usually straight; fruiting pedicels slender, erect to divaricate, persistent. *Sepals* ovate to oblong, free or rarely united, deciduous or persistent, erect, equal, base of inner pair not saccate; petals white, pink, or purple, rarely yellow, erect at base with flaring blade, slightly to distinctly longer than sepals; blade obovate to oblanceolate, apex obtuse to rounded; claw often slightly differentiated from blade, shorter than sepals, glabrous, entire; stamens 6, slightly exserted, erect, tetradynamous;

filaments wingless, unappendaged, glabrous, free, dilated at base; anthers ovate or oblong, not apiculate at apex; nectar glands 4, lateral, 1 on each side of lateral stamens; median glands absent; ovules 4–28 per ovary; placentation parietal. *Fruits* dehiscent, capsular siliques or silicles, linear, oblong, lanceolate, ellipsoid, ovoid, or globose, terete or slightly latiseptate, not inflated, unsegmented; valves papery, with a distinct midvein, glabrous or pubescent, not keeled, smooth or torulose, wingless, unappendaged; gynophore absent; replum rounded, visible; septum complete, membranous, usually translucent, veinless; style obsolete or short and to 1.2(–2.5) mm, cylindrical, persistent, glabrous; stigma capitate, entire or slightly 2-lobed, lobes free, not decurrent, unappendaged. *Seeds* uniseriate or biseriata, wingless, oblong or ovoid, plump; seed coat minutely reticulate, not mucilaginous when wetted; cotyledons incumbent or rarely obliquely so. $x = 7$.

As delimited herein, *Braya* consists of 23 instead of the 25 species estimated by Al-Shehbaz (2012). The difference is the reduction of some of the species to synonymy based on the examination of substantial material, including types.

KEY TO THE SPECIES OF *BRAYA*

- 1a. Fruits linear, rarely linear-oblong 2
 1b. Fruits globose, ovoid, ellipsoid, oblong, or lanceolate 15
 2a. Sepals united *B. gamosepala*
 2b. Sepals free 3
 3a. Plants scapose or subscapose; stems simple or rarely branched, leafless or rarely 1(–3)-leaved 4
 3b. Plants not scapose; stems usually branched, more than 3-leaved 9
 4a. Fruits oblong-linear, to 7 time longer than broad 5
 4b. Fruits linear, usually more than 7 times longer than broad 7
 5a. Raceme capitate in fruit; fruits recurved at apex (4–7 times in *B. alpina*) *B. thomsonii*
 5b. Raceme elongated in fruit; fruits not recurved at apex 6
 6a. Seeds biseriata throughout; Alaska, Canada, Russian Far East *B. glabella*
 6b. Seeds often biseriata only proximally, distally (or throughout) subbiseriata to almost uniseriate; Siberia, Central Asia, Himalayas . . . *B. rosea*
 7a. Style (0.5–)0.9–1.2 mm in fruit; petals 4–6 mm; Mongolia, Russia (Siberia, Far East) *B. siliquosa*
 7b. Style 0.1–0.5 mm in fruit; petals 2.5–3.5(–4) mm; Europe 8
 8a. Fruits 8–15 × 0.9–1.3 mm, 9–12 times longer than wide; ovules 20–28 per ovary; Greenland, Norway, Sweden *B. linearis*
 8b. Fruits 5–11 × 1–1.7 mm, 4–7 times longer than wide; ovules 12–18 per ovary; Alps of Austria and Italy *B. alpina*
 9a. All leaves pinnatisect to subpectinate; petioles long ciliate with subsetose simple trichomes to 1.2 mm *B. sichuanica*
 9b. At least some leaves entire, dentate, or pinnatifid; petioles not ciliate or rarely short ciliate with non-setose trichomes 10
 10a. Petals 1–2.5 × 0.5–0.9(–1.1) mm; fruits 5–10(–12) mm, widest and biseriately seeded basally *B. parvia*
 10b. Petals 2.5–10 × 0.7–6 mm; fruits 9–35 mm, uniformly wide and uniseriately seeded basally 11
 11a. Fruits tortuose; stigma distinctly wider than style, often profoundly lobed with recurved lobes *B. stigmatosa*
 11b. Fruits straight; stigma narrower than or about as wide as style, entire or with non-recurved lobes 12
 12a. Petals 6–9(–10) × (3–)3.5–6 mm, purple or rarely lavender; leaves pinnatifid or sinuate-pinnatifid; plants with thick, woody caudex *B. fengii*
 12b. Petals (2.5–)3–5(–5.5) × (0.7–)1–2(–3) mm, white, lavender, or rarely purple; leaves entire, dentate, or sinuate, rarely pinnatifid; caudex slender or poorly developed 13
 13a. Cotyledons obliquely incumbent; fruits latiseptate or slightly flattened; stigma 2-lobed *B. piasezkii*
 13b. Cotyledons incumbent; fruits terete; stigma entire or 2-lobed 14
 14a. Fruiting racemes with straight rachis; stigma entire; basal leaves entire or dentate, not pinnatifid *B. humilis*
 14b. Fruiting racemes with flexuous rachis; stigma strongly 2-lobed; basal leaves pinnatifid *B. qingshuiheense*
 15a. (1b) Flowers yellow 16
 15b. Flowers white, pink, lavender, rose, or purple 17
 16a. Fruits torulose, 6–8(–14) × 1–1.2 mm, 5–8(–11) times longer than broad; racemes ebracteate or basally bracteate, elongated in fruit *B. pamirica*
 16b. Fruits smooth, rarely torulose, 3–4.5(–5) × 1.8–2 mm, 1.8–2.5 times longer than broad; racemes bracteate throughout, not elongated in fruit *B. scharnhorstii*

KEY TO THE SPECIES OF *BRAYA* CONT.

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| 17a. Trichomes exclusively simple; ovary 4–8-ovuled | <i>B. forrestii</i> |
| 17b. At least some trichomes branched; ovary 10–30-ovuled | 18 |
| 18a. Racemes bracteate throughout; fruits basally biseriate, distally uniseriate | <i>B. parvica</i> |
| 18b. Racemes ebracteate; fruits usually uniformly either uniseriate or biseriate | 19 |
| 19a. Fruits globose to broadly ovoid, 1–2 times longer than broad | 20 |
| 19b. Fruits narrowly ovoid, ellipsoid, lanceolate, to oblong, more than twice longer than broad | 23 |
| 20a. Fruits 1–1.2 mm wide; raceme not elongated in fruit; China, India, Pakistan | <i>B. tibetica</i> |
| 20b. Fruits (1.2–)3–5 mm wide; raceme elongated or not in fruit; Canada, Russia, Central Asia, U.S.A. (Alaska) | 21 |
| 21a. Style 1.2–2(–2.5) mm in fruit; petals 4.5–6.5 × 3–5 mm | <i>B. pilosa</i> |
| 21b. Style 0.1–0.7(–1) mm in fruit; petals 2–3.7 × 1–1.5 mm | 22 |
| 22a. Fruits 1.2–2 mm wide; basal leaves linear to linear-oblongate; Russia (Siberia), Central Asia | <i>B. rosea</i> |
| 22b. Fruits 3–5 mm wide; basal leaves spatulate to narrowly so; Canada, Greenland, Russia (Far East) | <i>B. thorild-wulfii</i> |
| 23a. Fruit replum not expanded at base; ovules 16–24 per ovary | 24 |
| 23b. Fruit replum expanded at base; ovules 10–16 per ovary | 25 |
| 24a. Racemes elongated in fruit; fruits more than 3.5 times longer than wide | <i>B. glabella</i> |
| 24b. Racemes not elongated in fruit; fruits 2.5–3.5 times longer than wide | <i>B. purpurascens</i> |
| 25a. Seeds biseriate at least at fruit base; Himalayas, Central Asia, Siberia, Mongolia | <i>B. rosea</i> |
| 25b. Seeds uniseriate throughout; Canada | 26 |
| 26a. Fruits pubescent; petals obscurely clawed, 2.5–3.5(–4) × 0.8–1.3(–2) mm | <i>B. fernaldii</i> |
| 26b. Fruits glabrous or subglabrous; petals distinctly clawed, (3–)3.3–5 × (1.2–)1.5–2.5(–3) mm | <i>B. longii</i> |

1. ***Braya alpina*** Sternb. & Hoppe, Denkschr. Königl.-Baier. Bot. Ges. Regensburg 1: 66. 1815; *Sisymbrium alpinum* (Sternb. & Hoppe) E. Fourn., Recherch. Anat. Taxon. Fam. Crucif. 131. 1865; *Hesperis alpina* (Sternb. & Hoppe) Kuntze, Revis. Gen. Pl. 2: 934. 1891. TYPE: [AUSTRIA]. “Habitat in vicinia montis Glockner, ultra moles glaciales, in alpe Gamsgrube Carinthiae superioris, in confinibus ditionis Salisburgensis Tirolisque, floret Julio,” *D. H. Hoppe s.n.* (Holotype: GZU).

Braya alpina var. *rivularis* E. Fries, Novit. Fl. Succ. Mantiss. 2: 41. 1839. TYPE: not seen.

Distribution: Austria, Italy.

2. ***Braya fengii*** (Al-Shehbaz) Al-Shehbaz & D. A. German, *comb. nov.* Based on *Phaeonychium fengii* Al-Shehbaz, Novon 10: 335. 2000. TYPE: CHINA. Yunnan, Pai-shu-ho, NE Likiang Snow Range, open moist streams, 3 April 1939, *K. M. Feng 654* (Holotype: A; Isotypes: KUN, PE).

Torulularia humilis prol. *venusta* O. E. Schulz, Notizbl. Bot. Gart. Berlin-Dahlem 11: 230. 1931. **Syn. nov.** TYPE: CHINA. NW Yunnan, between Li-Kiang and Young Ning, 3400 m, E and W of the Yangtze, March 1929, *Joseph F. Rock 17374* (Lectotype here designated: US; Isolectotypes: GH, LE, NY, P, W).

Distribution: China (SE Tibet, Yunnan).

When *Phaeonychium fengii* was described (Al-Shehbaz, 2000a), no fruiting material was available, and its generic relationship was not entirely clear. However, the availability of additional material with young fruits amply demonstrate that the affinity of this species is with *Braya humilis*, especially for having linear, terete fruits with submalpighiaceous trichomes and basally bracteate racemes. All other species of *Phaeonychium* O. E. Schulz sensu Al-Shehbaz (2000a) have recently been transferred by Yue et al. (2008) and German & Al-Shehbaz (2010) to *Solms-Laubachia* Muschl.

