

CARDAMINE Linnaeus, Sp. Pl. 2: 654. 1753.

Ihsan A. Al-Shehbaz and Karol Marhold

Tribe: Cardamineae Dumort., Fl. Belg.: 124. 1827.

Name derivation: Greek *kardamon*, used by Dioscorides for some species of Brassicaceae.

Lectotype species (designated by Britton & Brown, Ill. Fl. N.U.S., ed. 2, 2: 183. 1913): *C. pratensis* L.

Dentaria Linnaeus, Sp. Pl. 2: 653. 1753. Lectotype species (designated by Britton & Brown, Ill. Fl. N.U.S., ed. 2, 2: 187. 1913): *D. pentaphyllos* L.

Dracamine Nieuwland, Amer. Midl. Naturalist 4: 40. 1915. Type species: not designated.

Heterocarpus Philippi, Bot. Zeitung 14: 641. 1856, not Wight (1853). Type species: *H. fernandezianus* R. A. Philippi.

Ghinia Bubani, Fl. Pyrenaea 3: 158. 1901, non Schreber (1789). Type species: not designated.

Iti Garnock-Jones & P. N. Johnson, New Zealand J. Bot. 25: 603. 1988. Type species: *I. lacustris* Garnock-Jones & P. N. Johnson.

Loxostemon J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 5: 129. 1861. Type species: *L. pulchellus* J. D. Hooker & Thomson.

Porphyrocodon W. J. Hooker in Bentham & J. D. Hooker, Gen. Pl. 1: 79. 1862. Type species: *P. pictus* (W. J. Hooker) B. D. Jackson.

Pteroneurum de Candolle, Mém. Mus. Hist. Nat. 7: 231. 1821. Type species: not designated.

Sphaerotorrhiza (O. E. Schulz) Khokhrjakov, Fl. Magadansk. Obl. 235. 1985. Type species: *S. trifida* (Poiret ex Lamarck) Khokhrjakov.

Herbs, annual, biennial, or perennial, rhizomatous or tuberous, sometimes with axillary bulbils. **Trichomes** absent or simple. **Multicellular glands** absent. **Stems** erect or prostrate, leafy or rarely leafless and plant scapose. **Basal leaves** petiolate, rosulate or not, simple and entire, toothed, or 1–3-pinnatisect, or palmately lobed, sometimes trifoliolate, pinnately, palmately, or bipinnately compound; cauline leaves alternate, rarely opposite or whorled, simple or compound as basal leaves, petiolate or sessile and base cuneate to attenuate or auriculate to sagittate, margin entire, dentate, or variously lobed. **Racemes** several to many-flowered, ebracteate or rarely bracteate throughout, corymbose or in panicles, elongated in fruit; rachis straight or rarely flexuous; fruiting pedicels slender or thickened, erect, divaricate, or reflexed. **Sepals** ovate or oblong, free, caducous or rarely persistent, erect to rarely spreading, equal or unequal, base of lateral pair saccate or not. **Petals** white, pink, purple, or violet, never yellow, erect to spreading, longer than sepals, rarely absent; blade obovate, spatulate, oblong, or oblanceolate, apex obtuse or emarginate; claw absent or strongly differentiated from blade, longer to shorter than sepals, glabrous, unappendaged, entire. **Stamens** 6 and slightly to strongly tetradynamous, rarely 4 and equal in length, erect or spreading, exerted or included; filaments wingless, unappendaged, glabrous, free, dilated or not at base; anthers ovate to oblong or linear, not apiculate at apex. **Nectar glands** confluent and subtending bases of all stamens; median nectaries 2 or rarely 4 or absent; lateral nectaries annular or semiannular. **Ovules** 4–80 per ovary; placentation parietal. **Fruit** dehiscent capsular siliques, linear or rarely oblong, elliptic, or narrowly lanceolate, slightly to strongly latiseptate, not inflated, unsegmented; **valves** papery, not veined or rarely proximal part with an obscure midvein, glabrous or very rarely hairy, not keeled, flat, not covering entire fruit width, smooth or torulose, wingless, unappendaged, dehiscing elastically acropetally, spirally or circinate-coiled; **gynophore** absent; **replum** strongly flattened, visible; **septum** complete, membranous, translucent, veinless; **style** distinct and slender, rarely obsolete, persistent, glabrous; **stigma** capitate, entire, unappendaged. **Seeds**

uniseriate, wingless or not margined, oblong to ovate, slightly flattened; **seed coat** smooth, minutely reticulate, colliculate, or rugose; mucilaginous or not when wetted; **cotyledons** accumbent or very rarely incumbent. $\times = 7, 8$.

256 species: worldwide and with native species on all continents except Antarctica.

References:

Interactive key to the genera is being prepared

acris
africana
altigena
anemonoides
angulata
angustata
anhuiensis
amara
apennina
appendiculata
arakiana
armoracioides
asarifolia
astoniae
auriculata
balnearia
bellidifolia
bilobata
blaisdellii
bodinieri
bonariensis
breweri
bulbifera
bulbosa
calcicola
caldeirarum
californica
calthifolia
camosa
caroides
castellana
changbaiana
chelidonia
chenopodiifolia
cheotaiyienii
chilensis
circaeoides
clematitis
concatenata
conferta
constancei
cordata
cordifolia
corymbosa
crassifolia
debilis
delavayi
densiflora
dentata
depressa
digitata

diphylla
dissecta
douglasii
elegantula
engleriana
enneaphyllos
enriquei
eremita
fallax
fargesiana
flagellifera
flexuosa
fragariifolia
franchetiana
franklinensis
fulcrata
gallaecica
georgiana
geraniifolia
glacialis
glanduligera
glauca
glechomifolia
gouldii
gracilis
graeca
granulifera
granulosa
griffithii
gunnii
heptaphylla
hirsuta
hispidula
holmgrenii
hydrocotyloides
hygrophila
iliciana
impatiens
jamesonii
jejuna
jonselliana
keysleri
kitaibelii
komarovii
kruesselii
lacustris
latior
lazica
leucantha
lihengiana
lilacina

lineariloba
lojanensis
longii
longipedicellata
loxostemonoides
luxurians
lyrata
macrocarpa
macrophylla
majovskii
marginata
maritima
matthioli
maxima
mexicana
micranthera
microphylla
microthrix
microzyga
moirensis
monteluccii
multiflora
multijuga
nepalensis
niigatensis
nipponica
nuttalii
nymanii
obliqua
occidentalis
oligosperma
opizii
ovata
pachystigma
papillata
papuana
parviflora
pattersonii
paucifolia
paucijuga
pectinata
pedata
penduliflora
pennsylvanica
pentaphyllos
penzesii
picta
plumieri
pratensis
prorepens
pulchella

purpurascens
purpurea
quinquefolia
raphanifolia
repens
resedifolia
rivularis
robusta
rockii
rostrata
rotundifolia
rupicola
scaposa
schinziana
schulzii
scutata
seidlitziana
seravschanica
silana
simplex
speciosa
sphenophylla
stellata
stenoloba
subcarnosa
tanakae
tangutorum
tenera
tenuifolia
tenuirostris
tianqingiae
trichocarpa
trifida
trifolia
trifoliolata
tryssa
tuberosa
uliginosa
uniflora
umbellata
variabilis
victoris
violacea
volckmannii
vulgaris
waldsteinii
yezoensis
yunnanensis

Species in red are not yet described

Cardamine acris Grisebach, Spicil. Fl. Rumel. 1: 253. 1843; *C. raphanifolia* Pourret subsp. *acris* (Grisebach) O. E. Schulz, Bot. Jahrb. Syst. 32: 512. 1903. TYPE: [F.Y.R. Makedonija] “gregarie ad fontem m. Kobelitz [Kobelica] juxta Mandram Weitzensem alt. 4200’, 21 Jul 1839, Grisebach 943 (lectotype designated by Strid (1986: 257), GOET; isolectotype, K).

Cardamine africana Linnaeus, Sp. Pl. 2: 655. 1753. Lectotype (designated by Marais, 1970): Hermann, Paradisus Batavus Fig. p. 202 (1698).

Cardamine innovans O. E. Schulz, Bot. Jahrb. Syst. 32: 417. 1903. TYPE: Guatemala, above Tecpam, 2500 m, 1882, F. C. Lehmann 1475 (lectotype, here designated, G-BOIS).

Cardamine borbonica Persoon, Syn. Pl. 2: 195. 1807. TYPE: Réunion [Bourbon], *Bory de St. Vincent* (holotype, G).

Cardamine holtziana Engler & O. E. Schulz, Bot. Jahrb. Syst. 32: 416. 1903. TYPE: Tanzania, Lushoto District, W. Usambara Mts, between Wambugu and Malalo, A. Engler 1356 (holotype, B).

Cardamine ovata Bentham var. *corymbosa* Britton, Bull. Torrey Bot. Club 16: 16. 1889. TYPE. Bolivia, [La Paz], Undavi, 10000 ft, Oct 1885, H. H. Rusby 1206 (holotype, NY!).

Herbs, perennial. **Rhizomes** slender, not tuberous. **Stems** (5–)25–70(–80) cm, erect to ascending, simple or sometimes branched near middle, glabrous throughout or pubescent. **Basal leaves** not rosulate; lower and middle cauline leaves 4–10(–15) cm, trifoliolate; petiole 2–6(–7) cm; terminal leaflet (1–)1.5–7 × 1.5–4 cm, lanceolate to ovate, sparsely strigose with trichomes to 0.6 mm, base cuneate to subobtusate, margin ciliolate or glabrous, serrate or crenate, teeth mucronate, apex acute, petiolule 2–2.5 cm; lateral leaflets same size or slightly smaller than terminal one, base oblique. **Racemes** ebracteate, slightly elongated or not elongated in fruit; rachis straight; fruiting pedicels 0.5–3 cm, ascending, stout, straight. **Sepals** oblong, 1.5–4 × 1–1.5 mm, not saccate, caducous, glabrous; petals white or lavender, spatulate, 3.5–9 × 2–4 mm, apex obtuse; filaments 2.5–5 mm; anthers oblong, 1–1.5 mm; ovules 8–20 per ovary. **Fruits** linear, (2.5–)3.5–5(–6) cm × 1.5–2.5 mm, glabrous; style 0.5–1.5 mm, stout. **Seeds** brown, oblong, 1.5–2.5 × 1–1.5 mm.

Flowering: Sep–Jan.

Habitat: Moist or wet areas, mixed forests, disturbed places, roadside clearings, damp shady areas.

Elevation: 500–3400 m.

Distribution: **native** of Africa (Comores, Ethiopia, Kenya, Madagascar, South Africa, Tanzania, Uganda), **naturalized** in Asia (India, Indonesia, Malesia, Papua New Guinea, Sri Lanka), Central America (Costa Rica, El Salvador, Guatemala, Honduras, Mexico [Chiapas]), and South America [Argentina (Misiones, Salta, Tucumán), Bolivia (Cochabamba, La Paz, Santa Cruz, Tarija), Brazil (Parana, Río Grande Do Sul, Santa Catalina), Columbia (Cundinamarca), Ecuador (Santiago-Zamora), Peru (Amazonas, Cajamarca, Cuzco), Venezuela (Mérida)].

Specimens examined: **ARGENTINA. Misiones:** Gral. Manuel Belgrano, 8 km de Bernardo de Irigoyen hacia San Antonio, 26°12’S, 53°40’W, *Morrone et al. 1378* (MO, SI). **Salta:** Santa Victoria, camino al Angosto del Baritú, 22°30’S, 64°45’W, *Ahumada & Agüero 8343* (SI); Parq Nac. Baritú, Lipeo, Rio Naranjo, *Zuloaga et al. 1165* (BACP, SI); Anta, Parque Nac. El Rey, Picada al Chomo Los Loios, Ezcurra, *Ponce & Brown 431* (SI). Dep. Anta, Res. Nac. Fca. Del Rey, *Ezcurra et al. 431* (BACP). **Tucumán:** Dep. Chicligasta, arroyo Celeste, R 65, Km 28,

27°20'S, 65°50'W, *Boelcke et al.* 5474 (BAA). **BOLIVIA. Chuquisaca.** Prov. Hernando Siles, Comunidad Vallecito, *Villalobos & Jimenez* 903 (MO). **Cochabamba:** Chapare, Cochabamba 95.2 km hacia Villa Tunari, *Beck* 7285 (BACP, GH, MO). **La Paz:** Yungas, *Bang* 227 (BM, E, K, MO, NY, W); Murillo, 44 km below Lago Zongo, 16°03'S, 68°01'W, *Solomon* 10777 (GH, MO), Cahua, Valle de Zongo, *Beck & Foster* 13949 (LPB, MO); Nor Yungas, 17.3 km NE Chuspipata on road to Yolosa, 16°13'S, 67°47'W, *Solomon* 12547 (GH, MO, NY); 4.5 km below Yolosa, then 10 km W on rd up the Rio Huarinilla, 16°12'S, 67°50'W, *Solomon* 8551 (GH, MO). **Sant Cruz:** Caballero, Enpalme, 17°49'S, 64°36'W, *Rivera et al.* 63 (MO). **Tarija:** Arce, Rio Chillaguatas, on trail between Sidaras and Tariquia, 22°05'S, 64°25'W, *Solomon* 11270 (GH, MO); entre Emboruzú y La Mamora, *Zuloaga et al.* 1058 (BACP, SI). **BRAZIL. Parana:** Tres Barras, *Dusén* 17565 (GH, NY, S). **Rio Grande Do Sul:** Morro do Forno-Josafá, *Sobral & Jarenkow* 8022 (F). **Santa Catalina:** Sun. Sao Miguel d' Oeste, forest above Rio Reperi-guacu, Peperi, 26°32'S, 53°44'W, *Smith & Reitz* 12783 (B, F, GH, MO, NY, P); Bom Retiro, Agua Boa, Riozinho, *Smith & Kline* 7892 (GH). **COLOMBIA. Cundinamarca:** Quetame to Susumuco, *Pennell* 1344 (NY) **ECUADOR.** Andes, without locality, *Spruce* 5378 (E, G, GH, NY, P, W). **Santiago-Zamora:** Río Itzintza, 2°40'S, 78°W, *Camp E-1218* (GH, NY); above Tambo Valladolid, *Steyermark* 54625 (NY). **PERU. Amazonas:** Pongará, Yambrasbamba, *Tillett* 673-364 (F, GH). **Cajamarca:** San Ignacio, San José de Lourdes, 4°59'S, 78°54'W, *Díaz et al.* 10540 (MO). **Cusco:** La Convención, Santa Ana, Madre Selva, 12°53'S, 72°45'W, *Valenzuela et al.* 3047 (MO); Valle de Santa Ana, above Quillabamba, *Plowman & Davis* 4803 (GH). **VENEZUELA. Merida:** La Mucuy, *Bernardi* 1835 (NY).

Both Schulz (1903) and Rollins (1993) recognized *Cardamine africana* and *C. innovans* as inDep. endent species, but the alleged differences in the presence vs. absence of leaf marginal trichomes are unreliable.

Cardamine altigena O. E. Schulz, Bot. Jahrb. Syst. 62: 479. 1929. TYPE:

Herbs, perennial, glabrous or sparsely pubescent. **Rhizome** slender. **Stems** 2–5 dm, ascending to prostrate, rooting from lower nodes. **Leaves** 3–7-foliolate or rarely unifoliolate, glabrous or ciliate; basal soon withered, 2–7 cm; cauline leaves remote, few, to 6 cm, the petiole not auriculate and to 2 cm; terminal leaflet trifid, orbicular to reniform becoming oblanceolate in uppermost leaves, 0.5–1.5(–3) × 0.1–1.2(–2) cm, sessile or with a petiolule 1–8 mm; lateral leaflets trifid to oblanceolate, 2–7 × 1–5 mm, petiolule ca. 1 mm. **Racemes** ebracteate, 3–10-flowered; fruiting pedicels erect to divaricate, straight, 8–15 mm. **Sepals** oblong, 1.8–2.7 mm; petals white, spatulate, 3.5–6 × 1–2 mm, apex obtuse; stamens 6, filaments subulate, anthers 0.3–0.5 mm; ovules – per ovary. **Fruits** linear, 1.3–3.5 cm × 1.3–1.8 mm; style 0.4–2 mm. **Seeds** oblong, 1.4–1.7 × ca. 1 mm, smooth.

Habitat: wet grassy slopes, near running water, along streams.

Elevation: 1700–4000 m.

Distribution: New Guinea.

Cardamine anemonoides O. E. Schulz, Bot. Jahrb. Syst. 32: 340. 1903; *Dentaria corymbosa* Matsumura, Bot. Mag. (Tokyo) 13: 52. 1899; *Cardamine matsumurana* Nemoto, Fl. Japan Suppl. 263. 1936; not *C. corymbosa* J. D. Hooker, Icon. Pl. 7: 686. 1844. TYPE: Japan, **select one of the five syntypes.** (lectotype, here designated, TI!).

Cardamine anemonoides var. *suavis* O. E. Schulz, Bot. Jahrb. Syst. 32: 341. 1903. TYPE: Schikoku, Prof. Tosa, pr. Nanokawa, 17 Apr 1890, *Watanabe s.n.* (holotype, GH!).

Herbs, perennial. **Rhizomes** creeping, scaly, subfleshy, without tuberous knots, 1–3 mm in diam., not stoloniferous. **Stems**, 6–30 cm, slender, erect, simple, glabrous. **Rhizomal leaves** withered by flowering time; cauline leaves 2–5, trifoliolate or very rarely simple, not auriculate, hirsutulous with antrorse trichomes 0.3–0.5 mm; petiole (0.5–)1–3.5 cm; terminal leaflet (or leaf when simple) broadly ovate, lanceolate, or elliptic, rarely obovate, 1–6 × 0.6–2.5 cm, on a petiolule to 1 cm, base cuneate, margin ciliolate antrorse trichomes to 0.1 mm, crenate-serrate to serrate, the teeth mucronate, apex acute to acuminate; lateral leaflets 1 pair, sessile, similar to terminal leaflet in shape but smaller and often with oblique base. **Racemes** ebracteate, 2–7-flowered; fruiting pedicels ascending to suberect, 1–2.5 cm, straight, slender. **Sepals** narrowly oblong, 3–4 × 1–1.5 mm; petals white, narrowly obovate, 6–10 × 2–3 mm, apex rounded; median filament pairs 5–6 mm, lateral pair 4–5 mm; anthers oblong, 1.2–1.5 mm; ovules 8–20 per ovary. **Fruit** linear, 3–4.7 cm × 1–1.5 mm; valves smooth, glabrous; style 3–8 mm. **Seeds** brown, oblong, 1–15 × 0.7–1 mm.

Flowering: Apr–May.

Habitat: mountain forests.

Elevation: 500–1300 m.

Distribution: Japan (Honshu).

Cardamine angulata W. J. Hooker, Fl. Bor.-Amer. 1: 44. 1829. TYPE :

Cardamine angulata var. *alba* Nuttall, in Torrey & A. Gray, Fl. N. Amer. 1: 84. 1838. TYPE:

Cardamine angulata var. *hirsuta* O. E. Schulz, Bot. Jahrb. Syst. 32: 407. 1903. TYPE:

Cardamine angulata var. *pentaphylla* O. E. Schulz, Bot. Jahrb. Syst. 32: 407. 1903. TYPE:

Cardamine helleriana O. E. Schulz, Bot. Jahrb. Syst. 32: 547. 1903. TYPE:

Dentaria grandiflora Rafinesque, Atlantic J.-Extra of No. 6 (Herb. Raf.) 47. 1833. TYPE:

Herbs, perennial, glabrous or sparsely pubescent. **Rhizomes** slender, cylindrical, to 2 mm in diam.; stolons absent. **Stems** (1.5–)2.5–8.5(–10) dm, erect, simple, sparsely to densely hirsute at base. **Rhizomal leaves** 3(or 5)-foliolate, (4–)7–20(–22) cm; petiole (2–)4–12(–14) cm; terminal leaflet ovate to broadly lanceolate, 1.5–7(–9) cm, with a petiolule (0.3–)0.5–1.5 cm, base cuneate, rarely subreniform or obtuse, margin 3–5(–7)-lobed or -toothed, puberulent; lateral leaflets about as large as or smaller than terminal leaflet, subsessile, margin same as terminal leaflet; cauline leaves (3 or)4–8, 3(or 5)-foliolate; petiole 1–4 cm, base not auriculate; terminal lobe broadly ovate to narrowly lanceolate, 2–7 × 0.6–4 cm, minutely pubescent along margin, petiolulate or sessile; lateral leaflets similar to terminal one but smaller, sessile, margin dentate or rarely entire. **Racemes** ebracteate; fruiting pedicels ascending to divaricate, (0.9–)1.2–2.5 cm. **Sepals** oblong, 2.5–4 × 1.3–2 mm, erect, base of lateral pair saccate; petals white or rarely pinkish, obovate, 8–15 × 4–8 mm, clawed, apex rounded or emarginate; median filament pairs 3.5–6 mm, lateral pair 2–3.5 mm; anthers oblong, 0.8–1.2 mm. **Fruit** linear, 1.5–3.2 cm × 1.4–2 mm; valves glabrous; style (0.5–)1–4 mm; ovules and seeds 10–16 per fruit. **Seeds** dark brown, oblong, 1.8–2.3 × 1–1.2 mm. **2n** = 40.

Flowering: Apr–Jun.

Habitat: moist grounds, streambanks, swampy or damp woods, thickets, wet meadows.

Elevation: 0–900 m.

Distribution: Canada (British Columbia), United States (Alaska, N California, Oregon, Washington).

2. Cardamine angustata O. E. Schulz, Bot. Jahrb. Syst. 32: 349. 1903; *Dentaria heterophylla* Nuttall, Gen. N. Amer. Pl. 2: 66. 1818; *Cardamine heterophylla* (Nuttall) A. Wood Amer. Bot. & Fl. 38. 1870; not Host, Syn. P. Austral. 366. 1797; not Lapeyrouse, Hist. Abr. Pl. Pyr.

377. 1813; not Bory, Ann. Sci. Gen. Phys. 3: 6. 1820; not W. J. Hooker, Comp. Bot. Mag. 1: 273. 1835. TYPE:

Cardamine angustata var. *ouachitana* E. B. Smith, Brittonia 34: 379. 1982. TYPE: United States, Arkansas, Polk Co., common along the Cossatot River, 12.1 miles S of the junction of Hwys 375 and 8 near Mena, 19 Mar 1982, E. B. Smith 3664 (holotype, UARK; isotypes M!), NY!, US!).

Herbs, perennial, glabrous or rarely sparsely pubescent. **Rhizomes** fleshy, moniliform, segments fusiform, 3–6 mm in diam.; stolons absent. **Stems** 1.2–3(–4) dm, erect, simple, glabrous or pubescent. **Rhizomal leaves** 3-foliolate, to 24 cm; petiole (3–)5–12(–16) cm; terminal leaflet broadly ovate to rhombic-ovate, 1.5–6(–8) cm, with a petiolule (0.2–)0.5–1.5(–2) cm, base cuneate, rarely subtruncate, margin coarsely dentate to crenate or 3-lobed, puberulent or not; lateral leaflets about as large as or smaller than terminal leaflet, subsessile or with a petiolule 2–10 mm, margin same as terminal leaflet; cauline leaves 2(or 3), 3-foliolate, alternate or rarely opposite, different in morphology from rhizomal leaves; petiole 0.5–2 cm, base not auriculate; terminal leaflet narrowly lanceolate to narrowly oblong or oblong-lanceolate, 2–7 cm × 3–6 mm, minutely puberulent along margin, petiolulate or sessile; lateral leaflets similar to terminal one but smaller, sessile, margin dentate or rarely entire. **Racemes** ebracteate; fruiting pedicels ascending to divaricate, 1.5–4 cm. **Sepals** oblong, 5–7.5 × 1–2 mm, erect, base of lateral pair slightly saccate; petals purple to pale pink, oblanceolate, 9–18 × 2–5 mm, clawed, apex rounded; median filament pairs 5–10 mm, lateral pair 3.5–8 mm; anthers linear, 1.5–3 mm. **Fruit** linear, 2.5–4 cm × 1.5–2.5 mm; valves glabrous; style (5–)7–11 mm; ovules and seeds 8–12 per fruit. **Seeds** dark brown, oblong, 2–2.5 × 1–1.5 mm. **2n** = ca. 128.

Flowering: Mar–May.

Habitat: moist woods, wooded ridges and bottomlands, flood plains, shady ravines, stream beds.

Elevation: 300–1300 m.

Distribution: United States (Alabama, Arkansas, Delaware, District of Columbia, Georgia, Indiana, Kentucky, Maryland, Mississippi, New Jersey, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Virginia, West Virginia).

Cardamine anhuiensis D. C. Zhang & J. Z. Shao, Bull. Bot. Res., Harbin 6(2): 127. 1986.

TYPE. China, Anhui, Tongling Xian, Lang-Keng, 200 m, 14 Apr 1985, Shao Jianzhang 84050 (holotype, ANUB; isotypes, NAS!, PE!).

Cardamine jinshaensis Q. H. Chen & T. L. Xu, Acta Bot. Yunnan. 15: 361. 1993. TYPE: China, Guizhou, Jinchuan, Qingmen, 1000 m, 26 Apr 1988, Qianxi Expedition 330 (holotype, HGAS).

Herbs, perennial, sparsely pilose to glabrous. **Rhizomes** stout, often without stolons. **Stems** 11–35 cm, erect, simple or sometimes 1- or 2-branched above, not flexuous. **Basal leaves** trifoliolate or simple; petiole 2–17 cm; terminal leaflet or leaf blade suborbicular or rarely ovate-orbicular or reniform-orbicular, 0.6–3.5 × 1–5 cm, base cordate or rarely subtruncate, margin crenate or rarely repand-crenate; petiolule of terminal leaflet 0.7–1.4 cm, that of lateral leaflets much shorter; lateral leaflets similar to terminal but much smaller; cauline leaves 3(or 5)-foliolate; petiole 1.3–3.5 cm, base not auriculate; terminal leaflet ovate-orbicular or subreniform, 1.5–3 × 1–3.2 cm, with a petiolule to 6 mm, margin crenate or crenate-repand; lateral leaflets similar to terminal one, shortly petiolulate to subsessile. **Racemes** ebracteate; fruiting pedicels divaricate to divaricate-ascending, 0.6–1.5 cm, slender. **Sepals** oblong, 2–2.8 × 0.8–1.2 mm, base not saccate; petals white, spatulate, 4–6 × 1.5–2.5 mm, apex rounded; median filament pairs 2.5–4 mm, lateral pair 1.5–2.5 mm; anthers oblong, 0.5–0.7 mm; ovules 24–30 per ovary. **Fruit**

linear, 2–4 cm × 1–1.5 mm; valves smooth, glabrous; style 1–3 mm. **Seeds** brown, oblong, 1.2–2 × 0.8–1.3 mm, wingless.

Flowering: Mar–May.

Habitat: shady slopes, along ditches.

Elevation: 0–1000 m.

Distribution: China (Anhui, Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, Zhejiang).

Cardamine amara Linnaeus, Sp. Pl. 2: 656. 1753. TYPE: Herb. Linn. No. 835.17 (lectotype designated by Khatri (1989: 92), LINN).

Cardamine apennina Lihová & Marhold, Pl. Syst. Evol. 245: 85. 2004. TYPE:

Cardamine appendiculata Franchet & Savatier, Enum. Pl. Japon. 2: 281. 1879; *C. macrophylla* Willdenow var. *appendiculata* (Franchet & Savatier) Yatabe, Bot. Mag. (Tokyo) 6: 100. 1892; *Dentaria appendiculata* (Franchet & Savatier) Matusmura, Bot. Mag. (Tokyo) 31: 51. 1899. TYPE: Northern Japan, *Savatier s.n.* (holotype, P!).

Herbs, perennial, **Rhizomes** creeping, not scaly, slender, without tuberous knots, 1–4 mm in diam., not stoloniferous. **Stems** (20–)30–65 cm, stout or slender, erect, simple, glabrous, slightly flexuous. **Rhizomal leaves** 1–5 cm; petiole 2–7 cm; terminal leaflet oblong to ovate, (1–)2–4 × 0.8–2 cm, sessile or petiolulate, base cuneate, margin serrate to crenate, apex acute; lateral leaflets 1 or 2 pairs, similar to terminal but smaller; cauline leaves (3–)5–10, glabrous or scabrous with antrorse trichomes to 0.2 mm; petiole (1–)2–7(–10) cm, basal auricles 1–6 × 0.5–2 mm; terminal leaflet broadly ovate, lanceolate, elliptic, or oblong, (1.5–)3–7(–10) × (0.5–)1–4(–7) cm, glabrous or pubescent, subsessile or petiolulate, base cuneate, margin ciliolate with appressed trichomes to 0.2 mm, crenate, serrate, or serrulate, the teeth mucronate, apex acute, rarely subacuminate; lateral leaflets 2–5 pairs, sessile, similar to terminal leaflet. **Racemes** ebracteate, 10–30-flowered; fruiting pedicels divaricate, 1–2(–2.7) cm, straight, slender. **Sepals** oblong, 2.5–3.5 × 1–1.5 mm; petals white, narrowly obovate, 7–9 × 3–4 mm, apex rounded; median filament pairs 4–5 mm, lateral pair 3–4 mm; anthers oblong, 1.2–1.5 mm; ovules 8–16 per ovary. **Fruit** linear, 2–3 cm × ca. 1.5 mm; valves smooth, glabrous; style (2–)3–6 mm. **Seeds** brown, ovoid, 1.5–2.5 × 1–1.5 mm.

Flowering: May–Jul.

Habitat: wet areas along streams, shady places in forests.

Elevation: 200–2000 m.

Distribution: Japan (Hondo, Honshu).

Cardamine arakiana Koidz, Acta Phytotax. Geobot. 5: 119 (1936). TYPE:

Herbs, perennial. **Rhizomes** slightly thickened. **Stems** (10–)15–35(–42) cm; erect pubescent or rarely glabrous, usually branched above. **Basal leaves** simple, trifoliolate or rarely 5-foliolate, 6–17 cm; blade or terminal leaflet orbicular- or cordate-reniform, 1.3–4.5(–5.5) cm, 1.5–5.5(–6.5) mm wide, base cordate, margin repand or crenate, apex rounded; lateral leaflets suborbicular, 0.5–1 cm, 0.5–1.3 mm wide, base truncate to cordate, margin crenate; cauline leaves trifoliolate or rarely 5-foliolate, 2.5–15 cm, adaxially glabrous, pubescent adaxially; terminal leaflet ovate to suborbicular, 1–2.5 cm, 1–3 cm wide, base cordate to obtuse, margin crenate; lateral leaflets elliptic, ovate, or orbicular, 0.5–2.5 cm, 0.3–2 cm wide, usually petiolulate. **Racemes** ebracteate, 2–10 cm in fruit; fruiting pedicels 1–2 cm, ascending. **Sepals** 2–

2.5 mm, ca. 1 mm wide, sparsely pubescent; petals white, 5–6 mm, 2–3 mm wide; filaments 2–3 mm. **Fruits** linear, 2.5–4 cm, ca. 1 mm wide, glabrous; style 2–3 mm. **Seeds** 1.5–2 mm. $2n = 32$. Flowering: Mar–Apr.

Habitat: Grassy silty-clay forest floor, forest margins in low mountains.

Distribution: Japan (Honshu).

Cardamine armoracioides Turczaninow, Bull. Soc. Imp. Naturalistes Moscou 27(2, 4): 293.

1854 (1855). TYPE: Venezuela, New Grenada, *Linden 1416* (holotype, KW?; isotypes, BM!, G!, K!, P!).

Cardamine lanceolaris Linden & Planchon, Trois. Voy. Linden, Bot., Pl. Columb. 1: 12. 1863.

TYPE: Same as that of *C. armoracioides* but holotype at P!.

Herbs, perennial, with woody base, sometimes annual. **Rhizomes** absent. **Stems** 20–50 cm, erect or decumbent, simple or branched above, glabrous. **Cauline leaves** (lower and middle ones) 4–22 cm, simple or rarely with a tiny lateral leaflet; petiole (1.5–)3–7 cm; leaf blade (3–)4.5–15 × (1.5–)2–5.5 cm, lanceolate to ovate, glabrous or sparsely pubescent with trichomes to 0.5 mm, base cuneate, margin ciliolate with trichomes to 0.2 mm, serrate, teeth mucronate, apex long acuminate or rarely acute; uppermost leaves smaller, reduced into bracts. **Racemes** bracteate at least along proximal half; bracts simple, linear to linear-oblong, petiolate, reduced in size upward; fruiting pedicels 1–2 cm, divaricate to ascending, stout, straight. **Sepals** oblong, 2.5–3.5 × 1–1.5 mm, not saccate; petals white, spatulate to oblong, 4.5–6 × 1.5–2.5 mm; filaments 3–4 mm; anthers oblong, 0.7–0.9 mm; ovules 10–14 per ovary. **Fruits** 3–5.5 cm × 1.5–2 mm; style 1–3 mm. **Seeds** brown, oblong, 2–2.7 × 0.9–1 mm.

Flowering: May–Sept.

Habitats: Rich steep forest slopes.

Elevation: 2100–2700 m.

Distribution: Colombia?, Venezuela (Mérida).

Specimens examined: **COLOMBIA**. Jaji, Moritz 1052 (B). **VENEZUELA**. New Grenada, *Linden 1414* (BM). **Merida**: above La Isla, above Tabay, Steyermark 56596 (F, GH); La Isla, arriba de La Mucuy, 8 km arribay de Tabay, Bunting 4540 (F, GH); Laguna de Coromoto, June–Sept. 1958, Schwabe s.n. (B); Mucuy above Merida, 31 Dec. 1972, Schuabe s.n. (B).

The locality from Colombia needs further checking to see if it is indeed in that country or in Venezuela.

Cardamine asarifolia Linnaeus, Sp. Pl. 2: 654. 1753. TYPE: Hermann, P. *Paradisus batavus*, 1698, p. 203, entitled “NASTURTIUM montanus Asari folio” [lectotype designated by Marhold (1996: 114)].

Cardamine astoniae I. Thompson, Muellera 9: 156. 1996. TYPE: Australia, Victoria,

Snowfields, Bogong High Plains, between Rocky Valley Reservoir and Basalt Hill, Falls Creek area, 36°54'S, 147°18'E, 1650 m, 28 Dec 1994, *Ian Thompson 84* (holotype, MEL).

Herbs, perennial, glabrous throughout. **Rhizomes** slender, sometimes branched. **Stems** to 25 cm, erect, simple. **Basal leaves** not rosulate, sometimes clustered at stem base, somewhat fleshy, long petiolate, to 15 cm, simple or pinnately compound and 3–5-foliolate; terminal leaflet ovate to elliptic, cuneate to cordate at base; lateral leaflets smaller, orbicular to elliptic; cauline leaves several, petiolate, not auriculate at base, pinnately compound or pinnatisect, lateral segments/leaflets strongly angled forward. **Racemes** ebracteate, many flowered, short; fruiting

pedicels 10–20 mm. **Sepals** ovate, 3–4 mm; petals white or pink outside, differentiated into blade and claw, 6–11 × 3–6 mm; stamens 6. **Fruits** linear, erect to suberect, 2–3 cm × 2–2.5 mm. **Seeds** oblong-elliptic, ca. 2 mm.

Flowering: Nov–Jan.

Habitat: among tussocks, moist to boggy alpine to subalpine areas.

Elevation: ca. 1650 m.

Distribution: Australia (New South Wales, Tasmania, Victoria).

Cardamine auriculata S. Watson, Proc. Amer. Acad. Arts 17 : 319. 1882. TYPE:

Herbs, annual, sparingly hispid near base. **Stems** 1.5–4 dm, erect to ascending or decumbent, slender, branched. **Leaves** pinnately compound, with 2 or 3 pairs of leaflets, petiolate, not auriculate; leaflets petiolulate, ovate to ovate-oblong, 1–2 cm, crenate-dentate, sparsely pubescent or glabrous, minutely ciliate or not, sometimes a subsidiary leaflet present at lower side of rachis. **Racemes** ebracteate; fruiting pedicels divaricate-ascending, 6–10 mm, glabrous.

Sepals 2.5–3.5 mm, not saccate; petals white, spatulate, 6–8 mm; ovules –. **Fruits** linear, 2.5–4 cm × 1.5–2 mm; style 1.5–3 mm, slender. **Seeds** oblong, ca. 1.5 mm × 1 mm, occasionally winged.

Flowering: Apr–Jul.

Habitat: limestone ledges, wet banks, near streams, deep canyons, spring, wooded slopes.

Distribution: Mexico (Hidalgo, Nuevo León, San Luis Potosí, Tamaulipas).

Cardamine balnearia Standley & Steyermark, Field Mus. Nat. Hist., Bot. Ser. 23: 157. 1944. TYPE: Guatemala, Volcán de Zuni, ca. 2450 m, *P. Standley* 83332 (holotype, F!; isotype, US!).

Herbs, perennial, glabrous throughout. **Rhizomes** thickened, erect. **Stems** 3–3.5 dm, erect, simple below, branched and densely leafy above base. **Leaves** ca. 15 cm, 9–13-foliolate; petiole slender, 4–7 cm, not auriculate at base; lateral leaflets 1–3 cm × 4–12 mm, broadly ovate to oblong or oblong-lanceolate, glabrous, on a petiolule 4–6 mm, base oblique and cuneate to rounded, margin dentate to slightly lobed, the teeth mucronate, apex acute; terminal leaflet similar to lateral ones but slightly larger. **Racemes** ebracteate or only lowermost flowers bracteate; fruiting pedicels 1–1.5 cm, ascending, straight, slender. **Sepals** 2.5–3 × ca. 1 mm, purplish, oblong; petals 5–6 × ca. 2 mm, white tinged with purple; filaments 4–5 mm; anthers ca. 1 mm; ovules –. **Fruits** (immature) ca. 3.5 cm × 1 mm; style ca. 3 mm. **Seeds** not seen.

Flowering: Jan.

Habitat: wet mossy banks.

Elevation: ca. 2450 m.

Distribution: Guatemala.

Notes: known only from the type collection.

Cardamine bellidifolia Linnaeus, Sp. Pl. 2: 654. 1753. TYPE: Herb. Linn. 835.1. (lectotype designated by Khatri (1990a: 442), LINN).

Cardamine bellidifolia var. *beringense* A. Porsild, Proc. Trans. Roy Soc. Canada 32: 31. 1938.