Braya fengii differs from *B. humilis* by having thick and woody (vs. slender and non-woody) caudex, pinnatifid to sinuate-pinnatifid (vs. entire to dentate or rarely sinuate) basal leaves, purple or rarely lavender (vs. white, rarely lavender or purple) flowers, larger petals 6–9(–10) × (3–)3.5–5(–6) mm (vs. (2.5–)3–5(–5.5) × (0.7–)1–2(–2.5) mm), and 2-lobed (vs. entire or rarely slightly lobed) stigmas. The presence of simple trichomes in *B. fengii* varies a great deal from being restricted to the basal leaves to being widespread to the inflorescence, sepals, and sometimes fruits. By contrast, typical *B. humilis* either lacks the simple trichomes or have them restricted to petioles of lowermost and basal leaves.

Schulz (1931) cited two syntypes (*Rock 17190* and *Rock 17374*) for *Torulularia humilis* prol. *venusta*. The most complete specimen is designated herein as the lectotype.

3. ***Braya fernaldii*** Abbe, Rhodora 50: 12. 1948. *Braya purpurascens* (R. Br.) Bunge ex Ledeb. var. *fernalidii* (Abbe) B. Boivin, Naturaliste Canad. 94: 646. 1972. TYPE: CANADA. Northwestern Newfoundland, Pistolet Bay, Cape Norman, boggy depressions in limestone barrens, 18 July 1925, *K. M. Wiegand, L. Griscom & N. Hotchkiss 28434* (Holotype: GH; Isotypes: BH, PH).

Distribution: Canada (Newfoundland).

4. ***Braya forrestii*** W. W. Sm., Notes Roy. Bot. Gard. Edinburgh 8: 119. 1913. TYPE: CHINA. Yunnan, W flank of Liching Range, 27°20'N, 12,000–13,000 ft., June 1910, *G. Forrest 5749* (Holotype: E; Isotypes: BM, K).

Braya forrestii var. *puberula* W. T. Wang, Acta Bot. Yunnan. 9: 19. 1987. TYPE: CHINA. Sichuan, Yanyuan, Mons Huolushan, 4,000 m, 23 July 1983, *Expedition Qingzang 12322* (Holotype: PE; Isotype: KUN).

Distribution: Bhutan, China (Sichuan, Xizang, Yunnan).

Braya forrestii is anomalous in *Braya* for having exclusively simple trichomes, whereas all other species of

the genus have one or more type of branched trichomes in addition sometimes to simple ones. Warwick et al. (2004) showed that *B. forrestii* clearly falls in a clade sister to the rest of *Braya*. Based on that finding, Al-Shehbaz et al. (2004) suggested that the species perhaps ought to be placed in a genus of its own. Without detailed molecular studies on this species and other genera closely related to *Braya*, we prefer to tentatively retain the species in this genus.

5. ***Braya gamosepala*** (Hedge) Al-Shehbaz & Warwick, *Novon* 14: 269. 2004; *Arabidopsis gamosepala* Hedge in *Rech.f., Fl. Iranica* 57: 334. 1968. TYPE: AFGHANISTAN. Munjan, above Anjuman valley, near Anjuman, 3,100 m, 14 August 1965, *D. Podlech 12379* (Holotype: M; Isotypes: E, MSB).

Distribution: Afghanistan, Tajikistan.

This is the only species in the genus with gamosepalous calyx, a feature evolved independently in several other genera of the Brassicaceae (Al-Shehbaz, 2001). Except for its united sepals, *B. gamosepala* can hardly be distinguished from *B. humilis* as circumscribed here. However, due to its restricted distribution and our lack of thorough experimental and molecular studies on the complex, we tentatively maintain both species as distinct.

6. ***Braya glabella*** Richardson in Franklin Narr. Journey Polar Sea 743. 1823; *Sisymbrium alpinum* var. *glabellum* (Richardson) Trautv., *Trudy Imp. S.-Peterburgsk. Bot. Sada* 1: 59. 1871, "*glabella*;" *B. alpina* Sternb. & Hoppe var. *glabella* (Richardson) S. Watson, *Bibl. Index N. Amer. Bot.* 51. 1878; *B. humilis* (C. A. Mey.) B. L. Rob. var. *glabella* (Richardson) B. Boivin, *Phytologia* 16: 300. 1968. TYPE: CANADA. [Nunavut], Copper Mountains, 1820, *John Richardson s.n.* (Holotype: BM; Isotypes: GH, K).

Braya alpina Sternb. & Hoppe var. *americana* Hook., *Fl. Boreal. Amer.* 1: 65. 1830; *B. americana* (Hook.) Fernald, *Rhodora* 28: 203. 1926; *Braya humilis* (C. A. Mey.) B. L. Rob. var. *americana* (Hook.) B. Boivin, *Phytologia* 16: 300. 1968. TYPE: U.S.A. Rocky Mts., *Drummond s.n.* (Holotype: K).

Braya bartlettiana Jordal, *Rhodora* 54: 36. 1952. TYPE: U.S.A. Alaska, Bettles River, 20 miles northeast of Wiseman, steep, moist and mossy alpine tundra slope of limestone peak, 3,500 ft [1,067 m], 13 July 1949, *L. H. Jordal 2291* (Holotype: MICH).

Braya bartlettiana var. *vestita* Hultén, *Ark. Bot.* n.s. 7: 66. 1968, nom. invalid.; validated in *Madroño* 19: 223. 1968. TYPE: U.S.A. Alaska, Atkasuk, Mead River village, 5–8 Aug 1960, *E. Hultén s.n.* (Holotype: S).

Braya aenea subsp. *pseudoaenea* V. V. Petrovsky, *Arktichesk. Fl. SSSR* 7: 49. 1975. TYPE: RUSSIA. Southeast part of Chukotka peninsula, shore of Senyavin strait, vicinities of Yanrakynnot near the mouth of the river Marich, 22 July 1972, *V. V. Razzhivin & B. A. Yurtsev SG 72-33* (Holotype: LE; Isotypes: 3 at LE).

Distribution: Canada (Alberta, British Columbia, Northwest Territories, Nunavut, Quebec, Yukon), U.S.A. (Alaska, Colorado, Montana, Wyoming), Russia (Wrangel Island, East Chukotka).

7. ***Braya humilis*** (C. A. Mey.) B. L. Rob. in A. Gray & S. Watson, *Syn. Fl. N. Amer.* 1(1): 141. 1895; *Sisymbrium humile* C. A. Mey. in Ledeb., *Icon. Pl.* 2: 16. 1830; *Neotorularia humilis* (C. A. Mey.) Hedge & J. Léonard, *Bull. Jard. Bot. Natl. Belg.* 56: 394. 1986; *Torularia humilis* (C. A. Mey.) O. E. Schulz, *Repert. Spec. Nov. Regni Veg. Beih.* 12: 390. 1922; *Dichasianthus humilis* (C. A. Mey.) J. Soják, *Sborn. Nar. Muz. Praze*, 1982(1–2): 107. 1982; *Sisymbrium nanum* DC. var. *humile* (C. A. Mey.) Trautv., *Trudy Imp. St. Peterburgsk. Bot. Sada* 5: 25; *Hesperis hygrophila* Kuntze, *Revis. Gen. Pl.* 2: 936. 1891. TYPE: [RUSSIA. W Siberia, Altai Republic], 1033. Altai. In subsalsis siccis ad fluvios Kerlyk, Kan, Jebagan legit Ill. *Ledebour*; ad fluvium Tschuja, Dr. *Bunge*, Floret Junio, Julio, Majo 1826 (Lectotype designated by Dorofeyev in German (2005: 255): LE).

Arabis sinuata Turcz., *Bull. Soc. Imp. Naturalistes Moscou* (1840) 64. 1840; *Erysimum sinuatum* (Turcz.) Kuntze, *Revis. Gen. Pl.* 2: 934. 1891; *Cardaminopsis sinuata* (Turcz.) O. E. Schulz, *Nat. Pflanzenfam.* ed. 2, 17b: 541. 1936. TYPE: [RUSSIA, E Siberia, Sakha (Yakutia) Republic], In arenosis ad viam Ochotensem prope stat. Czernoliescaja legit Kuznetsoff 1835 (Lectotype designated by Berkutenko (1983: 82 as type) and here: LE; Isolectotypes: 2 at KW, 3 at LE, P, PRC).

Sisymbrium nanum DC. var. *leiocarpum* Trautv., *Trudy Imp. St. Peterburgsk. Bot. Sada* 5: 26. 1877; *Braya humilis* var. *leiocarpa* (Trautv.) Fernald, *Rhodora* 39: 276. 1937. TYPE: [RUSSIA, Sakha (Yakutia) Republic], Sibiria orient. ad fl. Olenek. Inter fl. Tomba inf.[eriores] et fl. Maigda super.[iores] 8 Julii [1874], A. *Czekanowski & F. Müller* (Lectotype here designated: LE).

Pilosella novae-angliae Rydb., *Torreyia* 7(8): 158. 1907; *Arabidopsis novae-angliae* (Rydb.) Britton in Britton & Brown, *Ill. Fl. N. U.S.*, ed. 2. ed. 2, 2: 176. 1913; *B. humilis* var. *novae-angliae* (Rydb.) Fernald, *Rhodora* 20: 201. 1919; *B. novae-angliae* (Rydb.) T. J. Sørensen, *Meddel. Grønland* 136 (8): 22. 1954. TYPE: U.S.A. Vermont, Willoughby Mountain, 16 July 1887, *C. E. Faxon s.n.* (Holotype: NY; Isotype: NY).

Pilosella richardsonii Rydb., *Torreyia* 7(8): 159. 1907; *Braya richardsonii* (Rydb.) Fernald, *Rhodora* 20: 203. 1919; *B. humilis* subsp. *richardsonii* (Rydb.) Hultén, *Ark. Bot.*, n.s. 7(1): 66. 1968. TYPE: [CANADA. Northwest Territories], about Mackenzie River, from lat. 60° to 68°; *Richardson s.n.* (Lectotype here designated: NY).

Torularia humilis subsp. *arctica* Böcher, *Meddel. Grønland* 147(7): 29. 1950; *Braya humilis* subsp. *arctica* (Böcher) Rollins, *Rhodora* 55: 115. 1953; *B. humilis* var. *arctica* (Böcher) B. Boivin, *Phytologia* 18: 285. 1969; *T. arctica* (Böcher) Á. Löve & D. Löve, *Bot. Not.* 128(4): 513. 1975 [1976]. TYPE: GREENLAND. Clavering Ø, 19 July 1933, *T. Sørensen 4231* (Lectotype designated as type by Böcher (1956: 23): C [not seen]).

Braya humilis subsp. *ventosa* Rollins, *Rhodora* 55: 114. 1954; *B. novae-angliae* subsp. *ventosa* (Rollins) Böcher, *Meddel. Grønland* 124, 7: 21. 1956; *B. humilis* var. *ventosa* (Rollins) B. Boivin, *Phytologia* 16: 300. 1968. TYPE: U.S.A. Colorado, border of Park and Summit counties, rocky slope of eastern extension of North Star Mountain,

1.5 mi W of Hossier Pass, 7 August 1951, *R. C. Rollins & W. A. Weber 51288* (Holotype: GH; Isotypes: GH, RM).

Braya intermedia T. J. Sørensen, Meddel. Grønland 136(8): 15, tab. 2, 3. 1954. TYPE: GREENLAND. Ella Ø, Kap Oswald, 72°53'N, 30 July 1932, *T. Sørensen 3556B* (Holotype: C).

Braya novae-angliae subsp. *abbei* Böcher, Meddel. Grønland 127(7): 21. 1956; *B. humilis* var. *abbei* (Böcher) B. Boivin, Phytologia 16: 299. 1968. TYPE: CANADA. Newfoundland, Table Mountain, 17 July 1914, *M. L. Fernald & H. St. John 10837* (Holotype: C [not seen]; Isotype: GH).

Braya novae-angliae var. *interior* Böcher, Meddel. Grønland 124(7): 20. 1956; *B. humilis* var. *interior* (Böcher) B. Boivin, Phytologia 16: 300. 1968. TYPE: CANADA. Manitoba, Fort Churchill, 27 July 1948, *Gillett 2242* (Holotype: C [not seen]; Isotype: S).

Braya novae-angliae var. *laurentiana* Böcher, Meddel. Grønland 124(7): 19. 1956; *B. humilis* var. *laurentiana* (Böcher) B. Boivin, Phytologia 16: 300. 1968. TYPE: CANADA. Quebec, Jupiter River, 11 August 1926, *Marie-Victorin & Rolland-Germain 24850* (Holotype: S).

Torularia humilis var. *parviflora* Malyshev, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk S.S.S.R. 22: 23, 1963, nom. invalid. (type not designated).

Torularia grubovii Botsch., Bot. Zhurn. (Moscow & Leningrad) 60: 948. 1975; *Neotorularia grubovii* (Botsch.) Botsch., Bot. Zhurn. (Moscow & Leningrad) 73: 1187. 1988. **Syn. nov.** TYPE: MONGOLIA. West vicinities of the lake Khubsugul [Khövsgöl], Darkhat depression, Choton-Gol at southwestern foot of Mt. Sula-Ula, 30 km NW Rinczin-Lchumbu, 8 August 1972, *V. I. Grubov et al. 749* (Holotype: LE).

Arabidopsis tuemurnica K. C. Kuan & C. H. An, Bull. Bot. Lab. North-East Forest Inst. 8: 44. 1980. TYPE: CHINA. Xinjiang, Wen-su Xian, Tuo-mu-er-feng, 2,400 m, 24 June 1977, *Tuo-mu-er-feng Expedition 770084* (Holotype: PE-00934765, listed as HP; Isotype: BJM, listed as HM [not seen]).

Neotorularia mongolica Botsch. & Gubanov, Bot. Zhurn. (Moscow & Leningrad) 73: 1186. 1988. **Syn. nov.** TYPE: MONGOLIA. Khubsugul [Khövsgöl] aimag, 20 km NNW of Khatgal. Valley of Arsyi-gol, Pebble deposits along the river bank in the forest belt. 1,900–2,000 m, 27 July 1982, *I. A. Gubanov 6052* (Holotype: MW; Isotype: LE).

Arabidopsis trichocarpa R. F. Huang, Fl. Qinghaiica 1: 509. 1997. TYPE: CHINA. Qinghai, Huzhu (Jadin), 2,300 m, 11 June 1971; *P. Z. Guo & T. N. He 9048* (Holotype: HNWP, as NWBI).

Distribution: Afghanistan, Bhutan, Canada (Alberta, British Columbia, Manitoba, Newfoundland, Northwest Territories, Nunavut, Ontario, Quebec, Yukon), China (Gansu, Hebei, Henan, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan), Greenland, India, Kazakhstan, Korea, Kyrgyzstan, Mongolia, Nepal, Pakistan, Russia (Siberia, Far East), Tajikistan, U.S.A. (Alaska, Colorado, Michigan, Montana, Vermont, Wyoming).

Braya humilis is by far the most variable and widespread species in the genus, and the variation covers almost every

aspect of morphology. It appears that the main sources of variation are the presence of different breeding systems, hybridization, and polyploidy (e.g., 4x, 6x, 8x, and 10x based on $x = 7$), which lead various authors to recognize several species, subspecies, and varieties in the complex (Harris, 2006a). Plants corresponding best to the type collections from the Altai Mountains (see also discussion under *B. fengii*) have white, small petals rarely to 5.5×2.5 mm, terete fruits with exclusively submalpighiaceous trichomes, entire stigmas narrower than the style, and leaves with predominantly submalpighiaceous and 3-fid trichomes and rarely some simple trichomes, especially along the petioles of basal and lowermost cauline leaves. The greatest variability occurs in the Himalayas, where lavender or purplish flowers are more common than white, and the presence of simple trichomes tends to be quite variable and ranges from the lower parts of the plant all the way up to the sepals and sometimes fruits. Flower size in the species is also most variable in the Himalayas, and some forms approach the smallest flower size of *B. fengii*. The cause of this variation is unclear, and extensive cytological and breeding experiments are needed to elucidate the sources of this complexity. Plants with preponderance of simple trichomes are extremely rare and only in one case (*Rock 14131* at GH) had we examined a mixed collection of a typical *B. humilis* plant mounted with another having almost exclusively simple trichomes.

Harris (2006b) divided the North American populations of *Braya humilis* into four subspecies, including subsp. *humilis*. While his subsp. *ellesmerensis* J. G. Harris is distinctive and should merit recognition, the status of the sterile subsp. *macallae* J. G. Harris and subsp. *porsildii* J. G. Harris requires further study, especially in connection with the extensively widespread and far more variable Asian representatives of the species. Without such a thorough study, it would be meaningless to recognize infraspecific taxa in a small portion of the species range and ignore the vast territory it occupies in Asia, especially the Himalayas. It is beyond the scope of this study to deal with the North American infraspecific taxa, and the interested reader should consult the Panarctic Flora website (<http://nhm2.uio.no/paf/flora#paf-670903>) and Harris (2006b, 2010).

Torularia grubovii was separated from *B. humilis* by having numerous rosette leaves and higher percentage of simple and long-stalked forked (instead of sessile to subsessile) trichomes (Botschantzev, 1975). Indumentum variability in *B. humilis* is discussed above and number of rosette leaves also varies greatly and cannot be used as reliable character for maintaining the former a distinct species.

Neotorularia mongolica was distinguished from *B. humilis* by being annual [vs. perennial] with usually entire [vs. predominantly sinuate-dentate] leaves, yellow petals 5.5 mm long [vs. white to pink or purplish petals (2.5–)3–5(–5.5) mm], style of equal width to [vs. slightly narrower than] the stigma, and opaque [vs. translucent] septum (Botschantzev & Gubanov, 1988). Despite these apparently convincing differences, they only partly work at best. Thus, life form in *B. humilis* is flexible and being usually perennial

it can flower during the first season. Variability of leaf shape and margin was well illustrated by Berkutenko (1977), and her observations are supported by our study. Furthermore, while in the isotype of *N. mongolica* most leaves are entire to subentire, the holotype has profoundly dentate leaves. Style of equal width with the stigma is another character rather typical for *B. humilis* and the petals 5.5 mm long found in *N. mongolica* corresponds the upper limit of petal size of *B. humilis* which varies a great deal within the species. Yellow petals is a unique feature unknown in *B. humilis* and related species, and it might justify some distinctness of *N. mongolica*. However, petals of the type gathering are white with pink claws and only youngest flowers are very pale yellowish. It is highly desirable to have fresh material to resolve the status of *N. mongolica*, but with the currently available single collection (two specimens) and taking into consideration the overall similarity with *B. humilis* in all other characters, we refrain from recognizing *N. mongolica*.

The holotype of *Neotorularia mongolica* in MW is with a printed label "Isotypus" while the isotype in LE bears the label "Typus." Furthermore, the latter is reported as holotype in the catalogue of type specimens of LE (Buzunova, 2000), and Gubanov (2002) mentioned that MW was wrongly indicated in the protologue as the place of deposition of the type instead of LE and that the specimen in MW is an isotype. However, this change is in conflict with ICN Art. 9.1, Note 1 (McNeill et al., 2012) and cannot be accepted; thus, the specimen in MW is holotype, as stated in the protologue, and that in LE is an isotype.

8. ***Braya linearis*** Rouy, Illustr. Pl. Europ. Rar. 11: 84. 1899. TYPE: NORWAY. Troms, Skjervøy, "île Hukö," Haukøya, *J. M. Norman s.n.* (Holotype: LY [not seen]).

Distribution: Greenland, Norway, Sweden.

9. ***Braya longii*** Fernald, Rhodora 28: 202. 1926; *B. purpurascens* (R. Br.) Bunge ex Ledeb. var. *longii* (Fernald) B. Boivin, Naturaliste Canad. 94: 646. 1972. TYPE: CANADA. NW Newfoundland, Sandy (or Poverty) Cove, Straits of Belle Isle, gravelly and peaty limestone barrens, 25 July 1925, *M. L. Fernald, B. Long, & F. A. Gilbert, Jr. 28424* (Holotype: GH; Isotypes: K, PH, NY).

Distribution: Canada (Newfoundland).