TYPE:

Cardamine bellidifolia var. *laxa* Lange, Meddel. Gronland 3: 251. 1887. TYPE:

Cardamine bellidifolia var. *pachyphylla* Coville & Leiberg, Proc. Biol. Soc. Wash. 11: 170. 1897. TYPE:

Cardamine bellidifolia var. *pinnatifida* Hultén, Madroño 19: 223. 1968. TYPE:

Herbs, perennial, glabrous throughout, somewhat caespitose. **Rhizomes** and stolons absent; caudex with slender or rarely stout, rhizome-like branches. **Stems** 0.1–0.8(–1.4) dm, erect to ascending, many, glabrous, subscapose. **Basal leaves** simple, rosulate, (0.6–)1.2–5(–7) cm; petiole (3–)1–3.5(–5.5) cm; leaf blade ovate to oblong, rarely oblanceolate to obovate, (0.4–)0.8–1.7(–2.5) × (0.2–)5–1(–1.6) cm, base cuneate to obtuse, margin entire or rarely repand or obtusely small toothed, not puberulent, apex obtuse; cauline leaves absent or 1(or 2), simple, short petiolate, base not auriculate, similar in shape and much smaller than basal leaves. **Racemes** ebracteate; fruiting pedicels ascending to erect, 3–6(–8) mm. **Sepals** oblong, 2–3(–4) × 0.8–1.5(–2) mm, erect, base of lateral pair not saccate; petals white, oblanceolate, 4–5.5(–7) × 1.3–2(–2.5) mm, not clawed, apex rounded or emarginate; median filament pairs 2.5–4 mm, lateral pair 2–3 mm; anthers oblong, 0.5–0.9 mm. **Fruit** linear, (0.8–)1.3–2.8(–3.7) cm × 1.3–2 mm; valves glabrous; style 0.5–3 mm; ovules and seeds 8–18 per fruit. **Seeds** brown, oblong, 1.5–2 × 0.9–1.2 mm. **2n** = 16.

Flowering: Jun–Sep.

Habitat: mossy places, tundra, marshes at stream headwaters, cliffs, talus slopes, barren chert slopes, moist rock crevices, rocky slopes, alpine brooks, sandy beaches, moist rocky stream beds. Elevation: 0–2300 m.

Distribution: Canada (Alberta, British Columbia, Labrador, Nunavut, Northwest Territories, Quebec, Yukon), Greenland, **n Europe**, Russia (Siberia, Far East), United States (Alaska, California, Maine, New Hampshire, Oregon, Washington).

Cardamine bilobata Kirk, Stud. Fl. 27. 1899. TYPE: New Zealand, Kurow, *Petrie s.n.* (holotype, W).

Cardamine blaisdellii Eastwood, Bot. Gaz. 33: 146. 1902; *C. microphylla* Adams subsp.

blaisdellii (Eastwood) D. F. Murray & S. Kelso; *C. microphylla* var. *blaisdellii* (Eastwood) Khatri. TYPE:

Herbs, perennial, glabrous throughout or rarely pilose. **Rhizomes** slender, cylindrical, 0.7–1.5 mm in diam.; stolons absent. **Stems** 0.5–2(–2.5) dm, erect or ascending, simple, glabrous or rarely pilose. **Rhizomal leaves** pinnately 5–7-foliolate, not fleshy, 2.5–12 cm; petiole 1.5–4(–9) cm; terminal leaflet suborbicular to broadly obovate, 4–15 × 2.5–14 mm, glabrous or rarely pilose, base obtuse to subcordate, margin 3–5-toothed, apex apiculate, petiolule 1.5–3 mm; lateral leaflets toothed or rarely entire, about as large as or smaller than terminal leaflet, similar in other aspects; cauline leaves 1–3, (3–)5-foliolate, alternate; petiole 0.2–2(–6.5) cm, base not auriculate; terminal leaflet obovate to oblanceolate, 5–15 × 3–10 mm, subsessile or with a petiolule to 2 mm, base cuneate, margin 3-toothed or entire, apex apiculate; lateral leaflets similar to terminal one. **Racemes** ebracteate; fruiting pedicels erect to ascending, 7–22 mm. **Sepals** oblong, 2–3.5 × 2–2.5 mm, erect, base of lateral pair slightly saccate; petals white, broadly obovate, 7–10 × 3–6 mm, clawed, apex rounded; median filament pairs 3–4 mm, lateral pair 2–3 mm; anthers oblong, 1–1.5 mm. **Fruit** linear, 1.6–4 cm × 1–1.3 mm; valves glabrous; style 0.7–3 mm; ovules and seeds 14–24 per fruit. **Seeds** brown, oblong, ca. 1.5 × 1 mm. **2n** = 28, 42.

Flowering: Jul–Aug.

Habitat: moist streamsides, meadows, river gravel, mesic grounds, wet tundra, moist humus, scree slopes, calcareous fellfield.

Elevation: 50–950 m.

Distribution: Russia (Far East), United States (W Alaska).

Cardamine bodinieri (H. Léveillé) Lauener, Notes Roy. Bot. Gard. Edinburgh 26: 336. 1965; *Dentaria bodinieri* H. Léveillé, Repert. Sp. Nov. Regni Veg. 8: 452. 1910. TYPE: China, Guizhou, Kouy-Yang, May 1910, *Bodinier s.n.* (holotype, E).

Herbs, perennial. **Rhizomes** present. **Stems** ca. 60 cm, erect, simple or branched above, glabrous except for leaves. **Basal leaves** withered by flowering; cauline leaves 5–8, simple, deeply 3-lobed; petiole 0.5–5 cm, with a broad wing 2–6 mm wide extending along entire length, base amplexicaul; auricles broadly oblong to ovate, to 6 × 4 mm; terminal leaf lobe ovate to ovate-lanceolate, 4–8 × 2–4 cm, sparsely hirsute with stout trichomes to 0.4 mm, sessile and base decurrent with lateral lobes, margin serrate-crenate, ciliolate with trichomes less than 0.1 mm, teeth mucronate, apex acute to acuminate; lateral lobes similar to terminal but smaller. **Raceme** ebracteate, several flowered; fruiting pedicels divaricate-ascending, 5–10 mm, straight, glabrous. **Sepals** ovate-oblong, 2–3 × ca. 1.5 mm, glabrous, lateral pair subsaccate; petals purple, obovate, ca. 7 × 3 mm, not clawed; median filaments pairs 2.5–3 mm, lateral pair 1.5–2 mm; anthers ca. 0.6 mm; ovules 8–12 per ovary. **Fruit** linear, 0.8–1.2 cm × 1–1.2 mm; gynophore ca. 0.5 mm; valves glabrous, smooth; style 0.5–2 mm. **Seeds** dark brown, oblong, 1.3–1.7 × 0.7–0.9 mm, wingless. Flowering May–Jul.

Elevation: ca. 1100 m.

Distribution: China (Guizhou).

Cardamine bonariensis Persoon, *Syn. Pl.* 2: 195 (1807); *C. flaccida* subsp. *bonariensis* (Persoon) O. E. Schulz. TYPE: Argentina, Buenos Aires, *Commerson s.n.* (holotype, P-JU; isotype, P!).

Cardamine flaccida Chamisso & Schlechtendall, *Linnaea* 1: 21. 1826; *C. bonariensis* var. *flaccida* (Chamisso & Schlechtendall) J. F. Macbride, *Field Mus. Pub. Bot.* 13, pt. 2: 962. 1938. TYPE: Chile. Talcaguano, 1816, *Chamisso & Eschscholz s.n.* (holotype, LE; isotype, B).

Nasturtium radicans Walpers, *Nov. Act. Acad. Case. Leop.-Carol.* 19(1). Suppl. 247. 1843; *Cardamine radicans* (Walpers) Kuntze, *Revis. Gen. Pl.* 1: 21. 1891. TYPE: Chile, Valparaiso, **Collector ? (holotype, ...)**.

Nasturtium turfosum Kunze ex Walpers, *Nov. Act. Acad. Case. Leop.-Carol.* 19(1). Suppl. 247. 1843. TYPE: Chile, Valparaiso, *Pöppig 165 (holotype, ?; isotypes, G, ...)*.

Cardamine laxa Bentham, *Pl. Hartweg.* 158. 1845; *C. flaccida* prol. *laxa* (Bentham) O. E. Schulz, *Bot. Jahrb. Syst.* 32: 448. 1903. TYPE: Ecuador, Popayan: near Tambo de Garbiel Lopez in Páramo de Guanaco, *Hartweg 880* (holotype, K!; isotypes, 2G!).

Cardamine nasturtioides Bertero ex Barnéoud in Gay, *Fl. Chile* 1: 113. 1846. TYPE: Chile, Valparaiso, Berro, 1830, *Bertero 174* (holotype, P!; isotypes, G!, P!; fragments, BAA!).

Cardamine laxa var. *pumila* A. Gray, *Bot. U. S. Expl. Exped. Wilkes* 1: 50. 1854. TYPE: Peru. Culani to Casa Cancha, high Andes, **collector? (holotype, GH?, or US?)**.

Cardamine minima Steudel, *Flora* 39: 410. 1856; *C. flaccida* subsp. *minima* (Steudel) O. E. Schulz, *Bot. Jahrb. Syst.* 32: 451. 1903; *C. bonariensis* var. *minima* (Steudel) J. F. Macbride, *Field Mus. Pub. Bot.* 13, pt. 2: 962. 1938. TYPE: Peru. San Antonio, *Lechler 1811* (holotype, P!).

Cardamine pusilla Philippi, *Linnaea* 28: 665. 1856; *C. alsophila* Philippi var. *pusilla* (Philippi) Reiche, *Fl. Chile* 1: 99. 1896; *C. flaccida* subsp. *alsophila* (Philippi) O. E. Schulz prol. *pusilla* (Philippi) O. E. Schulz, *Bot. Jahrb. Syst.* 32: 450. 1903. TYPE: Chile, Mina de plata Las Arañas, Prov. Santiago, *Philippi s.n.* (holotype, SGO-49308!; ?isotype, B!; fragments, BAA!).

- Cardamine ramosissima* Steudel, Flora 39: 409. 1856. TYPE: Chile, Rancagua [as Tagua-Tagua in the original description], 1829, *Bertero 147* (holotype, P!; isotypes, W!). There are several of Bertero's collection # 147, and some were collected prior or post 1829, as well as from Rancagua or other localities. However, none of those should be considered as part of the type collection of *C. ramosissima*.
- Cardamine nemophila* Philippi, Linnaea 30: 186. 185. 1859–1860. TYPE: Chile, Puerto Montt, Feb 1858, *Philippi s.n.* (holotype, SGO-49306!).
- Cardamine demissa* Triana & Planchon, Annal. Sci. Nat., Bot. ser. 4, 17: 60. 1862. TYPE: Colombia, Tolima, Llanitos du pied de Loma, 1844, *J. Goudot s.n.* (holotype, P!).
- Cardamine axillaris* Weddell, Ann. Sci. Nat. ser. 5, 1: 290. 1864. TYPE: Bolivia, La Paz, Larecaja, vicinity of Sorata, river Challasuyo, 2600–2800 m, 1857–1858, *Mandon 904* (holotype, P!; isotypes, BM!, F!, GH!, NY!, W!). A specimen each at G, K, and W were collected at altitudes (3600–3800 m) and a river bank (Lacaita) different from those of the holotype and isotype. Although they carry the exact other information of the type, they are not considered herein as isotypes. How about the specimen at BM?
- Cardamine axillaris* var. *tucumanensis* Grisebach, Abh. Königl. Ges. Wiss. Göttingen 19: 71. 1874; *C. flaccida* var. *tucumanensis* (Grisebach) O. E. Schulz, Bot. Jahrb. Syst. 32: 451. 1903. TYPE: Argentina, Tucuman, rivulis pr. Siambon, 25/31 Mar 1872, *Lorentz 743* (holotype, GOET, not seen; isotype, CORD!).
- Cardamine andicola* Philippi, Anal. Mus. Nac. Bot. 2: 1. 1891. TYPE: Chile, Aminchas, between Ascotan and Pica, c. 3000 m, Feb 1885, *F. Philippi s.n.* (holotype, SGO-49317!; fragments, BAA!). The protologue gives an altitude of 3000 m, but the specimen above says 3800 m. Muñoz-Pizarro (1960) also listed SGO-63913 as type collection, but I have not seen this number.
- Cardamine alsophila* Philippi, Anal. Univ. Chile 81: 73. 1892; *C. flaccida* subsp. *alsophila* (Philippi) O. E. Schulz, Bot. Jahrb. Syst. 32: 449. 1903. TYPE: Chile, “In glareosis rivuli de Aculeo,” Dec 1886, *Philippi s.n.* (holotype, ?SGO-71631!; see Muñoz-Schick, 1973).
- Cardamine tridens* Philippi, Anal. Univ. Chile 81: 74. 1892; *C. alsophila* Philippi var. *tridens* (Philippi) Reiche, Fl. Chile 1: 98. 1896. TYPE: Chile, Prov. Aconcagua, Jahuel, pr. San Felipe, Aug. Brochers 2276 (holotype, SGO-71620!; fragments, BAA!). Muñoz-Pizarro (1960) listed two other collections, SGO-63882 and 63910 (fragments, BAA!), that I have not yet seen, but if these do not carry the exact data given in the protologue, then they are not part of the type collection.
- Cardamine caespitosa* Philippi, Anal. Univ. Chile 81: 79. 1892. *C. alsophila* Philippi var. *caespitosa* (Philippi) Reiche, Fl. Chile 1: 99. 1896. TYPE: Chile, “Valle de de Santa Gertrudis ad radicem borealem vulcani de Chillan,” Oct 1889, *Fridericus Puga s.n.* (holotype, SGO-49312!; fragments, BAA!). Muñoz-Pizarro (1960) also listed SGO-63910 as type collection, but I have not seen that.
- Cardamine bracteata* Philippi, Anal. Univ. Chile 81: 85. 1892; *C. alsophila* Philippi var. *bracteata* (Philippi) Reiche, Fl. Chile 1: 99. 1896; *C. flaccida* f. *bracteata* (Philippi) O. E. Schulz, Bot. Jahrb. Syst. 32: 448. 1903. TYPE: Chile, Andes of Santiago, *Philippi s.n.* (holotype, SGO-49313!).
- Cardamine cymbalaria* Chodat & Wilczek, Bull. Herb. Boiss. Ser. 2, 2: 189. 1902. TYPE: Argentina, Las Juntas, entrance of Valle de l'Atuel, *E. Wilczek 447* (holotype, G!).
- Cardamine flaccida* prol. *Dep. ressa* O. E. Schulz, Bot. Jahrb. Syst. 32: 448. 1903. TYPE: Chile, Talcahuano, 1828, *Pöppig s.n.* (holotype, W!).

Cardamine flaccida var. *pilosa* O. E. Schulz, Bot. Jahrb. Syst. 32: 448. 1903. TYPE: Chile, Juan Fernandez Is., Nov 1864, *Philippi s.n.* (lectotype, here designated, B!; isolectotypes, SOG!, W!).

Cardamine flaccida var. *ebracteata* O. E. Schulz, Bot. Jahrb. Syst. 32: 452. 1903. TYPE: Mexico, San Andres, 1849, *Chrismar s.n.* (lectotype, here designated, B).

Cardamine flaccida var. *macrantha* O. E. Schulz, Bot. Jahrb. Syst. 32: 452. 1903. TYPE: Mexico, San Pedro and S. Pablo, 1839, *C. Ehrenberg 215* (holotype, B).

Cardamine killipii O. E. Schulz, Notizbl. Bot. Gart. Berlin-Dahlem 10: 341. 1928. TYPE: Colombia, Santander, eastern Cordillera, edge of Páramo de las Vegas, 3300–3700 m, 20–21 Dec 1926, *E. P. Killip & A. C. Smith 15596* (holotype, B!; isotypes, F!, GH!, K!, NY!).

Cardamine flaccida var. *ravenii* Rollins, Crucif. Continental N. Amer. 273. 1993. TYPE: Mexico, Chiapas, Municipio de Tenejapa, Banbil, 9,100 ft, 10 Oct 1965, *D. E. Breedlove & P. H. Raven 12909* (holotype, GH!).

Cardamine flaccida var. *turfosiorum* Rollins, Crucif. Continental N. Amer. 273. 1993. TYPE: Costa Rica, Cartago, Cordillera de Talamanca, near the Pan American Highway, ca. 2,000 m, 25 Aug 1961, *C. Weber 6065* (holotype, GH!).

Herbs, perennial, usually rooting from lower nodes, glabrous or sparsely pubescent.

Rhizomes present. **Stems** (3–)7–35(–50) cm, erect, decumbent, or prostrate, simple or branched above and/or below. **Cauline leaves** (0.8–)2–8 cm, petiolate, not auriculate, pinnately compound or trifoliolate, rarely simple; petiole (0.5–)1–4(–5.5) cm; terminal leaflet (or leaf blade in simple leaves) 0.5–2.5 cm, orbicular, subreniform, ovate, oblong, or lanceolate, base cuneate, obtuse, to cordate, margin entire to repand or coarsely dentate to lobed, apex rounded to acute or subacuminate, petiolule to 2 cm; lateral leaflets 1–3(–4) on each side of rachis, similar to terminal leaflet but smaller and often with shorter petiolules, base cuneate or somewhat oblique, usually absent and leaves simple in submerged plants; uppermost leaves smaller, with fewer leaflets or all simple. **Racemes** bracteate throughout or at least along proximal half, rarely only lowermost few flowers bracteates, many flowered; rachis straight or rarely slightly flexuous; fruiting pedicels (0.5–)0.8–2(–2.6) cm, erect to ascending, slender, straight or curved. **Sepals** 1.4–2 × 0.5–0.8 mm, oblong, caducous; petals 2–4.5 × 0.7–1.5 mm, white, spatulate, apex obtuse; filaments 1.5–2.5 mm; anthers oblong to ovate, 0.4–0.5 mm; ovules 20–40 per ovary. **Fruits** (0.7–)1.5–2.2(–3) cm × 0.7–1.2(–1.5) mm; style 0.5–1(–1.8) mm. **Seeds** light brown, oblong, 0.8–1 × 0.6–0.8 mm.

Flowering: all year.

Habitat: ponds, streams, seepage areas, bogs, moist slopes, wet bluffs, muddy banks, wet paramo, moist turf, gravel, wet grass fields, swales, marshes, ponds.

Elevation: 0–4500 m

Distribution: Argentina (Buenos Aires, Catamarca, Chubut, Cordoba, Entre Rios, Jujuy, La Rioja, Mendoza, Misiones, Neuquén, Salta, Santa Cruz, Tucumán), Bolivia (Cochabamba, La Paz, Potosí, Santa Cruz, Tarija), Brazil (Paraná, Santa Catarina, Rio Grande do Sul), Chile (Región I, IV, V, Santiago, VI, VII, VIII, IX, X, XII, Juan Fernandez Is), Colombia (Antioquia, Boyacá, Caldas, Cauca, Cundinamarca, Huila, Nariño, Norte de Santander, Putumayo, Quindio, Putomayo, Santador, Tolima, Valle), Costa Rica, Ecuador (Azuay, Bolivar, Cañar, Carchi, Chimborazo, Cotopaxi, Imbabura, Loja, Morona-Santiago, Napo, Pastaza, Pichincha, Tungurahua, Zamora-Chinchi), Guatemala, Paraguay, Peru (Amazonas, Ancash, Apurimac, Ayacucho, Cajamarca, Cuzco, Huánuco, Junin, La Libertad, Lima, Pasco, Puno), Uruguay (Canelones), Venezuela (Merida).

Specimens examined: **ARGENTINA. Buenos Aires:** San Isidro, *Parodi 10536* (F), *Boelcke 3306* (BAA); Isla Santiago, *Cabrera 2883* (LP, SI), *Cabrera 3366* (G, GH, LP, NY, SI); Punta Lara, Pastore-Troncoso 981 (SI); Anchosena, *Hunziker 6279* (CORD, SI); Tigre, *Burkart 149* (SI); La Plata, *Krapovickas 530* (BAA). **Catamarca:** Las Chacritas, *Boelcke et al. 5525* (BAA); Dep. Ambato, Las Chacritas, 27°50'S, 65°55'W, *Boelcke et al.* (BAA); Andalaglá, Esq. Grande, *Jørgensen 1441* (BAF, GH, MO, US), Dep. Belén, Nacimiento de San Antonio, *Cabrera et al. 24696* (LP, SI). **Chubut:** Dep. Futaleufú, lago Futalufguen, *Correa et al. 4168* (BAA, BAB, BACP). **Cordoba:** Punilla, Route 20, 7 km W Tanti, *Marínez-Laborde & Bernardello 30* (BACP); Sierra Chica, *Lossen 279* (MO). Dep. San Alberto: Pampa de Achala:, Estancia San Miguel, 25 km S ruta 20, *Hunziker & Moscone 25099* (CORD). **Entre Rios:** Concepcion del Uruguay, *Burkart 17987* (BAA, SI); Concordia a Los Charnas, *Troncoso et al. 1994* (SI). **Jujuy:** Valle Grande, arroyo de las Losetas, *Cabrera et al. 27883* (MO, SI); Tumbaya, Ruta 52, Abra de Potrerillos, 25 km de Purmamarca camino a Susques, 24°40'S, 65°37'W, *Morrone et al. 2741* (SI). Dep. Tilcara: Casa Colorado, La Aguidita, *Cabrera & Hernandez 13947* (LP). **La Rioja.** Dep. Famatia/Chilecito: La Hoda, *Kurtz 15105* (CORD); Sierra de Famatina, La Mesada, *Sparre 8885* (LIL). **Mendoza:** Dep. Malargüe, Invernada del Viejo, 35°43'S, 70°10'W, *Prina et al. 2196* (SI, SRFA). **Misiones:** Dep. Candelaria: Bompland, Nov. 1910, *Hansen s.n.* (BAB). Dep. Guaraní, Predio Guaraní, *Tressens et al. 6417* (GH, NY). **Neuquén:** Dep. Minas, Las Ovejas, 37°01'S, 70°45'W, *Boelcke et al. 13551* (BAA, BAB, BACP, LIL, SI); Valle del Pichi Neuquén, *Boelcke et al. 13642* (BAA, BACP); confluencia del río Varvarco con el arroyo Turbio, *Boelcke et al. 14361* (BAA, BAB, BACP, SI); Cajón de los Chenques, 36°28'S, 70°48'W, *Boelcke et al. 13878* (BAA, BAB, BACP, SI); Aduana Vieja, 36°50'S, 71°04'W, *Boelcke et al. 10830* (BAA, BAB, SI). **Salta:** Cachi, rout du Cerro Negro, Km 20.5, *Charpin & Lazare 24040* (G); Cafayate, *Krapovickas & Cristóbal 20682* (BAA, LIL). Dep. Capital: Salta, Nov. 1892, *Kuntze s.n.* (CORD). Dep. Guachipas: Pampa Grande, *Kurtz 12646* (CORD). Dep. Santa Victoria: camino de Los Toldos a Huaico Chico, *Legname & Cuezco 9618c* (LIL). **Santa Cruz:** Dep. Río Chico, Río Oro, 47°26'S, 72°05'W, *Boelcke et al. 12885* (BAA, BAB, SI). **Tucumán:** Alpachiri, Río Cochuna, *Burkart 26540* (SI, US). Dep. Tafí: Quebrada Honda, *Sparre 9325* (LIL); Tafi del Valle, *Diers 75* (SI). Dep. t Chicligasta, arroyo Celeste, R 65, Km 28, 27°20'S, 65°50'W, *Boelcke et al. 5468* (BAA), *Boelcke et al. 5465* (BAA). **BOLIVIA.** Unduavi, *Rusby 1366* (NY, US); Bermejo, *Fiebrig 2086* (G), *Fiebrig 2184* (G). **Cochabamba:** Cercado, Cerro Multi Mayu, 17°21'S, 66°06'W, *Ritter 1891* (MO); Chapare, Río Chaqui Mayu, nr hway, *Ritter & Crow 1102* (MO); Chapare, Jutun Corral, Río Candelaria, 17°16'S, 66°55'W, *Ritter & Crow 2160* (MO); Sacaba, Incachaca, *Steinbach 5744* (K, SI), *Steinbach 5949B* (SI). **La Paz:** *Weddell s.n.* (P); Murillo, 11.4 km E Ventilla on rd to Lambate, 16°34'S, 67°54'W, *Solomon 15163* (GH, MO); Murillo, *Asplund 597* (UPS), *Asplund 612* (UPS); Ingavi, Huacullani, *Beck 1036* (GH, LPB, MO). **Potosí:** Cerranía del Khare-Kare, Laguna Chalaviri, *Schulte 57* (MO). **Santa Cruz:** Yungas de San mateo, *Steinbach 8522* (GH, K, LIL, NY). **Tarija:** entre Tarija y Narvaes, *Zuloaga et al. 1289* (SI). **BRAZIL: Paraná:** Calmon, *Dusén 9298* (S). **Santa Catarina:** Serra do Oratório, *Reitz & Klein 6985* (US); Estrada Dona Francisca, Joinville, *Reitz & Klein 4661* (US), Mun. Bom Retiro, Campo dos Padres, Smith, *Reitz & Klein 7687* (US); Pinheiral, Riozinho, *Smith & Kline 7911* (GH). **Rio Grande do Sul:** São Francisco de Paula-Lajeado Grande, *Wasum 3413* (G). **CHILE. I:** Parinacota, Salar de Surire, 18°47'S, 69°06'W, *Argomedo 47* (CONC); Camino entre Putre y Pacollo, 18°47'S, 69°31'W, *Arroyo 84-882* (CONC). **IV:** Coquimbo, Illapel, La Vega Escondida, E Cuncumen, *Morrison 16954* (DS, UC, US); Limarí, Cordillera de Ovalle, Río Molles, 30°43'S, 70°31'W, *Jiles 3695* (CONC); Chopa,

Illapel, Fundo El Mollar-Los Vilos, 31°48'S, 71°29'W, *Schlegel 3809* (CONC); Dep. Elqui, Quebrada Las Trancas, Km 26 del camino Vicuña a Hurtado, *Wagenknecht 4095* (SI). **V:** Río Colorado, Los Andes, [32°53'S, 70°25'W], 23 Sept. 1951, *Salazar s.n.* (CONC); Cerro de la Campana, Cajón Grande, cerca de la Poza del Coipo, [32°57'S, 71°08'W], *Garaventa 4618* (BACP, CONC, SI), *Garaventa 4616* (BACP, CONC, SI); Estero de Limache, [33°01'S, 71°16'W], *Garaventa 2862* (BAA, BACP, CONC, SI), *Garaventa 2687* (BAA, SI); Laguna Verde, [33°03'S, 71°42'W], *Garaventa 2396* (BAA, BACP, CONC, SI), *Garaventa 2858* (SI); Portezuelo de San Pedro, Limache, [32°57'S, 71°08'W], *Garaventa 3380* (CONC), *Garaventa 2208* (BAA, BACP, SI); Las Zabras, [33°21'S, 71°34'W], *Garaventa 2719* (BAA, CONC); Quintero, [32°46'S, 71°31'W], *Richter 19636* (CONC), *Gunckel 23792* (CONC); Quillota, [32°53'S, 71°15'W], Oct. 1969, *Martinez s.n.* (CONC); Laguna de Campiche, 32°46'S, 71°32'W, *Gunckel 39475* (CONC); Fundo Perales, [33°05'S, 71°36'W], Sept. 1912, *Jaffuel s.n.* (CONC); Valle de Oca, [32°50'S, 71°07'W], *Schlegel 1162* (CONC); Valpariso, Claude-Joseph 3630 (US); Catapilco, *Philippi 62a* (SGO); Papudo, *Zöllner 8306* (MO, NA, NY); Hacienda El Pangal, near Limache, *Killip & Pisano 39744* (US); Chapparro, *Garaventa 2721* (BAA, BACP, SI). **Santiago:** Potrero Grande de las Condes, [33°26'S, 70°20'W], 3 Jan. 1936, *Grandjot s.n.* (CONC); Peñalolén, [33°28'S, 70°32'W], *Gunckel 23310* (CONC); Peñalolén, 1 Nov 1881, *Philippi s.n.* (SGO), *Ortuzar Montt 202* (CONC); between P. Caldera and Maitenes, [33°16'S, 70°21'W], *Skottsberg & Sparre 11097* (CONC); Santuario de la Naturaleza Yerba Loca, 2.5 km from Villa Paulina, *Sweeney 266* (MO); Til-Til, Looser 3352 (SI); Puente Alto, *Garaventa 1711* (BAA, BACP, SI). **VI:** Colchagua, 1842, *Cuming s.n.* (G, W). **VII:** Cordillera de El Planchón, [35°10'S, 70°35'W], *Barros 2783* (CONC, SI); Liico, Curicó, [34°46'S, 72°041'W], *Barros 2796* (CONC); Itahue, Fundo "El Colorado," a la orilla del Río Claro, [35°08'S, 71°21'W], *Garaventa 4515* (BACP, CONC, SI); Cerro de Talca, [35°36'S, 71°12'W], 10 Jan. 1915, *Silva s.n.* (CONC); El Picazo, Talco, [35°32'S, 71°0'W], *Barros 2800* (CONC, SI); Predio Venecia, 1 km al sur de Talca, 35°27'S, 71°39'W, *Rodríguez & Baeza 2401* (CONC). **VIII:** San Rosendo, *Claude-Joseph 4382* (CONC, US); Cordillera de Nahuelbuta, cerro Pino Huacho, 37°41'S, 73°14'W, *Martcorena et al. 1581* (CONC); Sta. Bárbara-Fundo Ancud, [37°42'S, 71°58'W], *Pfister 21312* (CONC), *Pfister 664* (CONC); Gualpen, [36°47'S, 73°09'W], *Barros 1217* (CONC); La Toma, [35°50'S, 73°02'W], *Junge 2961* (CONC); Camino Concepción a Coronel, Km 15.5, 36°53'S, 73°08'W, *Parra & Rodríguez 32* (CONC); Arauco, camino desde Cañete a Contulmo, 1 km antes del fundo La Pasión, [37°53'S, 73°20'W], *Baeza & Kottirsch 1436* (CONC). **IX:** Fundo Solano, Los Alpes, Cordillera de Nahuelbuta, *Eyerdam 10214* (F, UC, US); Contulmo, Cerro Santa Elena, [38°0'S, 73°148'W], *Ricardi 9239* (CONC); Saboya, [38°0'S, 72°48'W], *Montero 5348* (CONC, SI); Cautin, Dep. Victoria, road 14 km from Termas de Tolhuaca to Laguna de Malleco, *Morrison & Wagenknecht 17467* (UC). **X:** Valdivia, Sept. 1895, *Buchtien s.n.* (F, GH, US); Río Valdivia, [39°50'S, 73°14'W], *Gunckel 37606* (CONC); San Juan, *F. Philippi 60a* (SGO); Llanguihue, Los Santos, [44°08'S, 72°25'W], *Villagrán 67663* (CONC); Riñihue, [39°50'S, 72°25'W], *Gunckel 5860* (CONC), *Santesson 1106* (S); Estancilla, [39°57'S, 73°19'W], *Junge 2564* (CONC); Cumleufu (Trumao), [40°21'S, 73°10'W], *Hollermayer 637a* (CONC); La Aguada, [39°53'S, 73°25'W], *Gunckel 2778* (CONC, GH). Dep. Castro, Lago Huillinco, 42°42'S, 73°50'W, *Martcorena et al. 143* (CONC). **XII:** Isla Long., 52°18'S, 73°38'W,

anonymous s.n. (SGO-63899). **Juan Fernandez Is.:** Falls V. Paugal, 4 April 1920, *Bryan s.n.* (RSA); Masatierra, [33°380'S, 78°52'W], *Sparre 61* (CONC), *Gunckel 72958* (CONC), *Skottsberg 61* (NY, US), *Skottsberg 219* (NY, P, US), *Skottsberg 603* (US), *Meyer 9589* (GH); Mas Atiera, Pangal Falls, *Meyer 9589* (CONC). **COLOMBIA. Antioquia:** San José de San Andrés, *Correa & Velásquez 53* (US). **Boyacá:** Sierra Nevada del Cocuy, El Llano de Deslenguadas, Finca Ritacuva, *Barclay & Juajibioy 7248* (GH, MO); Quebrada de San Paulino, El Morrón, *Cuatrecasas 1380* (F); Sierra Nevada del Cocuy, above Guican, *Grubb et al. 86* (K, US). **Caldas:** rd to Nevado, between rd to Libano and Sta. 10, *Barclay & Juajibioy 6401* (GH, MO); Cordillera Central, Paramo del Nuevado del Ruiz, *Humbert et al. 27044* (P, SI), *27006* (P); Nevado de Santa Isabel, páramos de la Laguna del Mosquito, *Cuatrecasas 23242* (US); Páramo del Quindio, *Pennell & Hazen 9974* (NY). **Cauca:** Puracé, Parque Nacional Natural de Puracé, *Lozano et al. 4542* (F, NY); Puracé, *Sneidern 2274* (GH, NY, S); Cabeceras del Río Páez, Laguna del Páez, *Cuatrecasas 19078* (GH, K, US); P'aramo del Puracé, San Francisco, *Cuatrecasas 14567* (US); Macizo Colombiano, alrededores de La Hoyala, Idrobo, *Pinto & Bischler 3548* (P); Mt Purace, Rio Anambiu, *Killip 6771* (GH, NY). **Cundinamarca:** Macizo de Bogotá, Quebrada del Rosal, *Cuatrecasas 5702* (F); Macizo de Bogotá: Quebrada de San Cristóbal, *Cuatrecasas 5121* (F); Old Spanish rd from San Cristóbal to Ubaque, Finca El Delirio, *Schiefer 911* (GH, MO, NY); Mt Chuscal, W Zipaquira, *Pennell 2603* (NY). **Huila:** Balsillas, *Rusby & Pennell 715* (GH, MO, NY); Rio Villalobos, vicinity of Río Suazita, *Schultes & Villarreal 5613* (GH, NY). **Nariño:** Mariña, near village Chiles, E Volcán Chiles, on the Colombia-Ecuador border, *Wiggins 10585A* (DS). **Norte de Santander:** 23 km N Toledo up Río Culaga, *Fassett 25987* (US); NE of La Belleja, *Fassett 25812* (GH). **Putumayo:** 5 km S of Sibundoy, *Chindoy 96* (GH). **Quindio:** Mpo Salento, Vereda Cocóra, 4°40'-45'N, 75°20'-25'W, Luteyn, *Fuertes & Rangel 13073* (GH, MO, NY). **Putumayo:** Pato-Macoa rd, near Mirador, *Croat 51786* (MO); 5 km S of Sibundoy, *Bristol 434* (GH). **Santander:** between La Paz and Velez, *Fassett 25141* (GH). **Tolima:** Rosalito, near Páramo de Ruiz, *Pennell 2976* (GH, K, MO, NY). **Valle:** cabecerass del río Tuluá, Quebrada de Las Vegas, *Cuatrecasas 20259* (P, US), *Cuatrecasas 20392* (P, US). **ECUADOR.** Vicinity of Huigra, *Rose & Rose 22227* (NY). **Azuay:** road Gualaceo-Limón, km 25.2, 3°0'29"-51"S, 78°39'43"-78°40'2"W, *Jørgensen et al. 1882* (MO, NY). **Bolivar:** Hacienda Talahua, *Penland & Summers 638* (F, GH). **Bioco:** Malabo-Pico Basilé, km 3, *Carvalho 2154* (MO). **Cañar:** Ingapirca, 2°30'S, 78°53'W, *Kohn 1460* (MO); near El Tambo, *Camp E-3984* (GH, NY). **Carchi:** between Tulcan and Maldonado, 0°47'N, 77°58'W, *Eriksen 59005* (AAU, MO, NY, QCA); 28 km N El angel, 0°43'N, 77°47'W, *Holm-Nielsen 23884* (AAU, NY). **Chimborazo:** Nevado El Altar, near Río Blanco, 1°40'S, 78°30'W, *Juncosa 848* (GH, MO); Riobamba Canton, Parroquia Pungala, Comunidad Alao-Lactapamba, Parque Nacional Sangay, Páramo de Culebrillas, 1°58'S, 78°28'W, Cerón, *Montesdeoca & Craing 11806* (MO, QCNE); Urbina Pass, Nudo de Igualata, *Penland & Summers 455* (F, GH); Páramo de Carnicería, Bolcán Sangay, *Acosta Solís 7679* (F); Chimborazo/Morona Santiago, Cerros Yuibug, Pailacajas, 1°45'S, 78°27'W, *Sklenar & Sklenarova 3084* (MO, PRC). **Cotopaxi:** Muro Urcu, 0°47'S, 78°24'W, *Holm-Nielsen 16480* (AAU, MO, NY, QCA); Parque Nac. de Cotopaxi, Quebrada Mishaguaico along road to Limpio Pungo, 0°38'S, 78°28'W, *Laegaard 101467* (AAU, MO); Río Chalupas, at Cotopaxi/Napo, 0°50'S, 78°21'W, *Laegaard 101739* (AAU, MO). **Imbabura:** Lake Cuicocha, Isolte Chica, *Asplund 7159* (GH, K, LIL, NY, P, S); NE side of Cayambe Mt, *Cazalet & Pennington 5776* (B, K, NY, UC, US); km 28-31 Yahuarcocha-Mariano Acosta, 0°20'N, 77°58'W, *Laegaard 101216* (AAU, MO); NW slopes of Cayambe, *Wiggins 10374* (DS, GH). **Loja:** Loja-Zamora rd, km 15, 3°58'S, 79°08'W, *Madsen 74028* (AAU); 12 km

on Loja-Zamora rd, 3°55'S, 79°09'W, *Ellemann* 75382 (AAU, MO); 12 km NW Saraguro on Loma Paredones, 3°36'S, 79°10'W, *Ellemann* 91666 (AAU, MO). **Morona-Santiago:** between Cebadas and Zuñac on Riobama-Macas rd, 2°12'S, 78°23'W, *Croat et al.* 86242 (MO); Gualaceo-Limón rd, 0.6 km E of Azuay border, 28.5 km E Gualaceo, 3°00'S, 78°42'W, *Croat & Menke* 89183 (MO); Parque Nacional Sangay, between Yanayacu and Culebrillas, 2°0'S, 78°30'W, *Clark et al.* 1867 (MO); between Mendez and Paute, 25 km W Méndez, 2°38'S, 78°25'W, *Croat et al.* 90779 (MO). **Napo:** Laguan Papallacta, 0°23'S, 78°9'W, *Laegaard* 103120 (AAU, MO, QCA); Laguna San Marcos, 0°7'S, 77°58'W, *Øllgaard et al.* 34054 (AAU, MO, NY, QCA); 6 km NE of km 45 on Salcedo-Napo rd, 0°56'S, 78°23'W, *Laegaard* 53365 (AAU, MO, QCA); NW slope of Antisana, N Lago Mauca-Machay, 0°26'S, 78°9'W, *Holm-Nielsen* 20751 (AAU, MO, NY, QCA); Quijos Cantón, Laguna La Mica, 0°32'S, 78°13'W, *Vargas & Narváez* 2150 (MO); Río Aliso, 8 km SE Cosanga, 0°36'S, 77°56'W, *Vargas et al.* 2934 (MO); Baeza, 0°28'S, 77°53'W, *Balslev & Madsen* 10301 (F); Laguna Encantada, 1°11'S, 78°12'W, *Holm-Nielsen* 41979 (AAU, NY). **Napo-Pastaza:** flat below Ainchilibi, *Barclay & Juajibioy* 9056 (MO); Baeza, *Gilli* 354 (W). **Pichincha:** Tambillo, *Asplund* 6413 (K, NY); Carretera antigua Chillagallo-San Juan-Chiriboga-Empalme, km 27, 0°17'S, 78°38'W, *Zak* 862 (AAU, K, MO, NY); Pifo-Pintag, 0°19'S, 78°17'W, *Laegaard* 102255 (AAU, MO, QCA); Rucu Pichinca, 0°10'S, 78°34'W, *Sklenar & Kostechova* 249 (MO, PRC); Oyacachi, *Acosta-Solis* 11102 (F) **Tungurahua.** Santiago de Pillaro, Parque Nacional Llanganates, Valle de los Frailejones, 1°10'S, 78°15'W, *Narváez et al.* 494 (MO); Mocha, Parroquia Pinguili, 2 km antes de la Base del Lado Oriental del Caryguayrazo, *Cerón* 19261 (MO); Banos Cantón, Parque Nacional Llanganates, 0°10'S, 78°15'W, *Vargas, Ronquillo & Granda* 2742 (MO); 6 km S Mocha, half way between Ambato and Riobamba, 1°27'S, 78°41'W, *Iltis & Iltis E-453* (MO); between Leito and la Cima, *Acosta-Solis* 9064 (F). **Zamora-Chinchipec:** km 17 on Loja-Zamora rd, 3°59'S, 79°8'W, *Holm-Nielsen & Jeppesen* 3546 (AAU, B, MO, S); 13 Km E pass on Loja-Zamora rd, 3°58'S, 79°05'W, *Øllgaard et al.* 90892 (AAU); parque nacional Podocarpus, Yangana-Valladolid rd, km 26, 4°29'S, 79°9'W, *Madsen et al.* 75769 (AAU). **PARAGUAY.** Cordillera de Villa Rica, *Balansa* 2622 (P); 81.3 km from border of Loja Prov. on road from Zamora to Loja, 4°08'S, 79°56'W, *Croat & Mencke* 89834 (MO). **PERU.** Pueblo, 3 miles below Ambo, Tomaiquichua, *Macbride & Featherstone* 2431 (F, G, NY). **Amazonas:** Chachapoyas, Leimebamba-La Joya trail, *Boeke* 1857 (SI). **Ancash:** Cajatambo, *Weberbauer* 2688 (G); Huaylas, Quebrada Alpamayo, 8°50'S, 77°42'W, *Smith et al.* 9836 (MO); Huaraz, Quebrada Shallap, 9°30'S, 77°23'W, *Smith et al.* 9685 (MO); Yungay, Quebrada Ranicuray, 8°59'S, 77°34'W, *Smith et al.* 10413 (GH, MO); Carhuaz, Quebrada Ishinca, 9°22'S, 77°25'W, *Smith et al.* 9542 (GH, MO). Prov. Bolognesi, Racrachaca, *Cerrate* 711 (GH). **Apurimac:** 4 km E of Cincacasa at km 177 from Puquio on rd to Chalhuanca, *Iltis et al.* 522 (GH). **Ayacucho:** Prov. Lucanas, 8 km NW Puquio, above San Juan, *Iltis et al.* 468 (GH). **Cajamarca:** San Miguel, Piedra Angosta, *Llatas* 809 (MO); Cajamarca, Pampa Larga, N Minera Yanacocha, *Sánchez* 7144 (F); Contumazá, Jalca de las Quinuas, *Sagástegui et al.* 10093 (MO, NY); Celendín, Sendamal, *Sagástegui et al.* 12095 (MO, NY). **Cuzco:** Pancartambo, Hac. Churu, *Herrera* 2331 (F); La Raya, *Pennell* 13498 (F); Paucartambo to Tres Cruces, Cerro de Cusilluyoc, *Pennell* 14164 (F, GH, NY). **Huánuco:** Huánco, Carpish pass, *Asplund* 12814 (K, UPS); Carpish pass, 84 km from Tingo María on hwy to Lima, *Allard* 20992 (US); between Huico and Tingo María

in valley of Río Huallaga, near km 443.5, 9°38'S, 76°03'W, *Croat 57830* (GH, MO); 13 km S Chinchao, *Gentry et al. 19270* (GH, MO, NY); 46.8 km NE Huánco on rd to Tingo María, *Plowman & Rury 11112* (F). **Junin:** Yauli-San Cristobol road, ca. 8 km from Yauli, *Duncan et al. 2663* (MO); km 125 on route 20A from Lima to La Oroya, *Davidson 3346* (MO). **La Libertad:** near Trujillo, *Morrison 8879* (UC). **Lambayeque:** Lambayeque, El Potrero, Penachi, *Llatas 1427* (F); Ferrenafe, ca. 4 km NW Incahuasi, below Cerro Punamachay on trail to Laguna Hualtaco, *Dillon & Skillman 4161* (F). **Lima:** Río Blanco, *Killip & Smith 21712* (F, NY); Prov. Yuayos, Cruz-pampa, *Cerrate 1113* (GH). **Pasco:** Oxapampa, 2-4 km N Mallampampa, 10°32'S, 75°45'W, *Smith & Canne 5850* (MO). **Puno:** N of Puno at km 4 on road to Juliaca, *Hutchison 1821* (MO, UC); Occa Pampa, *Shepard 92* (GH). **URUGUAY. Canelones:** Pando, *Herter 2258* (MO). **VENEZUELA. Merida:** vicinity of Timotes, *Pittier 12671* (G, NY); Páramo de Mucubají, alrededores de La Laguna Grande, *Barclay & Juajibioy 9629* (MO); 15 km WSW Santo Domingo or road to Merida, 8°48'N, 70°46'W, *Liesner 13767* (MO); Miranda, Quebrada El Turmero (afluente del Río Motatán), 10.4 km de El Aquila por la carretera a Pñango, *Berry & Calvo 4380* (MO); slightly below La Laguna Negra on trail to Laguna de Mucubaji, *Barclay & Juajibioy 9803* (GH, MO); Rangel, Páramo de Motumbo, along border of divide to Laguna Las Parias, *Stergios, Dorr & Wurdack 20519* (MO, US); Laguna Mucubají, above Los Apartaderos, *Steyermark 57498* (F, GH), *Vareschi 2123* (M)

Undoubtedly, *Cardamine bonariensis* is the most variable Central and South America species of the genus, and it exhibits tremendous altitudinal and latitudinal ranges accompanied by a wide variation of water bodies in which it frequently grows. It occupies altitudes from sea level (*Parra & Rodríguez 32* at CONC) to 4500 m (*Schulte 57* and *Duncan et al. 2663*, both at MO) and diverse habitats ranging from somewhat dry or slightly mesic areas all the way to completely submerged forms. This ecological diversity goes hand in hand with tremendous morphological variation and phenotypic plasticity. Perhaps the most variable parts are the leaves and they range from compound and 3–9-foliolate terrestrial forms to those with exclusively simple leaves growing in aquatic or mesic habitats with saturated soils. The leaf and leaflet margin also varies, and in the aquatic forms it is always entire or repand whereas in the terrestrial forms they are dentate or lobed. The presence of indumentum always seems to be found in the terrestrial forms. The bracteate portion of the raceme also varies considerably, and some forms have racemes bracteate throughout while others have only the proximal half is bracteate, and yet in other very rare forms only the lowermost one or two flowers are bracteate. As for fruit length and orientation, it is quite variable, and none of the morphological extremes in leaf morphology show any correlation with fruit orientation and size. The morphological continuity between the various forms often occurs within a given area, and the variation in morphology does not correspond with geography. What is most urgently needed is to conduct extensive experimentation on plants with identical genotypes grown under different ecological conditions. Because the plants are rhizomatous perennial, one can easily conduct that type of experimentation. However, it appears likely that some ecological differentiation would be found in such a variable species with continuous variation from Mexico southward into Patagonia.

Schulz (1903), Boelcke & Romanczuk (1984), and Rollins (1993) adopted the name *Cardamine flaccida* for the species, but the earliest name is *C. bonariensis*, and the types of the two taxa are hardly distinguishable. However, Schulz (1936) recognized both *C. bonariensis*, *C. flaccida*, and *C. killipii* as three related species. Boelcke (1967) recognized both *C. bonariensis* and *C. flaccida* and separated *C. bonariensis* by having prostrate (vs. ascending or erect) stems, flowers from axils of middle and upper leaves (vs. bracteate racemes), and variously oriented (vs. erect) fruits. In my opinion, this complex represents a continuum the three species recognized by

Schulz (1936) of which represent only a fraction of the many extremes variously recognized as species, subspecies, varieties, or forms. The type of *C. bonariensis* is a robust plant bracteate throughout and with obovate, three lobed, simple, long-petiolate bracts and trifoliolate uppermost cauline leaves. The basal portion of the plant is missing. The types of other extreme (initially described as *C. minima*, *C. demissa*, *C. pusilla*, *C. andicola*, and *C. axillaris*) have simple, orbicular to reniform, entire, short-petiolate leaves and bracts and rooting nodes. This form is typical of the floating, submersed, or boggy plants, and often it forms dense mats. Its much coarser form was recognized by Schulz (1928, 1936) and Macbride (1938) as *C. killipii*. The other extreme, represented by *C. nasturtioides* and *C. alsophila*, are erect plants of wet habitats and have 7–9-foliolate cauline leaves, 3–5-foliolate bracts, and dentate to crenate leaflets. The type of *C. flaccida* falls morphologically between those of *C. bonariensis* and *C. nasturtioides*.

There is no perfect solution that handles all of the tremendous variability to the satisfaction of everyone. Schulz (1903), and to a limited extent Rollins (1993), took the position of according infraspecific status to as many variants as they can and without consideration of the geographic and morphological integrity of the variants. For example, forms almost typical to the type of *C. killipii* from Colombia and be found in Argentina (*Parodi 10536* at F), Peru (*Killip & Smith 21712* at F), Bolivia (*Ritter & Garrett 1102*, MO), and Ecuador (*Sklenar & Sklenarova 3084* at MO). Similar examples can also be cited for the other forms represented by the types of *C. bonariensis*, *C. nasturtioides*, and *C. minima*. Indeed, Schulz (1903) left behind far more additional variants that he did not name, and most of the taxa he recognized have sporadic occurrence throughout South America similar to the example of *C. killipii*. Following and further building on that approach, one would make the taxonomy of this complex far more confusing for subsequent workers. The other extreme would be to recognize one, highly variable species without infraspecific taxa and in the same way we handle the equally variable watercress, *Nasturtium officinale* R. Brown. In the absence of extensive field and molecular studies on the *C. bonariensis* complex, I am inclined not to recognize any infraspecific taxa.

Morrison 16954 is a mixed collection of *Cardamine bonariensis* and *C. volckmannii*, whereas Holm-Nielson et al. 3546 is a mixed sample of *C. bonariensis* and *C. ovata*. Boelcke et al. 5465 (BAA) is a mixed collection of *C. bonariensis* and *C. vulgaris*.

Cardamine bonariensis is the most variable Central and South America species of the genus, and it exhibits tremendous altitudinal and latitudinal ranges accompanied by a wide variation of water bodies in which it frequently grows. Perhaps the most variable parts are the leaves and they range from compound and 3–9-foliolate terrestrial forms to those with exclusively simple leaves growing in aquatic or mesic habitats with saturated soils. The leaf and leaflet margin also varies, and in the aquatic forms it is always entire or repand whereas in the terrestrial forms they are dentate or lobed. The bracteate portion of the raceme also varies considerably, and some forms have racemes bracteate throughout while others have only the proximal half is bracteate, and yet in other very rare forms only the lowermost one or two flowers are bracteate. As for fruit length and orientation, it is quite variable, and none of the morphological extremes in leaf morphology show any correlation with fruit orientation and size. The morphological continuity between the various forms often occurs within a given area, and the variation in morphology does not correspond with geography. What is most urgently needed is to conduct extensive experimentation on plants with identical genotypes grown under different ecological conditions.

Cardamine breweri S. Watson, Proc. Amer. Acad. Arts 10: 339. 1875. TYPE: United States, California, near Sonora Pass, 8000–10,000 ft, 17 Jul 1863, *W. H. Brewer 1890* (lectotype designated by Detling (1937: 72), GH!).

Cardamine callosicrenata Piper, Bot. Gaz. 22: 488. 1896. TYPE: United States

Cardamine foliacea Greene, Pittonia 4: 201. 1900. TYPE: United States,
Cardamine hederifolia Greene, Pittonia 4: 202. 1900. TYPE: United States, Oregon, E base of
 Cascade Mts., 1893, Mrs. R. M. Austin s.n. (holotype, NDG).
Cardamine leibergii Holzinger, Contr. U.S. Natl. Herb. 3: 212. 1895; *C. breweri* var. *leibergii*
 (Holzinger) C. L. Hitchcock, Univ. Wash. Publ. Biol. 17(2): 468. 1964; *C. vallicola* subsp.
leibergii (Holzinger) O. E. Schulz, Bot. Jahrb. Syst. 32: 523. 1903; *C. sandbergii* Holzinger,
 Contr. U.S. Natl. Herb. 3: pl. 3. 1895. TYPE: United States, Idaho, Kootenai Co., near summit
 of Packsaddle Peak, 6 Aug 1892, J. H. Sandberg, D. T. MacDougal, & A. A. Heller 856
 (holotype,; isotypes, NY!; US!).
Cardamine modocensis Greene, Pittonia 4: 203. 1900. TYPE: United States, California, Modoc
 Co., Lassen Creek, Aug. 1894, Mrs. R. M. Austin s.n. (lectotype designated by Jepson (Fl.
 Calif. 2: 55. 1936), NDG).
Cardamine orbicularis Greene, Pittonia 4: 202. 1900; *C. breweri* var. *orbicularis* (Greene)
 Detling, Amer. J. Bot. 24: 73. 1937. TYPE: United States,
Cardamine vallicola Greene, Pittonia 3: 116. 1896. TYPE: United States,
Herbs, perennial, glabrous or rarely sparsely pubescent near base. **Rhizomes** slender,
 cylindrical, rarely slightly thickened at stem base, 1–3(–4) mm in diam.; stolons absent. **Stems**
 (0.6–)1.5–6(–7) dm, erect or decumbent at base, simple or branched, glabrous or pubescent near
 base. **Rhizomal leaves** absent; cauline leaves 3–8(–11), 3–5-foliolate or rarely only terminal
 leaflet present, 2.5–12(–13.5) cm; petiole (0.7)1–4(–6) cm, base not auriculate; terminal leaflet
 ovate to orbicular or rarely subcordate, 1.5–4(–5) × 1.5–3.5(–5) cm, petiolule 0.4–1.6 cm, base
 truncate, rounded or cordate, margin crenate, dentate, sinuate, or to 11-lobed, puberulent or not;
 lateral leaflets (when present) often considerably smaller and narrower than terminal one,
 subsessile or on petiolule to 4 mm, margin same as terminal leaflet. **Racemes** ebracteate; fruiting
 pedicels ascending to divaricate-ascending, (0.7–)1–2 cm. **Sepals** oblong, 2–3(–3.8) × 1–1.5 mm,
 erect, base of lateral pair not saccate; petals white, oblanceolate, 3.5–6(–7) × 1.5–2.5(–3) mm,
 not clawed, apex rounded or slightly emarginate; median filament pairs 2.5–3.5 mm, lateral pair
 2–2.5 mm; anthers oblong, 0.7–1 mm. **Fruit** linear, 1.5–3.5 cm × 1–1.5 mm; valves glabrous;
 style 0.2–1.5(–2.5) mm; ovules and seeds 14–28 per fruit. **Seeds** brown, oblong, 1–1.6 × 0.9–1.1
 mm.
 Flowering: Jun–Jul.
 Habitat: streambanks, seepage, lake shores, creeks, wet meadows, swamps, ponds.
 Elevation: 1200–3000 m.
 Distribution: Canada (British Columbia), United States (E and N California, N Colorado, Idaho,
 W Montana, Nevada, Oregon, N Utah, Washington, W and S Wyoming).

Cardamine bulbifera (Linnaeus) Crantz, Cl. Crucif. Emend. 127. 1769; *Dentaria bulbifera*
 Linnaeus, Sp. Pl. 2: 653. 1753. TYPE: Herb. Burser XVIII(1): 82 (lectotype designated by
 Marhold (2001: 45), UPS).

Cardamine bulbosa (Schreber ex Muhlenberg) B.S.P., Prelim. Cat. 4. 1888; *Arabis bulbosa*
 Schreber ex Muhlenberg, Trans. Amer. Philos. Soc. 3: 174. 1793; *Dracamine bulbosa*
 (Schreber ex Muhlenberg) Nieuwland, Amer. Midl. Naturalist 4: 40. 1915. TYPE:
Arabis rhomboidea Persoon, Syn. Pl. 2: 204. 1807; *C. rhomboidea* (Persoon) de Candolle, Syst.
 Nat. 2: 246. 1821; *Dentaria rhomboidea* (Persoon) Greene, Pittonia 3: 124. 1896. TYPE :
Cardamine rhomboidea var. *hirsuta* O. E. Schulz, Bot. Jahrb. Syst. 32: 426. 1903. TYPE:
Cardamine rhomboidea var. *parviflora* O. E. Schulz, Bot. Jahrb. Syst. 32 : 426. 1903. TYPE:
Cardamine rhomboidea var. *pilosa* O. E. Schulz, Bot. Jahrb. Syst. 32: 426. 1903. TYPE:

Herbs, perennial, glabrous or sparsely pubescent distally. **Rhizomes** fleshy, tuberous at stem base and sometimes at intervals, subglobose, lobed, 4–15 mm in diam.; stolons absent. **Stems** (1–)2–6 dm, erect, simple, glabrous or sparsely pubescent on distal half with trichomes 0.02–0.1 mm. **Rhizomal leaves** simple, (2–)4–13(–16) cm; petiole (1.5–)2.5–10(–13) cm; blade reniform to cordate or ovate, rarely oblong, (1–)2–4(–6) cm, base obtuse to cordate, margin repand or entire, rarely shallowly dentate, not puberulent; cauline leaves (2–)4–10(–14), simple, not auriculate at base, middle ones short petiolate, 3–6(–9) × 1–3(–4.5) cm, upper ones sessile, ovate to oblong or oblong-linear to lanceolate, entire, repand, or dentate, minutely pubescent along margin, **Racemes** ebracteate; fruiting pedicels ascending to divaricate, (1–)1.5–2.2(–3) cm. **Sepals** oblong, 2.5–4.5 × 1.5–2 mm, erect, glabrous, base of lateral pair not saccate; petals white or very rarely pale pink, obovate, (6–)7–12(–16) × 3–5 mm, short clawed, apex rounded; median filament pairs 4.5–7 mm, lateral pair 2–3.5 mm; anthers oblong, 1–1.5 mm. **Fruit** linear, 2–3.5(–4) cm × 1.4–1.7 mm; valves glabrous; style 2–4(–5) mm; ovules and seeds 14–24 per fruit. **Seeds** dark orange to greenish yellow, oblong to circular, 1.7–2.1 × 1–1.4 mm. **2n** = 16, 56, 64, 80, 96, 112.

Flowering: Mar–Jun.

Habitat: wet grounds, low woodlands, moss hummocks, alluvial woods, grassy floodplains, wet pastures, meadows, pine lands, creek bottoms, stream banks, sandy bottoms, ditches, mesic or wet forests, swamps, marshes, seepy bluffs.

Elevation: 0–850.

Distribution: Canada (Manitoba, Ontario, Quebec), United States (Alabama, Arkansas, Connecticut, Delaware, District of Columbia, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New Hampshire, New Jersey, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, South Carolina, E South Dakota, Texas, Tennessee, Vermont, Virginia, West Virginia, Wisconsin).

Cardamine calcicola W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 11: 203. 1919. TYPE: China, Yunnan, Mountains in the NE of the Yangtze bend, 27°45'N, 11,000–12,000 ft, Jul 1913, *George Forrest 10471* (holotype, E!).

Herbs, perennial, sparsely to densely pilose on stem and petioles with crisped trichomes to 1.2 mm. **Rhizomes** thick, short, often with several stolons. **Stems** 10–35 cm, erect, simple, pilose or distal parts subglabrous, not flexuous. **Basal leaves** rosulate, simple or rarely trifoliolate; petiole 1–10 cm, often densely pilose; leaf blade or terminal leaflet reniform, 0.7–3 × 1–4 cm, sparsely pilose or subglabrous, base cordate, margin subentire, repand, or 7–9-crenate, apex acute or obtuse; cauline leaves 2–6, 3–7-foliolate; petiole 0.2–2.5 cm, not auriculate at base; terminal leaflet obovate, 0.7–2.5 × 0.6–2.5 cm, with a petiolule 1–8 mm, sparsely pilose or subglabrous, base cuneate and often decurrent with adjacent lateral leaflets, margin entire or obscurely to strongly dentate, apex acute or rounded; lateral leaflets much smaller than terminal one, sessile or rarely shortly petiolulate. **Racemes** ebracteate; fruiting pedicels divaricate or ascending, 0.7–1.6 cm, straight. **Sepals** oblong, 3–4 × 1–2 mm, margin and apex membranous, base not saccate; petals white, obovate, 6–9 × 3–5 mm, apex rounded; median filament pairs 2.5–3.5 mm, lateral pair 2–2.5 mm; anthers narrowly oblong, 1–1.3 mm; ovules 12–14 per ovary. **Fruit** linear, 2–3 cm × 1–1.5 mm; valves glabrous, smooth; style 0.5–2 mm. **Seeds** brown, oblong-ovate, 1.3–1.9 × 0.8–1.3 mm, wingless.

Flowering: May–Jul.

Habitat: crevices of limestone cliffs, moist rocky pastures, valleys.

Elevation: 2600–3700 m.
Distribution: China (Yunnan).

Cardamine caldeirarum Guthnick

Cardamine californica (Nuttall) Greene, Fl. Francisc. 266. 1891; *Dentaria californica* Nuttall in Torrey & A. Gray, Fl. N. Amer. 1: 88. 1838; *D. integrifolia* var. *californica* (Nuttall) Jepson, Man. Fl. Pl. Calif. 426. 1925. TYPE:

Cardamine californica var. *brevistyla* O. E. Schulz, Bot. Jahrb. Syst. 32: 389. 1903. TYPE:

Cardamine californica var. *fecunda* O. E. Schulz, Bot. Jahrb. Syst. 32: 386. 1903. TYPE:

Cardamine californica var. *pubescens* O. E. Schulz, Bot. Jahrb. Syst. 32: 388. 1903. TYPE:

Cardamine californica var. *robinsoniana* O. E. Schulz, Bot. Jahrb. Syst. 32: 385. 1903. TYPE:

Cardamine cardiophylla Greene, Fl. Francisc. 266. 1891; *C. californica* prol. *cardiophylla* (Greene) O. E. Schulz, Bot. Jahrb. Syst. 32: 388. 1903; *C. californica* var. *cardiophylla* (Greene) Rollins, Harvard Pap. Bot. 4: 44. 1993; *D. cardiophylla* (Greene) B. L. Robinson in A. Gray & S. Watson, Syn. Fl. N. Amer. 1(1): 155. 1895; *D. californica* var. *cardiophylla* (Greene) Detling, Amer. J. Bot. 23: 576. 1936; *D. integrifolia* var. *cardiophylla* (Greene) Jepson, Man. Fl. Pl. Calif. 426. 1925. TYPE:

Cardamine cuneata Greene, Bull. Calif. Acad. Sci. 1: 74. 1885; *C. californica* subsp. *cuneata* (Greene) O. E. Schulz, Bot. Jahrb. Syst. 32: 386. 1903; *C. californica* var. *cuneata* (Greene) Rollins; *D. californica* var. *cuneata* (Greene) Detling, Amer. J. Bot. 23: 576. 1936; *D. cuneata* (Greene) Greene, Pittonia 3: 123. 1896. TYPE:

Cardamine sinuata Greene, Erythea 1: 148. 1893; *C. californica* var. *sinuata* (Greene) O. E. Schulz, Bot. Jahrb. Syst. 32: 387. 1903; *C. integrifolia* var. *sinuata* (Greene) C. L. Hitchcock, Univ. Wash. Publ. Biol. 17(2): 469. 1964; *D. sinuata* (Greene) Greene, Pittonia 3: 123. 1896; *D. californica* var. *sinuata* (Greene) Detling, Amer. J. Bot. 23: 576. 1936. TYPE:

Cardamine paucisecta Benthams, Pl. Hartweg. 297. 1848. TYPE:

Dentaria integrifolia Nuttall in Torrey & A. Gray, Fl. N. Amer. 1: 88. 1838; *C. integrifolia* (Nuttall) Greene, Bull. Calif. Acad. Sci. 2: 389. 1887; *C. californica* prol. *integrifolia* (Nuttall) O. E. Schulz, Bot. Jahrb. Syst. 32: 386. 1903; *C. californica* var. *integrifolia* (Nuttall) Rollins, Harvard Pap. Bot. 4: 44. 1993; *D. californica* var. *integrifolia* (Nuttall) Detling, Amer. J. Bot. 23: 586. 1936. TYPE:

D. integrifolia var. *traceyi* Jepson, Man. Fl. Pl. Calif. 426. 1925. TYPE:

Dentaria pachystigma S. Watson var. *dissectifolia* Detling, Amer. J. Bot. 23: 575. 1936; *C. pachystigma* (S. Watson) Rollins var. *dissectifolia* (Detling) Rollins, Harvard Pap. Bot. 4: 45. 1993. TYPE: United States, California, Butte Co., Magalia, L. E. Detling 1631 (holotype, DS!).

Herbs, perennial, glabrous or rarely minutely pubescent. **Rhizomes** fleshy, globose to ovoid or suboblong, (3–)4–10 mm in diam., deeply underground; stolons absent. **Stems** (2–)2.7–6(–7) dm, erect, simple, glabrous or rarely pubescent. **Rhizomal leaves** 3(or 5–7)-foliolate, or occasionally simple, 8–25(–38) cm; petiole (5–)8–25(–32) cm; terminal leaflet or blade of simple leaf ovate to orbicular to broadly cordate or reniform, (1.5–)2.5–7.5(–10) × (1.2–)2–9(–13) cm, with a petiolule (0.7–)2–5(–11) cm, base obtuse to cordate, margin entire or dentate to shallowly sinuate, often with apiculae at veins ending at margin, glabrous or minutely pubescent on veins; lateral leaflets (when present) about as large as or smaller than terminal leaflet, petiolulate to subsessile, margin same as terminal leaflet; cauline leaves 2–5, 3(or 5)-foliolate or rarely simple; petiole 1–5(–9) cm, base not auriculate; terminal lobe broadly ovate to suborbicular or lanceolate, rarely narrowly oblong, 1–7 × (0.5–)1–4.7(–6.5) cm, petiolulate or sessile; lateral leaflets similar

to terminal one but smaller, sessile, margin dentate or rarely entire. **Racemes** ebracteate; fruiting pedicels ascending to divaricate, 1–3.3(–4.1) cm. **Sepals** oblong, 3.5–4.5(–5.5) × 1.5–2(–2.5) mm, erect to ascending, base of lateral pair saccate; petals white to pale rose, often broadly obovate, 8–13(–15) × 4–8 mm, clawed, apex rounded; median filament pairs 4–6.5 mm, lateral pair 3–4 mm; anthers oblong, 1.2–1.7 mm. **Fruit** linear, 2.2–5.4(–6) cm × 2–3 mm; valves glabrous; style 2–5(–6) mm; ovules and seeds 12–22 per fruit. **Seeds** dark brown, oblong to broadly ovate, 1.7–2.8 × 1.2–1.8 mm. **2n** = 32.

Flowering: Jan–May.

Habitat: wooded ravines, forest floor, shady slopes, open woods, shady rock crevices, stream banks and bottoms, canyons, moist hillsides, cliffs.

Elevation: 0–1400 m.

Distribution: Mexico (Baja California), United States (California).

Cardamine calthifolia H. Léveillé, Bull. Acad. Géog. Bot. 24: 281. 1914. TYPE: China, Yunnan, valley of Kiao-me-ti, 300 m, *E. E. Maire s.n.* (holotype, E!; isotypes, E!, P!).

Herbs, perennial, sparsely pilose at least on leaves. **Rhizomes** stout, to 7 cm in diam., with a few stolons. **Stems** 11–30 cm, stout, thickest at base, erect, simple. **Basal leaves** fleshy, simple; petiole (3.5)6–15(–20) cm, glabrous; leaf blade reniform, (1–)1.5–3 × (1.5–)3–6 cm, always wider than long, glabrous, base broadly cordate, margin repand, mucronate at vein endings, apex rounded; cauline leaves 2–5, simple, petiolate or rarely uppermost sessile; petiole (0.3–)1–3.5 cm, base not auriculate or rarely with minute auricles to 0.3 × 0.3 mm; leaf blade reniform, 1–2.5 × 1.5–4 cm, base cordate, margin dentate-repand and mucronate at vein endings. **Racemes** ebracteate; flowering pedicels 1–2 cm, divaricate, straight, glabrous, stoutish. **Sepals** ovate or oblong, 2.5–4 × 1.5–2 mm, glabrous, margin membranous, base of lateral pair saccate; petals violet, deep magenta, or rarely pale lavender or white, obovate, 7–10 × 3.5–5 mm; median filament pairs 3.5–5 mm, lateral pair 2–3.5 mm; anthers oblong, 0.9–1.1 mm. **Fruits** and seeds not seen.

Flowering: Mar–Apr.

Habitat: Shady wet places, moist stony pastures.

Elevation: 2400–3000 m.

Distribution: China (Guangdong, Sichuan, Yunnan), Myanmar.

Cardamine carnosa Waldstein & Kitaibel, Descr. Icon Pl. Hung. 137, t. 129. 1804; *Pterneurum carnosum* (Waldstein & Kitaibel) de Candolle, Syst. Nat. 2: 270. 1821. TYPE: [Croatia, Velebit Mts.], “inter lapides libros montium clcareorum Croatiam a Dalmatia separantium,” *Kitaibel s.n.* (B-WILLD 11974).

Cardamine caroides C. Y. Wu ex W. T. Wang, Acta Bot. Yunnan. 9: 17. 1987. TYPE: China, Sichuan, Motikonga, Lamashi, 6 Jul 1937, 3800 m, *T. T. Yü 6889* (PE!).

Herbs, perennial, glabrous or sparsely to densely pilose with trichomes to 0.7 mm. **Rhizomes** thick, to 10 × 5 mm, with numerous stolons. **Stems** 7–15 cm, erect, simple, thick at base, pilose or glabrous at base. **Rhizomal leaves** and lowermost cauline pilose; petiole 1–3 cm; leaf blade pinnatisect into linear to linear-oblong lobes; terminal lobe obovate in outline, to 8 × 4 mm, cuneate basally into a petiolule 1–4 mm, deeply trifid or apically three toothed; lateral lobes 1–4 on each side of rachis, 2–8 × 0.5–2 mm, undivided or unequally 2- or 3-fid, margin entire, apex acute; cauline leaves 2–4, including petiole 1.5–4.5 cm, similar to lowermost cauline leaves but with fewer and narrower lobes, petiole base not auriculate. **Racemes** ebracteate, 6–14-flowered;

fruiting pedicels ascending or suberect, 0.7–1.5 cm, slender, glabrous, subappressed to rachis. **Sepals** ovate or suboblong, 2–2.5 × 0.8–1.5 mm, sparsely pilose, subapically membranous, lateral pair subsaccate; petals lavender, obovate, 5–6 × 2–2.5 mm, apex obtuse; median filament pairs 2.5–3.5 mm, flattened and to 0.5 mm wide; lateral pair 1.5–2 mm; anthers oblong, 0.6–0.8 mm; ovules 12–16 per ovary. **Fruit** (young) ca. 2 cm × 0.8 mm; valves glabrous; style 1–1.5 mm.

Seeds not seen.

Flowering: Jul.

Elevation: about 3800 m.

Distribution: China (Sichuan).

Notes: known thus far only from the holotype.

Cardamine castellana Lihová & Marhold, *Taxon* 52: 795. 2003. TYPE:

Cardamine changbaiana Al-Shehbaz, *Novon* 10: 323. 2000. TYPE: China, Jilin, Changbai Shan, Tianchi, rocky slopes, 2400 m, 1 Aug 1957, *Qian Jiaju 580* (holotype, PE!).

Cardamine resedifolia Linnaeus var. *morii* Nakai, ... TYPE:

Herbs, perennial, 2–8 cm, scapose, glabrous throughout. **Rhizomes** slender, 0.4–0.7 mm in diam. **Stems** 2–8 cm, erect, leafless or rarely 1-leaved. **Basal leaves** rosulate, fleshy; petiole 0.3–3.5 cm; leaf blade simple or rarely 3-lobed, broadly ovate, subcordate, or oblong, 2–10 × 1.5–8 mm, base cordate or obtuse, margin entire or repand, apex rounded or obtuse; cauline leaves absent, rarely 1 and petiolate, similar but narrower than basal leaves, petiole base not auriculate. **Racemes** ebracteate, 2–5(–7)-flowered; fruiting pedicels erect to erect-ascending, 2–7 mm, straight. **Sepals** oblong, 1.3–1.7 × 0.6–0.8 mm; petals white, obovate, 3–3.5 × 1.5–1.8 mm, base tapering into a claw 0.4–1 mm, apex rounded or subemarginate; filaments 1.4–2 mm; anthers oblong, 0.5–0.8 mm; ovules 8–12 per ovary. **Fruit** linear, 1–2 cm × 1.3–2 mm; gynophore 0.3–1 mm; valves smooth, glabrous; style 0.5–2 mm. **Seeds** brown, oblong to ovate-oblong, 1.2–1.5 × 0.8–1.1 mm, wingless and not margined.

Flowering: Jul–Aug.

Habitat: rocky slopes.

Elevation: 2400–2500 m.

Distribution: China (Jilin), Korea.

Cardamine chelidonia Linnaeus, *Sp. Pl.* 2: 655. 1753. TYPE:

Cardamine chenopodiifolia Persoon, *Syn. Pl.* 2: 195. 1807. TYPE: Uruguay, Montevideo, 1767, *Commerson s.n.* (holotype, P-JU; isotype, P!).

Sisymbrium spathulatum Poiret in Lamarck, *Encycl.* 7: 221. 1806; *Arabis spathulata* (Poiret) de Candolle, *Syst. Nat.* 2: 227. 1821, non *Cardamine spathulata* Michaux, *Fl. Boreal. Amer.* 2: 29. 1803. TYPE: Uruguay, Montevideo, 1767, *Commerson s.n.* (holotype, P-JU; isotype, P!; fragments, BAA!).

Sisymbrium bellidifolium Poiret in Lamarck, *Encycl.* 7: 220. 1806; *Arabis commersonii* de Candolle, *Syst. Nat.* 2: 228. 1821, non *Cardamine bellidifolia* Linnaeus, *Sp. Pl.* 2: 654. 1753, nec *A. bellidifolia* Crantz, *Stirp. Austr. Fasc. ed. 1, Fasc. 1, 42.* 1762. TYPE: Argentina, Buenos Aires, *Commerson s.n.* (holotype, P-JU; isotype, P!).

Heterocarpus fernandezianus Philippi, *Bot. Zeit.* 14: 641. 1856; *Cardamine fernandezianua* Johow, *Estud. Fl. Juan Fernand.* 110. 1896. TYPE:Muñoz Pizzaro (1960) listed *Philippi*

s.n. (SGO-63902) as the type, but that specimen was collected in September 1872, 16 years after the description of the species.

Cardamine argentina Spegazzini. TYPE: Argentina, Sierra Ventana, Nov 1895, *C. Spegazzini s.n.* (holotype, LP!).

Herbs, annual, sparsely to densely hirsute basally with trichomes to 1 mm, glabrescent above, with chasmogamous and cleistogamous flowers. **Stems** few to several from base, (0.6–)10–50 cm, erect or decumbent, simple or branched above, hirsute. **Basal leaves** rosulate, lyrate or undivided; petiole 1–4(–11) cm; leaf blade obovate to spatulate or oblong to oblanceolate, (1–)2–6(–8) × (0.5–)1–3(–4) cm, sparsely to densely hirsute, sometimes glabrous except for ciliate margin, base cuneate, margin dentate to crenate, sometimes repand, apex obtuse; cauline leaves petiolate, smaller or same size but gradually reduced in size and becoming sessile upward. **Racemes** ebracteate, 10–30-flowered; fruiting pedicel divaricate to ascending, 4–12(–17) mm. **Sepals** oblong, 2–2.5 × 1–1.2 mm, caducous; petals white, spatulate to oblanceolate, 3–5(–6) × 1.5–2 mm, apex obtuse; stamens 6; filaments 2–2.5 mm; anthers oblong to ovate, 0.4–0.5 mm; ovules (12–)14–20 per ovary. **Fruits** dehiscent, linear, (1.7–)2–3.5(–4) cm × 1.5–2.2 mm, thin walled; style 0.5–1(–1.8) mm. **Seeds** light brown, broadly oblong-ovate, 1.8–2.3 × 1.5–1.8 mm, with a narrow wing 0.1–0.3(–0.4) mm wide. **Cleistogamous** flowers solitary, producing geocarpic fruits; sepals to 0.8 mm; petals absent or to 0.5 mm; stamens 2, median; filaments to 0.6 mm; anthers to 0.2 mm; fruiting pedicels solitary, arising from basal leaf rosette, (1–)2–5 cm; geocarpic fruits indehiscent, obovate to fusiform, (5–)6.5–10 × 2.4–4 mm, slightly corky, (1–4)-seeded, without style; seeds oblong, 2.5–3.5 × 2–2.5 mm.

Flowering:.

Elevation: 0–800 m.

Habitat: Damp places.

Distribution: Argentina (Buenos Aires, Chaco, Córdoba, Corrientes, Entre Ríos, Formosa, Misiones), Bolivia (La Paz), Brazil (Rio de Janeiro, Rio Grande do Sul), Chile (Juan Fernandez Islands), Paraguay, Uruguay (Canelones, Moldonado, Montevideo, San José, Soriano).