10. ***Braya pamirica*** (Korsh.) O. Fedtsch., Turdy Imp. S.-Peterburgsk. Bot. Sada 21: 280. 1903; *Erysimum pamiricum* Korsh., Mém. Acad. Imp. Sci. Saint Pétersbourg, ser. 8. 4(4): 88. 1896; *B. thomsonii* var. *pamirica* (Korsh.) O. E. Schulz in Engler, Pflanzenreich IV. 105(Heft 86): 230. 1924. TYPE: [TAJKISTAN, Pamir]: Turkestan. Pass Kizyl-art alt. [14,000 ft = 4,267 m], red clayey soil. 8 July 1895, *S. Korshinsky [449]* (Lectotype here designated: LE; Isolectotype: LE).

Solms-laubachia carnosifolia C. H. An, Fl. Xinjiang. 2(2): 377. 1995. TYPE: CHINA. Xinjiang. Taxkorgan Xian, 4,000 m, 4 July 1982, *Cui Nairan 820202* (Holotype: XJA; Isotype: MO).

Neotorularia pamirica C. H. An, Fl. Xinjiang. 2(2): 380.

1995. TYPE: CHINA. Xinjiang, Taxkorgan Xian, 3,250 m, 4 July 1978, *Xinjiang Expedition 959* (Holotype: WUK [not seen]).

Distribution: China (Tibet, Xinjiang), Tajikistan.

Schulz (1924) treated *Braya pamirica* as a variety of the Tibetan-endemic *B. thomsonii*, whereas Bondarenko (1974) reduced the earlier-published, white-flowered, and recurved-fruited *B. thomsonii* to synonymy of yellow-flowered and torulose-fruited *B. pamirica*. In our opinion, the two species are sufficiently different morphologically to merit their recognition as distinct.

11. ***Braya parvia*** (C. H. An) Al-Shehbaz & D. A. German, *comb. nov.* Basionym: *Torularia parvia* C. H. An, Bull. Bot. Res., Harbin 1(1–2): 104. April 1981. *Neotorularia parvia* (C. H. An) C. H. An (as *parav.*), J. August 1st Agr. Coll. 14(2): 48. 1991. TYPE: CHINA. Xizang (Tibet), Dalong Xian, 5 July 1961, *J. W. Zhang 2560* (Holotype: NAS, as JSBI).

Torularia brachycarpa Vassilcz., Fl. URSS. 8: 635. 1939; *Neotorularia brachycarpa* (Vassilcz.) Hedge & J. Léonard, Bull. Jard. Bot. Natl. Belg. 56: 393. 1986; *Dichasianthus brachycarpus* (Vassilcz.) J. Soják, Sborn. Nar. Muz. Praze, 1982(1–2): 107. 1982; *Braya brachycarpa* (Vassilcz.) Al-Shehbaz & Warwick, Novon 14: 269. 2004; nom. illeg., non *B. brachycarpa* Vassilcz. in Komarov, Fl. URSS 8: 72, 636. 1939. TYPE: [TAJKISTAN]. Pamir. Secus fl. Ak-bajtal (confl. Murgab), ca. 13,000 ft [3,900 m], 7 July 1901, [*F. N.] Alexeenko 2391* (Holotype: LE).

Torularia conferta R. F. Huang in S. G. Wu [S. K. Wu] & Z. J. Feng, Biol. & Human Physiol. Hoh Xil Region 51. 1996; *Neotorularia conferta* (R. F. Huang) R. F. Huang, Acta Phytotax. Sin. 35: 558. 1997, non *Neotorularia conferta* (Stev. ex Turcz.) V. I. Dorof., Turczaninowia 1(3): 25. 1998, *comb. invalid. & illegit.* (no basionym was cited and a later homonym of the prior name). TYPE: CHINA. Qinghai, Hoh Xil, Taiyanghu Prefecture, 4,900–5,000 m, 27 July 1991, *R. F. Huang K-313* (Holotype: HNWP).

Torularia bracteata H. L. Yang, Acta Phytotax. Sin. 19: 243. May 1981; *Neotorularia bracteata* (H. L. Yang) C. H. An, J. August 1st Agr. Coll. 14: 48. 1991. TYPE: CHINA. Gansu, Aksay, Dangjinshan, 3,550 m, 18 Aug 1964, *G. L. Zhang & J. Z. Hu 1622* (Holotype: LZU [not seen]).

Torularia tibetica C. H. An, Bull. Bot. Res., Harbin 1(1–2): 105. 1981, nom. inval.; *Neotorularia tibetica* (C. H. An) C. H. An, J. August 1st Agr. Coll. 14: 48. 1991, nom. inval. TYPE: CHINA. Qinghai, Qaidam, 14 Jun 1959, *Qinghai-Xizang Expedition 256, 406, 427* (NAS). The basionym was not validly published because three collections were listed as the type, and was illegitimate as its generic name is a later homonym. No type collection was cited by An (1991) upon transferring the epithet to *Neotorularia* which made relevant combination invalid as well.

Distribution: China (Gansu, Qinghai, Xinjiang, Xizang), Tajikistan.

Braya parvia resembles *B. humilis* in the bracteate raceme, terete fruits, and submalpighiaceous trichomes. It is readily distinguished by having generally smaller petals

1–2.5 × 0.5–0.9(–1.1) mm (vs. (2.5–)3–5(–5.5) × (0.7–)1–2 (–2.5) mm), fruits basally biseriate (vs. uniseriate), usually shorter (vs. longer) than 1 cm, and widest (vs. narrower) at base.

12. *Braya piasezkii* (Maxim.) Al-Shehbaz & D. A. German, *comb. nov.* Basionym: *Arabis piasezkii* Maxim., Bull. Acad. Imp. Sci. Saint-Petersbourg 26: 420. 1880; *Erysimum piasezkii* (Maxim.) Kuntze, Revis. Gen. Pl. 2: 933. 1891; *Torulularia piasezkii* (Maxim.) Botsch., Bot. Zhurn. (Moscow & Leningrad) 44: 1488. 1959; *Neotorularia piasezkii* (Maxim.) Botsch., Bot. Zhurn. (Moscow & Leningrad) 73: 1188. 1988. (comb. invalid., no basionym cited); *T. humilis* var. *piasezkii* (Maxim.) Jafri, Notes Roy. Bot. Gard. Edinburgh 22: 119. 1956; *T. humilis* var. *piasezkii* (Maxim.) H. L. Yang, Acta Phytotax. Sin. 19: 243. 1981, *comb. illeg.* TYPE: CHINA. Gansu (as Kansu), 3/15 June 1875, P. Y. Piasezky *s.n.* (Holotype: LE).

Distribution: China (Beijing, Gansu, Hebei, Shanxi, Tibet).

Braya piasezkii is easily distinguished from *B. humilis* by having obliquely incumbent (vs. incumbent) cotyledons, horizontally spreading (vs. ascending to erect) fruits and fruiting pedicels, latiseptate to slightly flattened (vs. terete) fruits, and 2-lobed (vs. entire) stigmas usually slightly wider (vs. narrower) than style. Both species and *B. stigmatosa* have similar petal size (3–5 × 1–2.5 mm), but they differ from the last species by their straight (vs. tortuose) fruits.

The illustration of *Braya piasezkii* (as *Arabis*) in plate 12 of Maximowicz (1889a) corresponds very well to the type specimen. However, that on plate 26 differs remarkably in the stigma, and it was based on plants recognized by Maximowicz as *Sisymbrium piasezkii* and herein as *B. stigmatosa*.

13. *Braya pilosa* Hook., Fl. Bor.-Amer. 1: 65, pl. 17A. 1830; *B. purpurascens* (R. Br.) Bunge ex Ledeb. subsp. *pilosa* (Hook.) Hultén, Kungl. Svenska Vetens.-Akad. Handl. 13(1): 18. 1971. TYPE: CANADA. Northwest Territories, “Arctic Sea coast” Cape Bathurst, [18 July 1826], John Richardson *s.n.* (Holotype: K).

Distribution: Canada (Northwest Territories, N Yukon), Russia (Arctic E Siberia and Far East.), U.S.A. (N Alaska).

Braya pilosa was considered by Harris (2006a, 2010) to be restricted to the type locality, but the species range was expanded in the Panarctic Flora to cover the larger territories listed above. Forms outside the area of type locality seem to have somewhat shorter styles, and further studies are needed to firmly establish whether or not they are conspecific.

14. *Braya purpurascens* (R. Br.) Bunge ex Ledeb., Fl. Ross. 1: 195. 1841; *Platypetalum purpurascens* R. Br., Chlor. Melvill. 9. 1823; *Braya glabella* Richardson subsp. *purpurascens* (R. Br.) W. J. Cody, Canad. Field.-Naturalist 108: 93. 1994. TYPE: [CANADA. Northwest Territories], Melville Island, Winter Harbour area, 1820, J. Ross *s.n.* (Lectotype designated by Grant (1994: 251): BM [000884034]).

Platypetalum dubium R. Br., Chlor. Melvill. 9. 1823; *Braya dubia* (R. Br.) Hook.f., Trans. Linn. Soc. London 23: 319. 1861; *B. purpurascens* var. *dubia* (R. Br.) O. E. Schulz in Engler, Pflanzenreich IV. 105(Heft 86): 235. 1924. TYPE: CANADA. Northwest Territories, Melville Island, 1820, in a box labeled “Flora Arctica, Capt’n Parry’s 1st Voyage, spec. 12, William E. Parry? *s.n.* (Neotype designated by Grant (1994: 251): BM).

Braya arctica Hook., Bot. App. Parry J. Sec. Voy. 387. 1825. TYPE: [CANADA]. Arctic shore of America, John Richardson *s.n.* (Holotype: K).

Braya purpurascens var. *longisiliquosa* Trautv. in Middendorff, Reise 1, 2: 60. 1856; *Sisymbrium alpinum* var. *macrocarpum* Trautv., Trudy Imp. S.-Peterburgsk. Bot. Sada 1: 59. 1871, “*macrocarpa*,” nom. illeg. superfl. TYPE: [RUSSIA, Krasnoyarsk province]. Ad fl. Taimyr 7 August [1843], [A. T. von] Middendorff *s.n.* (Lectotype here designated: LE [the two plants to the left]; Isolectotype: LE).

Braya henryae Raup, Contr. Arnold Arbor. 6: 167. 1934. TYPE: CANADA. Northwest Territories, pass N of Robb Lake, 26 August 1932, J. Henry 45531 (Holotype: GH).

Braya glabella subsp. *prostrata* J. G. Harris, Novon 16: 350. 2006. **Syn. nov.** TYPE: CANADA. Nunavut, Ellesmere Island, Hazen Camp, level delta plain 1.5 mi WSW of Camp, 28 July 1962, D. B. O. Savile 4764A (Holotype: DAO).

Distribution (circumpolar): Canada (British Columbia, Northwest Territories, Nunavut), U.S.A. (Alaska), Norway, Russia (Far East, NE European part, Siberia), Svalbard (Spitzbergen).

The taxonomic status of *Braya purpurascens* varied from treating it as a synonym of *B. glabella* (Harris, 1985; Rollins, 1993), as a subspecies of the latter (Harris, 2006b, 2010), or as a distinct species (Schulz, 1924; Vassilczenko, 1939; Ball, 1993; Jalas & Suominen, 1994; Czerepanov, 1995). Although molecular data (Warwick et al., 2004) showed that the two species are similar in their ITS sequences, it is clear that they are reproductively isolated in areas of sympatry, as evidenced from field observation reported in the Panarctic Flora (<http://nhm2.uio.no/paf/flora#paf-670903>). We prefer to follow that latter conclusion and maintain both taxa as independent species.

The differences between *Braya purpurascens* s. str. and subsp. *prostrata* rests solely on quantitative and continuous characters and may not justify the division of the species into infraspecific taxa.

15. *Braya qingshuiheense* (Y. Q. Ma & Zong Y. Zhu) Al-Shehbaz & D. A. German, *comb. nov.* Based on *Microsymbrium qingshuiheense* Y. Q. Ma & Zong Y. Zhu, Acta Sci. Nat. Univ. Intramongol. 20: 538. 1989. *Neotorularia qingshuiheense* (Y. Q. Ma & Zong Y. Zhu) Al-Shehbaz, O’Kane & G. Yang, Edinb. J. Bot. 56: 326. 1999. TYPE: CHINA. Nei Mongol, Ulanqab Meng, Qingshuihe, Jicaizhang, 16 July 1988, Z. Y. Zhu 88-003 (Holotype: HIMC [not seen]).

Distribution: China (Nei Mongol).

Braya qingshuiheense resembles *B. humilis* in flower and fruit size, the overall habit, and trichomes type. It is readily distinguished from the latter by the characters listed in the key above.

16. *Braya rosea* Bunge, Del. Sem. Hort. Dorpat. 7. 1839; *Hesperis rosea* (Bunge) Kuntze, Revis. Gen. Pl. 2: 935. 1891; *Sisymbrium alpinum* (Sternb. & Hoppe) E. Fourn. var. *roseum* (Bunge) Trautv., Trudy Imp. S.-Peterburgsk. Bot. Sada 1: 59. 1871. TYPE: [RUSSIA, SW Siberia, Altai Republic], Herbar. Bung. Flor. Orient. Altaica. 1839, *sine coll.*, *s.n.* (Lectotype designated by German (2005: 258) and here: LE [specimen at the upper right corner of the herbarium sheet]; Isolectotypes: G, GOET, HAL, 7 at LE).

Braya aenea Bunge, Del. Sem. Hort. Dorpat. 8. 1841; *B. rosea* Bunge var. *aenea* (Bunge) Malyshev, Fl. Vost. Sayana 141. 1965; *Sisymbrium alpinum* (Sternb. & Hoppe) E. Fourn. var. *aeneum* (Bunge) Trautv., Trudy Imp. S.-Peterburgsk. Bot. Sada 5: 26. 1877. TYPE: [RUSSIA, SW Siberia, Altai Republic], Herbar. Bung. 1841. Flor. Orient. Altaica. 1839 (Lectotype designated by Dorofeyev in German (2005: 257) and by Dorofeyev here: LE [specimen at the upper left corner of the herbarium sheet]; Isolectotypes: GOET [002725], HAL [84905], KW, 6 at LE, M, MO).

Braya aenea var. *multicaulis* Korsh., Bull Acad. Sci. Pétersb. V, 9: 416. 1898; *B. rosea* var. *multicaulis* (Korsh.) B. Fedtsch. in O. & B. Fedtschenko, Consp. Fl. Turk. 1: 73. 1906. TYPE: [TAJIKISTAN]. Pamir, along fl. Balian-kiik a to the south of the pass Kaindy, on stony slopes. 27 August [8 September 18]97, *S. Korshinsky* [455] (Lectotype here designated: LE; Isolectotype: LE).

Braya aenea var. *simplicior* Korsh., Bull Acad. Sci. Pétersb. V, 9: 416. 1898; *B. rosea* var. *simplicior* (Korsh.) B. Fedtsch. in O. & B. Fedtschenko, Consp. Fl. Turk. 1: 73. 1906. TYPE: [TAJIKISTAN, N Pamir]. In the valley of Kok-sai near [the pass] Kizyl-art. 8 [20] July [18]95, *S. Korshinsky* 459 (Lectotype here designated: LE; Isolectotype: LE).

Braya brevicaulis Em. Schmid, Repert. Sp. Nov. Regni Veg. 31: 48. 1932. [CHINA]. Tibet, Sirigh-Jilganange-See, 5,300 m, 31 May 1927, *Bosshard s.n.* (Holotype: Z? [not seen]).

Braya angustifolia (N. Busch) Vassilcz. in Komarov, Fl. URSS 8: 636. 1939; *B. rosea* var. *angustifolia* N. Busch, Fl. Sib. Or. Extr. 6: 583. 1931. TYPE: [RUSSIA, SE Siberia, Buryatia Republic], Sayan Mts., Irkutsk province, Tunkinskiy district, Koimarskiy Arshan. 23 May 1902. *V. Komarov s.n.* (Lectotype here designated: LE; Isolectotype: LE).

Braya brachycarpa Vassilcz. in Komarov, Fl. URSS 8: 72, 636. 1939, non (Vassilcz.) Al-Shehbaz & Warwick, Novon, 14: 269. 2004; *B. rosea* var. *brachycarpa* (Vassilcz.) Malyshev, Fl. Vost. Sayana. 141. 1965. TYPE: [TAJIKISTAN]. Pamir, moist sand at Muskol, 1901, *M. K. Tulinov s.n.* (Holotype: LE).

Braya limosella Bunge, Del. Sem. Hort. Dorpat. 8. 1841; *Hesperis limosella* (Bunge) Kuntze, Revis. Gen. Pl. 2: 934. 1891; *Sisymbrium limosella* (Bunge) E. Fourn., Recherch. Anat. Taxon. Fam. Crucif. 132. 1865; *B. aenea* Bunge var. *limosella* (Bunge) A. L. Ebel, Turczaninowia 3, 3: 20. 2000. TYPE: [RUSSIA, SW Siberia, Altai Republic], alp. ad Tschujam, *sine coll.*, *s.n.* Herb. Al. de Bunge (Holotype: P).

Braya limoselloides Bunge ex Ledeb., Fl. Ross. 1: 194. 1841; *Hesperis limoselloides* (Bunge ex Ledeb.) Kuntze, Revis. Gen. Pl. 2: 934. 1891. TYPE: same as that of *B. limosella*.

Braya rosea var. *glabra* Regel, Turdy Imp. S.-Peterburgsk. Bot. Sada 5: 241. 1877. TYPE: On the passes of Terekty and in the valley of Ak-sai, June 1872, [*A. V. J. Kaulbars s.n.* (Holotype: LE)].

Braya rosea var. *leiocarpa* O. E. Schulz in Engler, Pflanzenreich IV. 105(Heft 86): 232. 1924. TYPE: not designated.

Braya trinkleri Em. Schmid, Repert. Sp. Nov. Regni Veg. 31: 48. 1932. TYPE: INDIA. Ladak, Zingrul, 4,500 m, 16 July 1927, *Trinkler s.n.* (Holotype: Z? [not seen]).

Distribution: Bhutan, China (Gansu, Qinghai, Sichuan, Tibet (Xizang), Xinjiang), India, Kashmir, Kazakhstan, Kyrgyzstan, Mongolia, Nepal, Pakistan, Russia, Tajikistan.

The limits of *Braya rosea* was so broadly delimited by Zhou et al. (2001) that it clearly encompassed other species. The examination of all types in this complex clearly demonstrates that both *B. tibetica* and *B. thomsonii* should be recognized as independent species readily distinguishable by the key above.

17. *Braya scharnhorstii* Regel & Schmalh., Turdy Imp. S.-Peterburgsk. Bot. Sada 5: 241. 1877; *Braya oxycarpa* Hook.f. & Thomson var. *scharnhorstii* (Regel & Schmalh.) O. E. Schulz in Engler, Pflanzenreich IV. 105(Heft 86): 237. 1924. TYPE: [KYRGYZSTAN]. In valleys of Tian Shan and on the passes Suyok, Sart et Basrkaun, 6,000–12,500 ft [1,829–3,810 m], July 1872, *Scharnhorst s.n.* (holotype: LE).

Beketowia tianschanica Krasn., Scripta bot. Hort. Univ. Petrop. 2(1): 13. 1887. TYPE: [KYRGYZSTAN, Issyk-Kul province]. Prope Ak-bel pass, 1886, *A. N. Krassnow [Krasnov] s.n.* (Lectotype here designated: LE; Isolectotypes: 2 at LE).

Distribution: China (Xinjiang), Kyrgyzstan.

18. *Braya sichuanica* Al-Shehbaz, *sp. nov.* TYPE: CHINA. Sichuan, Jiulong Xian, Tanggu Xiang, NW of the city of Jiulong at Wuxu Hai (Wuxu Lake) Scenic Area, gentle to steep slopes and adjacent limestone cliffs and sand scree slopes, 29°8'14"N, 101°24'47"E, 3,665–4,460 m, 4 August 2010, *D. E. Boufford, L. Y. Chen, J. L. Dong, X. H. Li and J. P. Yue* 42622 (Holotype: A; Isotype: MO). Fig. 1.