Specimens examined: **ARGENTINA. Buenos Aires:** Hudson, *Parodi 9924* (GH, K, S), *Burkart 3952* (SI); Ribera del Rio de la Plata, Punta Larga, *Cabrera 2874* (SI); Parana Mini, *Burkart 20029* (SI); Dolores, Laguna Seigné, *Correa et al. 2369* (SI); Balcarce, Cerro de la Virgen, *Boelcke et al. 2402* (BAA); Partido Balcarce: Sierra de Volcán, Balcarce, *Hunziker 3870* (CORD). Partid. Tigre: Arroyo Gelves, *Hunziker 1456.5* (CORD). **Chaco.** Fontana, *Meyer 2322* (LIL). **Córdoba:** Punilla, Molinari, *Nicora 17637* (SI). **Corrientes:** Paso de los Libres, laguna Mansa, *Goodall & Tirel 39* (P), *Schinini et al. 7200* (SI); Gral. Alvear, rte 40 and rte Aguapey, *Lourteig et al. 2836* (P, SI); Mburucuya, Yaguareté-Rincón, *Pedersen 790* (K, LP, P, S); Mercedes, 75 km N Mercedes, Laguna Trin, Ea. Culantrillar, *Schinini et al. 11892* (G); Mercedes, Salto Ita Jhase, 9 km SW Boqueron, *Teressens et al. 5353* (GH, LIL, MO); Ituzaingó, Isla Apipé Grande, *Schinini & Vanni 15744* (MO); Paso de los Libres, *Goodall & Tirel 39* (P); La Cruz, *Burkart 7857* (SI). Dep. Mburucuyá, Estancia Santa Teresa, *Burkart 19331* (SI). Dep. Santo Tomé, 7 km E de Gdor. Virascro, Arroyo Garabí, *Schinini & Ahumada 20758* (BACP). **Entre Ríos:** Gualaguaychi, rio Paranacito, *Burkart et al. 26966* (BACP, K, SI); Concepcion del Uruguay, *Troncoso & Bacigalupo 3209* (BACP, SI), *Burkart et al. 28648* (SI). Dep. Concordia, camino de Calabacilla a Pto. Yerúa, *Troncoso et al. 2308* (SI). **Formosa:** Guaycules, *Jørgensen 3423* (LIL, MO, SI). **Misiones:** Dep. Iguazu: Parq Nac Iguazú, *Hunziker et al. 15481* (CORD), *Zardini et al. 854* (LP); Puerto Aguirro, *Fangualli 61* (LP). **BOLIVIA.** Coroico, *Bang 2347* (BM, E, F, G, GH, K,

MO, NY, W). **La Paz:** Sud Yungas, *Buchtein 178* (BAF, W); Sud Yungas, Puente Villa unos 2 km arriba del río Tamanpaya, *Beck 17776* (LPB, MO). **BRAZIL. Rio de Janeiro:** road between Alto da Serra and Meio da Serra, 22°33'S, 43°11'W, *Smith 1559* (BM, F, GH, K, NY, P, S, UC); Chemiss du Corcorado, *Glaziou 6466* (P). **Rio Grande do Sul:** Without locality, *Saint-Hilaire 1854* (F, P); Porto Aesgre, *Linman 339* (G); Parecí, Porto Montenegro, *Rambo 42972* (B, LIL); Vila Manresa, Porto Alegre, *Rambo 43476* (B, LIL), *Lindman 339* (K, NY, S); Osorio, *Rambo 48797* (B, SI); Granja Neugebauer, P. Itapoan, *Rambo 48944* (B, LIL), Pelotas, Cost Sacco & Rambo 824 (F); Morretes, Rio dos Sinos, *Rambo 42831* (K, W); San Francisco de Paula Cambara, *Rambo 36544* (S); Sao Leopoldo, *Eugenio 163* (NY). **CHILE.** Juan Fernandez, *Reed 89* (SG). **PARAGUAY.** Doña Juana, Villa-Rica, *Balansa 2622* (P). Del Guairá, Iturbe, *Montes 12758* (LP). **URUGUAY.** Doña-Juana, *Balansa 2623* (P); Concepcion, *Lorentz 1189* (B, G, K, P, W). **Canelones:** Santa Lucia, *Herter 78937* (F). **Moldonado.** Pungt Ballena, *Hunziker 3989* (BAB). **Montevideo:** Pocitos/Carrasco, *Herter 71215* (G, GH, K, LIL, MO, S, SI, UC); Punta Yeguas, *Osten 22933* (CAS); Carrasco, *Legrand 1162* (F); Punta Gorda, *Osten 5271* (SI). **San José:** Barra Sta. Lucia, *Herter 82210* (B). **Soriano:** Juan Jackson, St. Elena, *Gallinal et al. 5254* (MO, NY); Juan Jackson, Monzón-Heber, *Gallinal et al. 4388* (MO).

The specific epithets of *Sisymbrium bellidifolium* and *S. spathulatum* were published one year before that of *Cardamine chenopodiifolia*, but neither of them can be used in *Cardamine* (see synonymy above).

Of the approximately 200 species in *Cardamine*, *C. chenopodiifolia* is the only species that produces two fruit types, an indehiscent-geocarpic and dehiscent-aerial. The seeds produced from subterranean fruits are distinctly heavier and grow faster than those produced from aerial fruits (Cheplick, G. P. 1983. Differences between plants arising from aerial and subterranean seeds in the amphicarpic annual *Cardamine chenopodiifolia* (Cruciferae). *Bull. Torrey Bot. Club* 110: 442-448.). It has been shown that the subterranean fruiting pedicels produce adventitious roots (Gamm, R. & F. Weberling. 1986. Sporossbürtige Wurzeln an den unterirdischen Fruchtstielen bei der amphikarpen Art *Cardamine chenopodiifolia* Pers. *Flora*. 178: 19-21). The species also produces 2-stamened cleistogamous flowers that produce the subterranean fruits and 6-stamened chasmogamous aerial flowers (Gorczyński, T. 1935. Untersuchungen über Kleistogamie. 4. Entwicklung der Archesporgewebe und der Befruchtungsvorgang bei *Cardamine chenopodiifolia*. *Acta Soc. Bot. Pol.* 12: 257-274). Fruit and seed anatomy of both areal and subterranean parts were studied by P. Grimbach (1913. Vergleichende Anatomie verschiedenartiger Früchte und Samen bei derselben Spezies. *Bot. Jahrb.* 51(Beibl. 113): 1-52. *Cardamine chenopodiifolia*: pp. 33-50, figs. 22-31).

Cardamine chenopodiifolia is the only species that produces two fruit types, an indehiscent-geocarpic and dehiscent-aerial. The seeds produced from subterranean fruits are distinctly heavier and grow faster than those produced from aerial fruits (Cheplick, 1983). The species also produces 2-stamened cleistogamous flowers that produce the subterranean fruits and 6-stamened chasmogamous aerial flowers.

Cardamine cheotaiyenii Al-Shehbaz & G. Yang, *Harvard Pap. Bot.* 3(1): 73. 1998; *Hilliella alatipes* (Handel-Mazzetti) Y. H. Zhang & H. W. Li var. *macranthus* Y. H. Zhang, *Acta Bot. Yunnan.* 8: 403. 1986. TYPE: China, Yunnan, Malipo, Guan-gaw, 1000 m, 14 Feb 1940, C. W. Wang 86836 (holotype, KUN!; isotype, IBSC!).

Herbs, perennial, scapose. **Rhizomes** ca. 5 mm in diam., with prominent petiolar scars. **Stems** (scapes) 15–30 cm, glabrous, leafless. **Rhizomal leaves** 2, trifoliolate; petiole 5–30 cm, glabrous; leaflets ovate, 7–18 × 4–5 cm, adaxially glabrous, abaxially sparsely hirsute with thick trichomes 0.5–0.8 mm, base of terminal leaflet cuneate, that of lateral ones oblique, margin

repand to repand-crenate, sparsely ciliate with trichomes 0.1–0.2 mm, apex obtuse to acute; lateral veins ending with mucros 0.3–0.5 mm; petiolule of terminal leaflet 0.6–1.5 cm, that of lateral leaflets 2–6 mm; cauline leaves absent. **Racemes** ebracteate, few flowered, corymbose; flowering pedicels slender, 2–3.5 cm, glabrous. **Sepals** ascending, oblong, 5–6 × 2.5–3.5 mm, erect, slightly saccate at base, glabrous; petals white, oblong, 1.5–1.7 cm × 5–8 mm, erect, apex rounded; claw 1–2 mm; filaments white, erect, median pairs 6–7 mm, lateral pair 5–5.5 mm; anthers oblong, ca. 2 mm. **Fruits** and seeds unknown.

Flowering: Feb.

Elevation: ca. 1000 m.

Distribution: China (Yunnan/Malipo Xian).

Notes: known thus far only from the type collection.

Cardamine chilensis de Candolle, *Syt. Nat.* 2: 254. 1821. TYPE: Chile, “Dubia tetradynama siliquosa,” Ruiz & Pavón s.n. (holotype, BM or G). **My initial notes from that specimen is that it probably belongs to C. africana. Therefore, the plant must be checked again.**

Cardamine nana Barnéoud in Gay, *Fl. Chile* 1: 108. 1846; *C. chilensis* var. *nana* (Barnéoud) O. E. Schulz, *Bot. Jahrb. Syst.* 32: 445. 1903. TYPE: Chile, Valdivia, *C. Gay s.n.* (holotype, P!; isotypes, F!, P!).

Cardamine valdiviana Philippi, *Anal. Univ. Chile* 27: 314. 1865; *C. chilensis* var. *valdiviana* (Philippi) Reiche, *Fl. Chile* 1: 94. 1896. TYPE: Chile, Valdivia: San Juan, Oct 1864, *F.*

Philippi s.n. (lectotype, here designated, SGO-94383!; isotypes, G!, SGO-63908!, in part).

Cardamine solisii Anal. Univ. Chile 27(2): 325. 1865. Chile, Chillán, 1864, *Manue Antonio de Solís s.n.* (holotype, SGO-63895!).

Cardamine micropetala Philippi, *Anal. Univ. Chile* 81: 76. 1892; *C. ramosissima* Steudel var. *micropetala* (Philippi) Reiche, *Fl. Chile* 1: 97. 1896; *C. vulgaris* Philippi var. *micropetala* (Philippi) O. E. Schulz, *Bot. Jahrb. Syst.* 32: 544. 1903. TYPE: Chile, Araucana, *R. Philippi s.n.* (lectotype, here designated, SGO-71619!; fragments, BAA!). Muñoz (1960) listed three type collections, the other two, SGO-49373 and 63906, I have not seen.

Cardamine callitrichoides Spegazzini, *Anal. Mus. Nac. Buenos Aires* 7: 211. 1902; *C. valdiviana* Philippi var. *callitrichoides* (Spegazzini) O. E. Schulz, *Bot. Jahrb. Syst.* 32: 446. 1903. TYPE: Argentina, Chubut: Languiñeo, río Carreu-leufú, 1900, *N. Illin s.n.* (holotype, LP #12341!; fragments, BAA!).

Cardamine chilensis var. *angustifolia* O. E. Schulz, *Bot. Jahrb. Syst.* 32: 445. 1903. TYPE: Chile. Without locality, Apr 1834, *Cumming 603* (lectotype, here designated, W!; isotypes, CGE, K!; fragments, BAA!).

Herbs, perennial or rarely annual, often with thickened, tuberlike stem base, sometimes rooting from lower nodes, glabrous or with trichomes 0.1–0.2. **Stems** (2–)4–30(–50) cm, erect, simple or several from base, simple or branched above, glabrous or sparsely to densely pubescent near base. **Basal leaves** and lowermost cauline (0.8–)1.4–4(–5.5) cm, petiolate, not auriculate, simple or or rarely trifoliolate; petiole (0.4–)0.8–3(–3.5) cm; blade (or terminal leaflet) (0.2–)0.7–1.5(–2.5) cm × (1–)3–8(–12) mm, oblanceolate to spatulate or obovate to ovate, glabrous or sparsely pubescent, usually minutely ciliate, base cuneate to attenuate or rarely obtuse, margin entire to repand or rarely crenulate, apex rounded to obtuse; lateral leaflets (when present) ovate to oblanceolate, considerably smaller than terminal one; middle and uppermost leaves simple, gradually reduced in size into the racemes. **Racemes** bracteate throughout or at least along proximal half, rarely only lowermost few flower bracteate, many flowered; rachis slightly to

strongly flexuous, glabrous; fruiting pedicels (2–)4–10(–17) cm, ascending, slender, straight. **Sepals** oblong, 1.2–1.5(–2) × 0.4–0.5 mm, glabrous, caduceous; petals white, oblanceolate, 2.5–3.5(–4) × 0.7–1(–1.5) mm, apex obtuse; filaments 1–2 mm; anthers ovate, 0.1–0.2 mm; ovules (16–)20–30 per ovary. **Fruits** 0.7–1.5(–2) cm × 0.7–0.8(–1) mm; style 0.1–0.5(–1) mm. **Seeds** light brown, oblong to ovate, 0.7–0.9 × 0.5–0.6 mm, usually with a distal wing ca. 0.1 mm wide.

Flowering: Aug–Jan.

Elevation: 0–1000 m

Habitat: seepy site, streamside, pond margin, sloughs in dry sandy matorral.

Distribution: Argentina (Chubut, Nuequén, Río Negro, Salta), Chile (Región V, Santiago, VI, VII, VIII, IX, X).

Specimens examined: **ARGENTINA. Chubut:** Dep. Futaleufú, Lago Verde, *Burkart 19893* (SI). Dep. Cushamen, valle río Carrileufú, *Correa et al. 8956* (BAA, BAB); Parq. Nac. Lago Puelo, *Cusato & Rossow 4040* (BAF). **Nuequén:** Dep. Huiliches, orilla Lago Paimum, *Burkart & Troncoso 26484* (SI); Lago Paimún, Orilla Norte a 5 km Puesto Gendarmería, *Valla et al. 3241* (BAA). Dep. Los Lagos, near Villa la Angostura, *Pedersen 1510* (K), *Mallo et al. 18175* (BAA); Lago Nahuel Huapi, *Rúgolo 1075* (SI); Bahía Ptol. Manzano, *Diem 2962* (BAA), *Boelcke 8976* (BAA); Isla Victoria, *Boelcke 1796* (BAA); Isla Victoria, Punta Nortto, *Diem 1892* (LIL, SI); Isla Victoria, desagüe Laguna Larga, *Boelcke 8996* (BAA). **Río Negro:** Dep. Bariloche, Park. Nac. Nahuel Huapi, Isla Victoria, *Boelcke 1796* (SI). Dep. Pilcaniyeu, Río Pilcanué, camino Bariloche, *Nicora 3769* (SI). **Salta:** Dep. La Caldera, camino Jujuy a Salta, *Burkart 30460* (SI). **CHILE. V:** Catapilco, *Philippi 67* (SGO); Las Láunas, [33°06'S, 71°25'W], *Jaffuel 3005* (CONC, GH), *Jaffuel 3114* (CONC, GH); Olmué, [32°59'S, 71°09'W], *Garaventa 2024* (CONC, SI); Cerro de La Campana, [32°57'S, 71°08'W], 27 Sep. 1962, *Weisser s.n.* (CONC); Quilpué, *Zöllner 4601* (BACP, SI); Marga Marga, [33°06'S, 71°26'W], *Zöllner 7103* (CONC, NA), *Jaffuel & Pirion 3056* (GH); Limache, [33°02'S, 71°16'W], *Garaventa 2230* (BACP, CONC, SI); Viña del Mar, [33°02'S, 71°34'W], 30 Aug. 1932, *Behn s.n.* (CONC); Concón, *Pöppig 171* (W); El Pangal, *Garaventa 4090* (BAA, BACP, SI). **Santiago:** Batuco, [33°12'S, 70°51'W], *Garaventa 2206* (BAA, CONC, SI). **VI:** Caro, 0.6 km W of RR crossing in Alcones on road to Pichilemu, [34°23'S, 71°43'W], *Bliss 547* (CONC); Mine La Leona, Oct. 1935, *Grandjot s.n.* (MO); Lolol, [34°44'S, 71°38'W], *Barros 2797* (CONC, SI); Colchagua, Lolol, *Bliss 754* (CONC); Rancagua, *Bertero 145* (GH, P); Leona, *Bertero 146* (G, MO, NY, P, W). **VII:** Talca, *Claude-Joseph 4321* (US); SE Linares along Río Ancoa, along rd to Melado and Medina, 38.2 km upstream from intersection owoth rd to Peñasco, 35°50–52'S, 71°10–20'W, *Taylor & Gereau 10997* (CONC, MO); Itahue, Fdo. “El Colorado,” [35°08'S, 71°21'W], *Garaventa 4539* (BACP, CONC, SI); N Colbun, 35°38'S, 71°23'W, *Bliss 670* (CONC); 10 km E Cauquenes on rd to Parral, 35°59'S, 72°10'W, *Bliss 538* (CONC). **VIII:** Ñuble, 5 km W San Nicholas, 36°29'S, 72°15'W, *Bliss 850* (CONC); La Posada, [36°55'S, 73°08'W], *Barros 2804* (CONC, SI); 2 km S Escuadron on hwy 160, Lammers, *Baeza & Peñailillo 7490* (CONC, MO); Vegas de San Vicente, [36°43'S, 73°07'W], *Junge 992* (CONC, SI). **IX.** Biobío, Cabrero, 5–8 km N Salto El Laja, 37°11'S, 72°23'W, *Bliss et al. 2005* (CONC); Malleco, Mininco, [37°47'S, 72°28'W], *Montero 5253* (CONC, SI); 5–6 km SE Minico on rd to Collipulli, *Bliss 864* (CONC); Araucanía, Nov. 1887, *Philippi s.n.* (SGO); E Pucón, from the Río Turbio along rd to Termas de Huife, 39°20'S, 71°45'W, *Taylor & Taylor 10870* (MO). **X:** Valdivia, *Hohenacker 275* (G, P), *Buchtein s.n.*

(US); Talcahuano, *Pöppig 168* (P, W); Quinchilca, [39°52'S, 72°46'W], *Hollermayer 870* (CONC, SI). Bío Bío, Antuco, *Barros 2803* (SI); Llanquihue, Peulla, *Pennell 12669* (GH); San Miguel, *Barros 798* (BACP).

Cardamine chilensis is highly variable in habit, and under favorable conditions, the plants perenniate, and the stem base becomes only slightly to considerably indurated to tuberlike and often several stems are produced. This very aspect of the stem base was used by Schulz (1903) and Boelcke and Romanczuk (1984) as the basis for recognizing *C. valdiviana* as separate from the slender-based *C. chilensis*. In fact, the type of *C. valdiviana* is a single-stemmed plant only very slightly thickened at the stem base. No other differences can be found in the numerous collections examined in this complex.

There is considerable variation in the racemes, and the variation ranges from fully bracteate racemes to those basally bracteate or rarely only the lowermost few flower bracteate. *Cardamine solisii* is indistinguishable from *C. chilensis* in every aspect except for the nearly ebracteate raceme. Indeed, only the lowermost flower of the type of *C. solisii* is bracteate, but there are collections of *C. chilensis* with two, three, or more bracts. Should these be considered as distinct species? My answer is no. Because of the lack of any differences among *C. chilensis*, *C. valdiviana*, and *C. solisii* in leaf, flower, and fruit morphology, I am recognizing a single species undividable into infraspecific taxa, as Schulz (1903) and Boelcke and Romanczuk (1984) did.

Cardamine circaeoides J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 5: 144. 1861. TYPE: India, Sikkim, 5000–7000 ft, *J. D. Hooker s.n.* (holotype, K!; isotypes, B!, P!).

Cardamine agyokumontana Hayata, Ic. Pl. Formosa. 3: 19. 1913. TYPE: Taiwan (Formosa), (holotype, ...; photos, A, US).

Cardamine circaeoides var. *diversifolia* O. E. Schulz,

Cardamine heterandra J. Z. Sun & K. L. Chang, Tawania 41: 113–116. 1996. TYPE: China, Gansu, Wudu County, Pandi Xiang, 1,900 m, 19 Apr 1993, *Baishuijiang Team 2209* (holotype, LZU).

Cardamine insignis O. E. Schulz, Bot. Jahrb. Syst. 32: 439. 1903. TYPE: China, Yunnan, 6000 ft., *A. Henry 13,090* (holotype, B!; isotypes, E!, K!, MO!).

Cardamine macrocephala Z. M. Tan & S. C. Zhou, J. Sichuan Univ. (Natural Sci.) 33(5): 601. 1996. TYPE: China, Sichuan, Tianquan County, Erlong Mountain, Xingou, 6 Jun 1959, *Tianquan Expedition 665* (holotype, CDBI).

Cardamine reniformis Hayata, J. Coll. Sci. Imp. Univ. Tokyo 25(19): 50. 1908.

Cardamine violifolia O. E. Schulz, Bot. Jahrb. Syst. 32: 440. 1903. TYPE: China, Hupeh, near Ichang, *A. Henry 3298* (holotype, B!; isotypes, E!, GH!, K!, P!, US!).

Cardamine violifolia var. *diversifolia* O. E. Schulz, Bot. Jahrb. Syst. 32: 440. 1903. TYPE: China, Hupeh, near Ichang, *A. Henry 3298* (same as above)(holotype, B!; isotype, GH!).

Cardamine violifolia var. *pilosa* K. L. Chang & H. L. Huang, Tawania 41: 115. 1996. TYPE: China, Gansu, Wen Xian, Tielou Xiang, 2,200 m, 19 Sep 1993, *Baishuijiang Team 1572* (holotype, LZU).

Herbs, perennial, (5–)9–36(–45) cm, sparsely to densely pilose at least on leaves. **Rhizomes** slender, sometimes with a few stolons. **Stems** slender, erect or decumbent, simple or rarely branched above middle. **Basal leaves** not fleshy, simple or rarely 2–4-foliolate; petiole 1–9(–12) cm, glabrous or rarely ciliate; leaf blade or terminal leaflets cordate to ovate, rarely suborbicular, (0.7–)1.5–5.5(–6.7) × (0.7–)1.5–4.3(–5) cm, always longer than wide, pilose or glabrous, base cordate, sometimes obtuse, subtruncate, or subcuneate, margin often repand-crenate, sometimes coarsely crenate, crenulate, or subentire, often distinctly mucronate at vein endings, apex obtuse; lateral leaflets (when present) petiolulate or sessile, much smaller than terminal one; cauline

leaves 1–4, simple or rarely one 2- or 3-foliolate, petiolate or rarely uppermost subsessile; petiole (0.4–)1–5(–6) cm, with basal auricles 0.4–2 × 0.2–0.4 mm; leaf blade similar to that of basal leaves, cordate, sometimes ovate to ovate-lanceolate, 1–3.5(–6) × 1–3(–3.5) cm. **Raceme** ebracteate, many flowered; fruiting pedicels 3–12(–15) mm, ascending, divaricate, or reflexed, sometimes secund, glabrous, slender. **Sepals** ovate or oblong, 2–3.5 × 0.8–1.5 mm, glabrous, margin often membranous, base not saccate; petals white, spatulate, (4–)5–7(–8) × (1.5–)2–2.5(–4) mm; median filament pairs (2.5–)3.5–5 mm, lateral pair (2–)2.5–3.5 mm; anthers oblong, 0.5–1 mm; ovules 20–42 per ovary. **Fruit** linear, 1.3–3(–3.3) cm × 0.8–1.2(–1.5) mm; valves torulose, glabrous; style (0.5–)1–2 mm. **Seeds** brown, ovate to broadly oblong, 0.8–1.1 × 0.6–0.9 mm; wingless.

Flowering: Feb–Jul.

Habitat: ravines, along streams and ditches, rocky places, mixed woods, moist pastures, roadsides, forests.

Elevation: 400–3300 m.

Distribution: China (Gansu, Guangdong, Guangxi, Hunan, Sichuan, Taiwan, Yunnan), India (Sikkim), Laos, Myanmar, Thailand, Vietnam.

Cardamine clematitis Shuttleworth ex A. Gray, Proc. Amer. Acad. Arts 15: 45. 1880. TYPE:

Herbs, perennial, glabrous throughout. **Rhizomes** slender, cylindrical, 1–3 mm in diam.; stolons absent. **Stems** (0.8–)1–2.5(–3.5) dm, erect, simple or rarely few branched above, glabrous. **Rhizomal leaves** simple or 3-foliolate, (1.5–)3–8 cm; petiole (1–)2–6 cm; blade or terminal leaflet reniform to cordate, (0.5–)1–2 cm, petiolule to 1 cm, base cordate, margin entire or 3-lobed, not puberulent; lateral leaflets much smaller than terminal one, subsessile, margin same as terminal leaflet; cauline leaves 3–7, 3-foliolate or uppermost simple; petiole 0.7–3.5 cm, base auriculate, the auricle 0.7–5 mm; terminal lobe broadly ovate to suborbicular or reniform, 1.5–4 × 1.5–3.5 cm, often 3–5-lobed, the lobe apex minutely apiculate, glabrous along margin, petiolule 0.5–1 cm; lateral leaflets oblong to ovate or oblong, sessile or on petiolule to 0.5 cm. **Racemes** ebracteate; fruiting pedicels divaricate-ascending, (0.7–)1–1.7 cm. **Sepals** oblong, 2.5–3 × 1–1.5 mm, erect, base of lateral pair not saccate; petals white, oblanceolate, 6–8 × 2–3 mm, not clawed, apex obtuse to subemarginate; median filament pairs 3.5–4 mm, lateral pair 2–2.5 mm; anthers ovate, ca. 0.7 mm. **Fruit** linear, (1.5–)2–3.5(–4) cm × 1.3–1.7 mm; valves glabrous; style 2–4 mm; ovules and seeds 10–16 per fruit. **Seeds** brown, oblong, 1.7–2 × 1–1.2 mm.

Flowering: May–Jun.

Habitat: wet areas, springs, moist slopes.

Elevation: 1300–1800 m.

Distribution: United States (Alabama, Florida, Georgia, North Carolina, Tennessee, SW Virginia).

Cardamine concatenata (Michaux) O. Schwarz, Feddes Repert. Sp. Nov. Regni Veg. 46: 188.

1939; *Dentaria concatenata* Michaux, Fl. Bor.-Amer. 2: 30. 1803. TYPE:

Cardamine laciniata var. *integra* O. E. Schulz, Bot. Jahrb. Syst. 32: 349. 1903; *Dentaria laciniata* var. *integra* (O. E. Schulz) Fernald, Rhodora 10: 84. 1908. TYPE:

Cardamine laciniata var. *lasiocarpa* O. E. Schulz, Bot. Jahrb. Syst. 32: 349. 1903. TYPE:

Dentaria laciniata Muhlenberg ex Willdenow, **xxx**; *Cardamine laciniata* (Muhlenberg ex Willdenow) A. Wood, Amer. Bot. & Fl. 38. 1870, not *C. laciniata* Steudel, Nomencl. ed. 2, pt. 1: 281. 1840. TYPE:

Dentaria laciniata var. *alterna* Farwell, Amer. Midl. Naturalist 12: 58. 1930. TYPE:

Dentaria laciniata var. *coalescens* Fernald, Rhodora 40: 421. 1938. TYPE:

Dentaria laciniata var. *latifolia* Farwell, Amer. Midl. Naturalist 12: 58. 1930. TYPE:

Dentaria laciniata var. *opposita* Farwell, Amer. Midl. Naturalist 12: 58. 1930. TYPE:

Herbs, perennial, sparsely pubescent or sometimes glabrous. **Rhizomes** fleshy, moniliform, segments fusiform, 2–10 mm in diam.; stolons absent. **Stems** (1–)2–4(–5.5) dm, erect, simple, glabrous or pubescent distally. **Rhizomal leaves** 3-foliolate, (7–)10–20(–30) cm; petiole (4–)7–18(–25) cm; terminal leaflet oblong, lanceolate, oblanceolate, or linear, 2.5–6 cm, sessile, base cuneate, margin coarsely dentate to incised or lacinate, sometimes 3-lobed and the lobes toothed to incised, rarely entire, puberulent with trichomes 0.2–0.3 mm, or not; lateral leaflets about as large as or smaller than terminal leaflet, sessile, margin same as terminal leaflet; cauline leaves (2 or) 3, 3-foliolate, whorled to opposite or rarely alternate, similar in morphology to rhizomal leaves; petiole 1–)1.5–6(–7.5) cm, base not auriculate; terminal leaflet lanceolate, linear, or oblanceolate, (3–)4–10(–12) × (0.3–)0.5–2(–2.5) cm, coarsely dentated to incised or rarely subentire, minutely puberulent along margin, subsessile or with petiolule to 3 cm; lateral leaflets similar to terminal one, sometimes smaller, sessile. **Racemes** ebracteate; fruiting pedicels ascending to divaricate, (0.6–)1–2.7(–3.3) cm. **Sepals** oblong, (4–)5–8 × 2–4 mm, erect, base of lateral pair slightly saccate; petals white to pale pink, oblanceolate, (8–)10–20 × (3–)4–7(–9) mm, short clawed, apex rounded; median filament pairs 8–12 mm, lateral pair 6–8 mm; anthers oblong-linear, 1.5–2.5 mm. **Fruit** linear-lanceolate, (2–)2.5–3.8(–4.8) cm × 1.5–3 mm; valves glabrous or sparsely pubescent; style (2–)5–9(–12) mm; ovules and seeds 10–14 per fruit. **Seeds** brown, oblong, 1.6–3 × 1.8–2 mm. **2n** = 128–256.

Flowering Feb–May.

Habitat: wooded bottoms and bluffs, rich woods, limestone cliffs and outcrops, rocky banks, mesic forests, moist areas with leaf litter, floodplain woods.

Elevation: 0–1000 m.

Distribution: Canada (Ontario, Quebec), United States (Alabama, Arkansas, Connecticut, Delaware, District of Columbia, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, E Nebraska, New Hampshire, New Jersey, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, South Carolina, Tennessee, E. Texas, Vermont, Virginia, West Virginia, Wisconsin).

Cardamine conferta

Cardamine constancei Detling, Madroño 3: 176. 1935. TYPE:

Herbs, perennial, glabrous or sparsely hirsute. **Rhizomes** slender, cylindrical, to 2 mm in diam.; stolons absent. **Stems** 1.5–5 dm, erect, simple, glabrous or sparsely hirsute near base. **Rhizomal leaves** absent; cauline leaves 4–7, crowded above middle of stem, simple, (5–)7–15(–20) cm; petiole (0.5–)1–4(–5) cm, base not auriculate; leaf blade broadly ovate or ovate-lanceolate to ovate-elliptic, rarely obovate, 5–13 × 2–6.5 cm, minutely pubescent along margin, base cuneate, margin coarsely serrate with small apiculae, or repand to undulate, apex acute. **Racemes** ebracteate; fruiting pedicels divaricate-ascending to suberect, 1–2.2 cm. **Sepals** oblong, 6–8 × 2–2.5 mm, erect, base of lateral pair slightly saccate; petals pink, oblanceolate, 15–28 × 5–8 mm, claws to 10 mm, apex rounded; median filament pairs 8–10 mm, lateral pair 4–6 mm; anthers linear, 2–3 mm. **Fruit** linear, 2.5–3.5(–5) cm × 1.9–2.1 mm; valves glabrous; style 2–3.5 mm; ovules and seeds 12–16 per fruit. **Seeds** brown, oblong, 2–2.5 × 1.2–1.5 mm.

Flowering: May–Jun.

Habitat: moist cliffs, wooded creek bottoms, shaded draws, hillsides, moist woods, mixed coniferous forests, granitic soils.

Elevation: 400–600 m.

Distribution: United States (N Idaho/Cleawater, Idaho, Kootenai, Nez Perce, and Shoshone counties).

Cardamine cordata Barnéoud in Gay, Fl. Chile. 1: 109. 1846. TYPE: Chile, Coquimbo, 1839, *C. Gay s.n.* (holotype, P!; isotypes, F!, K!, P!; fragments, BAA!).

Cardamine decumbens Barnéoud in Gay, Fl. Chile 1: 109. 1846; *C. cordata* Barnéoud var. *decumbens* (Barnéoud) O. Schulz, Bot. Jahrb. Syst. 32: 430. 1903. TYPE: Chile. Coquimbo: Cordillera de Guanta, 2490 m, 1838, *C. Gay* 329 (holotype, P!; possible isotype, P!; fragments, BAA!)

Cardamine calbucana Philippi, Anal. Univ. Chile 41: 668. 1872; *C. cordata* prol. *calbucana* (Philippi) O.E. Schulz, Bot. Jahrb. Syst. 32: 429. 1903. TYPE: Chile. Volcán Calbuco, Jan. 1872, Carlos *Juliet s.n.* (holotype, SGO-49393!; fragment, BAA!). **Muñoz (1960) also listed SGO-63898 as the type collection, but I have not seen that.**

Cardamine andina Philippi, Anal. Univ. Chile 81: 71. 1892; *Cardamine nivalis* Gillies var. *andina* (Philippi) O. E. Schulz, Bot. Jahrb. Syst. 32: 519. 1903. TYPE: Chile. Cordillera de Las Condes, 7-8000 ft, Jan. 1891, *Edwyn Reed s.n.* (lectotype, here designated, SGO-63884!). Muñoz (1960) listed two other sheets, SGO-63912! and SGO-71625!, as part of the type collection. The one I designated as the lectotype agrees best with the original description.

Cardamine monticosa Philippi, Anales Univ. Chile 81: 72. 1892. TYPE: Chile. Prov. Colchagua, Las Vinas, Jan 1872, *Philippi s.n.* (lectotype, here designated, SGO-49335!). Muñoz (1960) listed three sheets as part of the type collection of this species, of which SGO-49335! is *C. tenuirostris* and does not correspond morphologically with the original description of *C. monticosa*. **I have not seen the third sheet, SGO-49322** (fragments, BAA!).

Cardamine peteroana Philippi, Anal. Univ. Chile 81: 74. 1892. TYPE: Chile. Curicó: Thermas de Peteroa, Manuel *Vidal s.n.* (holotype, SGO-...). **not seen, and no sheets listed by Muñoz (1960).**

Cardamine rostrata Grisebach var. *alpina* Chodat & Wilczek, Bull. Herb. Boiss. Ser. 2, 2: 288. 1902. TYPE: Argentina. Cajon del Burro, 3000 m, *Wilczek* 431 (holotype, G, not seen; fragments, BAA!).

Perennial herbs, glabrous throughout. Rhizomes not tuberous, short, slender, not scaly, rarely swollen at the well-spaced nodes. Stems single from rhizome, (3–)5–33(–55) cm tall, erect or subdecumbent, glabrous, simple or rarely branched above, with 2–8 crowded or rarely well-spaced leaves. Basal leaves not rosulate, they and lowermost cauline leaves simple or rarely with 1 or 2 pairs of lateral leaflets; petiole 1–4(–8) cm long; leaf blade or terminal leaflet orbicular to cordate or reniform, (0.5–)1–3.5(–4) × (0.8–)1.5–4(–4.5) cm, often wider than long, palmately veined, always fleshy, base often deeply cordate, repand to crenate or obtusely angled, rarely veins ending in a minute mucro, petiolule (if leaves compound) 0.5–1.5 cm long; lateral leaflets (when present) sessile or less frequently on petiolules 0.5–3 mm long, cordate or oblong to ovate, 0.5–12(–25) × 3–7(–17) mm, base usually oblique; middle and upper cauline leaves simple or rarely, 3–7-foliolate leaflets, smaller and narrower than lowermost leaves, margin entire, repand or obtusely dentate. Racemes corymbose, ebracteate, elongated slightly or moderately in fruit; rachis straight; fruiting pedicels (0.2–)0.5–1(–1.8) cm long, ascending erect, forming a straight line with fruit, appressed to rachis, stout, glabrous. Sepals oblong, 3–4(–4.5) × 1.5–1.8 mm, erect, caducous, glabrous.

Petals white, oblanceolate to obovate, 7–9 × 2.5–4 mm, apex obtuse. Filaments 3.5–5 mm; anthers oblong, 0.7–1 mm. Ovules 20–38 per ovary. Fruits linear, (1.8–)2–3.5 cm × 1.2–1.5 mm, slightly attenuate to apex; style 0.7–2(–3) mm long. Seeds brown, oblong to broadly ovate, 1–1.5 × 0.8–1 mm, sometimes narrowly winged at apex.

Fl.: Oct–Feb.

Alt.: 700–2900 m

Habitat: Brooks, springs, wet areas, meadows, moist slopes along rivulets, wet flushes near springs, stunted Nothofagus forest to base of snow.

Distribution: Argentina and Chile.

Specimens examined: **ARGENTINA.** Cajon del Burro, *Gerk 109* (SI). **Chubut:** Dep. Languiñeo, Rio Tecke, Ea. Pampa Chica, *Soriano 3817* (BAA); Co. Colorado, Corcovado, *Krapovickas 4083* (BAA, BAB). Dep. Rio Senguerr, Lago Blanco, *Koslowsky 12492* (NA); Laguna Blanca, 45°52'S, 71°15'W, *Koslowsky 45* (SI). Dep. Tehuelches, Lago Verde, *Soriano 4255* (BAA). **Mendoza:** arroyo de los Alverjalitos, *Kurtz 5822* (CORD, LP). Rio Salado Valley, 33°S, *Böcher et al. 1019* (BAA, MO). Dep. Malargüe, Ruta Prov. 224, camino a Po. Pehuenche, Puesto Rojas, 35°57'S, 70°21'W, *Prina et al. 2047* (SI, SRFA); Arroyo Negro, *Kurtz 5737* (CORD, LP). Dep. San Rafael, Arroyo Grande frente de Los Molles, *Sleumer 538* (LIL); Portezuelo Ancho an Camino a Valle Hermoso, *Leal 24582* (BAA). **Neuquén:** Dep. Chos Malal, Arroyo Dominyo, 36°44'S, 70°23'W, *Boelcke et al. 11304* (BAA, BAB, SI); Los Tábonos, *Boelcke et al. 11339* (BAA, BAB, SI). Dep. Minas, Lagunas Epu-Lauquén, *Boelcke et al. 10902* (MO, SI); Vegas del Pelán, *Boelcke et al. 11131* (BAA, BAB, LIL, MO, SI); Piedra del Gallo, 36°42.5'S, 70°30'W, *Boelcke et al. 11396* (BAA, SI); Sierra de Cochicó, cajón de la Botica, 36°21–22'S, 70°34–36'W, *Boecke et al. 14113* (BAA, BACP, SI); cajón del Portillo, 36°12'S, 70°36'W, *Boecke et al. 14161, 14185* (BAA, BAB, BACP, SI); confluence rós Pichi-Neuquén and Neuquén, cerro de las Yeguas, 36°35'S, 70°46'W, *Boelcke et al. 13778* (BAA, BAB, BACP, SI); Colunco, *Ammann 50* (F); Lapala, Mallin, *Ammann 50b* (F); Cord. Del Viento, Arroyo Mamanque, *Patore 31* (SI); Parq. Nac. Nahuel Huapi, Refugio Co. Colorado, E de Punto, *Boelcke 9028* (SI). Dep. Minasa, cruzada de Tricao Malal al Cajón de Butaló, 36°58'S, 70°30'W, *Boelcke et al. 11564* (BAA, BAB). Dep. Los Lagos, Parq. Nac. Nah. Huapi, refugio Co. Colorado, *Boelcke 9025* (BAA); Ea. Fortín Chacabuco, *Correa et al. 3785* (BAA, BAB). Dep. Ñorquín, Copahue, Rossow et al. 859 (BAB, BACP). Dep. Picunches, Pino Hachado, Rossow 1140 (BAB, BACP). **Río Negro:** Cerro López, 41°, *Böcher et al. 1745* (BAA, MO), *Boelcke 1838* (SI); Bariloche, Cerro López, *Rassow & Gómez 370* (BACP); Cerro Ñireco, Mallui, 6 Jan. 1947, *Beruasconi s.n.* (SI); Parque Nac Nahuel Huapi, Cerro Tronador, *Boelcke & Correa 5742* (BAB, SI); Parq. Nac. Nahuel Huapi, Pampa Linda, Ventisqueros del Tronador, *Boelcke et al. 10454* (BAA, SI). Dep. Pilcaniyeu, Los Juncos, Ea. San Ramón, Port. Lana Grande, *Boelcke & Correa 11737* (BAA); Valle de Comallo, *Vallerini 2794* (SI); Co. Tronador, garganta del Diablo, 16 Jan 1988, Valla et al. sn. (BAA); Cerro Lopez, *Parodi 11491* (BAA). **Santa Cruz:** Lago Buenos Aires, near Perito Moreno, *Ager 436* (US). **CHILE:** **IV:** Dep. Ovalle, Quebrada del Toro, Pabellon, 20 km E Hurtado, Hacienda El Bosque, *Wagenknecht 18491* (F, G, GH, MO, UC), *Wagenknecht 4091* (CONC, SI). **V:** Los Andes, de Portillo rd, base de Caracoles, *Charpin & Lazare 23820* (G). **Santiago:** Paso de Jorquera, Farellones, [33°21'S, 70°19'W], *Garaventa 4517* (CONC, SI); Los Perales, [33°45'S, 71°06'W], *Montt 233* (CONC); near Rio Colorado, *Hastings 430* (US); Piuquencillos, Valle del Rio Colorado, [33°35'S, 70°13'W], *Pisano et al. 1662* (CONC). **VI:** Cord. Colchagua, 1870, *Philippi s.n.* (G); Adnes of Rancagua, [33°54'S,

70°28'W], *Montt 288* (CONC). **VII**: Thermas de Longavi, Jan. 1888, *Schoenemann s.n.* (SGO); Cord. Talca, Feb. 1879, *F. Philippi 68e* (SGO); Cord. del Peuco, [33°56'S, 70°30'W], *Cádiz s.n.* (SGO); Peteroa, [35°15'S, 70°34'W], *Grandjot 602* (CONC, SI), *Philippi s.n.* (SGO); Laguna de Teno, [35°10'S, 70°35'W], *Marticorena & Matthei 908* (CONC), *Marticorena et al. 28* (CONC); Laguna del Maule, [36°00'S, 70°30'W], *Schlegel 3540* (CONC). **VIII**: Laguna del Loja, [37°21'S, 71°19'W], *Garaventa 4626* (BACP), *Montero 6127* (CONC); Baños de Chillan, *Werdermann 1313* (CAS, CONC, E, F, G, GH, LIL, MO, NY, SI, UC, US), *Pennell 12441* (F, GH, NY, US); Cordillera de Chillán, 1855, *Germain* (G, SGO); Santa Barbara, 1839, *Gay s.n.* (SGO); Termas de Chillán, [36°54'S, 71°31'W], *Pfister 8754* (CONC), *Jaffuel 2005* (CONC); Valle de las Nieblas, Feb. 1892, *Philippi s.n.* (SGO); Cordillera de Los Andes, rd to Shangrila, 36°52'S, 71°27'W, *Gardner & Knees 6827* (E, MO); Las Fumarolas and Valle de las Nieblas, 36°54'S, 71°23'W, *Taylor et al. 10297* (CONC). **IX**: Volcán Llaima, [38°43'S, 71°43'W], *Gunckel 12281, 13905* (CONC), *Montero 6834* (CONC); Termas Rio Blanco, *Montero 3397* (GH); Termas de Alpehue, [38°54'S, 71°37'W], *Montero 10846* (CONC); Curacautín, Cord. de los Andes, Parque Nacional Conguillío, 38°36'S, 71°36'W, *Brownless et al. 990* (MO); Malleco, Sierra Nevada, Laguna Conguillío, [38°36'S, 71°35'W], *Schlegel 7152* (CONC). **X**: Volcán Choshuenco, [39°56'S, 72°04'W], *Hollermayer 799* (CONC); Dep. t. Puerto Varas, Peulla, [41°06'S, 72°02'W], *Zollitsch 269* (CONC); Parque Nacional Puyehue, Antillanca, 40°46'S, 72°12'W, *Gardner & Knees 3998* (CONC, E), *Schlegel 6770, 7301* (CONC), *Sparre & Constance 10780* (CONC); Paso Payehue, [40°40'S, 71°55'W], *Sparre & Constance 10833* (CONC); Palena, Las Escalas, Futaleufú, 43°12'S, 71°50'W, *Hildebrand-Vogel 32* (CONC). **XI**: Estanci Coyhaique Alto, near Cerro Coyhaique, *Santesson 1287* (S). **Prov.??**: Valle de las aguas Calientes, 27 Feb. 1862, *Philippi s.n.* (SGO); Cajón de Azufre, Feb. 1891, *Albert s.n.* (SGO); Cajón del Calro, Feb. 1891, *Albert s.n.* (SGO); Al pié de la Quebrada Ventana, *Garaventa 3131* (BACP, CONC, SI).

A comparison of the types of *Cardamine calbucana* and *C. monticosa* reveals that they are indistinguishable from that of *C. cordata*. Those of *C. andina* and *C. decumbens* represent robust forms of the species that are erect or decumbent, respectively. The *C. andina* type has sessile and somewhat decurrent leaflets of upper leaves, but this aspect, though rare in typical *C. cordata*, does not merit the creation of an inDep. endent taxon. As for *C. decumbens*, it might deserve to be recognized as an ifraspecific taxon of *C. cordata*, as was done by Schulz (1903), but in the absence of fieldwork, it would be better to retain it as a synonym.

Cardamine cordifolia A. Gray, Mem. Amer. Acad. Nat. Sci. (Pl. Fendl.) 4: 8. 1849. TYPE:

United States, New Mexico, Santa Fe Co., margin of Santa Fe Creek, 15 May–16 Jun 1847, *A. Fendler 28* (holotype, GH!; isotypes, K!, MO!, NY!, PH, UC!).

Cardamine cardiophylla Rydberg, Bull. Torrey Bot. Club 28: 280. 1901, not Greene, Fl.

Francisc. 266. 1891; *C. cordifolia* var. *cardiophylla* O. E. Schulz, Bot. Jahrb. Syst. 42: 438.

1903; *C. infausta* Greene, Pittonia 4: 307. 1901. TYPE: United States, Colorado, Lake Co., Tennessee Pass, 27 Jun 1900, *G. E. Osterhout 2178* (holotype, NY!; isotypes, GH!, RM).

Cardamine cordifolia var. *diversifolia* O. E. Schulz, Bot. Jahrb. Syst. 32: 438. 1903. TYPE:

United States, New Mexico, Santa Fe Co., Santa Fe Canyon, 9 miles E of Santa Fe, 8000 ft, 2 Jun 1897, *A. A. & E. G. Heller 3647* (holotype, B; isotypes, DS!, MO!, NY!).

Cardamine cordifolia var. *incana* A. Gray ex M. E. Jones, Proc. Calif. Acad. Sci. II, 5: 620.

1895; *C. incana* (A. Gray ex M. E. Jones) A. Nelson, Bot. Gaz. 42: 50. 1906. TYPE: United

States, Utah, Piute Co., Marysvale, 7000 ft, 1 Jun 1894, *M. E. Jones 5341a* (holotype, POM; isotype, MO!).

Cardamine cordifolia var. *pubescens* A. Gray ex O. E. Schulz, Bot. Jahrb. Syst. 32: 439. 1903. TYPE: United States, Utah, Wayne Co., S slope of Thousand Lake Mt., 8000 ft, 14 Jul 1875, *L. F. Ward 396* (lectotype designated by Welsh (1982: 162), US!; isolectotype, GH!, NY!).
Cardamine lyallii S. Watson, Proc. Amer. Acad. Arts 22: 466. 1887; *C. cordifolia* subsp. *lyallii* (S. Watson) O. E. Schulz, Bot. Jahrb. Syst. 32: 438. 1903; *C. cordifolia* var. *lyallii* (S. Watson) A. Nelson & J. F. Macbride, Bot. Gaz. 61: 31. 1916. TYPE: (lectotype should be designated).

Cardamine uintahensis F. J. Hermann, Rhodora 36: 410. 1934. TYPE: United States, Utah, Summit Co., muddy bank of Mill Creek, SW base of Mt. Elizabeth, 6 miles SE of Goodman Ranch, Bear River Valley, 8500 ft, *F. J. Hermann 5894* (holotype, GH!).

Herbs, perennial, glabrous or densely puberulent. **Rhizomes** slender or stout, cylindrical, 1.5–3 mm in diam.; stolons absent. **Stems** 2–7(–10.2) dm, erect, simple or branched above, glabrous or sparsely to densely puberulent near base or throughout. **Rhizomal leaves** absent or rarely present, simple, 5–15 cm; petiole 2.5–12 cm; leaf blade reniform to cordate, 1.5–4.5(–6) cm; cauline leaves (3–)5–17(–23), simple or very rarely lowermost 3-foliolate; petiole 1–6.5(–8.5) cm, base not auriculate; leaf blade somewhat fleshy, reniform, deltoid-cordate, or ovate-cordate, (1–)2–7.2(–9.7) × 1–5.5(–8.5) cm, glabrous or sparsely to densely pubescent, base cordate or truncate, margin crenate to slightly sinuate, veins ending in small apicula, puberulent or not. **Racemes** ebracteate; fruiting pedicels divaricate to ascending, (0.7–)1–2 cm. **Sepals** oblong, 2.5–4.5 × 1.5–2 mm, erect, base of lateral pair slightly saccate; petals white, broadly obovate, 7–12 × 4–6 mm, with a claw to 6 mm, apex rounded to subtruncate or emarginate; median filament pairs 3.5–5 mm, lateral pair 2–3.5 mm; anthers oblong, 1–1.5 mm. **Fruit** linear, (2–)2.5–3.7(–4) cm × 1.2–2 mm; valves glabrous or sparsely puberulent; style 0.5–3(–6) mm; ovules and seeds 14–24 per fruit. **Seeds** brown, oblong, 1.6–2 × 1–1.3 mm. **2n** = 24.

Flowering: May–Aug.

Habitat: streambanks, springs, shady gullies, creek bottoms, lake shores, ponds, cold springs, meadows, moist hillsides, mossy areas, alpine streams, mixed coniferous forests.

Elevation: 600–3600 m.

Distribution: Canada (British Columbia), United States (Arizona, California, Colorado, Idaho, New Mexico, Nevada, Oregon, Utah, Washington, Wyoming).

Cardamine corymbosa J. D. Hooker, Fl. Antarct. 1: 6. 1844; *C. hirsuta* Linnaeus var. *corymbosa* (J. D. Hooker) J. D. Hooker, Handb. New Zeal. Fl. 12. 1864. TYPE:

Cardamine crassifolia Pourret

Cardamine debilis Banks ex de Candolle, Syst. Nat. 2 : 265. 1821; not *C. debilis* D. Don, Prodr. Fl. Neal. 201. 1825; *Cardamine hirsuta* Linnaeus var. *debilis* (Banks ex de Candolle) J. D. Hooker, Handbook New Zeal. Fl. 12. 1864. TYPE: New Zealand,.. (holotype, xx).

Sisymbrium heterophyllum G. Forster, Prodr. 46. 1786; *Cardamine heterophylla* (G. Forster) O. E. Schulz, Bot. Jahrb. Syst. 32: 487. 1903, not *C. heterophylla* (Nuttall) A. Wood Amer. Bot. & Fl. 38. 1870; not Host, Syn. P. Austral. 366. 1797; not Lapeyrouse, Hist. Abr. Pl. Pyr. 377. 1813; not Bory, Ann. Sci. Gen. Phys. 3: 6. 1820; not W. J. Hooker, Comp. Bot. Mag. 1: 273. 1835. TYPE: New Zealand,.....(holotype,).

Cardamine delavayi Franchet, Bull. Soc. Bot. France 33: 397. 1886. TYPE: China. Yunnan: near Mo-so-yun, Lankong, 2 Apr 1885, *Delavay 1838* (holotype, P!; isotypes, P!, US!).

Herbs, perennial, 15–45, sparsely pilose on leaves and at nodes, or glabrous throughout.

Rhizomes slender and much elongated, with a few stolons and no bulbils. **Stems** simple at base, rarely branched above, erect, strongly flexuous; nodes well spaced, lowermost internodes to 9 cm. **Rhizomal leaves** simple; petiole 3–12 cm; leaf blade reniform, cordate, or suborbicular, 1.2–2.5 × 1.5–3 cm, palmately veined, base cordate, margin entire or obscurely 5-lobed, endings of principal veins and leaf apex mucronate; cauline leaves 2–5, trifoliolate; petiole of lowermost and middle ones 2–5 cm, not auriculate and sometimes ciliate at base; terminal leaflet broadly oblong or narrowly obovate, 0.7–2 × 0.7–1.5 cm, with a petiolule to 4 mm, margin entire, apex mucronate; lateral leaflets similar to terminal, slightly smaller. Uppermost cauline leaves trifoliolate; petiole 1–3.5 cm, not auriculate at base; terminal leaflet narrowly oblong or linear, sessile, 1–3 cm × (1–)2–4(–5) mm; lateral leaflets smaller. **Racemes** ebracteate, 7–15-flowered; fruiting pedicels ascending, (1–)1.2–2(–2.3) cm, straight. **Sepals** ovate, 2–3 × 1–1.5 mm, margin membranous; petals white, broadly obovate, 5–7 × 2.5–4 mm, apex rounded; median filament pairs 2.5–4, not flattened; lateral pair 1.5–3 mm; anthers linear-oblong, 1–1.3 mm; ovules 10–20 per ovary. **Fruit** linear, 2–3 cm × 1–1.3 mm; valves torulose, glabrous; style 2–4 mm. **Seeds** brown, oblong, 1.2–1.5 × 0.6–0.9 mm, wingless.

Habitat: Open gravel along streams, forests and clearings.

Elevation: 2100–4000 m.

Distribution: Bhutan, China (Sichuan, Yunnan).

Cardamine densiflora

Cardamine dentata

Cardamine Dep. ressa J. D. Hooker, Fl. Antarct. 1: 6. 1844. TYPE: New Zealand, moist places near the sea at Rendezvous Harbour, J. D. Hooker s.n. (holotype, K).

Cardamine digitata Richardson, Bot. App. Frankl. Narr. Journey Polar Sea 743. 1823, not *C. digitata* (Lamarck) O. E. Schulz (1903). TYPE:

Cardamine digitata var. *oxyphylla* Trautvetter; *C. hyperborea* var. *oxyphylla* (Trautvetter) O. E. Schulz, Bot. Jahrb. Syst. 32: xxx. 1903. TYPE:

C. hyperborea O. E. Schulz, Bot. Jahrb. Syst. 32: 550. 1903. TYPE:

C. richardsonii Hultén, Acta Univ. Lund. N. F., Adv. 2, 41 (Fl. Alaska & Yukon): 838. 1945. TYPE:

Herbs, perennial, glabrous throughout. **Rhizomes** slender, cylindrical, 0.5–1.5 mm in diam.; stolons absent. **Stems** (0.6–)1–2(–3) dm, erect, simple, glabrous. **Rhizomal leaves** pinnately 5–7-foliolate, not fleshy, (2–)4–10 cm; petiole (1.5–)3–7(–9) cm; terminal leaflet linear to narrowly oblong or narrowly lanceolate, (0.5–)1–2.5(–3.3) cm × 0.5–4(–8) mm, sessile, glabrous, base cuneate to attenuate, margin entire; lateral leaflets about as large as or smaller than terminal leaflet, similar in other aspects; cauline leaves (1 or)2 or 3, 5–7-foliolate, alternate; petiole (2–)5–12(–15) mm, base not auriculate; terminal leaflet narrowly lanceolate to linear, 1–3.2(–4) cm × 0.5–2.5(–3.5) mm, sessile, base cuneate to attenuate, margin entire, apex acute to acuminate; lateral leaflets similar to terminal one but smaller, sessile. **Racemes** ebracteate; fruiting pedicels suberect to divaricate-ascending, (0.7–)1–2.5 cm. **Sepals** ovate, 2.5–3.5 × 1.5–2.5 mm, erect, base of lateral pair not saccate; petals white, obovate, 5–9 × 2.5–5 mm, clawed, apex rounded;

median filament pairs 3–4.5 mm, lateral pair 1.5–2.5 mm; anthers oblong, 1–1.5 mm. **Fruit** linear, (1.5–)2–4 cm × 1.5–2 mm; valves glabrous; style (1–)1.5–2.5(–4) mm; ovules and seeds 6–12 per fruit. **Seeds** brown, oblong, 1.5–2.2 × 0.9–1.1 mm. $2n = 28, 42$.

Flowering: Jun–Aug.

Habitat: damp flats, river banks, tundra, meadows, bluffs, hummocks, sandy beaches, slopes, mossy mats, sedge swales.

Elevation: 0–1400 m.

Distribution: Canada (Northwest Territories, Yukon), Russia (Siberia, Far East), United States (Alaska).

Cardamine diphylla (Michaux) A. Wood, Amer. Bot. & Fl. 37. 1870; *Dentaria diphylla*

Michaux, Fl. Bor.-Amer. 2: 30. 1803. TYPE:

Dentaria bifolia Stokes, Bot. Mat. Med. 3: 443. 1812. TYPE:

Dentaria incisa Small, Fl. SE U.S. 480. 1903, not *D. incisa* Eames, Rhodora 5: 216. 1903.

TYPE:

Herbs, perennial, glabrous or rarely sparsely pubescent. **Rhizomes** fleshy, cylindrical, 2–10 mm in diam., unsegmented, not fragile, with dentate leaf scars, somewhat uniform in diam.; stolons absent. **Stems** (1.2–)1.5–3.5(–4) dm, erect, simple, glabrous or rarely sparsely pubescent distally. **Rhizomal leaves** 3-foliolate, (5.5–)8–22(–26) cm; petiole (3–)4.5–16(–20) cm; terminal leaflet ovate-elliptic to broadly ovate, (2–)3.5–8(–10) × (0.5–)2–6.5(–8) cm, with a petiolule 0.5–1.2 cm, base cuneate to obtuse, margin coarsely crenate or dentate, puberulent with trichomes to 0.1 mm; lateral leaflets often similar to terminal one in shape, size and margin, base often oblique, subsessile or petiolulate; cauline leaves 2(or 3), opposite or nearly so, 3-foliolate, resembling rhizomal leaves; petiole (1–)2–4.5 cm, base not auriculate; terminal leaflet broadly elliptic to ovate, (2–)4–8(–10) × 1–5 cm, coarsely dentate or crenate, minutely puberulent along margin, subsessile or with petiolule 2–10 mm; lateral leaflets similar to terminal one. **Racemes** ebracteate; fruiting pedicels ascending to divaricate, (1–)1.5–3(–3.6) cm. **Sepals** oblong, (4–)5–8 × 2–3 mm, erect, base of lateral pair slightly saccate; petals white or pink to purple, obovate to oblanceolate, (7–)9–15(–17) × (3–)4–7 mm, short clawed, apex rounded; median filament pairs 5–8 mm, lateral pair 3.5–6 mm; anthers linear to oblong, 2.5–3 mm. **Fruit** linear-lanceolate, 1.5–4 cm × 1.5–2.5 mm; valves glabrous; style 4–8(–10) mm; ovules and seeds 10–14 per fruit.

Seeds rarely produced, brown, oblong, 2–2.2 × 1.2–1.5 mm; cotyledons incumbent. $2n = 96$.

Flowering: Apr–Jun.

Habitat: wooded bottoms and ravines, cliffs, bluffs, leges, shaded slopes, meadows, moist fields, alluvial banks, rich woods.

Elevation: 50–1300 m.

Distribution: Canada (New Brunswick, Nova Scotia, Ontario, Quebec), United States (Alabama, Arkansas, Connecticut, Georgia, Illinois, Indiana, Kentucky, Maine, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Vermont, Virginia, West Virginia, Wisconsin).

Cardamine dissecta (Leavenworth) Al-Shehbaz, J. Arnold Arb. 69: 82. 1988; *Dentaria dissecta*

Leavenworth, Amer. J. Sci. 7: 62. 1824. TYPE: United States, Alabama, Cherokee Co.,

Leavenworth s.n. (holotype,).

Dentaria multifida Muhlenberg ex Elliott, Sketch Bot. S. Carolina 2: 142. 1822; *C. multifida*

(Muhlenberg ex Elliott) A. Wood, Amer. Bot. & Fl. 38. 1870, not *C. multifida* Pursh, Fl.

Amer. Sept. 2: 440. 1814; *Cardamine angustata* O. E. Schulz var. *multifida* (Muhlenberg ex

Elliott) H. E. Ahles; *C. laciniata* (Muhlenberg ex Willdenow) A. Wood subsp. *multifida*

(Muhlenberg ex Elliott) O. E. Schulz; *C. laciniata* var. *multifida* (Muhlenberg ex Elliott) J. F. James, Bot. Gaz. 8: 207. 1883; *D. heterophylla* Nuttall var. *multifida* (Muhlenberg ex Elliott) H. E. Ahles, J. Elisha Mitchell Sci. Soc. 80: 172. 1964; *D. laciniata* Muhlenberg ex Willdenow var. *multifida* (Muhlenberg ex Elliott) J. F. James, Bot. Gaz. 13: 234. 1888. TYPE: United States, mountains of Carolina, Schweinitz s.n. (holotype, CHARL).

Dentaria furcata Small, Fl. SE U.S. 480. 1903. TYPE: United States, Alabama, near Tuscaloosa, Rev. W. Johnson s.n. (holotype, NY!).

Herbs, perennial, glabrous throughout. **Rhizomes** fleshy, segments oblong, moniliform, 3–5 mm in diam.; stolons absent. **Stems** 1–3.5 dm, erect, simple, glabrous. **Rhizomal leaves** palmately compound, biternate, 7–20 cm; petiole 4–13 cm; terminal leaflet ternately or pinnately lobed, petiolule 1–3(–4) cm; ultimate segments linear, 0.7–3.5 cm × 0.6–3 mm, base attenuate to cuneate, margin entire, apex apiculate; lateral leaflets about as large as or smaller than terminal leaflet, similar in other aspects; cauline leaves (2 or) 3, palmately compound, biternate and resembling rhizomal leaves, alternate to subopposite; petiole (0.5–)1–4(–5.5) cm, base not auriculate; terminal leaflet ternate, petiolule (0.3–)0.7–1.5(–2.5) cm; ultimate segments linear, (0.4–)1.5–5(–6.5) cm × 0.7–4(–6) mm, base cuneate to attenuate, margin entire; lateral leaflets similar to terminal one. **Racemes** ebracteate; fruiting pedicels ascending to divaricate, 1–2.5(–3.5) cm. **Sepals** oblong, 4–6 × 1.5–2 mm, erect, base of lateral pair not saccate; petals white to pale pink, oblanceolate, 9–15 × 2–4 mm, not clawed, apex rounded; median filament pairs 6–7.5 mm, lateral pair 3–5 mm; anthers linear, 1.5–2.5 mm. **Fruit** linear-lanceolate, 2–3.5 cm × 1.5–2 mm; valves glabrous; style 4–7(–10) mm; ovules and seeds 10–14 per fruit. **Seeds** brown, oblong, 1.5–2.5 × 1–1.5 mm. $2n = 64, 112$.

Flowering: Mar–May.

Habitat: oak-hickory woods, moist loamy areas, floodplain woods, bluffs, rocky calcareous woods, limestone slopes, along streams.

Elevation: 0–300 m.

Distribution: United States (Alabama, Georgia, Indiana, Kentucky, Ohio, North Carolina, Tennessee).

Cardamine douglassii Britton, Trans. New York Acad. Sci. 9: 8. 1889 *Dentaria douglassii* (Britton) Greene, Pittonia 3: 124. 1896. TYPE:

Arabis rhomboidea Persoon var. *purpurea* Torrey, Amer. J. Sci. 4: 66. 1822; *Dracamine purpurea* (Torrey) Nieuwland, Amer. Midl. Naturalist 4: 40. 1915. TYPE:

Cardamine douglassii var. *albidula* Farwell, Amer. Midl. Naturalist 9: 26. 1925. TYPE:

Thlaspi tuberosum Nuttall, xxxxxxxx. TYPE:

Herbs, perennial, hirsute throughout or glabrous proximally. **Rhizomes** fleshy, tuberous at stem base, subglobose, lobed or not, (3–)4–10 mm in diam.; stolons absent. **Stems** (0.7–)1–2.5(–3) dm, erect, simple, sparsely to densely hirsute with trichomes (0.2–)0.3–0.6(–0.8) mm, or glabrous near base. **Rhizomal leaves** simple, (3–)5–15(–18) cm; petiole (2–)4–12(–16) cm; blade orbicular to cordate, sometimes reniform or ovate, (1–)2–6 × (0.7–)1.7–5 cm, base obtuse to cordate, margin repand or entire; cauline leaves 3–6(–8), simple, not auriculate at base, middle ones short petiolate, 2–5 × 0.5–2.5 cm, upper leaves sessile, oblong to ovate or lanceolate, entire, repand, or coarsely dentate. **Racemes** ebracteate; fruiting pedicels ascending to divaricate, (1–)1.5–3.5(–5) cm, sparsely pubescent or glabrous. **Sepals** oblong, 2.5–4(–6) × 1.5–2.5 mm, erect, often hirsute, base of lateral pair not saccate; petals rose-purple to pink or very rarely white, obovate, (7–)8–13(–15) × 3–5 mm, short clawed, apex rounded; median filament pairs 4–7 mm, lateral pair 2–4 mm; anthers oblong, 1.3–1.7 mm. **Fruit** linear, (1.5–)2–4 cm × 1.5–2 mm;

valves glabrous; style 2–5 mm; ovules and seeds 10–16 per fruit. **Seeds** brown, oblong to ovate, 1.7–2.5 mm × 1–5 mm. $2n = 56, 64, 96, 112, 144$.

Flowering: Mar–May.

Habitat: rich woods, bluffs, mesic bottomland forest, rocky hillsides, floodplains, seepage of bogs, springy areas.

Elevation: 50–400 m.

Distribution: Canada (S Ontario), United States (Alabama, Connecticut, District of Columbia, Illinois, Indiana, Iowa, Kentucky, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Virginia, West Virginia, Wisconsin).

Cardamine elegantula J. D. Hooker & Thomson, J. Linn. Soc., Bot. 5: 146. 1861. TYPE: Bhutan, 6500 m, *Griffith s.n.* (holotype, K!; isotype, P!).

Herbs, perennial, slender, pilose on leaves and stems with trichomes to 0.6 mm. **Rhizomes** slender, stoloniferous. **Stems** 8–30 cm, simple, flexuous. **Basal leaves** compound, rosulate, often present by fruiting; petiole 0.7–2 cm; terminal leaflet broadly ovate to obovate, petiolulate, sparsely pilose, base distinctly oblique, margin entire or obscurely 1-toothed on each side; lateral leaflets 2–4 on each side, with a petiolule 0.5–1.5 mm, ovate to elliptic, 2–5(–8) × 1–3.5(–5) mm, similar to terminal one or with a lateral lobe on abaxial margin, distinctly mucronate; cauline leaves compound, not auriculate at base; petiolule 0.5–3 mm; terminal leaflet elliptic to linear-elliptic, 3–6(–9) × 0.5–2 mm, base attenuate to cuneate and decurrent with adjacent lateral lobes, margin entire and scabrous with trichomes 0.05–0.1 mm, apex mucronate; lateral leaflets 5–8 on each side of rachis, petiolulate, similar to terminal leaflets. **Racemes** ebracteate, 2–5-flowered; rachis strongly flexuous; fruiting pedicels strongly reflexed, slender, straight, 4–6 mm, glabrous. **Sepals** ovate, 1.5–2 × 0.8–1 mm, glabrous, membranous at margin and apex; petals pink or white, broadly obovate, 6–7 × 3–4 mm; median filament pairs 2.5–3 mm, filiform; lateral pair 1.5–2 mm; anthers oblong, 0.4–0.5 mm; ovules 14–20 per ovary. **Fruit** linear, 1.2–1.5 cm × 0.7–1 mm; valves glabrous; style 1–2 mm. **Seeds** pale brown, oblong, ca. 1.8 × 0.8 mm, wingless. Flowering: May–Jun.

Habitat: beneath wet rock overhang, damp rocks in forests, marshy area along streams.

Elevation: 3050–2400 m.

Distribution: Bhutan, India (Sikkim), Nepal.

Cardamine engleriana O. E. Schulz, Bot. Jahrb. Syst. 32: 407. 1903. TYPE:

Cardamine griffithii J. D. Hooker & Thomson var. *grandifolia* T. Y. Cheo & R. C. Fang, Bull.

Bot. Lab. North-East. Forest. Inst., Harbin 1980(6): 25. 1980. TYPE: China, Hubei, Xingshan Xian, 1,600 m, 27 May 1957, *Y. Liu* 529 (holotype, NAS).

Herbs, perennial, sparsely to densely pilose, often glabrescent above, rarely glabrous throughout. **Rhizomes** slender, with 1 or few filiform stolons. **Stems** 10–24(–30) cm, erect, simple, terete, crisped pilose at base. **Basal leaves** not rosulate, often withered by anthesis; petiole 0.5–2 cm; terminal leaflet reniform or suborbicular, 0.5–1.5 × 0.7–1.7 cm, base cordate, margin shallowly crenate or repand; lateral leaflets 2, much smaller than terminal ones, sometimes absent and leaf simple; middle and upper cauline leaves trifoliolate, sessile, to 10 cm; terminal leaflet reniform, suborbicular, or broadly ovate, 1.5–6(–7) × 1.2–4(–5) cm, with a petiolule 0.3–2.5(–5.2) cm, base cordate, rounded, or cuneate, glabrous, ciliate, or trichomes forming small tufts at teeth, margin crenate, repand, or obscurely to distinctly 2–6-toothed on each side, apex obtuse or acute; lateral leaflets 2, auriclelike, attached at or just above node, often

giving appearance of amplexicaul leaf base, suborbicular, ovate, obovate, or reniform, 3–16(–25) × 2–13(–17) mm, much smaller than terminal leaflet, margin entire, 1- or 2-toothed, or repand. **Racemes** ebracteate, 3–10-flowered; fruiting pedicels 0.5–1.7 cm, divaricate or ascending, slender. **Sepals** ovate, 2.5–3 × 1–1.5 mm, lateral pair subsaccate; petals white, obovate, 6–8 × 2–3 mm, apex rounded; median filament pairs 3–4.5 mm; lateral pair 1.5–3 mm; anther oblong, 0.7–1 mm; ovules 8–16 per ovary. **Fruit** linear, slightly flattened, 1.5–2.5 cm × 1–1.2 mm; valves smooth, glabrous; style 1–2 mm. **Seeds** brown, oblong, 1.5–1.8 × 0.8–1 mm, wingless. Flowering: Apr–Jul.

Habitat: shady slopes, woodlands, moist places in ravines.

Elevation: 800–2900 m.

Distribution: China (Anhui, Gansu, Hubei, Shaanxi, Sichuan).

Cardamine enneaphyllos (Linnaeus) Crantz, Cl. Crucif. Emend. 127. 1769; *Dentaria enneaphyllos* Linnaeus, Sp. Pl. 2: 653. 1753. TYPE: “*Dentaria triphyllus* Bauhin. As salinas Austriae Superioris, Herb. Burser no. XVIII(1): 83 (lectotype designated by Marhold (2001: 44), UPS).

Cardamine enriquei Marhold, Lihová & Perný, Bot. J. Linn. Soc. 139: 293. 2002. TYPE:

Cardamine eremita Standley & Steyermark, Field Mus. Nat. Hist., Bot. Ser. 23: 53. 1944; *C. bonariensis* Persoon subsp. *eremita* (Standley & Steyermark) Sjöstedt, Bot. Not. 128: 15. 1975. TYPE: Guatemala, *J. Steyermark 50143* (holotype, F!; isotype, US!).

Herbs, perennial, caespitose, with slender caudices, glabrous throughout. **Rhizomes** absent.

Stems 8–20 cm, erect or ascending, simple or branched above. **Basal leaves** and lowermost cauline 2–4 cm, petiolate, not auriculate; terminal leaflet 3–7(–10) × 2–5 mm, linear-oblong to oblanceolate, sessile, base attenuate, margin entire, apex obtuse; lateral leaflets 2–4 on each side of rachis, similar to terminal leaflet but smaller; uppermost leaves smaller, becoming simple. **Racemes** bracteate basally, secund and dense in fruit; **fruiting** pedicels 5–9 mm, ascending, slender, straight. **Sepals** 1.5–2 × 0.7–1 mm, oblong, caducous; petals 3.5–5 × 1–1.5 mm, white, spatulate, apex obtuse; filaments 2–2.5 mm; anthers 0.2–0.3 mm; ovules 12–14 per ovary. **Fruits** 2–2.7 cm × 0.8–0.9 mm; style 1–1.8 mm. **Seeds** 1.5–1.7 × ca. 0.5 mm, brown, oblong.

Flowering: Feb–Aug.

Habitat: rocky areas in alpine pine forests, limestone ridges, meadows.

Elevation: 2800–3700 m. (Endemic).

Distribution: Guatemala.

Cardamine fallax (O. E. Schulz) Nakai, Rep. Veg. Ooryongto 19. 1919; *C. flexuosa* subsp. *fallax* O. E. Schulz, Bot. Jahrb. Syst. 32: 478. 1903; *C. flexuosa* var. *fallax* (O. E. Schulz) Nakai, J. Coll. Sci. Imp. University Tokyo 31: 441. 1911; *C. flexuosa* var. *fallax* (O. E. Schulz) T. Y. Cheo & Fang, Bull. Bot. Lab. N.E. Forest. Inst. Harbin 1(6): 23. 1980, isonym; *C. scutata* subsp. *fallax* (O. E. Schulz) H. Hara, J. Fac. Sci. Univ. Tokyo, sect. 3, Bo. 6(2): 59. 1952. TYPE: [Japan], Mama-mura, Shimosa, anonymous, 11 May 1894 (lectotype designated by Marhold et al. (2007: 657), US00324475!).

Cardamine fargesiana Al-Shehbaz, Novon 10: 324. 2000. TYPE: China, Sichuan, Tchen-kéou-tin, *R. P. Farges 1341 bis* (holotype, P!; isotype, P!).

Herbs, perennial. **Rhizomes** ovoid or oblong, 2–5 × 1.5–2 mm; stolons slender, densely pilose with crisped trichomes. **Stems** 8–23 cm. simple, erect, densely crisped pilose at base, gradually sparser upward, completely glabrous at raceme. **Basal leaves** 1–4 per plant, simple or rarely with a pair of leafletlike lobes; petiole 0.5–4.5 cm, densely crisped pilose; leaf blade orbicular, 5–12 mm in diam., palmately 5-veined, abaxially glabrous or sparsely pilose along proximal portion of veins, adaxially pilose with simple, straight trichomes to 0.5 mm, base cordate, margin entire or obscurely 5-angled, mucronate at vein tips; cauline leaves 3–5, 0.9–2.2 × 0.7–1.5 cm, broadly ovate or oblong in outline, pinnatisect, abaxially glabrous, adaxially pilose; petiole absent and leaf base appearing auriculate; rachis 2–15 mm; terminal lobe of lowermost leaf obovate, 4–14 × 2–6 mm, apically 3-toothed, sometimes with a minute tooth subbasally on each side, base cuneate into a petiolule to 3 mm, margin entire, apex mucronate; lateral lobes 4–6, linear to lanceolate-linear, margin entire, apex acute, proximal 2–4 attached at one point on each side of rachis. **Racemes** ebracteate, 3–7-flowered; flowering pedicels ascending, 5–12 mm, straight, glabrous. **Sepals** ovate, 2.5–3 × 1.2–1.6 mm, glabrous, margin and apex membranous, lateral pair saccate; petals white, broadly obovate, 5–6 × 2.5–3 mm, apex rounded; median filament pairs 3–3.5 mm, slender, lateral pair 2–2.5 mm; anthers oblong, 0.8–1.1 mm, base sagittate. **Fruit** (young) glabrous; style 1–1.5 mm; stigma entire. **Seeds** not seen. Distribution: China (Sichuan).

Notes: Known only from two collections bothy made in late 19th century.

Cardamine flagellifera O. E. Schulz, Bot. Jahrb. Syst. 32: 405. 1903. TYPE:

Cardamine hugeri Small, Man. Fl. SE. U.S. 569. 1933; *Cardamine flagellifera* var. *hugeri* (Small) Rollins, Cruciferae Continental N. Amer. 274. 1993. TYPE:

Herbs, perennial, hirsute below, sparsely pubescent or glabrous above. **Rhizomes** fleshy, swollen and compact at stem base, producing many, slender, pubescent or glabrous stolons ca. 1 mm in diam. **Stems** 1–2.5 dm, erect, simple or rarely few branched above, sparsely to densely hirsute or pilose near base, sparsely so or glabrous distally. **Rhizomal leaves** simple or rarely 3-foliolate, (3–)6–16 cm; petiole (1.5–)4–13 cm; blade or terminal leaflet orbicular to reniform or broadly ovate, (1–)1.5–4.5 cm, petiolule 0.5–2 cm, base cordate, margin repand to coarsely crenate and apiculate at vein endings, sparsely pubescent or glabrous, not puberulent; lateral leaflets much smaller than terminal one, subsessile or on petiolules to 0.5 cm; cauline leaves 2–5, 3–5-foliolate; petiole 0.8–5 cm, base not auriculate; terminal lobe broadly ovate to suborbicular, 1.5–4(–5) × 1.2–3.5 cm, repand to coarsely crenate or slightly lobed, apiculate at vein endings, glabrous along margin, petiolule 0.5–1.5 cm; lateral leaflets similar to terminal but smaller, sessile or on petiolule to 0.5 cm. **Racemes** ebracteate; fruiting pedicels ascending to divaricate-ascending, 0.7–2 cm. **Sepals** oblong, 3–3.5 × 1–1.5 mm, ascending, base of lateral pair not saccate; petals white, oblanceolate, 5–6.5(–8) × 1.5–2.5 mm, not clawed, apex obtuse to submarginate; median filament pairs 3.5–5 mm, lateral pair 2.5–3 mm; anthers oblong, 1.2–1.6 mm. **Fruit** linear, 1.5–2.5 cm × 1–1.2 mm; valves glabrous; style 1.2–2.5 mm; ovules and seeds 10–14 per fruit. **Seeds** brown, oblong, 1.2–1.7 × 0.8–1.1 mm.