Herbs perennial; caudex simple, slender, covered with some leaf remnants of previous years. *Stems* erect to ascending, single to several from caudex, simple or rarely branched, 4–12 cm, pubescent throughout with minutely stalked, submalpighiaceous trichomes 0.2–0.7 mm. *Basal leaves* rosulate, pinnatisect to subpectinate, 1–1.5 cm, sparsely pubescent with stalked, 2- or 3-forked trichomes mixed with submalpighiaceous ones; petiole 5–10 mm, ciliate with subsetose simple trichomes 0.7–1.2 mm; lateral lobes 2–4, ovate to oblong, 0.7–2 × 0.2–0.7 mm, proximal lobes smallest; terminal lobe larger than lateral ones, oblong to oblanceolate; cauline leaves similar to basal, progressively smaller upwards. *Raceme* 7–20-flowered, elongated in fruit; rachis straight, pubescent as stem; fruiting pedicels 2.5–6 mm, narrower than fruit, divaricate to horizontal, straight or recurved, pubescent as stem, lowermost bracteate. *Flowers* not seen. *Fruits* linear, terete, sessile, torulose, 10–17 × 0.7–0.9 mm, straight or arcuate, pubescent with

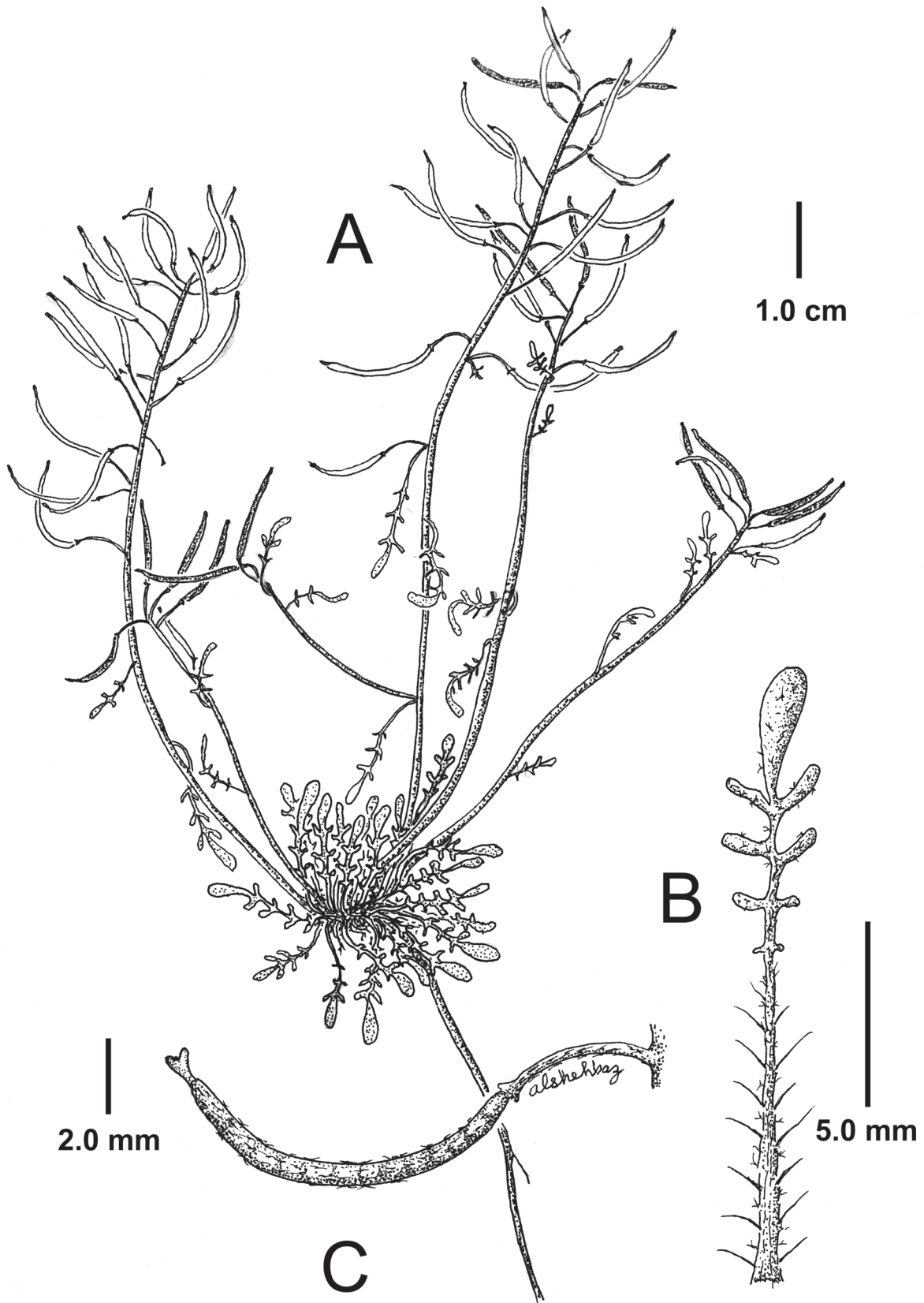


FIGURE 1. *Braya sichuanica* Al-Shehbaz. A, plant; B, basal leaf; C, fruit and fruiting pedicel. Bars = 1 cm (A); 5 mm (B); 2 mm (C). Drawn by Al-Shehbaz from the isotype (MO).

subsessile, submalpighiaceous trichomes variable in length; septum membranous; style 0.5–1 mm; stigma 2-lobed, lobes opposite replum. *Seeds* and ovules 18–26 per ovary, uniseriate, oblong, brown, 0.8–1 × ca. 0.4 mm; cotyledons incumbent.

Distribution: China (Sichuan). Known only from the type collection.

Braya sichuanica is allied to the *B. humilis* relatives that have linear, terete fruits pubescent with submalpighiaceous trichomes, basally bracteate racemes, and leafy stems. From these and the remainder of the genus, the species is easily distinguished by the finely pinnatisect to subpectinate basal leaves with petioles long ciliate with subsetose simple trichomes to 1.2 mm.

19. ***Braya siliquosa*** Bunge, Del. Sem. Hort. Dorpat. 7. 1839; *Sisymbrium siliquosum* (Bunge) E. Fourn., Recherch. Anat. Taxon. Fam. Crucif. 133. 1865; *Hesperis siliquosa* (Bunge) Kuntze, Revis. Gen. Pl. 2: 935. 1891. TYPE: [RUSSIA. SW Siberia, Altai Republic]. Tschuja; in lapidosis alpium ad fl. Tobogosch, *Politow s.n.* 1839. Herb. Al. de Bunge (Lectotype designated by German (2011: 46): P; Isolectotype: LE).

Braya versicolor Turcz., Bull. Soc. Imp. Naturalistes Moscou 15: 281. 1842; *Sisymbrium versicolor* (Turcz.) E. Fourn., Recherch. Anat. Taxon. Fam. Crucif. 133. 1865; *Hesperis versicolor* (Turcz.) Kuntze, Revis. Gen. Pl. 3: 935. 1891. TYPE: [RUSSIA. SE Siberia, Buryatia Republic]. In rupestribus alpis Nuchu-Daban legit cl. Kirilow *s.n.* 1836. Turcz[aninow] (Lectotype here designated: LE; Isolectotypes: K [000725041], KW, 2 at LE).

Distribution: Mongolia, Russia (Siberia, Far East).

Previous records of *B. siliquosa* from Kazakhstan are based on misidentified plants of *B. rosea* (German, 2003).

20. ***Braya stigmatosa*** (Franch.) Al-Shehbaz & D. A. German, *comb. nov.* Basionym: *Erysimum stigmatosum* Franch., Pl. David. 1: 38. 1884. TYPE: [CHINA, Nei Mongol], Mongolia. Ourato, June 1866, A. David 2665 (Lectotype here designated: P [00836339]; Isolectotypes: P [00836340 and 00836341]).

Sisymbrium piasezkii Maxim., Bull. Acad. Petersb. 26: 421. 1880; *S. humile* C. A. Mey. var. *piasezkii* (Maxim.) Maxim., Enum. Pl. Mongol. 1: 62. 1889; *Hesperis piasezkii* (Maxim.) Kuntze, Revis. Gen. Pl. 2: 935. 1891; *Torularia humilis* (C. A. Mey.) O. E. Schulz prol. *piasezkii* (Maxim.) O. E. Schulz in Engler, Pflanzenreich IV. 105(Heft 86): 226. 1924; *T. maximowiczii* Botsch., Bot. Zhurn. (Moscow & Leningrad) 44: 1488. 1959, non *T. piasezkii* (Maxim.) Botsch., Bot. Zhurn. (Moscow & Leningrad) 44: 1488. 1959; *T. humilis* var. *maximowiczii* (Botsch.) H. L. Yang, Acta Phytotax. Sin. 19: 243. 1981; *Neotorularia maximowiczii* (Botsch.) Botsch., Bot. Zhurn. (Moscow & Leningrad) 73: 1188. 1988; *Malcolmia perennans* Maxim., Fl. Tangut. 1: 63, t. 12. 1889. TYPE: CHINA. Mongolia occidentalis, mont. Alaschan borealis, 1873, N. M. Przewalski *s.n.* (Lectotype designated by Botschantzev (1959: 1488): LE [six plants on the lower left corner]).

Distribution: China (Beijing, Gansu, Hebei, Henan, Nei Mongol, Ningxia, Qinghai, Shanxi, Shaanxi, Sichuan).

Maximowicz (1880) simultaneously described *Sisymbrium piasezkii* and *Arabis piasezkii* and compared them with *Sisymbrium humile* (herein *Braya humilis*). He maintained *A. piasezkii* in a later publication (Maximowicz, 1889b) but apparently was uncertain of the status of *S. piasezkii* because he treated it as a variety of *S. humile* (Maximowicz, 1889b), as a synonym of the latter (Maximowicz, 1889c), or replaced it with *Malcolmia perennans* (1889a). The lack of consistency in Maximowicz's work regarding *S. piasezkii* caused further confusion later on. Subsequent taxonomic treatments varied from recognizing both *A. piasezkii* and *S. piasezkii* as distinct species of illegitimate later homonym *Torularia* O. E. Schulz (Botschantzev, 1959), as two species of *Neotorularia* (Botschantzev & Gubanov, 1988), as an infraspecific taxon, "prol. *piasezkii*" of *T. humilis* (Schulz, 1924), or as synonyms of *N. humilis* (Jafri, 1956; Zhou et al., 2001).

Schulz (1924) placed both *Erysimum stigmatosum* and *E. alyssoides* Franch. under the synonymy of *Braya* (as *Torularia*) *humilis*. The type collection of *E. alyssoides* has not yet been found in P, but four syntypes of *E. stigmatosum* exist, and the most fragmentary of which (P-0083640) was annotated by A. Polatscheck in 1983 as the lectotype. However, that lectotypification has never been published.

Braya stigmatosa resembles *B. humilis* in having terete fruits, incumbent cotyledons, comparable petal size, and similar indumentum. It is readily distinguished by its tortuous (vs. straight) fruits and prominently 2-lobed (vs. entire) stigmas.