Flowering: Mar–Jun.

Habitat: moist wooded slopes, gorges, wooded ravines, seepage places.

Elevation: 300–1000 m.

Distribution: United States (Georgia, North Carolina, South Carolina, Tennessee, West Virginia).

Cardamine flexuosa Withering, Arr. Brit. Pl., ed. 3, 3: 578. 1796; *C. hirsuta* Linnaeus subsp.

flexuosa (Withering) Forbes & Hemsl., J. Linn. Soc., Bot. 23: 43. 1886; *C. hirsuta* Linnaeus

var. *flexuosa* (Withering) J. D. Hooker & T. Anderson in J. D. Hooker, Fl. Brit. India 1: 138. 1872; *C. scutata* Thunberg subsp. *flexuosa* (Withering) H. Hara, J. Fac. Sci. Univ. Tokyo III, 6: 59. 1952. TYPE: "Rookery at Edgebaston". Lectotype (designated by Post et al. [J. Bot. Res. Inst. Texas 3(1): 227. 2009]): Curtis Flora Londinensis t. 277. 1777.

Cardamine arisanensis Hayata, Icon. Pl. Formos. 3: 20. 1912; *Barbarea arisanensis* (Hayata) S. S. Ying, Alp. Pl. Taiwan Color. 2: 170. 1978. TYPE:

Cardamine debilis D. Don, Prodr. Fl. Nepal. 201. 1825, not Banks ex de Candolle, Syst. Nat. 2: 265. 1821; *Cardamine flexuosa* Withering subsp. *debilis* O. E. Schulz, Bot. Jahrb. Syst. 32: 478. 1903; *Cardamine flexuosa* Withering var. *debilis* (O. E. Schulz) T. Y. Cheo & R. C. Fang, Bull. Bot. Lab. North-East. Forest. Inst., Habrin (1980)6: 23. 1980. TYPE:

Cardamine sylvatica Link var. *kamtschatica* Regel, Bull. Soc. Imp. Naturalistes Moscou 34: 172. 1861; *C. flexuosa* Withering var. *kamtschatica* (Regel) Matsumura, Bot. Mag. (Tokyo) 13: 73. 1899. TYPE:

Cardamine flexuosa Withering var. *ovatifolia* T. Y. Cheo & R. C. Fang, Bull. Bot. Lab. North-East. Forest. Inst., Habrin (1980)6: 24. 1980. TYPE: China. Zhejiang: Hangchow Longjing, 21 March 1957, S. Y. Chang 186 (holotype, NAS).

Cardamine hirsuta Linnaeus var. *flaccida* Franchet, Bull. Soc. Bot. France 33: 398. 1886. TYPE: China. Yunnan, Mosoyn, near Lankong, 14 March 1885, *Delavay 1839* (holotype, P!; isotype, US!).

Cardamine hirsuta Linnaeus var. *omeiensis* T. Y. Cheo & R. C. Fang, Bull. Bot. Lab. North-East. Forest. Inst., Habrin 6: 23. 1980. TYPE: China. Sichuan: Mount Omei, Jinding, 1 July 1938, 3035 m, H. C. Chou 7690 (holotype, WH (as HWH); isotypes, A!, NAS!).

Cardamine oculata Horneman, Hort. Hafn. Suppl. 71. 1919; *C. flexuosa* Withering subsp. *debilis* var. *oculata* (Horneman) O. E. Schulz, Bot. Jahrb. Syst. 32: 479. 1903. TYPE:

Cardamine sylvatica Link in Hoffmann, Phyt. Blätt. 1: 50. 1803. TYPE:

Cardamine zollingeri Turczaninow, Bull. Soc. Imp. Naturalistes Moscou 28: 294. 1854.

Nasturtium obliquum Zollinger & Mor., Nat. en Geneesk. Arch. Neerl. Indie 2: 580. 1845. TYPE:

Herbs, annual or biennial, sparsely to densely hirsute basally or throughout, or glabrous. **Stem** (6–)10–50 cm, erect, ascending, or decumbent, 1 to several from base, simple or branched, flexuous or straight. **Basal leaves** not rosulate, often withered by anthesis, petiolate; leaf blade (2–)4–10(–14) cm, lyrate; terminal lobe reniform, broadly ovate, or suborbicular, repand or 3–5-lobed; lateral lobes, (1 or)2–6(or 7) on each side of midvein, petiolulate or subsessile, oblong, ovate, or elliptic, smaller than terminal lobe, entire, repand, crenate, or 3(–5)-lobed; cauline leaves 3–15, including petiole (2–)3.5–5.5(–7) cm; petiole base not auriculate; terminal lobe 3–5-lobed; lateral lobes 2–7 on each side of midvein, suborbicular, ovate, oblong, oblanceolate, or linear, similar to or slightly smaller than terminal lobe, sessile or shortly petiolulate, entire, repand, dentate, or 3(–5)-lobed. **Raceme** ebracteate, several flowered; fruiting pedicels divaricate or ascending, (5–)6–14(–17) mm, slender. **Sepals** oblong, 1.5–2.5 × 0.7–1 mm; petals white, spatulate, 2.5–4(–5) × 1–1.7 mm; stamens 6, rarely 4 and lateral pair absent; filaments 2–3 mm; anthers ovate, 0.3–0.5 mm; ovules 18–40 per ovary. **Fruit** linear, (0.8–)1.2–2.8 cm × 1–1.5 mm; valves glabrous, torulose; style 0.3–1(–1.5) mm. **Seeds** brown, oblong or subquadrate, 0.9–1.5 × 0.6–1 mm, narrowly margined or not. $2n = 32$.

Flowering: Feb–Jun.

Habitat: Fields, roadsides, grasslands, disturbed sites, streamsides, clearings, running water, wet forests, dry sites, greenhouses.

Elevation: 0–3600 m.

Distribution: **native** in Europe (all countries except Iceland); **naturalized** in Africa (Algeria, Morocco), Asia [Bangladesh, Bhutan, China (Guangdong, Guizhou, Sichuan, Yunnan), India (Sikkim), Indonesia, Japan, Kashmir, Korea, Laos, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Taiwan, Thailand, Vietnam], naturalized in Australia, North America [Canada (British Columbia, Newfoundland, Ontario), United States (Alabama, California, Florida, Georgia, Illinois, Indiana, Louisiana, Maryland, Michigan, New York, North Carolina, Ohio, Oregon, Rhode Island, Texas, Virginia, Washington)], Central America (Mexico), and South America [Argentina (Corrientes, Jujuy, Salta), Bolivia (La Paz, Santa Cruz), Brazil (Linhares-Espirito Santo), Colombia (Antioquia), Paraguay, Peru (Cajamarca, Pasco), Venezuela].
 Specimens examined: **ARGENTINA. Corrientes:** San Cosme, 16 Dec. 1992, *Ishikawa s.n.* (MO); Corrientes, *Krapovickas 39348* (BACP, LIL), *Schinini 35131* (NY). **Jujuy:** Capital, *Rotman 691* (SI). **Salta:** San Martín, camino a Cambuco, 17 July 1980, *Azcue s.n.* (BACP). **BOLIVIA. La Paz:** Sud Yungas, 2 km N Chulumani or rd to Irupana, 16°23'N, 67°32'W, *Solomon & Nee 14278* (MO). **Santa Cruz:** Andres Ibañez, Santa cruz de la Sierra, Irala Avenue 565, 17°46'S, 63°11'W, *Abbott 16866* (MO). **BRAZIL. Linhares-Espírito Santo:** Reserve Florestal de Linhares, *Folli 3072* (MO); Cuitiba, Guaratuba, *Hatschbach 43877* (BACP). **COLOMBIA. Antioquia:** Titiribí, Verda "Corcovado," sitio alto de Buenavista, 6°4'N, 75°48'W, *González 19* (MO); Angelópolis, *Gutiérrez & Barclay 17c634* (GH). **PARAGUAY.** Central, Asunción, *Schinini 4132* (BAA, BACP). **Valle.** Cali, Can Antonio o Cerro La Horqueta, Silverston-Sopkin 1490 (MO). **PERU. Cajamarca:** San Ignacio, San José de Lourdes, between Camaná and Santo Tomás, 5°1'S, 78°52'W, *Campos & Corrales 3798* (MO, NY); San José de Lourdes Bosque secundario, *Campos & Vásquez 6476* (MO). **Pasco:** Oxapampa, Abra de Villa Rica, 10°40'S, 75°18'W, *Rojas et al. 3260* (MO). **VENEZUELA. Bolivar:** Gran Sabana, Sierra de Lema, La Escalera, 6°0'N, 61°23'W, *Diaz et al. 6832* (MO). **Distrito Federal:** Parque Nacional El Avila, Cordiller de la Costa, 10°34'N, 66°54'W, *Meier 7770* (MO). **Miranda:** Los Teques, Carretera hacia Laguneta, *Montes 346* (S). **Trujillo:** Dtto. Bocono, Laguna Aguas negras, 3 km SW of Batatal, 9°19'N, 70°11'W, *Aymard & Stergios 2405* (NY, PORT). (Bolivar, Distrito Federal, Miranda, Trujillo)].

Cardamine flexuosa is one of the most variable species of Brassicaceae, especially in plant height, flower size, stem direction, density of indumentum, orientation of fruiting pedicels, degree of zigzagging of the raceme rachis, and, most dramatically, shape, number, size, margin, and base (sessile vs. petiolulate) of lateral leaf lobes. Although Schulz (Bot. Jahrb. Syst. 32: 464–473. 1903) recognized 20 infraspecific taxa in *C. flexuosa*, an examination of the types of most of these reveals that he confused the limits of least four different species, including *C. parviflora*, *C. scutata*, and the North American *C. pensylvanica* Muhlenberg ex Willdenow. Only a small fraction of the vast number of variants of *C. flexuosa* have been accorded infraspecific ranks, but all of those occur sporadically throughout the species range, and we prefer to avoid the recognition of infraspecific taxa that are based on unreliable characters, especially the morphology of lateral leaf lobes. Although *C. occulata* was based on Chinese material, it was not mentioned in FRPS, and it represents only a minor variant of *C. flexuosa*.

Cardamine fragariifolia O. E. Schulz, Bot. Jahrb. Syst. 32: 446. 1903. TYPE: China, Hupeh, A. Henry 5803 (holotype, B; isotype, GH!).

Cardamine scoriarum W. W. Smith; *Cochlearia scoriarum* (W. W. Smith) Handel-Mazzetti.

TYPE: China, Yunnan, flank of volcanic mountain NW of Lengyueh?, 25°70'N, 7000 ft, Jun 1912, G. Forrest 8201 (holotype, B!).

Cardamine smithiana Biswas. TYPE: Donga La, 9500 feet, 25 Jul 1933, *F. Ludlow & G. Sherriff* 324 (holotype, BM!).

Cochlearia alatipes Handel-Mazzetti; *Hilliella alatipes* (Handel-Mazzetti) Y. H. Zhang & H. W. Li; *Yinshania alatipes* (Handel-Mazzetti) Y. Z. Zhao. TYPE: China, Hunan, in monte Yünschan, near Wukang. ca. 1000 m, 12 Jun 1918, *H. F. Handel-Mazzetti* 12,098 (holotype, WU!; isotypes, E!, W!, WU!).

Herbs, perennial. **Rhizomes** 3–8 mm in diam. **Stems** (3.5–)5–10(–13) dm, erect, simple or branched above, glabrous or rarely puberulent. **Basal leaves** withered by flowering; cauline leaves (5–)7–10(–15), petiolate, trifoliate, rarely lowermost with 4 or 5 leaflets, often simple below raceme; petiole 1–6(–10) cm, not auriculate at base, wingless or wing rarely to 1 mm wide; petiolules 1–6(–11) mm; leaflets subequal or terminal larger, ovate or lanceolate, rarely elliptic or subrhomboid, (1.5–)3–8(–12) × (1–)2–3(–5) cm, glabrous or with appressed, antrorse, simple trichomes 0.1–0.7 mm, base cuneate or obtuse, that of lateral leaflets often oblique, margin serrate or crenate, rarely lobed or subentire, ciliate with trichomes more than 0.1 mm, teeth mucronate, apex acute, acuminate, or acuminate-caudate. **Raceme** ebracteate, several flowered; fruiting pedicels divaricate, 5–9(–13) mm, slender, straight, glabrous or sparsely puberulent. **Sepals** oblong, 2.5–3.5(–4) × 1.5–2 mm, erect or ascending, not saccate, glabrous; petals purple, lavender, pink, or rarely white, obovate or obovate-oblong, (6–)7–9(–10) × (2.5–)3–4 mm, rounded at apex; claw 1.5–2(–3) mm; median filament pairs 4–5 mm, lateral pair 3–4 mm; anthers (0.6–)0.7–1 mm. **Fruit** (young) glabrous; style slender, ca. 1 mm; stigma entire. **Seeds** not seen.

Flowering: May–Jul.

Habitat: volcanic mountain slopes, shaded streamsides, wet forests, rocky places, moist grasslands.

Elevation: 1000–3000 m.

Bhutan, China (Guangxi, Guizhou, Hubei, Hunan, Sichuan, Yunnan), India, Myanmar.

Cardamine franchetiana Diels, Notes Roy. Bot. Gard. Edinburgh 5: 205. 1912; *Loxostemon delavayi* Franchet, Bull. Soc. Bot. France 33: 400. 1886, not *Cardamine delavayi* Franchet, Bull. Soc. Bot. France 33: 397. 1886. TYPE: China, Yunnan, Likiang, 9 Jul 1884, *Delavay* [35] (holotype, P!).

Loxostemon smithii O. E. Schulz, Acta Hort. Gothob. 1: 161. 1924; *Loxostemon smithii* O. E. Schulz var. *glabrescens* O. E. Schulz, Acta Hort. Gothob. 1: 162. 1924. TYPE: China, Sichuan, SE of Matang, 15 Sep 1922, 4800–5100 m, *H. Smith* 4445 (holotype, UPS!).

Herbs, perennial, hirsute or glabrescent. **Rhizomes** to 1 cm, with stolons and numerous bulbils; bulbils whitish, fleshy scales ovoid or subglobose, with rudimentary apical appendages. **Stems** (5–)10–20(–27) cm, simple, erect; underground proximal part whitish, slender or filiform, glabrous; aboveground part green or purplish, stout, pilose or glabrous. **Rhizomal leaves** 1 or 2, 4–12(–18) cm; petiole 4–10 cm; terminal leaflet oblong, 4–10 × 2–6 mm, sessile or with a petiolule to 2 mm; lateral leaflets 2–4 pairs, similar to terminal one; cauline leaves (1 or)2 or 3(or 4), 1.5–5 cm; petiole 0.4–4(–6) cm, base not auriculate; terminal leaflet oblong to oblong-elliptic, 4–11 × 1.5–3 mm, ciliate or glabrous, base cuneate, margin entire, apex mucronate; lateral leaflets (2 or)3–6 pairs, similar to terminal one. **Raceme** ebracteate, 3–8-flowered; fruiting pedicels divaricate-ascending to ascending, 4–13 mm, straight. **Sepals** ovate or suboblong, 2–3 × 1.2–1.7 mm, margin membranous; petals white or rarely lavender, broadly obovate or suborbicular, 6–9 × (3–)4–6 mm, base abruptly narrowed into a claw 1–2 mm, apex rounded; median filament pairs 3–4 × 0.4–0.6 mm, flattened, not extended apically into a tooth; lateral pair

slender, 2–3 mm; anthers oblong, 0.6–0.9 mm; ovules 8–16 per ovary. **Fruit** linear, 1.5–2.5 cm × 1.5–2 mm; valves smooth, glabrous; style 1–3 mm. **Seeds** brown, broadly oblong or ovate, 1.3–1.6 × 0.9–1.2 mm, wingless.

Flowering: Jun–Jul.

Habitat: mountain slopes, deep valleys, rocky areas, scree, crevices of boulders, meadows, moist pastures.

Elevation: 2300–4800 m.

Distribution: China (Qinghai, Xizang, Yunnan).

Cardamine franklinensis I. Thompson, *Muelleria* 9: 152. 1996. TYPE: Australia, Australian Capital Territory, 3.2 km above Bendora on Mt. Franklin Road, 13 Nov 1953, *C. W. E. Moore* 2777 (holotype, NSW).

Herbs, perennial, glabrous throughout. **Stems** erect, to 30 cm tall, usually branched from base and above. **Basal leaves** densely rosulate, thin, petiolate, to 15 cm, simple or pinnate; simple leaves spatulate, crenate or entire; pinnate leaves 3–5-foliolate, terminal lobe elliptic to ovate, lateral leaflets sessile, obovate, attenuate at base; cauline leaves 0–3, petiolate, not auriculate at base, reduced in size upwards, lower ones similar to basal leaves, uppermost simple, pinnatifid or entire. **Raceme** ebracteate, many flowered; fruiting pedicels divaricate-ascending, ca. 10 mm. **Sepals** ovate, 2–3 mm; petals strongly differentiated into blade and claw, white or pink on the outside, 4.5–6.5 mm; stamens 6. **Fruits** suberect, 2.5–3.5 cm × 1.5–1.8 mm; style 1–2 mm. **Seeds** elliptic, 1.3–1.5 mm.

Flowering:

Habitat: subalpine woodlands, rocky scree slopes, among *Poa* tussocks.

Distribution: Australia (Australian Capital Territory, New South Wales, Tasmania, Victoria).

Cardamine fulcrata Greene, *Pittonia* 3: 155 (1897). TYPE: Mexico, *Pringle s.n.* (holotype, ND-G). US has three sheets as Pringle 4989 marked as isotypes: check original publication.

Cardamine aschersoniana O. E. Schulz, *Bot. Jahrb. Syst.* 32: 410. 1903. TYPE: Venezuela, Tovar, May 1836, *Moritz* 369 (lectotype, here designated, B!).

Cardamine bradeii O. E. Schulz, *Notizbl. Bot. Gart. Berlin-Dahlem* 8: 328. 1923. TYPE: Costa Rica, Barba, 22 Jan. 1909, *A. C. Brade* 2305 (holotype, B?).

Cardamine fulcrata var. *scabra* O. E. Schulz, *Bot. Jahrb. Syst.* 32: 411. 1903. TYPE: Venezuela, Tovar, 2340–2670 m, 1854–1855, *A. Fendler* 23 (holotype, GH!; isotypes, K!, NY!).

Herbs, perennial. **Rhizomes** slender, not tuberous. **Stems** (1.5–)2.5–6(–8) dm, erect or decumbent, simple or branched above, glabrous or puberulent. **Cauline leaves** (lower and middle) 3.3–16(–23) cm, trifoliolate; petiole 2–8(–10) cm; terminal leaflet 2–8(–11) × (0.7–)1.5–3(–4) cm, lanceolate, oblong, elliptic, or ovate, sparsely hirsute or puberulent with trichomes to 0.5 mm, base cuneate to subobtuse, margin ciliolate with trichomes to 0.2 mm, serrate or crenate, teeth mucronate, apex acute to long acuminate, petiolule 0.5–1.5 cm; lateral leaflets smaller than terminal lobe, subsessile or with a petiolule to 5 mm, base oblique; uppermost leaves smaller, reduced into bracts. **Racemes** bracteate throughout or rarely only basally; bracts simple, linear to linear-oblongate; lowermost filiform to lanceolate and to 5 × 1.5 cm, subsessile or on petioles to 2 cm; fruiting pedicels (7–)10–20(–25) mm, divaricate to ascending, stout. **Sepals** oblong, 2–3.5 × 1–1.5 mm, not saccate; petals white, obovate to oblongate, 4.5–7 × 2–4 mm; filaments 2.5–4.5 mm; anthers oblong, 0.8–1.2 mm; ovules

12–20 per ovary. **Fruits** (2.8–)3.5–5(–5.8) cm × 1.5–2.2 mm; style 1–2.7(–4) mm. **Seeds** brown, oblong, 1.5–2.7(–3) × 0.8–1.2(–1.5) mm.

Flowering: sporadically throughout the year.

Habitats: Cloud or rain forests, shady hillsides, mossy stream banks, along trails, forest margins.

Elevation: 700–3300 m.

Habitat: cloud forests, shady hillsides, mossy stream banks, along trails in forests, forest margins.

Elevation: 700–2800 m. Distribution: Southern Mexico (Chiapas), Central America (Costa Rica, Guatemala, Honduras, Panama) and northern South America [Colombia (Magdalena, Santander), Venezuela (Lara, Merida, Monagas, Sucre, Tachira, Trujillo)].

Specimens examined: **COLOMBIA. Magdalena:** E of La Finca de Cortes, 0.5 km, 10°54'N, 73°58'W, *Kirkbride & Forero 1860* (US). **Santander:** W slope of Cordillera Oriental, hwy from Bucaramanga to Cúcuta, km 31, *Stein 3622* (GH, MO, NY); Chitagá Valley, 1 km N Alto del Almorzadero, 73°39–40'W 06°59'N, St. John 20794 (GH); Zapatoca, *Fassett 25519* (GH).

VENEZUELA. Lara: Dtto. Moran, trail from Humocaró to Buenos Aires (Caserío) below Páramo Los Rosas, *Liesner et al. 8160* (MO). **Merida:** La Carbonera, *Bernardi, Charpin & Jacquemoud 17188* (F, G); San Rafael, Páramo de Las Coloradas, *Cuatrecasas, Ruiz-Terán & López-Figueiras 28521* (F, US); Andrés Bello, Zerpa, *Wessels Boer 1737* (F, K, MO, NY); Campo, Bosque de San Eusebio, *Ruiz-Terán 1095* (MO); La Mucuy, 15 km NEE of Mérida, *Breteler 3474* (NY, S, US); La Mucuy, Rio Loro, on trail to La Lagtuna Coromoto, *Barclay & Juajibioy 9936* (GH, MO); trail from Cabin at La Escalera to the Puente de La Escalera, *Luteyn et al. 6213* (MO, NY); Mucuquí, Bosque del Cacique, *Bernardi 177* (NY). **Monagas:** Cuácharo Cave, 6 km NW Guácharo, *Steyermark 62314* (F, GH). **Sucre:** Cerro Turumuquire, headwaters of Río Manzanares, *Steyermark 62685* (F). **Tachira:** Páramo Zumbador, *Charpin, Jacquemoud & Ruiz-Terán 13392* (F, G); 3–8 kms de Zumbador, between Zumbador and Queniquea, *Steyermark 105081* (MO); Quebrada Agua Azul, S El Reposo, 14 km SE Delicias, 7°31'V, 72°24'W, *Steyermark & Liesner 118343* (GH, MO). **Trujillo:** Boconó, Parque Nacional Guaramacal, Laguna de Agua Negra, Qda Salvaje, *Stergios, Dorr & Caracas 20295* (MO, US); sector Quebrada Honda de El Santuario, 1012298N, 359185E, *Stergios, Niño & Cuello 19338* (MO, US); Guaramacal Paramo, *Stergios & Caracas 19226* (MO, US); Dorr et al. 4980 (GH, NY).

The only difference used by Schulz (1903) to separate *Cardamine fulcrata* from *C. aschersoniana* in having smaller and acute instead of larger and acuminate terminal leaflets of cauline leaves. By contrast, the differences he (Schulz, 1923) used to separate *C. fulcrata* from *C. bradeii* is having sessile instead of long petiolulate (to 5 mm Long) lateral leaflets. In my opinion, these differences break down when the overall variability of the species in its entire range is taken into consideration. Furthermore, Schulz (1903) cited one collection, *Fendler 23* (GH) under both *C. fulcrata* and *C. aschersoniana*.

Cardamine fulcata is often confused with *C. africana*, an African species naturalized in the Neotropics, but it is easily distinguished by having bracteate instead of ebracteate inflorescences.

Cardamine gallaecica (M. Laínz) Rivas Mart. & Izco, *Itinera Geobot.* 15: 699. 2002.

Cardamine georgiana Al-Shehbaz & Warwick, *Rhodora* 101: 275. 1999; *Dentaria microphylla* Willdenow, Sp. Pl. 3: 479. 1800; *C. microphylla* (Willdenow) O. E. Schulz, Bot. Jahrb. Syst. 32: 342. 1903, not *C. microphylla* Adams, Mém. Soc. Imp. Naturalistes Moscou 5 : 111. 1817, nor *C. microphylla* J. Presl, Delic. Prag. 1 : 15. 1822. TYPE: Georgia, anonymous (holotype, B-W!).

Cardamine geraniifolia (Poiret) de Candolle, Syst. nat. 2: 268. 1821; *Sisymbrium geraniifolium* Poiret in Lamarck, Encycl. 7: 218. 1806; *Dentaria geraniifolia* (Poiret) Reiche, Fl. Chile 1: 104. 1896. TYPE: Chile, Magellan, *Commerson s.n.* (holotype, P-JU! ; isotypes, 2P!)

Herbs, perennial. **Rhizomes** fleshy, elongated, non-scaly, to 12 cm × 6 mm. **Stems** (14–)20–38(–46) cm, erect or decumbent only at base, simple or branched above, often glabrous. **Rhizomal leaves** and lowermost cauline compound, pinnate, (7–)12–28 cm; petiole (3–)6–10(–15) cm; lateral leaflets 2–4 pairs, broadly to narrowly ovate, 2–6 × 1.5–5 cm, sparsely to moderately pubescent with trichomes to 0.5 mm, pinnately lobed or incised to coarsely dentate or serrate, base oblique or rarely cuneate, apex acute; petiolule (0.8–)1–2.2 cm; terminal leaflet same size or slightly larger than lateral ones; cauline leaves 3–5, progressively smaller and with shorter petioles and petiolules upward. **Racemes** ebracteate, 8–15-flowered, dense corymbose, ebracteate, slightly to strongly elongated in fruit; rachis straight; fruiting pedicels 0.9–2.5 cm, stout, ascending to divaricate-ascending, straight. **Sepals** green, oblong, 4–6 × 2–2.5 mm, caducous, glabrous; petals white, broadly obovate, (0.8–)1–1.5 cm × 4–8 mm, apex obtuse or rounded; filaments 4–7 mm; anthers oblong, 1–1.5 mm; ovules 12–20 per ovary. **Fruits** linear, (3–)4–8(–9) cm × 2–2.5(–2.9) mm, glabrous; style (2–)3–5 mm. **Seeds** brown, oblong, 2.5–3.2 × 1–1.8 mm. 2n = 144.

Flowering: Oct–Feb.

Habitat: wet or swampy areas.

Elevation: 0–600 m.

Distribution: Argentina (Santa Cruz, Tierra del Fuego), Chile (Región X, XI, XII).

Specimens examined: **ARGENTINA. Santa Cruz:** Río Santa Cruz, *Montt 197* (CONC). Dep. Lago Argentino, Lago Argentino, 22 Feb 1914, *Hicken & Hauman s.n.* (SI); Porto Ferrari, Lago Argentino, *Hicken & Hauman 375, 429* (SI). **Tierra del Fuego:** Dep. Ushuaia, arroyo Culebra, 10 km N Ushuaia, *Boelcke et al. 15276* (B AA, BACP); Estancia Moat, 54°56'S, 66°44'W, *Moore 1693* (BAA, BAB); S Lago Fagnane, Mt. Heuhuepen, 54°34'S, 71°01'W, *Moore & Goodall 394* (BAB, K); Ushuaia, Bahía Buen Suceso, *Biganzoli 467* (MO, SI); Valle Lasifashaj, Las Cotorras, ca. 20 km ENE of Ushuaia, *Santesson 416* (K, P, S); near Monte Olivia, *Hunziker 8213* (CORD, GH); E Monte Olivia River of Vela de la Novia falls, *Goodall & Lutken 42* (BAB, MO); S Lago Escondido, 54°40'S, 67°53'W, *Roivainen 611* (MO); Ushuaia, Monte Susana, *Roivainen 1097* (MO); Ushuaia, *Pennington 307* (SI); Co. Dos Banderas, *Correa & Pérez Moreau 2058* (BAA, BAB); Valle de l'Oliveira, 14-17 Feb 1896, *Alboff s.n.* (SI); Parq Nac Cañadón Toro, *Correa & Reynoso 11732* (BAA); Montes Martiales, camino Laguna Azul, 9 Jan 1960, *Gronadona s.n.* (BAA). **CHILE.** Ruta Austral, Paso Queule, *Schlegel 8109* (CONC); Estancia Remolino, 54°50'S, 67°52'W, *Moore 1999* (BAA, K). **X.** Ró Palena, Jan-Feb. 1887, *Delfuis s.n.* (SGO). **XI.** Coihaique, El Sitio (Cerro El Cielo), Bosque Lengua, *Godoy et al. 64* (CONC); Valle de río Cajón, afluyente de río Ibáñez, la parte dltta del río Ibáñez antes de su confluencia con el río Cajón, y el valle del Estero Pérez, 46°10'S, 72°17'W, 5 Dec 2002, *Moreira s.n.* (SGO). **XII.** Punta Arenas (Sandy Point), 1878, *Ortega s.n.* (SGO), *Dusén 107* (LIL, MO, S, UPS), *Philippi 65* (SGO), *Lechler 1162* (G, P, UPS, W), *Cunningham s.n.* (B, GH); Punta Arenas, Tres Brazos, [53°16'S, 70°57'W], *Giorgio 37* (CONC); Río Bueno, *Donat 345* (BA, BAF, BM, CAS, F, GH, K, LIL, NY, SI); Bahía Morris, Isal Capitan Aracena, [54°15'S, 71°01'W], *Pisano 3293* (BAA, CONC), *Moore 2723* (BAB, K, UPS); Fiordo Peel, Río Murtillar, 50°27'S, 73°37'W, *Pisano 6013* (CONC); Canal de las Montañas, 51°38'S, 73°24'W, *Pisano*

6125 (CONC); Rio Hilco, *Skottsberg s.n.* (S, UPS); Tierra del Fuego, Fiordioa Contralmirante Martínez, Bahía Escandallo, Río de la Laguna, 54°13'S, 70°10'W, *Pisano & Dominguez 7165* (CONC); Sector Bahía Victoria, Forestal Trillium, 54°50'S, 69°52'W, *Pisano et al. 8323* (CONC). **Where?** : Tierra del Fuego, Rio Fontaine, 3 Jan. 1908, *Skottsberg s.n.* (SGO). Bahia Morris, Isla Capitan Aracena, *Pisano & Moore 3393* (BAA). Península Muñoz Gamero, Calet Dora, *Pisano & Dollenz 5879* (GH). Laguna Parrillar, *Pisono 3890* (GH). **Peru. Cusco**, Calca, Dist. Lares, Choquecancha, Azulcocha, 12°33'S, 72°W, Valenzuela et al. 4976 (MO).

Cardamine geraniifolia is one of the most distinctive South American species of the genus. Despite its variation in flowers size, petiole and petiolule length, leaflet size and margin type, and fruit length, it has not been divided into infraspecific taxa, as evidenced from the synonymy above. It is readily distinguished from all congeners in South America by the fleshy, repent, non-scaly rhizome, pinnately compound leaves with long petiolules, 2–4 lateral pairs of serrate to incised or lobed leaflets, and large petals to 1.5 mm long.

The above collection from Peru represents the first record of this otherwise Patagonian species. The Peruvian plant is with immature fruits, but in floral, leaf, and receme aspects it is indistinguishable from plants of *Cardamine geraniifolia*. Without mature fruits, the placement of this collection is this species remains tentative.

- Cardamine glacialis** (G. Forster) de Candolle, Syst. Nat. 2: 264. 1821. *Sisymbrium glaciale* G. Forster, Comm. Soc. Regiae Göttingen 9: 32. 1789. TYPE: Argentina, Tierra del Fuego: Ushuaia, *J. R & G. Forster s.n.* (holotype, BM, not seen).
Sisymbrium grandiflorum Molina, Sag. Stor. Nat. Chili, ed. 2, 292. 1810; non *S. grandiflorum* Weddell, Ann. Sci. Nat., Ser. 5, 1: 290. 1864; nec *S. grandiflorum* Post, Pl. Postinae 1: 3. 1890. TYPE: Chile, **Collector? (holotype, BOLO?). Neither type nor original publication seen.**
Cardamine pratensis Linnaeus var. *minor* Barnéoud in Gay, Fl. Chile 1: 114. 1845. TYPE: Chile, *C. Gay s.n.* (holotype, **P, not seen**)
Cardamine glacialis var. *pumila* A. Gray, A. Gray, Bot. U. S. Expl. Exped. Wilkes 1: 49. 1854. TYPE: Tierra del Fuego, **collector?** (holotype, **GH?, or US?**).
Cardamine glacialis var. *elatior* A. Gray, A. Gray, Bot. U. S. Expl. Exped. Wilkes 1: 49. 1854. TYPE: Tierra del Fuego, Orange Harbor, 1838-1842, *Wilkes s.n.* (holotype, **GH?, or US?**; isotype, **P!**).
Cardamine antiscorbutica Banks & Solander ex Grisebach, Abh. Königl. Ges. Wiss. Göttingen 6: 115. 1854; *C. hirsuta* Linnaeus var. *antiscorbutica* (Banks & Solander ex Grisebach) Reiche, Fl. Chile 1: 100. 1896 TYPE: Chile, Magallanes, Brunswick Peninsula, Sandy Point, *Lechler 1116* (lectotype, inadvertently designated by Steudel, GOET, **not seen**; isotypes, **G!, NY!, 4P!, SGO!**). Grisebach (1854) listed both *Lechler 1116* and *1161* under the description of *C. antiscorbutica*. The latter collection was taken by Stuedel as the type of *C. strictula* and therefore *C. antiscorbutica* was lectotypified.
Cardamine strictula Steudel, Flora 39: 410. 1856. TYPE: Chile, Magellan: Sandy Point, *Lechler 1161* (holotype, **P!**; isotypes, **K!**; fragment, **BAA!**).
Cardamine gongyloides Philippi, Linnaea 28: 664. 1856. TYPE: Chile, Chonos Island, *Fr. Fonk 83* (holotype, SGO-49417!; fragments, **BAA!**).
Cardamine magellanica Philippi, Anal. Univ. Chile 41: 666. 1872; *C. hirsuta* Linnaeus var. *magellanica* (Philippi) Reiche, Fl. Chile 1: 100. 1896. TYPE: Chile, Del Strecho de Magallanes, *Philippi s.n.* (holotype, **SGO-...**). **not seen, and no sheets listed by Muñoz (1960).**
Cardamine litoralis Philippi, Anal. Univ. Chile 27(2): 313. 1865; *C. glacialis* subsp. *litoralis* (Philippi) O. E. Schulz, Bot. Jahrb. Syst. 32: 541. 1903. TYPE: Chile, Valdivia: boca del río

Hueicolla, Nov. 1864, *F. Philippi* 59 (holotype, SGO-63893!; fragments, BAA!). **The type information was copied from Muñoz (1960) who listed also SGO-49422 as part of the type collection. I have not seen the latter sheet.**

Cardamine palenae Philippi, Anal. Univ. Chile 81: 80. 1892. TYPE: Chile, Río Palena, Jan-Feb. 1887, *Federico Delfin s.n.* (holotype, SGO-71618!). Although Muñoz (1960) listed and annotated another sheet, SGO-63892!, as part of the type collection, the sheet does not carry Philippi's hand writing about the collector and locality given above and, therefore, it should not be considered as part of the type material.

Cardamine soehrensii Philippi, Anal. Univ. Chile 81: 84. 1892; *C. hirsuta* Linnaeus var. *soehrensii* (Philippi) Reiche, Fl. Chile 1: 100. 1896; *C. glacialis* var. *soehrensii* (Philippi) O. E. Schulz, Bot. Jahrb. Syst. 32: 543. 1903. TYPE: Chile, Andes of Prov. Santiago, horto botanico (as H. B.), October 1890, *Philippi s.n.* (holotype, SGO-71636!). **Muñoz (1960) listed SGO-63892 as another specimen of the type collection, but I have not seen that.**

Cardamine glacialis var. *pubescens* Philippi ex O. E. Schulz, Bot. Jahrb. Syst. 32: 541. 1903. TYPE: Chile, *Bridges s.n.* (holotype, B!; isotype, G!).

Herbs, perennial. **Rhizomes** much thickened, short, forming a tuberous stem base, not scaly. **Stems** (2-)7-45(-115) cm, erect, 1 to numerous from base, glabrous or sparsely to densely pubescent throughout, slender or stout, lowermost nodes without adventitious roots. **Basal leaves** and lowermost cauline compound, 2-15 cm, 3-11(-15)-foliolate, glabrous to densely pubescent; petiole (1-)2-9(-11) cm; terminal leaflet (0.4-)0.8-3.8(-5) × 0.7-3(-4) cm, ovate to obovate or suborbicular to subreniform, obtusely dentate to repand or entire, with petiolule 0.3-1.7(-3) cm; lateral leaflets ovate to oblong, 0.3-2(-3.5) × 0.2-1.5(-2.5) cm, sessile or on a petiolule 0.5-4(-6) mm, entire to repand or dentate; upper cauline leaves similar to lower ones in shape and size though sometimes smaller upwards. **Racemes** ebracteate; rachis straight; fruiting pedicels 4-15(-25) mm, ascending to suberect, slender or stout, straight, often forming a straight line with fruit. Sepals oblong to broadly ovate, (1.7-)2-3 × 0.8-1.5 mm; petals white, narrowly obovate to oblanceolate, 4-7(-8.5) × 1.5-3 mm, gradually narrowed to base, apex obtuse; filaments 2-4 mm; anthers ovate, 0.5-0.8 mm; ovules 20-32 per ovary. **Fruits** linear, (1.6-)2-3.5(-4) cm × 1.2-2 mm, not attenuate at apex; style stout, (0.3-)0.5-1.5(-2) mm. **Seeds** brown, ovate, 1-1.7 × 0.7-1 mm, wingless.

Flowering: Oct-Mar.

Habitat: moist shade under Nothofagus trees, spring seepage, swamps, costal dunes, mossy and sandy humus over rocks.

Elevation: 0-1450 m.

Distribution: Argentina (Chubut, Santa Cruz, Tierra del Fuego), Chile (Región X, XI, XII), Falkland Islands.