Braya stigmatosa exhibits substantial variation in stigma size and the development of its lobes. However, the stigmas are always distinctly wider than the style, compared to those of *B. humilis*, which are usually entire and narrower than style. Plants described by Maximowicz (1880, 1889a) as *Sisymbrium piasezkii* and *Malcolmia perennans*, respectively, have stigmas emarginate though wider than the style. However, the development of prominently 2-lobed stigmas are found throughout the species range. The occurrence of tortuose linear fruits in *Braya* is unique to *B. stigmatosa*, including *S. piasezkii*.

Previous records of *B. stigmatosa* (as *Torularia maximowiczii* or *Neotorularia maximowiczii*) from Mongolia are based on misidentified plants of *B. humilis* (German, 2001).

21. ***Braya thomsonii*** Hook.f., J. Proc. Linn. Soc., Bot. 5: 168. 1861. TYPE: [CHINA]. Tibet, Piti, 4 September 1847, 12,000–13,000 ft [3,658–3,962 m], *T. Thomson s.n.* (lectotype partially designated by Jafri (1973: 261) as type and completed herein: K; Isolectotypes: B, K). Two sheets of this type collection are at K; the one annotated by J. D. Hooker as *Braya thomsonii* is taken here as the lectotype. The three plants on the upper part of lectotype sheet belong to this taxon and perfectly match the original description; the six rosettes in the envelope represent *Aphragmus oxycarpus* infected with rust, and the plant to the lower right is sterile and may not be *Braya*.

Distribution: China (Tibet).

22. ***Braya thorild-wulffii*** Ostenf., Meddel. Grønland 64: 176. 1923; *B. pilosa* Hook. subsp. *thorild-wulffii* (Ostenf.) V. V. Petrovsky, Arktichesk. Fl. SSSR 7: 52. 1975; *B. purpurascens* (R. Br.) Bunge ex Ledeb. subsp. *thorild-wulffii* (Ostenf.) Hultén, Kungl. Svenska Vetensk.-akad. Handl. 13(1): 18. 1971; *B. purpurascens* var. *thorild-wulffii* (Ostenf.) B. Boivin, Naturaliste Canad. 94: 646. 1972. TYPE: GREENLAND. Gunnar Andersson Valley, [82°28'N], 11 July 1917, *Thorild Wulff s.n.* (Holotype: C; Isotype: GH).

Braya thorild-wulffii subsp. *glabrata* J. G. Harris, Novon 16: 352. 2006. **Syn. nov.** TYPE: CANADA. Northwest Territories, Banks Island, Bernard River, 6 August 1963, *W. J. Maher & S. MacLean 139* (Holotype: CAN [not seen]).

Distribution: Canada (Northwest Territories, Nunavut), Greenland, Russia (Wrangel Island).

The presence vs. absence of trichomes on part or whole plant in the Brassicaceae does not necessarily justify the division of species into infraspecific taxa, especially if used alone. This difference can be controlled by a simple

Mendelian inheritance (Rollins, 1958). Therefore, in the absence of other morphological differences we are reluctant to recognize subsp. *glabrata* and reduce herein to synonymy.

23. ***Braya tibetica*** Hook.f. & Thomson, J. Proc. Linn. Soc., Bot. 5: 168. 1861. TYPE: [CHINA]. Tibet, without locality, *T. Thomson s.n.* (Lectotype partially designated by Jafri (1973: 262) and completed herein: K; Isolectotypes: B, BM, E, GH, GOET, KW, M, MPU, NY, P, W).

Braya sinuata Maxim., Fl. Tangut. 69, t. 28 figs. 24–33. 1889. TYPE: [CHINA. Tibet], Keria jugum, 10,500–13,000' s.m. [3,200–3,962 m] in campis lapidosis, frequens, 3–15 July 1885, *N. M. Przewalski 175* (Holotype: LE).

Braya tibetica var. *breviscapa* Pamp., Bull. Soc. Bot. Ital. 1915: 30. 1915. TYPE: [PAKISTAN]. Kashmir, Karakorum, camp Cip-Xiak, confluence of Shaioik, 4,900 m, 11 July 1914, *G. Dainelli & O. Marinelli s.n.* (Lectotype here designated: FI).

Distribution: China (Qinghai, Tibet (Xizang), Xinjiang), India, Pakistan.

TAXA EXCLUDED FROM *BRAYA*

The following 36 names are excluded from *Braya* and assigned to 18 genera of ten tribes. Names in boldface are the currently accepted placements of the excluded *Braya* taxa, and their tribal assignments are given between square brackets [] at the end of each entry.

Braya boryi (Boiss.) Bonnier, Fl. Compl. France, Suisse & Belg. 1: 70. 1912. Based on *Cardamine boryi* Boiss., Elench. Pl. Nov. 9. 1838. TYPE: [SPAIN]. “Hab. in summis jugis Sierra Nevada in fissuris rupium et in glareosis glacialibus. Alt. 9,000–10,000 ft [2,743–3,048 m]” (Holotype: G-BOIS [not seen]) = ***Murbeckiella boryi*** (Boiss.) Rothm., Bot. Not. 90: 469. 1939. [Oreophytoneae]

Braya cachensis Speg., Comun. Mus. Nac. Buenos Aires 1(2): 46. 1898. TYPE: ARGENTINA. Salta, Navado de Cachi, Feb 1897, *C. Spegazzini s.n.* (Holotype: LPS [10440]); Isotype: B). = ***Aschersoniodoxa cachensis*** (Speg.) Al-Shehbaz, Syst. Bot. 392. 1990. [Eudemeae]

Braya calycina (Desv.) Wedd., Chlor. And. 2: t. 85A. 1859. Based on *Draba calycina* Desv., J. Bot. Agric. 3: 185. 1815. TYPE: PERU. Desvaux's Herbarium (Lectotype listed as type by Al-Shehbaz (1989: 620) and finalized herein: P [02141476], fragments BAA; Isolectotype: P). = ***Brayopsis calycina*** (Desv.) Gilg & Muschl., Bot. Jahrb. Syst. 42: 484. 1909. [Eudemeae].

Braya densiflora Muschl., Bot. Jahrb. Syst. 40: 275. 1908. TYPE: PERU. Hacienda Arapa, Yauli, Lima-Oroya rd., 4,400 m, *A. Weberbauer 304* (Lectotype designated by Macbride (1938: 973): B; Isolectotype: G). = ***Weberbaueria spathulifolia*** (A. Gray) O. E. Schulz in Engler, Pflanzenreich IV. 105(Heft 86): 193. 1924. [Thelypodieae]

Braya dentata Dalla Torre, Anleit. Beob. Alpenpfl. 52. 1882. TYPE: not seen. = ***Murbeckiella pinnatifida*** (Lam.) Rothm., Bot. Not. 90: 469. 1939. [Oreophytoneae]

Braya eschscholtziana (Andrz. ex DC.) Benth. & Hook.f. ex S. Watson, Bibl. Ind. North Am. Bot. 1: 51. 1878. TYPE: [U.S.A. Alaska, Aleutian Islands], In summis montibus

alpinis insulae Unalaschka inter lapides acervatos legit [1817 *J. F. G.*] *Eschscholtz s.n.* Hb. Cham[isso] (Lectotype designated as type by Ebel (1998: 21): LE; Isolectotypes: 3 at G, HAL [84097], 3 at KW, 2 at LE). = ***Aphragmus eschscholtzianus*** Andr. ex DC., Prodr. 1: 210. 1824. [Aphragmeae]

Braya falcata A. Rich., Tent. Fl. Abyss. 1: 17. 1847. TYPE: ETHIOPIA. Begemdir, *Schimper II. 1309* (Lectotype designated by Jonsell (1982: 68): P; isolectotypes: K, UPS, W). = ***Oreophyton falcatum*** (A. Rich.) O. E. Schulz in Engler, Pflanzenreich IV. 105(Heft 86): 183. 1924. [Oreophytoneae]

Braya foliosa Pamp., Bull. Soc. Bot. Ital. 1926: 40. 1926. TYPE: INDIA. Kashmir, Karakorum, valley above Sciaiok, 4,830 m, 12 July 1914, *G. Danielli & O. Marinelli s.n.* (holotype: FI). = ***Aphragmus oxycarpus*** (Hook.f. & Thomson) Jafri, Notes Roy. Bot. Gard. Edinburgh 22: 96. 1956. [Aphragmeae]

Braya glebaria Speg., Anales Mus. Nac. Buenos Aires 7: 224. 1902. TYPE: ARGENTINA. Chubut, Dep. Sarmiento, entre Choique-lauen y lago Musters, *N. Illin s.n.* [Herb. Speg. 12579] (Holotype: LP; Isotypes: B, K, UPS) = ***Xerodraba glebaria*** (Speg.) Skottsbl., Kongl. Svensk. Vetenskapsakad. Handl. 56(5): 362. 1916. [Eudemeae]

Braya graminea (Greene) M. E. Jones, Contr. W. Bot. 15: 68. 1929 as “*granininea*.” TYPE: U.S.A. Colorado. Carson, 12,500 ft [3,810 m], 21 July 1901, *C. F. Baker 296* (Holotype: NDG [not seen]; Isotypes: GH, MO, NY, POM, US). = ***Draba graminea*** Greene, Pl. Baker. 3: 5. 1901. [Arabideae]

Braya heterophylla W. W. Sm., Notes Roy. Bot. Gard. Edinburgh 11: 201. 1920. TYPE: CHINA. Yunnan, Beima Shan, ledges of cliffs and humus-covered boulders, 28°12'N, 14,000 ft [4,267 m], July 1917, *G. Forrest 14385* (Holotype: E; Isotype: K). = ***Eutrema heterophyllum*** (W. W. Sm.) H. Hara, J. Jap. Bot. 48: 97. 1973. [Eutremeae]

Braya hirta (L.) Fernald, *Rhodora* 36: 338. 1934. TYPE: "Habitat in Alpibus Helveticis, Lapponicis, *D. C. Solander*." Type not designated. Original material: Herb. Linn. No. 823. 12 (LINN). = *Draba hirta* L., *Syst. Nat.*, ed. 10, 2: 1127. 1759. According to Jarvis (2007: 486), "this name appears to have been widely, though informally, rejected as confused or ambiguous." [Arabideae]