Specimens examined: **ARGENTINA. Chubut:** Dep. Río Senguerr, valle del lago Blanco, Koslovsky 12493 (BAB). **Santa Cruz:** N Lago Rico, Glacier Natl. Park, *Eyerdam et al.* 24314 (DS, G, MO, SI, UC). Dep. Güer Aike, Ea. Stag River, Meseta Latorre, Co. Punta Gruesa, 51°32'S, 72°05'W, *Roig et al.* 3081 (SI); Ea. Stag River, 16 km N de casco, río de los Venados, 51°34'S, 71°58'W, *TBPA* 3189 (BAB, BACP, SI); Ea. Las Viscachas, Laguna Viscachas, 50°43'S, 71°58'W, *TBPA* 2587 (BAB, SI); Ea. La Verdadera Argentina, Co de La Virgen, 50°50'S, 71°14'W, *TBPA* 2126 (BAB, SI); canal de los Tempanos, Glaciar Ameghino, 50°30'S, 73°0'W, *Correa et al.* 3101 (BAA, BAB). Dep. Lago Argentino, Lago Argentino, Pen. Magallanes, *Boelcke et al.* 16431 (BAA, BAB, BACP); Porto Ferrari, *Hicken*

& *Hauman 368* (SI); Estancia Cristina, N end of Lago Argentino, *Ager 504* (US). **Tierra Del Fuego:** Dep. to Ushuaia, Isla de los Estados, Puerto Cook, 54°45'S, 64°03'W, *Nicora et al. 7349* (BAA, SI); Bahía Franklin, 54°54'S, 64°42'W, *Dudley et al. 1451* (SI); Puerto Roca, 54°43'S, 64°12'W, *Dudley et al. 731* (SI); Puerto Vancouver, 54°47'S, 64°04'W, *Dudley et al. 1023* (A, E, MO, P, SI, UC), *Dudley et al. 934* (SI); Bahía Flinders, 54°46'S, 64°32'W, *Dudley et al. 1503* (E, P); side of Lago Fagnano, Monte Heuhuepen, 54°34'S, 67°07'W, *Moore 2846* (MO); Sierra Sorondo, behind Punta Segunda, 54°47'S, 67°58'W, *Moore 1959* (MO); Estancia Harberton, Monte Overo, Goodall 460 (E, NY, UC, US), *Boelcke et al. 15254* (BAA, BAB, BACP); Twin Islands of Estancia Haberton, *Goodall 1365* (NA); Lago Fagnano, *Boelcke et al. 15204* (BAA, BAB, BACP, MO); Ushuaia, Lapataia, *Boelcke et al. 15273* (BAA, BAB, BACP, MO); Lago Escondide, *Cabrera 34141* (MO); Estancia La Correntina, 14 km E Fabrica Kami, *Goodall 3984* (A, NA); Isla de los Estados, 54°52'S, 64°41'W, *Biganzoli 658* (SI); Mitre Peninsula of Isla Grande, 54°47-48'S, 65°15-16'W, *Dudley et al. 214* (SI); Montes Martiales, camino Laguna Azul Altura, *Grondona 7349* (BAA); Isal Wollaston, Caleta Lientur, 55°44'S, 67°19'W, *Pisano 4979* (GH). Dep. Islas del Atlántico Sur, Islas Malvinas: without locality, 1839-1843, *J. D. Hooker s.n.* (B, G, K); Pto. Stanley, *Ulibarri et al. 238* (SI). **CHILE. X:** Valdivia, Corral, 10 Nov 1902, *Buchtien s.n.* (E, G, GH, SI, US); Llanquihue, Isla Magdalena, *Werdermann 79* (CAS, E, F, G, GH, LIL, MO, SI, UC); Isla Grande de Chiloe, 30 km N Cucao at mouth of Rio Anay, 42°28'S, 74°15'W, *Gardner 3594* (CONC, E); Chepu, *Godley 343* (SGO); Pucatrihue, *Sparre 3879* (SGO); Niebla, [39°51'S, 63°24'W], *Gunckel 40611* (CONC); Hueicolla, [40°09'S, 73°39'W], *Hollermayer 778* (CONC, SI). **XI:** Portezuelo Los Mallines, enter los valles Simpson e Ibanez, *Rentzell 6132* (SGO); Galeta Vidal, *Behn 25* (SGO); Parque Nacional Laguna San Rafael, 46°37'S, 73°53'W, *Pisano 6259* (CONC); Estero Cofré, [46°11'S, 72°47'W,] *Vogel 560* (CONC); Coihaique, Mallín, *Godoy et al. 62* (CONC). **XII:** Isla Piazzzi, Caleta Ocación, 51°44'S, 74°01'W, *TBPA 1033* (SI); 15 km S Punta Arenas, *Eyerdam et al. 24113* (DS, G, MO, NA, SI, UC); 78 km NW Punta Arenas on rd to Puerto Natales, *Eyerdam et al. 24144* (CAS, G, MO, SI, UC); Estancia Maria Christina, 80 Km NE Punta Arenas, *Goodall 4023* (A); Vicuña, [54°08'S, 68°47'W], *Ricardi & Matthei 231* (CONC); Punta Arenas, 24 Jan 1936, [53°10'S, 70°54'W], *Behn s.n.* (CONC); Cerros Canchas de Sky, [53°09'S, 70°55'W], *Ricardi & Matthei 303* (CONC); Monte Fentón, *Barrientos 159* (CONC); Isla Guarelo, [50°21'S, 75°20'W], 13 Nov 1975, *Moyano s.n.* (CONC); Sierra Carmen silva, N Río Chico Valley, 53°30'S, 68°39'W, *Moore & Goodall 219* (BAB, NA); Estancia Cameron, *Moore 1105* (US); Rio Rubens, ca. 50 Km SE Natales, *Santesson 1611* (S); Isla Navarino, 2 km SW Puerto Williams, *Moore 352* (UC, US); Cerro Donoso, Sector Río de las Chinas, 50°44'S, 72°31'W, *Arroyo et al. 870308* (CONC); Sierra de los Baguales, Cerro Santa Lucía, 50°44'S, 72°20'W, *Arroyo 841121* (CONC); Parque Nacional Torres del Paine, Cerro Diente, 50°47'S, 72°57'W, *Arroyo & Squeo 850913* (CONC); Fiordo Parry, Bahía Cuevas, [54°42'S, 69°19'W], *Pisano 3003, 3071* (CONC, SI); Bahía Morris, Isla Capitan Aracena, [54°15'S, 71°01'W], *Pisano 30305* (CONC); Canal de las Montañas, 51°38'S, 73°24'W, *Pisano 6147* (CONC); Fiordo Peel, 50°30'S, 73°44'W, *Pisano 6104* (CONC); Puerto Eden, Isal Wellington, 49°09'S, 74°33'W, *Pisano 6398* (CONC); Kerber, Punto Enap, [52°45'S, 69°15'W], *Pisano 2590* (BAA, CONC, SI); Río Bueno, [53°10'S, 70°00'W], *Pisano 2489* (CONC); Península Roca,

Seno Resi, 51°51'S, 73°2'W, *Pisano* 2931 (SI); Fiordo Peel, Río Murtillar, 50°27'S, 73°37'W], *Pisano* 5897 (CONC); river outwash from Alemania Glacier, Beagle Channel, Llano 74 (NA); Río Santa Maria a 60 km Camino Sur, *Pisano* 3551 (BAA, NA); Laguna El Parrillar, *Pisano* 3915 (GH, NA); Los Tres Mrros, *Dolenz* 183 (CONC); Lago Blanco, Texera 2 (CONC); Fiordo Silva Palma, Angostura Titus, Río Raul, *Pisano* 3822 (NA); Río Caleta, *Pisano* 2728 (MO, SI); Los Azules, *Pisano* 2737 (MO, SI); Cerro Mirador, *Pisano* 2769 (MO, SI); Seno Ultima Esperanza, Puerto Bella Vista, 51°28'S, 73°16'W, *Moore & Pisano* 1587 (SI).

Cardamine glacialis is sometimes confused with the introduced *C. hirsuta* because both have pinnate leaves and erect appressed fruits. However, *C. glacialis* is a perennial with tuberous stem base, has six stamens, and blunt fruits mm wide. By contrast, *C. hirsuta* is an annual with four, rarely five or six, stamens, and fruits slener at apex and ... mm wide.

Of the several infraspecific taxa recognized by Schulz (1903) in *Cardamine glacialis*, perhaps subsp. *litoralis* might merit recognition. It differs from typical plants of the species by being robust plants with coarser leaves, shorter styles, and wider fruits. Although most plants that appear to belong to this variant were collected in the area Valdivia and other collections listed above under Región X, this variation is sporadic elsewhere, and many intermediate forms connect the two extremes of the species.

It is with a great deal of hesitation that I follow Schulz (1903) in the placement of *Cardamine soehrensii* in the synonymy of *C. glacialis*. The plant has most aspects of the latter but the fruiting pedicel and fruit do not form a straight line as most members of *C. glacialis* do. Furthermore, the type of *C. soehrensii* was collected from the codillera of Santiago, an area substantially disjunct from the distribution range of *C. glacialis*. It is possible that the locality data for the type collection of *C. soehrensii* is erroneous, and the type was collected from a much southerly area.

Schulz (1903) cited Werdermann 79 as *Cardamine macrostachya* (= *C. vulgaris*), but every aspect of the plants of that collection are characteristics of *C. glacialis*. Although the species is highly variable in the size of plant and leaf morphology, the overall aspects of the plant are basically the same. One collection, Dudley et al. 731 (SI), is unusually tall for the species, and it is well over one meter tall.

Of the several infraspecific taxa recognized by Schulz (1903) in *Cardamine glacialis*, perhaps subsp. *litoralis* might merit recognition. It differs from typical plants of the species by being robust plants with coarser leaves, shorter styles, and wider fruits. Although most plants that appear to belong to this variant were collected in the area Valdivia and other collections listed above under Región X, this variation is sporadic elsewhere, and many intermediate forms connect the two extremes of the species.

Cardamine glanduligera O. Schwarz, Repert. Sp. Nov. Regni Veg. 46: 188. 1939; *Dentaria glandulosa* Waldstein & Kitaibel ex Willdenow, Sp. Pl. 3: 478. 1800. TYPE: Habitat in Hungriae sylvis subalpinis, *Kitaibel s.n.* (holotype, B-W 11955).

Cardamine glauca Sprengel ex de Candolle, Syst. Nat. 2 : 266. 1821. TYPE: [Italy], “in aspero monte [Aspromonte] prope Reggio in Calabria,” L. Thomas (holotype, G-DC).

Cardamine glechomifolia H. Léveillé, Repert. Sp. Nov. Regni Veg. 11: 495. 1913. TYPE: Korea: Quelpaert, Mokan, May 1911, *Taquet* 5385 (holotype, E).

Cardamine gouldii Al-Shehbaz, Novon 11: 289. 2001. TYPE: Bhutan, [Bumthang District], Yatong La to Gyesta, 9,800–11,700 ft, 7 May 1938, *B. J. Gould 415* (holotype, KI).

Herbs, perennial; underground parts, basal leaves, and lowermost portions of stem unknown. **Stems** striate, sparsely pilose with trichomes to 0.6 mm; distal nodes 5–11 cm apart. **Cauline leaves** 5-foliolate; uppermost trifoliolate; petiole 1–3 cm, narrowly winged, base not auriculate; terminal leaflet oblong to oblong-lanceolate, 2.5–5 × 0.7–2 cm, sparsely hirsute with trichomes to 0.6 mm, subsessile or cuneate basally into a petiolule to 5 mm, margin entire to repand, ciliolate with trichomes to 0.1 mm, lateral veins ending in mucronulate callosities to 0.2 mm, apex rounded to obtuse; lateral leaflets oblong, sessile, similar to and smaller than terminal leaflet. **Racemes** ebracteate; lax, 5- to 10-flowered; flowering pedicels slender, recurved, 5–10 mm. **Sepals** drying lavender, oblong, 5–7 × 2–3 mm, sparsely pilose, base saccate; petals white, oblong, 12–15 × 4–6 mm, apex rounded; claw ca. 1.5 mm; stamens erect; filaments of median pairs 8–10 mm, those of lateral pair 6–7 mm; anthers oblong, ca. 1.5 mm. **Fruit** and seeds unknown.

Flowering: May.

Distribution: Bhutan.

Notes: known thus far only from the type collection.

Cardamine gracilis (O. E. Schulz) T. Y. Cheo & R. C. Fang, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 1980(6): 27. 1980; *C. multijuga* Franchet var. *gracilis* O. E. Schulz, Repert. Spec. Nov. Regni Veg. 17: 289. 1921. TYPE: China, Yunnan, Lichiang, near Ngu Le Keh, 2900 m, 18 Jul 1914, *Camillo Schneifer 1862* (holotype, B!; isotypes, GH!, K!, US!).

Herbs, perennial, glabrous throughout, semiaquatic. **Rhizomes** slender, to 10 cm or longer, 0.5–3 mm in diam. **Stems** 1–3.5(–5) dm, erect, simple, striate angled, rooting from lower and sometimes middle nodes. **Basal leaves** not known; cauline leaves 10–20 per stem, (1.5–)2.5–7.5(–9) cm × (1.5–)4–14(–17) mm; petiole absent or rarely to 2 mm; terminal leaflet narrowly obovate, oblong, or rarely broadly ovate, (2–)3–8(–9) × (0.5–)1.5–5(–7) mm, petiolule 0.5–2 mm, base cuneate or rarely obtuse, margin obscurely 1–3-toothed on each side, apex acute, submucronate; lateral leaflets (6 or)7–12(–15) pairs, linear or narrowly oblong, asymmetric, slightly smaller than terminal lobe, sessile or rarely with a petiolule to 0.5 mm, base oblique, proximal margin 1- or 2(or 3)-toothed, distal margin entire or rarely obscurely 1- or 2-toothed, apex acute; proximal pair of lateral leaflets auriclelike, attached at or just above node, often giving appearance of amplexicaul leaf base. **Racemes** ebracteate, 10–20-flowered; fruiting pedicels divaricate, 0.8–2.2 cm, slender. **Sepals** oblong or ovate, 3–4 × 1.2–2 mm, spreading, margin membranous, base of lateral pair subsaccate; petals lavender with darker veins, spatulate, 6–8 × 2–3 mm, spreading, apex rounded; filaments spreading, dilated at base, subequal, median pairs 3.5–5 mm, lateral pair 3–4.5 mm; anthers narrowly oblong, 1.3–1.6 mm; ovules 10–14 per ovary. **Fruit** linear, 2–4 cm × ca. 1.5 mm; gynophore ca. 0.5 mm; valves smooth, glabrous; style 4–6 mm. **Seeds** brown, oblong, 1.7–2 × ca. 1.3 mm, winged all around; wing ca. 0.4 mm wide.

Flowering: Jun–Aug.

Habitat: marshlands, lake shores, margins of ponds, ditches, open pastures.

Elevation: 2400–3300 m.

Distribution: China (Yunnan).

Cardamine graeca Linnaeus, Sp. Pl. 2: 655. 1753. TYPE: Herb. A. Van Royen, sheet 901.220-60. (lectotype designated by Marhold (1996: 118), L).

Cardamine granulifera (Franchet) Diels, Notes Roy. Bot. Gard. Edinburgh 5: 204. 1912. *C. tenuifolia* (Ledebour) Turczaninow var. *granulifera* Franchet, Bull. Soc. Bot. France 33: 399. 1886; *Loxostemon granulifer* (Franchet) O. E. Schulz, TYPE: China, Yunnan, Mt. Tsang-chan, above Tali, 2 Jun 1883, *Delavay 281* (holotype, P!).

Herbs, perennial, glabrous or sparsely pilose. **Rhizomes** much elongated, slender; bulbils few, spaced, rarely clustered. **Stems** 6–20(–30) cm, simple, erect, straight, slender, sparsely pilose along proximal half, or glabrous. **Rhizomal leaves** simple or trifoliolate; petiole 0.7–4 cm; leaf blade or terminal leaflet suborbicular, broadly ovate, or cordate, 3–12 mm in diam., base cordate or rounded, margin entire or obscurely lobed; cauline leaves 2–4, trifid or pinnatisect and with 2(or 3) lateral lobes on each side of midvein, lobes not decurrent; petiole 1–15(–28) mm, slender, wingless, glabrous, not auriculate at base; terminal lobe filiform to narrowly linear, 0.9–4.5 cm × 0.5–1.5(–2) mm, base attenuate, margin entire, scabrous with trichomes to 0.3 mm, apex acute. **Racemes** ebracteate, 3–10-flowered; flowering pedicels ascending, to 1.2 cm, straight, glabrous. **Sepals** ovate, 2–1.5 × 1–1.5 mm, glabrous, margin and apex membranous, lateral pair subsaccate; petals white or lavender, broadly obovate or spatulate, 5–7 × 2–3 mm, apex rounded; median filament pairs 3–4, slightly flattened; lateral pair 1.5–2.5 mm; anthers oblong, 0.6–0.8 mm. **Fruit** and seeds not seen.

Flowering: May–Jul.

Habitat: Moist shady forests, meadows.

Elevation: 2800–3800 m.

Distribution: China (Yunnan).

Cardamine granulose Allioni

Cardamine griffithii J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 5: 146. 1861. TYPE: Bhutan, Lamnoo, *Griffith s.n.* (holotype, K!).

Cardamine griffithii var. *pentaloba* W. T. Wang, Acta Bot. Yunnan. 9: 16. 1987. TYPE: China. Yunnan: Lanping, 2600–3100 m, 28 Jun 1981, *Expeditio Hengduanshan 1171* (holotype, PE!).

Herbs, perennial, glabrous throughout except for leaflet margin. **Rhizomes** creeping, without stolons. **Stems** (2–)3–10(–11.5) dm, erect, simple or branched above, striate angled, (9–)12–28(–37)-leaved. **Leaves** sessile, cauline; lower and middle ones (1–)2–9(–11) × (0.7–)1–3.5(–4.5) cm; terminal leaflet orbicular, broadly ovate, or obovate, (0.5–)1–3(–3.5) × (0.3–)0.6–1.9(–2.5) cm, with a petiolule 2–10(–15) mm, base subcordate, rounded, or rarely cuneate, margin repand or entire and sparsely ciliate, apex obtuse or rounded; lateral leaflets 2–4(or 5) pairs, slightly to distinctly smaller than terminal one, base obtuse or rarely slightly oblique, margin entire or repand and sparsely ciliate, apex obtuse or rounded; proximal pair of lateral leaflets auriclelike, attached at or just above node, often giving appearance of amplexicaul leaf base; uppermost leaves smaller. **Racemes** ebracteate; fruiting pedicels ascending or divaricate, (0.4–)0.7–1.5 cm, slender, straight. **Sepals** ovate or oblong, 2.5–3 × 1.5–2 mm, erect; petals purple or lavender, spatulate or obovate, 6–9 × (2.5–)3–5 mm, not clawed, apex rounded or subemarginate; filaments erect, median pairs 3.5–4.5 mm, lateral pair 2.5–3 mm; anthers oblong, 0.9–1.1 mm; ovules 10–22 per ovary. **Fruit** linear, (1.5–)2–4 cm × 0.9–1.2 mm; gynophore 0.5–1 mm; valves smooth, glabrous; style 0.5–1(–2) mm; stigma 2-lobed, distinctly broader than style. **Seeds** brown, oblong, 1.4–1.7 × 0.8–1.1 mm, wingless.

Flowering: May–Aug.

Habitat: mountain slopes, valleys, streamsides, pastures, marshy places, moist forest floor, shady rocky areas.

Elevation: 2400–4500 m.

Distribution: Bhutan, China (Sichuan, Xizang, Yunnan), India (Sikkim), Nepal.

Cardamine gunnii Hewson, Fl. Austral. 8: 390. 1982; *Cardamine heterophylla* W. J. Hooker, Comp. Bot. Mag. 1: 273. 1835; not Host, Syn. P. Austral. 366. 1797; not Lapeyrouse, Hist. Abr. Pl. Pyr. 377. 1813; not Bory, Ann. Sci. Gen. Phys. 3: 6. 1820; *Cardamine hirsuta* var. *heterophylla* (W. J. Hooker) J. D. Hooker, Fl. Tasmaniae 1: 20. 1855. TYPE: Australia, Tasmania, R. C. Gunn 446 (lectotype designated by Hewson (1982: 390), K).

Herbs perennial, glabrous or rarely pubescent, often scapose. **Rhizomes** present. **Stems** to 25 cm, leafless or rarely leafy, erect. **Basal leaves** rosulate, pinnately compound with 1 to several pairs of leaflets, pinnatisect, dentate, or entire, spatulate; cauline leaves (when present) petiolate, not auriculate at base. **Raceme** ebracteate, corymbose; fruiting pedicels erect to spreading, 5–17 mm, often minutely papillose. Sepals 2–2.5 mm, purplish; petals 4–6 mm, white; stamens 6; ovules –. **Fruits** linear, 1.5–3 cm × 0.7–1 mm, erect, often overtopping raceme; style < 1 mm. **Seeds** ovoid to oblong, flattened, 1–1.5 mm, narrowly winged.

Habitat: moist areas in alpine regions down to coastal places.

Distribution: Australia (New South Wales, South Australia, Tasmania, Victoria).

Cardamine heptaphylla (Villars) O. E. Schulz, Bot. Jahrb. Syst. 32: 371. 1903; *Dentaria heptaphylla* Villars, Hist. Pl. Dauphiné 1: 281. 1786. TYPE: *Dentaria eptaphyllos* [Villars] (lectotype designated by Marhold (2001: 47), GR, no. MNHGr. 1837.27769).

Cardamine hirsuta Linnaeus, Sp. Pl. 2: 655. 1753. TYPE: Herb. Linn. 835.13 (lectotype, designated by Fawcett & Rendle (Fl. Jamaica 1914: 239), LINN).

Cardamine hirsuta var. *formosana* Hayata, Mat. Fl. Formos. 30. 1911.

Cardamine hirsuta var. *rotundiloba* Hayata, Mat. Fl. Formos. 30. 1911.

Herbs, annual, sparsely hirsute at least along petioles of basal leaves, often glabrous above. **Rhizomes** absent; stolons absent. **Stems** (0.3–)1–3.5(–4.5) dm, erect, ascending, or decumbent, 1 to several from base, simple or branched above, not flexuous. **Basal leaves** rosulate, persistent by anthesis, (5–)8–15(–22)-foliolate, (2–)3.5–15(–17) cm; petiole ciliate, 0.5–5 cm; terminal leaflet reniform or orbicular, 0.4–2 × 0.6–3 cm, margin entire, repand, dentate, or 3–5-lobed, petiolule 2–10 mm; lateral leaflets oblong, ovate, obovate, or orbicular, smaller than terminal lobe, entire, repand, crenate, or 3-lobed; cauline leaves 1–4(–6), compound as basal leaves, shortly petiolate, including petiole (0.5–)1.2–5.5(–7) cm; petiole base not auriculate. **Racemes** ebracteate; fruiting pedicels erect to ascending, (2–)3–10(–14) mm. **Sepals** oblong, 1.5–2.5 × 0.3–0.7 mm, base of lateral pair not sacate; petals white, spatulate, 2.5–4.5(–5) × 0.5–1.1 mm, sometimes absent; stamens 4 and lateral pair often absent, rarely 5 or 6; filaments 1.8–3 mm; anthers ovate, 0.3–0.5 mm. **Fruit** linear, (0.9–)1.5–2.5(–2.8) cm × (0.8–)1–1.4 mm, often appressed; valves glabrous, torulose; style 0.1–0.6(–1) mm; ovules and seeds 14–40 per fruit. **Seeds** light brown, oblong or subquadrate, 0.9–1.3(–1.5) × 0.6–0.9(–1.1) mm, narrowly margined. **2n** = 16.

Flowering: Feb–Jul.

Habitat: roadsides, clearings, disturbed sites, slopes, cedar glades, mixed woods, meadows, fields, waste ground, damp places, grassy areas, paramo.

Elevation: 0–3600 m.

Distribution: **native** of Europe (all countries) and perhaps W Asia (Armenia, Azerbaijan, Cyprus, Georgia, Iran, Iraq, Israel, Jordan, Lebanon, Saudi Arabia, Syria, Turkmenistan, Turkey);

naturalized in S Africa, elsewhere in Asia [China (Yunnan), India, Indonesia, Japan, Korea, Laos, Malaysia, Papua New Guinea, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam], Australia, North America [Canada (British Columbia, Ontario), United States (Alabama, Arkansas, California, Connecticut, Delaware, District of Columbia, Florida, Georgia, Illinois, Kentucky, Louisiana, Maryland, Massachusetts, Mississippi, Missouri, New Jersey, New York, North Carolina, Ohio, Oklahoma, Oregon, Pennsylvania, South Carolina, Tennessee, Texas, Utah, Virginia, West Virginia, Washington)], and South America [Argentina (Buenos Aires, Chubut, Entre Rios, Salta, Neuquén, Santa Cruz, Tucumán), Brazil (Rio Grande do Sul), Chile (Región V, Santiago, VI, VII, VIII, IX, X, XII), Columbia (Antioquia), Ecuador (Cotopaxi, León, Napo, Pichincha), Uruguay (Montevideo), Venezuela (Aragua)].

Representative specimens: **ARGENTINA. Buenos Aires:** Tigre, *Burkart* 3886 (SI); La Plata, *Burkart* 749 (SI); La Plata, Vivero del Bosque Lugare Sombreado, *Cabrera* 4527 (F, GH, NY, SI); Gral Madariaga, Vill Gesell, *Boelcke* 8725 (K); San Miguel, 15 Sep 1960, *Burkart s.n.* (SI); Delta del Paraná, *Burkart* 4943 (SI); Tandil, *Boelcke* 8654 (BAA). **Chubut:** Dep. Futaleufú, Esquel, *Burkart* 19090 (SI); Trevelín, *Soriano* 4440 (BAA). Dep. Futaleufú: ruta 258, 24 km S lago Rosario, *Correa et al.* 9003 (BAB). **Entre Rios:** Concepcion del Uruguay, *Burkart* 23587 (SI). **Salta:** La Caldera, rte 9, 2 km N Ojoa de Agua, 5 km S of Abra de Santa Laura, *Novara* 8037 (G, S); Caldera, Abra de los Sauces, *Cabrera* 34137 (SI). **Neuquén:** Dep. Los Lagos, Parq. Nac. Nahuel Huapi, Puerto Manzano, *Boelcke & Correa* 11735 (BAA); pla. Qutrihué, *Boelcke & Correa* 6294 (BAA, BAB). **Río Negro:** Dep. Bariloche, co. Bella Vista, *Barba* 2214 (LIL). **Santa Cruz:** N end Lago Argentino, Estancia Cristina, *Ager* 522 (US). **Tucumán:** Tafi, Cerro San Savier, *Villo* 50 (BAB, F, GH); Quebrada de Lules, Venturi 928 (LIL, SI), *Parodi* 5230 (BAA); Cuest del Clavillo, 21 July 1981, *Martínez s.n.* (BACP). **BRAZIL. Rio Grande do Sul:** Mun. de Porto Alegre, Bueno 3665 (F). **CHILE. V:** Cerro Huinco, Dan Francisco de Limache, *Looser* 144 (GH); Limache, *Garaventa* 940 (GH, US); Cajón de San Pedro, “Mal Paso”, [32°57’S, 71°11’W], *Garaventa* 4598 (BACP, CONC, SI); Cerro de la Campana, [32°55’S, 71°08’W], *Garaventa* 2869 (BAA, BACP, CONC, SI); Limache, Estero de Maitenes, 32°59’S, 71°15’W], *Garaventa* 3381 (CONC); Quebrada del Almendro, 33°0’S, 71°16’W], 3 Nov. 1916, *Behn s.n.* (CONC); Palmas de Alvarado, [33°3’S, 71°06’W], *Garaventa* 4518 (BACP, CONC, SI); Estero de Limache, *Garaventa* 2397 (BAA, BACP, SI); La Huinca, *Garaventa* 1715 (SI); Estero de Maitenes, *Garaventa* 400 (BAA, BACP, SI); Masatierra, San Juan Bautista, 8 July 2002, *Cuevas s.n.* (CONC). **SANTIAGO:** Santiago, Claude-Joseph 1361 (US); Peñalolén, [33°28’S, 70°32’W], *Gunckel* 23311 (CONC), *Gunckel* 25910 (CONC), *Gunckel* 4478 (CONC); Marga-Marga valley, *Zöllner* 9363 (NA). **VI:** Baños de Cauquenés, [34°15’S, 70°34’W], *Gunckel* 39056 (CONC); Colchagua, San Fernando, [34°32’S, 71°1’W], *Montero* 3601 (CONC). **VII:** Talca, *Claude-Joseph* 2048 (US); Curicó, Cerro Condell, *Barros* 6442 (US); Rauquén, 34°57’S, 71°12’W, *Reyes* 3 (CONC). **VIII:** Chillán, [36°36’S, 72°05’W], *Matthei* 27149, 27150 (CONC); Bureo, Chillán, [36°34’S, 71°46’W], *Barros* 2787 (CONC, SI); Curapalihue, 36°49’S, 72°50’W, *Olea* 16 (CONC); Concepción, Cerro Carocol, 36°50’S, 73°02’W, *Arriagada & Ugarte* 3 (CONC); Concepción, [36°49’S, 73°03’W], *Barros* 1966 (CONC); Parque Hualpén, [36°47’S, 73°10’W], *Carrasco* 149 (CONC). **IX:** Temuco, [38°44’S, 72°33’W], *Montero* 2344 (CONC, SI), *Gunckel* 16549 (CONC); Cerro Ñielol, [38°43’S, 72°35’W], *Montero* 5212 (CONC); Nuevo Imperial, above Cholchol, [38°36’S, 72°51’W], *Montero* 11878 (CONC); Licán Ray, [39°29’S, 72°09’W], *Montero* 12566 (CONC). **X:** Corral, *Gunckel* 2341 (GH); Trumao, La Unión, *Hollermayer* 637b (CONC). **XII:** Parque Nacional El Paine, 10 km from Sarmiento, Nov. 1988, *Dombrowicz s.n.* (G). **COLOMBIA. Antioquia:** Medellín, Corregimiento Santa Helena,

Vereda La Queibra, 21 km SE Medellín, 6°14'N, 75°30'W, *Callejas 9567* (NY). **Caldas.** road from Fresno to Manizales, Gentry et al. 34746 (MO). **ECUADOR. Cotopaxi:** Cantolon Sigchos, Campo Alegra, ca. 20 km NW of Sigchos, 0°34'S, 78°47'W, *Ramos et al. 5905* (MO); Parque Nac. de Cotopaxi, NW Limpio Pungu to foot of Volcán Rumiñahui, 0°38'S, 78°28'W, *Laegaard 101449* (AAU, MO). **León:** Cotopaxi railway station, *Asplund 6511* (CAS, G, K, NY, S). **Napo:** Cantón Quijos, 4 km N Papllacta, 0°19'S, 78°8'W, *Yánez & Maza 930* (MO); Quito-Lago Agrio rd, W Laguna Papalacta, *Balslev & Steere 4533* (NY). **Pichincha:** Quito, Loma Murillo, 1 km fro rio Alambi, 0°2'44"S, 78°37'52"W, *Delgado et al. 105* (MO); Parroquia Calacalí, 0°5'N, 78°30'W, *Cerón 1813* (MO); Salvador, below San Juan, *Asplund 17153* (G, NY); below San Juan towards Chiriboga, *Asplund 16237* (G, K, NY); between km 37 and 50 along Río Saloya, *Steyermark 52496* (K, NY). **URUGUAY. Montevideo:** Miguelete, *Herter 80831* (F, G, GH, LIL, MO, NY, S, SI, UC); Prado, *Rosengurt 1955* (GH) **VENEZUELA. Aragua:** Monumento Natural Pico Codazzi, 4 km WSW Colonia Tovar en la carreteras Los Anaucos, 10°235'N, 67°19'W, *Meier et al. 6489* (MO); 7 km SE Colonia Tovar, 10°21'N, 67°14'W, *Steyermark & Liesner 121852* (MO, NY).

A highly variable species, especially with respect to shape, size, margins, and number lateral leaf lobes, plant size, density of indumentum, and flower morphology (e.g., presence vs. absence of petals, stamen number). The species has been divided into more than 15 subspecies, varieties, and forms. However, all of these taxa are based on characters that can be highly variable even within the same population. Only one synonym pertinent to China is cited above. For additional synonymy, the reader should consult Schulz (Bot. Jahrb. Syst. 32: 464–473. 1903).

Cardamine hispidula Philippi, Anal. Univ. Chile 81: 79. 1892; *C. alsophila* Philippi var. *hispidula* (Philippi) Reiche, Fl. Chile 1: 99. 1896. TYPE: Chile, Andes of Prov. Ñuble, October 1878, *Fed. Puga s.n.* (**holotype, not seen**).

Herbs, perennial. **Rhizome** globose-tuberous, stolon filiform, tuberous at apex. **Stems** 2–15 cm, erect, simple or branched at base, 8–15-leaved, flexuous, slender, subanglular, sparsely hirsute to glabrescent. **Leaves** minute, those of the rhizome rosulate, 1.2–3 cm, petiolate, 3-foliolate; terminal leaflet orbiculate, base subcoredate, obscurely crenate or 6-angled, long petiolulate, 3.5–8 × 2.5–8 mm, lateral leaflets ovate, entire, short petiolulate; stem leaves 0.8–2.5 cm, lower ones 3–5-foliolate; terminal leaflet ovate, strongly 1–2 crante, short petiolualte, 2.5–8 × 1.5–6 mm; lateral leaflets similar but sessile; uppermost leafes in racemes, short petiolate, 3-foliolate, leaflets 1-toothed; uppermost subsessile, simple, lanceolate, entire or 1-toothed; hirsute to long ciliate. **Racemes** ebracteate, 10-flowered, flowers small, ca. 3 mm. **Ovary** 20–28 ovuled. **Fruit** 1.8 cm × 0.7 mm.

Distribution: Chile (Región X?).

Note: known only from the type collection.

Cardamine holmgrenii Al-Shehbaz, Harvard Pap. Bot. 11: 275. 2007. TYPE: United States, Oregon, Baker County: Blue Mountains, boggy slopes 3 miles below (north) Anthony Lake, Elkhorn Ridge, 9 Aug 1946, *Basset Maguire & Arthur H. Holmgren 26941* (holotype, NY!; isotype, UTC).

Herbs, perennial, glabrous throughout. **Rhizomes** slender, 0.5–1 mm in diam.; stolons absent. **Stems** 1.5–2 dm, erect to ascending. **Leaves** all cauline, 3 or 4, compound, 3- or 5-foliolate; petiole 0.5–1.7 cm, base not auriculate; terminal leaflet obovate to lanceolate, becoming linear in uppermost leaves, 1.3–2.3 cm × 2–8 mm, base cuneate, margin entire subapically 1- or 2-toothed, petiolule 3–5 mm; lateral leaflets linear to linear-lanceolate, 0.9–1.5 cm × 1–3 mm, entire.

Racemes ebracteate; fruiting pedicels ascending to suberect, 5–14 mm. **Sepals** oblong, 1.2–1.5 × 0.6–0.8 mm, erect, base of lateral pair not saccate; petals white, oblanceolate, 2–2.5 × 0.8–1 mm, not clawed, apex rounded; median filament pairs 1.5–1.8 mm, lateral pair 1–1.2 mm; anthers ovate, 0.2–0.3 mm. **Fruit** linear, 1–2 cm × ca. 1 mm; valves glabrous; style 0.5–0.7 mm; ovules and seeds 16–24 per fruit. **Seeds** brown, oblong, 1.2–1.5 × 0.8–1 mm.

Flowering: Jul–Aug.

Habitat: boggy slopes.

Distribution: United States (E Oregon/Baker Co.).

Notes: known only from the type gathering.

Cardamine hydrocotyloides W. T. Wang, Acta Bot. Yunnan. 9: 8. 1987. China, Yunnan, Deqin, Benzilan, Mons Yongzhongshan, 6 Jul 1981, 3200–3400 m, *Qinghai-Xizang Team 2175* (holotype, PE!; isotypes, KUN!).

Herbs, perennial. **Rhizomes** short, thickened and somewhat fleshy at stem base, with several stolons bearing simple leaves. **Stems** 10–26 cm, erect, subglabrous or puberulent with often curved trichomes, simple from rhizomal branches, not flexuous. **Rhizomal leaves** and lowermost cauline simple; petiole 1.5–6 cm, puberulent or glabrous, not auriculate at base; leaf blade reniform or suborbicular, 0.5–2.5 × 0.8–3.5 cm, papery, glabrous or sparsely pilose adaxially, base cordate, margin repand-crenate or subentire; stolon leaves simple, similar to rhizomal leaves but smaller and with shorter petioles; uppermost cauline leaves usually 3-foliolate, rarely simple; petiole 0.3–2 cm; terminal leaflet suborbicular, reniform, or ovate-suborbicular, 0.6–2 × 0.8–3 cm, with a petiolule 0.5–7 mm, base cordate, rounded, or subtruncate, margin entire or repand, rarely slightly lobed; lateral leaflets similar to terminal one, petiolulate. **Racemes** ebracteate; fruiting pedicels 0.9–2 cm, divaricate or ascending, slender, glabrous or puberulent. **Sepals** ovate, 2–2.5 × 1–1.5 mm, glabrous, not saccate; **petals** white, obovate, 5–6 × 3–4 mm, apex rounded; median filament pairs 3–3.5 mm, slender, toothless; lateral pair 2–2.5 mm; anthers oblong, 0.8–1 mm; ovules 10–14 per ovary. **Fruit** linear, 1–2.8 cm × 1–1.3 mm; valves glabrous, smooth; style 1–3 mm. **Seeds** brown, oblong, ca. 1.3 × 0.8 mm, wingless.

Flowering: Jul–Aug.

Habitat: forests, along ditches and trails.

Elevation: 3200–3400 m.

Distribution: China (Sichuan, Yunnan).

Cardamine hygrophila T. Y. Cheo & R. C. Fang, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 1980(6): 26. 1980. TYPE: China, Sichuan, Nanchuan Xian, Jinfushan, 1,650, 14 Apr 1957, *Yong Jihua 90292* (holotype, IBSC; isotype, PE!).

Herbs, perennial. **Rhizomes** compact, thick, not stoloniferous. **Stems** (7–)10–25(–35) cm, erect, terete, pilose at base, glabrous from the middle upward, often more than 1 from base. **Basal leaves** rosulate, (3–)5–9(–11) cm; petiole (0.7–)1.5–3.5(–4.5) cm; terminal leaflet orbicular or reniform, (0.5–)1–3 × (0.5–)1.5–3.5 cm, with a petiolule 1–2 cm, base cordate or subtruncate, margin entire, repand, or obscurely coarsely crenate, apex rounded; lateral leaflets 2 or 3(–5) pairs, much smaller than terminal one; cauline leaves 2–5(–7), glabrous; middle ones 1.5–6(–8) cm; terminal leaflet suborbicular or broadly ovate, rarely oblong or sublanceolate, (0.5–)1.2–3(–3.5) × (0.5–)1–2.5(–3) cm, with a petiolule 5–12(–20) mm, base rounded or subcuneate, margin obscurely to strongly angled, rarely entire, often mucronulate at angles, apex obtuse to subacute; lateral leaflets (1 or)2 or 3 pairs, smaller and somewhat similar to terminal ones; proximal pair of lateral leaflets auriclelike, attached at or just above node, often giving appearance of amplexicaul

leaf base. **Racemes** ebracteate; fruiting pedicels divaricate or ascending, (0.7–)1–2.2(–3) cm, slender, glabrous, straight. **Sepals** ovate or oblong, 2.5–3 × 2–2.5 mm; petals white, obovate, 6–9 × 3–4 mm, not clawed, apex rounded; filaments subequal in length, somewhat spreading, 4.5–6 mm; anthers narrowly oblong, 1–1.3 mm; ovules 12–22 per ovary. **Fruit** linear, 1.5–4 cm × 1–1.5 mm; gynophore to 1 mm; valves smooth, glabrous; style slender, 2–4 mm; stigma entire, narrower than style. **Seeds** brown, oblong, 1.3–1.8 × 0.7–1 mm.