Braya imbricatifolia (Barnéoud) A. Gray, U.S. Expl. Exped., *Phan.* 15: 58. 1854. Based on *Draba imbricatifolia* Barnéoud in Gay, *Fl. Chile* 1: 158. 1846. TYPE: CHILE. Región IV, Cordillera de Coquimbo, 12,000 ft. [3,658 m], *Claude Gay s.n.* (Holotype: P; Isotypes: B, GH). = *Weberbaueria imbricatifolia* (Barnéoud) Al-Shehbaz, *J. Arnold Arbor.* 71: 247. 1990. [Thelypodieae]

Braya involucrata (Bunge) Ledeb., *Fl. Ross.* 1: 194. 1841. Based on *Platypetalum involucratum* Bunge, *Verzeichn. Suppl. Fl. Altai* 77. 1836. TYPE: [RUSSIA, Altai Republic]. *Platypetalum involucratum*. *Altai. Bunge s.n.* 1832 / Herb. Ledeb. 93.1 (Lectotype designated as type by Ebel (1998: 22); LE [except for the left-hand plant which is *Eutrema altaicum* (C. A. Mey.) Al-Shehbaz & Warwick]; Isolectotypes: B [100249674, plant in the envelope], G, K [000725027], 3 at LE). = *Aphragmus involucratus* (Bunge) O. E. Schulz in Engler, *Pflanzenreich* IV. 105(Heft 86): 198. 1924. [Aphragmeae]

Braya kokonorica O. E. Schulz, *Notizbl. Bot. Gart. Berlin-Dahlem* 12: 209. 1934. TYPE: CHINA. Qingahi, Kokonor, Amne Matchin, 4,500 m, 2 September 1930, *Hopkinson 1131* (Lectotype designated as type by Al-Shehbaz (2000a: 161): B; Isolectotype: P). = *Solms-laubachia villosa* (Maxim.) D. A. German & Al-Shehbaz, *Nord. J. Bot.* 28: 650. 2010. [Euclidieae]

Braya lapeyrouseana (Rouy & Foucaud) Bonnier, *Fl. Compl. France, Suisse & Belg.* 1: 70. 1912. Based on *Sisymbrium lapeyrouseanum* Rouy & Foucaud, *Fl. France* 2: 23. 1895. TYPE: not seen. = *Murbeckiella pinnatifida* (Lam.) Rothm., *Bot. Not.* 90: 469. 1939. [Oreophytoneae]

Braya lycopodioides Speg., *Anales Soc. Ci. Argent.* 47: 170. 1899. TYPE: ARGENTINA. Santa Cruz, Dep. Río Chico, meseta elevada al SO del Co. Kmanaich, February 1898, *C. Ameghino s.n.* [Herb. Speg. 10423] (Holotype: LP; Isotypes: B, UPS). = *Xerodraba lycopodioides* (Speg.) Skottsbl., *Kongl. Svensk. Vetenskapsakad. Handl.* 56(5): 362. 1916. [Eudemeae]

Braya lycopodioides var. *contracta* Speg., *Anales Mus. Nac. Buenos Aires* 7: 223. 1902. TYPE: ARGENTINA. Santa Cruz, Dep. Deseado, en rocas porfíricas a lo largo del río Deseado, 1899, *C. Ameghino s.n.* [Herb. Speg. 10421] (Holotype: LP). = *Xerodraba lycopodioides* (Speg.) Skottsbl., *Kongl. Svensk. Vetenskapsakad. Handl.* 56(5): 362. 1916. [Eudemeae]

Braya marinellii Pamp., *Bull. Soc. Bot. Ital.* 1915: 29. 1915. TYPE: INDIA. Kashmir, Karakorum, 5,200 m, 27 June 1914, *G. Danielli & O. Marinelli s.n.* (Holotype: FI). = *Solms-laubachia marinellii* (Pamp.) D. A. German & Al-Shehbaz, *Nord. J. Bot.* 28: 649. 2010. [Euclidieae]

Braya monantha (Gilg ex Kuntze) Speg., *Anal. Soc. Ci. Argent.* 47: 171. 1899. TYPE: ARGENTINA. Santa Cruz, 1891–1892, *Beaufils* 599 (Holotype: B; Isotype:

UPS). = *Xerodraba monantha* (Gilg ex Kuntze) Skottsbl., *Kongl. Svensk. Vetenskapsakad. Handl.* 56(5): 362. 1916. [Eudemeae]

Braya novae-zealandiae Hook.f., *Handb. New Zeal. Fl.* 1: 13. 1864. TYPE: NEW ZEALAND. Lake district, 1863, *J. Hector & J. Buchanan 19* (Holotype: K). = *Pachycladon novae-zealandiae* (Hook.f.) Hook.f., *Handb. New Zeal. Fl.* 1: 724. 1864. [Microrlepidieae]

Braya oregonensis A. Gray, *Proc. Amer. Acad. Arts* 17: 199. 1882. TYPE: U.S.A. Oregon, Union Co., Snake River, sterile subalpine ridges, 4,000 ft [1,219 m], June 1880, *W. C. Cusick s.n.* (Lectotype designated by Holmgren (2004: 245): GH; Isolectotype: ORE [not seen]). = *Cusickiella douglasii* (A. Gray) Rollins, *J. Jap. Bot.* 63: 69. 1988. [Boechereae]

Braya oxycarpa Hook.f. & Thomson, *J. Proc. Linn. Soc., Bot.* 5: 169. 1861. TYPE: [CHINA]. W Tibet, Piti prope Lara, 12,000–13,000 ft [3,658–3,962 m], *T. Thomson s.n.* (Holotype: K). = *Aphragmus oxycarpus* (Hook.f. & Thomson) Jafri, *Notes Roy. Bot. Gard. Edinburgh* 22: 96. 1956. [Aphragmeae]

Braya oxycarpa var. *stenocarpa* O. E. Schulz, *Notizbl. Bot. Gart. Berlin-Dahlem* 9: 1068. 1927. TYPE: INDIA. Uttar Pradesh, Tihri Garhwal, Dudu Gadh unter Srikanta, 5,000–5,300 m, 9 August 1883, *J. F. Duthie 898* (Holotype: CAL, not seen). = *Aphragmus oxycarpus* (Hook.f. & Thomson) Jafri, *Notes Roy. Bot. Gard. Edinburgh* 22: 96. 1956. [Aphragmeae]

Braya patagonica Speg., *Anales Soc. Ci. Argent.* 47: 171. 1899. TYPE: ARGENTINA. Santa Cruz, Dep. Lago Argentino, lago Argentino, Karr-aik, March 1898, *C. Ameghino s.n.* [Herb. Speg. 10432] (Holotype: LP; Isotype: UPS). = *Xerodraba patagonica* (Speg.) Skottsbl., *Kongl. Svensk. Vetenskapsakad. Handl.* 56(5): 362. 1916. [Eudemeae]

Braya pectinata Greene, *Erythea* 3: 69. 1895, non Speg. *Anales Mus. Nac. Buenos Aires* 7: 225. 1902. TYPE: U.S.A. California, Modoc Co., Ewing Creek, May 1894, *R. M. Austin s.n.* (Lectotype here designated: NDG [4701]; Isolectotypes: K, NDG [4700], P, UC). = *Polyctenium fremontii* (S. Watson) Greene, *Leafl. Bot. Observ. Crit.* 2: 219. 1912. [Boechereae]

Braya pectinata Speg., *Anales Mus. Nac. Buenos Aires* 7: 225. 1902, non *B. pectinata* Greene, *Erythea* 3: 69. 1895. TYPE: CHILE. Region XII (Magallanes), Ultima Esperanza, sa. de los Baguales, January 1899, *O. Mauri* 22 (Holotype: LP [10420]; Isotype: B). = *Xerodraba pectinata* Skottsbl., *Kongl. Svensk. Vetenskapsakad. Handl.* 56(5): 235. 1916. [Eudemeae]

Braya pinnatifida (Lam.) W. D. J. Koch, *Syn. Fl. Germ. Helv.* (Koch) 1(1): 50. 1835. Based on *Arabis pinnatifida* Lam., *Encycl.* 1: 221. 1783. TYPE: "...crôit sur les côtes pierreuses des montagnes. J'en ai trouvéabondamment en Auvergne" (Holotype: P [not seen]). = *Murbeckiella pinnatifida* (Lam.) Rothm., *Bot. Not.* 90: 469. 1939. [Oreophytoneae]

Braya pusilla A. Gray, U.S. Expl. Exped., *Phan.* 15: 57. 1854. Based on *Erysimum? pusillum* Gillies ex Hook. & Arn., *Bot. Misc.* 3: 140. 1833, non Bory & Chaub. in Bory, *Exp. Sci. Morée, Bot.* 3(2): 190. 1832. TYPE: CHILE. El

Cerro de la Porcura and la Cumbre de los Andes, 12,000 ft [3,656 m], *Gillies 8* (Holotype: E). = **Weberbaueria colchaguensis** (Barnéoud) Al-Shehbaz, *J. Arnold Arbor.* 71: 241. 1990. [Thelypodieae]

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657. 1753. TYPE: Herb. Linn. 836.12 (Lectotype designated by Jonsell & Jarvis (2002: 72): LINN). = **Erucastrum supinum** (L.) Al-Shehbaz & Warwick, *Novon* 13: 266. 2003. [Brassicaceae]

Braya tilingii Regel, *Nouv. Mém. Soc. Imp. Naturalistes Moscou* 11: 61. 1859. TYPE: [RUSSIA. Far East, Khabarovsk Province], Prope Ajan in montibus et collibus sterilibus, *Tiling s.n.* (Lectotype designated by German & Berkutenko in German (2012: 12): LE; Isolectotype: LE). = **Borodinia macrophylla** (Turcz.) O. E. Schulz in Engler, *Pflanzenreich IV.* 105(Heft 89): 342. 1927. [Boecheae]

Braya uniflora Hook.f. & Thomson, *J. Proc. Linn. Soc., Bot.* 5: 168. 1861. TYPE: CHINA. Xizang (as Tibet), 15,000–17,000 ft [4,572–5,182 m], *T. Thomson s.n.* (Lectotype designated as type by Jafri (1973: 244): K; Isolectotypes: B, GOET, KW, NY). = **Pycnoplithus uniflora** (Hook.f. & Thomson) O. E. Schulz in Engler, *Pflanzenreich IV.* 105(Heft 86). 199. 1924. [Euclidieae]

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