Flowering: Apr–Jun.

Habitat: valleys, streamsides.

Elevation: 1400–2200 m.

Distribution: China (Guangxi, Guizhou, Hubei, Hunan, Sichuan).

Cardamine iliciana

Cardamine impatiens Linnaeus, Sp. Pl. 2: 655. 1753. TYPE: Herb. Linn. 835.9 (lectotype designated by Jafri (1973: 169), LINN).

Cardamine basisagittata W. T. Wang, Acta Bot. Yunnan. 9: 10. 1987. TYPE: China, Sichuan, Kangding, Dajiangwan, 2700 m, 27 May 1974, *Exped. Bot. Sichuan 6079* (holotype, PE!).

C. dasycarpa Marschall von Bieberstein, Fl. Taur. Cauc. 3: 437. 1819; *C. impatiens* var. *dasycarpa* (Marschall von Bieberstein) T. Y. Cheo & R. C. Fang, Bull. Bot. Lab. North-East. Forest. Inst., Harbin 1980(6): 21. 1980. TYPE:

Cardamine glaphyropoda O. E. Schulz, Acta Hort. Gothob. 1: 159. 1924. LECTOTYPE (here designated): China, Sichuan, Chunche, W of Sungpan, 32°39'N, 102°58'E, 1 August 1922, *Harry Smith 4121* (hololectotype, UPS!; isolectotypes, B!, W!).

C. glaphyropoda var. *crenata* T. Y. Cheo & R. C. Fang, Bull. Bot. Lab. North-East. Forest. Inst., Harbin 1980(6): 21. 1980. TYPE: China, Sichuan, Markam Xian, 2520 m, 29 May 1957, *Li Xing 70889* (holotype, SZ; isotype, NAS!).

Cardamine impatiens Linnaeus var. *angustifolia* O. E. Schulz, Bot. Jahrb. Syst. 32: 459. 1903.

Cardamine impatiens Linnaeus var. *dasycarpa* (M. Bieb.) T. Y. Cheo & R. C. Fang, Bull. Bot. Lab. North-East. Forest. Inst., Harbin 6: 21. 1980. TYPE:

Cardamine impatiens Linnaeus subsp. *elongata* O. E. Schulz, Bot. Jahrb. Syst. 32: 459. 1903.

Cardamine impatiens Linnaeus var. *eriocarpa* de Candolle, Syst. Nat. 2: 262. 1821.

Cardamine impatiens Linnaeus var. *fumaria* H. Léveillé, Repert. Sp. Nov. Regni Veg. 12: 100. 1913.

Cardamine impatiens Linnaeus var. *microphylla* O. E. Schulz, Bot. Jahrb. Syst. 32: 460. 1903.

Cardamine impatiens Linnaeus var. *obtusifolia* Knaf, Flora 29: 294. 1846.

Cardamine impatiens Linnaeus var. *pilosa* O. E. Schulz, Bot. Jahrb. Syst. 32: 459. 1903.

Cardamine impatiens Linnaeus var. *tenuissima* Honda, Bot. Mag. (Tokyo) 54: 1. 1940.

Cardamine nakaiana H. Léveillé, Repert. Sp. Nov. Regni Veg. 10: 350. 1912. TYPE: Korea, Quelpaert, Tpjengen, 11 Jun 1910, *Taquet 4116* (holotype, E!).

Cardamine senanensis Franchet & Savatier, Enum. P. Jap. 2: 280. 1879. Japan, Prov. Senano, *Savatier 2803* (holotype, P!).

Herbs, biennial or rarely annual, glabrous or rarely sparsely pubescent near base. **Rhizomes** absent; stolons absent. **Stems** (1.2–)2–6.5(–9) dm, erect, simple at base, usually branched, above, angled, sometimes flexuous. **Basal leaves** rosulate, often withered by flowering, similar to cauline leaves but with fewer later leaflets; cauline leaves to 9–24, (9–)13–25-foliolate, including petiole (3–)4–20(–23) cm; petiole 2–6 cm, auriculate, the auricles to 10 × 2.2 mm; terminal lobe orbicular, obovate, ovate, or lanceolate, 1–4(–5) × 0.5–1.7 cm, with a petiolule to 5 mm, entire or obscurely to strongly 3–5(–9)-toothed or -lobed; lateral lobes similar to terminal one, often

smaller. **Racemes** ebracteate; fruiting pedicels divaricate or ascending, 3.5–12(–15) mm. **Sepals** oblong, 1.2–2(–2.5) × 0.7–1(–1.2) mm, base of lateral pair not saccate; petals white, oblanceolate, 1.5–4(–5) × 0.6–1.2 mm, rarely absent; stamens 6; filaments 2–3(–4) mm; anthers ovate, 0.3–0.5 mm. **Fruit** linear, (1–)1.6–3(–3.5) cm × 0.9–1.5 mm; valves glabrous or rarely pilose, torulose; style 0.6–1.6(–2) mm; ovules and seeds 10–30 per fruit. **Seeds** brown, oblong, 1.1–1.5 × 0.8–1 mm, compressed, sometimes apically narrowly winged. **2n** = 16.

Flowering: Feb–Jul.

Habitat: streamsides, slopes, roadsides, fields, disturbed areas.

Elevation: 0–4000 m.

Distribution: **native** to Europe (all countries except Iceland and Portugal) and Asia [Afghanistan, Bhutan, China (Anhui, Fujian, Gansu, Guangxi, Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan), India, Japan, Kashmir, Kazakhstan, Korea, Kyrgyzstan, Nepal, Pakistan, Russia, Taiwan, Tajikistan, Uzbekistan]; **naturalized** in South Africa, North America [Canada (Ontario), United States (Connecticut, Kentucky, Michigan, Minnesota, New Hampshire, Ohio, Pennsylvania, Virginia, West Virginia)].

Cardamine jamesonii Hooker, London J. Bot. 6: 293. 1847. TYPE: Ecuador, Cordillera of Pilaro, 15,000 ft, Apr 1834, *W. Jameson 88* (lectotype, here designated, K!).

Cardamine punicea Turczaninow, Bull. Soc. Imp. Naturalistes Mocou 27(2, 4): 295. 1854 (1855); *C. johnstonii* Oliver prol. *punicea* (Turczaninow) O. E. Schulz, Bot. Jahrb. Syst. 32: 420. 1903. TYPE: Venezuela, Merida, Culata, 9–10,000 ft, Apr 1847, *Funck & Schlim 1542* (holotype, KW; isotypes, G!, P!).

Cardamine nevadensis Turczaninow, Bull. Soc. Imp. Naturalistes Mocou 27(2, 4): 295. 1854; *C. jamesonii* Hooker var. *nevadensis* (Turczaninow) O. E. Schulz, Bot. Jahrb. Syst. 32: 422. 1903. TYPE: Venezuela, Merida, Sierra Nevada, 9,000 ft, Jun 1847, *Funck & Schlim 1554* (holotype, KW?; isotypes, G!, 2P!).

Cardamine pulchra Linden & Planchon, Trois. Voy. Linden, Bot., Pl. Columb. 1: 12. 1863. TYPE: Venezuela, Merida, Culata, 9–10,000 ft, Apr 1847, *Funck & Schlim 1542* (holotype, P!; isotypes, G!, KW).

Cardamine tolimensis Planchon & Linden in Triana & Linden, Ann. Sci. Nat. Bot. ser. 4, 17: 59. 1862. TYPE: Colombia, Pic de Tolima, près de Boqueron, 3300–3900 m, Jun 1843, *Linden 924* (922 in print) (lectotype, here designated, P!).

Cardamine jamesonii var. *goudotii* Planchon & Linden in Triana & Linden, Ann. Sci. Nat. Bot. ser. 4, 17: 59. 1862. TYPE: Colombia, Mariquita: Toluma, Cuchilla de la Divisadera, 1844, *J. Goudot* (lectotype, here designated, P!).

Cardamine jamesonii prol. *pulcherrima* O. E. Schulz, Bot. Jahrb. Syst. 32: 422. 1903. TYPE: Colombia, Cauca: Páramo de Guanacas, 2800–3300 m, *F. C. Lehmann 5605* (holotype, B!; isotypes, G!, K!).

Cardamine johnstonii var. *superba* O. E. Schulz, Bot. Jahrb. Syst. 32: 421. 1903. TYPE: Colombia, Cauca: Páramo de Moras, 3300 m, *F. C. Lehmann 2669* (holotype, G-BOIS).

Cardamine rhizomata Rollins, J. Arnold Arbor. 21: 392. 1940. TYPE: Ecuador, Carchi, Nudo de Boliche Voladero, 10 Jun 1939, *C. W. Penland & R. H. Summers 870* (holotype, GH!; isotype, COCO).

Herbs, perennial. **Rhizomes** slender, not scaly, with long internodes and nontuberous nodes. **Stems** (1.5–)2.8–6.5(–8) dm, erect or decumbent, simple or branched above, glabrous or rarely pubescent. **Cauline leaves** 6–20; lower and middle leaves (4–)7–14(–18) cm, 7–11(–13)-

foliolate, rarely basal ones 5-foliolate; petiole (1.5–)2.5–8(–10) cm, sometimes longer on rhizomal leaves; lateral leaflet (0.5–)1.5–3(–4.5) × (0.3–)1–2.2(–3) cm, broadly ovate to oblong-ovate or oblong-lanceolate, glabrous or sparsely to densely pubescent, base strongly oblique and subcordate to cuneate, margin crenate, incised-crenate, or rarely serrate, ciliolate with trichomes to 0.5 mm, teeth mucronate, apex acute; petiolule 0.2–1(–2) cm; terminal leaflet about same size as lateral; uppermost leaves gradually smaller, less divided, and often narrower. **Racemes** bracteate basally or very rarely only lowermost few flowers bracteate; bracts simple or compound, gradually reduced in size upward; fruiting pedicels (1–)1.5–3 cm, divaricate-ascending, straight, stout. **Sepals** dark purple, broadly oblong, 3–5 × 2–2.5 mm, glabrous; petals purple, violet, red, or rarely pale lavender, broadly obovate, (8–)10–14 × 5–8 mm, base broadly cuneate, apex rounded to emarginated; filaments 4–7 mm; anthers oblong, 1–1.5 mm; ovules 16–28 per ovary. **Fruits** 3–5.5(–7) cm × 1.5–2 mm; style stout, 3–8(–10) mm. **Seeds** oblong, 1.5–3 × 1–1.2 mm.

Flowering: Sep–Jul.

Habitat: wet trails in forests, páramo, moist banks of quebrada, heath and chapparal vegetation mixed shrubby paramo, dwarf woodland.

Elevation: 2500–3850 m.

Distribution: Colombia (Cauca, Mariquita, Nariño, Putumayo, Quindio, Tolima, Valle), Ecuador (Azuay, Carchi, Chimborazo, Cuenca, Imbabura, Loja, Morona-Santiago, Napo, Specimens examined: **COLOMBIA. Cauca:** Carretera a La Plata, de Puracé al Alto de San Rafael, Garcia-Barriga & Hawkes 12833 (LIL, US); Cordillera Central, Puracé, Sneider 1781 (F, GH, NY), Sneider 1782 (K, S), Barclay & Schultes 155 (GH); Páramo de Moras, between Mozoco and Pitayo, Pittier 1513 (NY). **Mariquita:** Tolima, pres du Boqueron, Linden 924 (G, P). **Nariño:** Zona fría, norte de Yacuanquer, Garganta 465 (F). **Putumayo:** río Putumayo, filo de la Cordillera enter El Encano y Sibundoy, páramo de San Antonio del Bodoncillo, Cuatrecasas 11751 (F). **Quindio:** Mpio Pijao, Páramo de Chili, above Finca Maizopolis, 4°15–20'N, 75°35'W, Juteyn et al. 12951 (GH, NY); Mpio Salento, Verde Cocóra, 4°40–45'N, 75°20–25'W, Luteyn et al. 13025 (GH, NY). **Tolima:** Rosalito, near Páramo de Ruiz, Pennell 2960 (GH, NY). **Valle:** Cordillera Central, cabeceras de los ríos Tuluá y Bugalagrande, Páramo de Las Vegas, Cuatrecasas 20309 (F). **ECUADOR. Laguna Cocha,** André 3020 (GH, K, NY). **Azuay:** Gualaceo-Limón rd, km 25.2, 78°39–40'W 03°00'S, Jørgensen et al. 1853 (MO); Páramo del Castillo, Camp E-5125 (GH, NY); Páramo de Tinajillas, 30–50 km S Cuenca, Camp E-2267 (GH, NY). **Carchi:** Páramo de El Angel. Laguna Sur de El Voladero, 78°26'W 00°37'S, León 1083 (AAU); road from El Playon de San Francisco to Cerro Mirador, 77°39'W, 00°36'S, Øllgaard 98159 (AAU); Tulcán-Maldonado hwy, km 26 Cueva de Botas, Boeke 797 (SI); Páramos de Angel, Barclay & Juajibioy 9405 (GH, MO), Benoist 4626 (P). **Chimborazo:** Camino de Pusucucho al Placer, Acosta Solís 7272 (F), Acosta Solís 7291 (F); Páramo de Carnicería, faldas volcán Sangay, Acosta Solís 7677 (F). **Cotopaxi-Tungurahua:** Llanganates, Aucacocha, laguna Aucacocha, *Jaramillo* 6021 (MO). **Cuenca:** Cerro Yanghuang, near Pindilic, Lehmann 5604 (F, GH, K). **Imbabura:** Lago San Marcos, Cayambe, Cazalet & Pennington 5313 (B, K, NY, UC, US); near Laguna Yanuyacu, Wiggins 10431 (DS); E slopes of Cayambe Peak, Wiggins 10409 (DS, GH); N slopes of Cayambe on headwaters of E fork of Río Desaguadero, Wiggins 10385 (DS). **Loja:** Cordillera de Las Lagunitas, Amaluza-Jimbura-Zumba, Km 39.2 at pass, 79°25'22"W, 4°44'38"S, Jørgensen et al. 938 (LOJA, MO, QCA, QCNE); between Tambo Cachiyacu, La Entrada and Nudo de Sabanillas, *Steyermark* 54459 (F, GH, NY); Parque Nacional Rodocarpus, road from Yangana to

radio towers on Cerro Toledo, *van der Werff & Palacios* 9182 (MO); Yangana-Cerro Toledo road, 70°6'W, 4°23'S, Øllgaard et al. 58238 (AAU); E of Nudo de Cajanuma, 79°10'W, 4°05'S, Øllgaard 74675 (AAU); 14 km E Loja, 4°0'S, 79°1'W, Knight 910 (GH). **Morona-Santiago:** Parque Nacional Sangay, between Plazapamba and Yanayacu, 78°25'W, 02°02'S, Clark et al. 1828 (MO, QCNE); between Culebrillas and Alao, 78°30'W, 02°00'S, Clark et al. 1876 (MO, QCNE); Cuenca_General Plaza (Limón), km 29, Sparre 18786 (S). **Napo:** Volcán Cayambe, 77°59'W, 00°3'S, Øllgaard et al. 34271 (MO); Quijos Cantón, Reserva Ecológica Antisana, Carretere Pifo-Baeza, Páramo de la Virgen, 78°12'W, 00°23'S, Freire-Fierro, Vargas & Narváez 2874 (MO). **Pichincha:** rd from Olmedo to Laguna San Marcos, N slope of Volcán Cayambe, 0°7'N, 78°0'W, Balslev & Steere 4474 (NY). **Tungurahua:** 2.5 km W of Cerro Hermoso, 1°13'S, 78°18'W, Holm-Nielsen & Jaramillo 28656 (AAU, NY); upper slopes of Volcano Tungurahua, Popenoe 1286 (NA); Páramo Minza, Penland & Summers 327 (DS, F, GH); Santiago de Pillaro, Parque nacional Llanganates, Camino desde el Valle de los Frailejones hasta el pamo de Soguillas, 78°16'W, 01°08'S, Narváez et al. 523 (MO); Laguna Soquillas, Clark & Fair 3508 (MO, QCNE). **VENEZUELA. Merida:** Laguna Mucubaji, above Los Aparaderos, *Steyermark* 57507 (F, GH); Sierra de Santo Domingo, Laguna Negra, Dennis 2147 (K). **Trujillo-Merida:** Andes, *Jameson* 179 (G).

Schulz (1903) treated some Venezuelan and Colombian plants of *Cardamine jamesonii* as members of the African *C. johnstonii* (as pro. *punicea* and var. *superba*, respectively). He also treated the latter species as distinct from the African *C. oblique* A. Richard, which he treated as occurring both in Africa and Mexico. Baehni (1937) disagreed with such a discrepancy and recognized *C. punicea* as a species distinct from the African *C. johnstonii*. However, he overlooked the fact that *C. punicea* is indistinguishable from *C. jamesonii*. In my opinion, the alleged trans-Atlantic distributions by Schulz (1903) represent misidentifications of native New World taxa superficially resembling some of the African species.

The variability in leaflets morphology and flower color has led to the recognition of several taxa within *Cardamine jamesonii*. However, the variation is continuous in every aspect of the plant, and it is impractical to divide the species into infraspecific taxa. The only exception is the type collection of *C. tolimensis*, which differs from the other collections of *C. jamesonii* by being densely pubescent throughout and by having six pairs of leaflets. It might represent an independent taxon, but for now it is tentatively placed in *C. jamesonii*.

Cardamine jamesonii is readily distinguished from *C. ovata* by having purple, violet, red, or lavender (vs. white) flowers, larger petals ((8–)10–14 × 5–8 mm (vs. (–)– × – mm) and middle stem leaves with 3–5(–6) pairs (vs. (1–)2(–4) pairs) of lateral leaflets. From *C. lojanensis*, *C. jamesonii* is readily distinguished by having purple, violet, red, or lavender (vs. white) flowers, non-tuberous and non-scaly (vs. tuberous and scaly) rhizomes, and cauline leaves with 3–5(–6) pairs (vs. 6–12 pairs) of lateral leaflets.

Pichincha, Tungurahua), Vezuela (Merida, Trujillo).

Cardamine jejuna Standley & Steyermark, Field Mus. Nat. Hist., Bot. Ser. 23: 54. 1944. Holotype: Guatemala, *J. Steyermark* 50569 (holotype, F!).

Herbs, annual, sometimes scapose. **Stems** 5–10 cm, erect, simple, leafless or 1-leaved, glabrous throughout. **Basal leaves** 1.5–3 cm, rosulate, pinnately compound, petiolate; terminal lobe 3–6 × 3–6 mm, suborbicular to broadly ovate, obscurely 3-lobed and the lobes mucronate, glabrous or sparsely hirsute adaxially with whitish flattened trichomes, base truncate to rounded,

margin entire, apex obtuse to rounded, long petiolulate; lateral lobes 1 or 2 each side of midvein, short petiolulate, similar to terminal one. **Raceme** ebracteate, 3–5-flowered, lax; fruiting pedicels 1–1.5 cm, erect, slender. **Sepals** 1.5–2 × ca. 0.7 mm, oblong; petals 3–4 × 1–2 mm, white, obovate; filaments 2–2.5 mm; anthers ca. 0.5 mm; ovules ca. 14 per ovary. **Fruits** 2–2.5 cm × 0.7–1 mm; style ca. 1.5 mm. **Seeds** ca. 1.5 × 0.6 mm, oblong.

Flowering: Aug.

Habitat: forests.

Elevation: ca. 2800 m.

Distribution: Mexico (Chiapas), Costa Rica.

Cardamine jonselliana Al-Shehbaz, Harvard Pap. Bot. 9: 5. 2004. TYPE: Uganda, Ruwenzori, Stuhlmann Pass, on moist open ground amongst grasses, 13,700 ft, between 18 Jun and 5 Jul 1968, A. C. Hamilton 742 (holotype, K!).

Herbs, perennial, glabrous throughout except for leaf margin. **Rhizomes** branched, not scaly, 3–5 mm wide. **Stems** 10–25 cm, erect, simple, usually rooting from lower nodes. **Rhizomal leaves** and basal absent; cauline leaves pinnately compound, 5–9-foliolate; petiole 2–4 cm, not auriculate at base; terminal leaflet ovate to orbicular, 4–10 mm, obscurely 3–5-lobed, repand, ciliate, on a petiolule 1–2 mm; lateral leaflets orbicular to broadly ovate, 2–6 mm, sessile, repand to entire. **Raceme** bracteate throughout, 12–25-flowered; lowermost bracts 5-foliolate, gradually reduced in size and number of leaflets upward, uppermost repand or obscurely lobed; fruiting pedicels ascending to suberect, straight, stout, 5–10 mm. **Sepals** reddish purple, oblong, 3–3.5 mm, glabrous; petals purple, spatulate, 7–9 × 3–3.5 mm, obtuse at apex, not differentiated into blade and claw; stamens 6, filaments 2.5–3.5 mm, anthers oblong, 0.7–1 mm. **Fruits** (young) 1–1.5 cm. **Seeds** not seen.

Flowering Jun–Jul.

Habitat: moist and open grounds among grasses.

Elevation: ca. 4170 m.

Distribution: Uganda.

Cardamine keyseri O. E. Schulz, Bot. Jahrb. Syst. 62: 480. 1929. TYPE:

Herbs annual or short-lived perennial. **Rhizome** slender, prostrate. **Stems** 1–4 dm, erect, rooting from lower nodes, hispidulous basally. **Leaves** pinnately compound, 5–9-foliolate, glabrous or sparsely pubescent; basal leaves 4–8 cm, petiole 1–4 cm, soon withered; cauline leaves to 9 cm, with non-auriculate petioles; leaflets trifid, 0.3–2.5 × 0.2–1.4 cm, base attenuate to cuneate or rarely truncate, apex acute; terminal leaflet larger, sessile or with petiolule to 1.5 cm. **Raceme** ebracteate, 5–10-flowered; fruiting pedicels 4–10 mm, divaricate. **Sepals** oblong, 2.5–3.5 mm; petals white, spatulate, 7–8 × 2.5–3.5 mm, obtuse or emarginate; stamens 6, subequal, filaments subulate; anthers ca. 0.8 mm; ovules – per ovary. **Fruits** linear, 2–3.8 × 1–2 mm; style 0.5–1.4 mm. Seeds elliptic, 1.4–1.8 × 1.2–1.4 mm, smooth.

Habitat: Sandy or gravelly streamsides, forest clearings.

Elevation: 900–4000 m.

Distribution: New Guinea.

Cardamine kitaibellii Becherer, Ber. Schweiz. Bot. Ges. 43: 57. 1934; *Dentaria polyphylla* Waldstein & Kitaibel, Descr. Icon. Pl. Hung. 2: 174, t. 160. 1805, not *C. polyphylla* D. Don, nor O. E. Schulz. TYPE: E Croatiae montibus ad Koreniczam et Priboy, Herb. Kitaibel, no. LI/111 (lectotype designated by Kováts (Ann. Hist.-Nat. Mus. Natl. Hung. 84: 41. 1992).

Cardamine komarovii Nakai, Repert. Spec. Nov. Regni Veg. 13: 271. 1914; *Alliaria auriculata* Komarov, Trudy Imp. S.-Peterburgsk. Bot. Sada 18: 437. 1901, not *Cardamine auriculata* S. Watson (1882).

Arabis cebennensis de Candolle var. *coreana* H. Léveillé, Bull. Acad. Géog. Bot. 19: 260. 1909. TYPE: Korea. "In petrosis rivorum montis des diamants," 24 June 1906, *Faurie 570* (holotype, E!).

Herbs, perennial, 12–75 cm. **Rhizomes** short, stout. **Stems** erect, simple at base, branched above, finely striate, pubescent or glabrescent. **Basal leaves** rosulate; petiole 2–5 cm, winged at base, glabrous or pilose; leaf blade broadly cordate or suborbicular, 1.5–4 × 1.5–3.5 cm, margin coarsely dentate, the teeth submucronate; cauline leaves 3–8, simple; petiole winged, (0.5–)1–4 cm, auriculate-amplexicaul at base; auricles oblong or lanceolate, 2–10 × 0.5–4 mm, entire; leaf blade cordate or broadly ovate, (2–)3–7.5(–9) × (1.2–)2.5–6 cm, pilose at least along veins and margins, rarely glabrous, base cordate, margin coarsely and irregularly toothed, sometimes incised on distal leaves, apex acuminate or obtuse. **Racemes** ebracteate; fruiting pedicels divaricate or ascending, 1–2.5 cm, slender, pilose or glabrous. **Sepals** oblong, 2.5–3 × 1.2–1.6 mm, glabrous or pilose, base not saccate; petals white, broadly obovate, 3–4 × ca. 1.5 mm, apex rounded; filaments 2–3 mm; anthers oblong, ca. 1.5 mm; ovules 6–12 per ovary. **Fruit** linear, 2–4 cm × ca. 1 mm; gynophore stout, 0.2–0.7 mm; valves glabrous or sparsely pilose, not torulose, acuminate; style 2–3 mm, slender. **Seeds** brown, oblong, 1.5–2 × 1–2 mm.

Flowering: May–Jun.

Habitat: streamsides, moist areas.

Elevation: 700–1000 m.

Distribution: China (Heilongjiang, Jilin, Liaoning), Korea.

Cardamine kruesselii Johow, Stud. Fl. Isals Juan Fernandez 112. 1896. TYPE: Chile. Juan Fernandez Islands: Masafuera, *Johow s.n.* (holotype,?)

Herbs, annual? perennial?, densely hirsute throughout. **Rhizome** tuberous?. **Stems** 5–15 cm, densely hirsute, subangular, branched near base and above, subdecumbent or ascending, flexous above. **Basal leaves** not seen; cauline leaves 3–5-foliolate, 2–5 cm; petiole hirsute, 1–2 cm; terminal leaflet 8–15 × 1–6 mm, entire or subapically toothed, ovate or obovate to narrowly lanceolate, subsessile or on a petiolule to 3 mm; lateral leaflets oblong to ovate or narrowly lanceolate, 4–10 × 1–7 mm, entire, cuneate or oblique at base. **Raceme** ebracteate or lowermost 1 or two flowers bracteate; rachis flexuous; fruiting pedicels slender, divaricate, 3–6.5 mm. **Sepals** oblong, glabrous, 1–1.5 × 0.3–0.7 mm; petals white, spatulate, 2.5–3 × 0.3–0.8.1 mm; stamens # ?; filaments 1–1.5 mm; anthers ovate, 0.1–0.2 mm; ovules 18–22 per ovary. **Fruit** linear, 1–2.5 cm × 0.8–1 mm, replum sparsely pubescent; style 1–1.5 mm. **Seeds** light brown, ovate, 0.9–1.2 × 0.6–0.7 mm, wingless.

Flowering: Dec.

Distribution: Chile (Juan Fernandez Islands/Mas Afuera).

Specimens examined: CHILE. Juan Fernandez Islands: Mas Afuera, [500 m], [33°45'S, 80°46'W], 28 Dec. 1891, *F. Johow s.n.* (CONC).

An obscurely known species for which I have seen only the specimen above. It is said to be a perennial, but the material examined is fragmentary. The presence of racemes bracteate basally and the rhizome suggest affinity to *Cardamine bonariensis*, if indeed different. However, the smaller size of flowers and the pubescent replum argue against that. Schulz (1903) indicated affinity to *C. hispidula*, but I have not seen material of the latter.

Cardamine lacustris (Garnock-Jones & P. N. Johnson) Heenan, *New Zealand J. Bot.* 40: 568. 2002; *Iti lacustris* Garnock-Jones & P. N. Johnson, *New Zealand J. Bot.* 25: 603. 1987. TYPE: New Zealand, Henry Creek, E side of Lake Te Anau, 21 May 1971, *P. N. Johnson s.n.* (holotype CHR 286399).

Herbs, annual or ephemeral, glabrous or sparsely pubescent. **Stems** to 5 cm, prostrate, geniculate. **Basal leaves** petiolate, rosulate, early ones entire, linear-spatulate; cauline leaves and later basal ones pinnatifid, 2–3(–5) cm; petiole 2–12 mm, not auriculate at base; terminal lobe narrowly spatulate, 2–3(–5) mm wide; lateral lobes 1 or 1(–3) on each side, narrowly oblong-spatulate, 4–10 mm. **Inflorescence** solitary flowers or 2(or 3) from leaf axils; fruiting pedicels 2–5 mm. **Sepals** oblong, suberect, glabrous, 1.5–2 mm; petals white, suberect, oblong- to obovate-spatulate, 1.8–2.5 × 0.8–1.2 mm; stamens 4(or 6), median pair(s) 1.6–2 mm, lateral 1–1.5 mm; ovules 10–16 per ovary. **Fruits** ellipsoid to oblong, (1–)2–3(–3.5) × 1–1.7 mm, convex, glabrous. **Seeds** oblong, ca. 1 mm. $2n = 48$.

Flowering: Mar–May.

Habitat: lake shores.

Distribution: New Zealand (South Island).

Cardamine latior Heenan, *New Zealand J. Bot.* 46: 562. 2008. TYPE: New Zealand, Auckland Islands, Bivouac Saddle, fellfield, 1600', Jan 1963, *E. J. Godley s.n.* (holotype, CHR 134244A; isotype, CHR).

Herbs, perennial, cespitose. Basal leaves compactly rosulate, pinnately compound, 11–15-foliolate, to 4(–5) cm; petioles 8–12 mm; leaflets often overlapping towards leaf apex, reniform to orbicular or broadly elliptic, entire; terminal leaflet 3.5–4.7 × 3.5–4.1 mm, with 2 lateral lobes; lateral leaflets 1.5–2.5 × 0.7–2.2 mm; cauline leaves sometimes present, not auriculate at base, similar to basal leaves but smaller and with fewer leaflets. **Racemes** basally bracteate, not elongated in fruit; fruiting pedicels 5–10(–17) mm, erect. **Sepals** 2–2.4 mm, oblong to elliptic, glabrous; petals white to pale pink or purple, 3.2–4 × 1.2–1.5 mm, obovate, apex obtuse to rounded; stamens 6, filaments 1.6–2.4 mm, anthers 0.4–0.5 mm. Fruits 1.2–2.3 cm × 1.7–2.2 mm, glabrous; style 0.7–1.4 mm. Seeds 1.4–2.1 × 1.1–1.5 mm, rounded to oblong.

Flowering: Oct–Dec.

Habitat: fellfields, among boulders, scree.

Distribution: New Zealand (Auckland and Adams islands).

Cardamine lazica Boissier & Balansa in Boissier, *Fl. Or. Suppl.* 31. 1888; *Cardamine amara* Linnaeus prol. *Lazica* (Boissier & Balansa) O. E. Schulz, *Bot. Jahrb. Syst.* 32: 500. 1903. TYPE: Turkey, in Ponto litorali ad rivulos prope Rize, 100m, et in regione subalpina inter Andon et Djimil, 1850, 1866, Balansa s.n. (lectotype, needs designation)

Cardamine leucantha (Tausch) O. E. Schulz, *Bot. Jahrb. Syst.* 32: 403. 1903; *Dentaria leucantha* Tausch, *Flora* 19: 404. 1836. TYPE:

Cardamine cathayensis Migo, *J. Shanghai Sci. Inst. Sect. III.* 3: 223. 1937.

Cardamine koreana (Nakai) Nakai, *Bull. Nat. Sci. Mus. Tokyo* 31: 49. 1952. **List synonym.**

Cardamine leucantha (Tausch) O. E. Schulz var. *crenata* D. C. Zhang, *Bull. Bot. Res., Harbin* 11: 42. 1991. TYPE: China, Anhui, Jingdixian, Yucun Wolonggou, 200 m, 7 May 1985, *Shao Jianzhang 82143* (holotype, ANU).

Cardamine leucantha (Tausch) O. E. Schulz var. *glaberrima* F. Maekawa ex H. Hara, *J. Jap. Bot.* 51: 192. 1976.

Cardamine macrophylla Willdenow var. *albiflora* Makino, Bot. Mag. (Tokyo) 8: 302. 1894.
Cardamine macrophylla Willdenow var. *parviflora* Trautvetter & C. A. Meyer, Fl. Ochot. 15
1856.

Dentaria dasyloba Turczaninow, Bull. Soc. Imp. Naturalistes Moscou 27: 296. 1854; *Cardamine dasyloba* (Turczaninow) Miquel, Ann. Mus. Bot. Lugduno-Batavi 2: 73. 1866; *D. macrophylla* (Willdenow) Bunge ex Maximowicz var. *dasyloba* (Turczaninow) Makino, Bot. Mag. (Tokyo) 11: 157. 1897. TYPE:

Herbs, perennial, sparsely to densely villous. **Rhizomes** creeping, slender, not scaly or stoloniferous. **Stems** 2.5–7.5 dm, simple, flexuous. **Cauline leaves** 4–7, including petiole (8–)10–20(–25) cm; petiole (1–)2–8(–10) cm, not auriculate at base; terminal leaflet lanceolate, elliptic, to ovate-elliptic, (3–)4–9(–13) × (0.6–)1–3.5(–4) cm, adaxially shortly strigose or puberulent, abaxially pilose or long strigose, with a petiolule 5–13(–20) mm, base cuneate, margin antrorsely ciliate and irregularly serrate, double serrate, or subdentate, apex acuminate or rarely acute; lateral leaflets 2 or 3 pairs, rarely uppermost leaf trifoliolate, similar to terminal one, smaller, sessile, base cuneate or sometimes oblique. **Racemes** ebracteate, 12–24-flowered; fruiting pedicels divaricate or ascending, (0.5–)1–1.8(–2.3) cm, pilose or puberulent, slender. **Sepals** oblong, (2–)2.5–3.5 × 0.9–1.5 mm, margin membranous, pilose abaxially; petals white, spatulate to oblong-oblancheolate, 6–8 × 2–3.5(–4) mm, cuneate and not clawed at base, apex rounded; median filament pairs 5–6 mm, lateral pair 4–5 mm; anther oblong, 0.8–1.3 mm; ovules 6–12 per ovary. **Fruit** linear, (1–)1.5–3 cm × 1–1.5 mm; gynophore 0.3–0.8(–1) mm; valves smooth, sparsely hairy or glabrous; style slender, (2–)3–5 mm. **Seeds** brown, oblong, 1.5–2.2 × 0.8–1.2 mm, narrowly winged or wingless. $2n = 16$.

Flowering: Apr–Jul.

Habitat: roadsides, shady areas, forests, wet places along streams, roadsides.

Elevation: 100–2000 m.

Distribution: China (Anhui, Gansu, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Jiangxi, Jilin, Jiangsu, Liaoning, Nei Mongol, Ningxia, Shaanxi, Shanxi, Sichuan), Japan (Honshu, Hokkaido), Korea, Mongolia, Russia (Far East).

Cardamine lihengiana Al-Shehbaz, Novon 10: 326. 2000. TYPE: China. Yunnan. Yiliang, Xia Cao Ba, 1900 m, 16 Jun 1982, *Li Heng, Chen Yü & Yü Hongyuan 1267* (holotype, KUN!; isotype, KUN!).

Herbs, perennial, glabrous throughout. **Rhizomes** slender, without stolons. **Stems** 3–5 dm, erect, angled, with internodes usually more than 2 cm. **Rhizomal leaves** and lower cauline simple; petiole 1–4 cm, not auriculate at base; leaf blade reniform or suborbicular, 0.7–2.5 × 1–3 cm, palmately veined, base cordate, margin repand-crenate, obscurely to distinctly 5- or 7-angled, apex obtuse, obscurely mucronulate; middle and upper cauline leaves with axillary flowers, simple or rarely 1 or 2 with a lateral, leafletlike lobe, suborbicular or ovate, angled, not crenate, progressively smaller upward. **Racemes** bracteate throughout, very lax; fruiting pedicels ascending, 1.5–3 cm, slender, straight. **Sepals** ovate, 1.5–1.8 × 0.9–1 mm, apex membranous, base not saccate; petals white, obovate, 3.5–4.5 × 1.5–2 mm, not clawed, apex rounded; median filament pairs ca. 2.5 mm, lateral pair ca. 2 mm; anthers oblong, ca. 0.6 mm; ovules 20–24 per ovary. **Fruit** linear, 2–3.6 cm × ca. 1 mm, sessile; valves glabrous, smooth; style 1–2 mm. **Seeds** brown, oblong, 1.2–1.4 × 0.7–0.9 mm, wingless.

Flowering May–Jun.

Elevation: ca. 1900 m.

Distribution: China (Yunnan).

Cardamine lilacina W. J. Hooker, Comp. Bot. Mag. 1: 273. 1835; *C. pratensis* var. *lilacina* (W. J. Hooker) J. D. Hooker, Fl. Tasmaniae 1: 19. 1855. TYPE: Australia, banks of the Macquarie River, *C. Fraser s.n.* (lectotype here designated, K).

Herbs, annual or perennial, sometimes forming cushions, often glabrous. **Rhizomes** present. **Stems** to 5 dm, erect to decumbent. **Basal leaves** pinnately compound, with 1–3 pairs of lateral leaflets; leaflets often ovate, to lanceolate, undivided, entire; cauline leaves petiolate, not auriculate at base, less divided, reduced in size upwards; uppermost lanceolate, entire. **Raceme** ebracteate, corymbose, elongated in fruit; fruiting pedicels erect to spreading, 5–20 mm, slender. Sepals 2–3 mm, purple, oblong; petals 7–11 mm, pink to purple; stamens 6; ovules –. **Fruit** linear, 1–4.5 cm × 1–2 mm; style 1–3 mm. **Seeds** oblong to ovoid, 1.5–2.5 mm, flattened, narrowly winged.

Habitat: damp forests, wet grounds.

Distribution: Australia (New South Wales, Tasmania, Victoria).

Cardamine lineariloba I. Thompson, Muelleria 9: 163. 1996. TYPE: Australia, Victoria, Mt. Arapiles, SE slope along watercourse, ca. 1.6 km down from top, 22 Sep 1968, A. C. Beauglehole 28699 (holotype, MEL).

Herbs, annual, glabrous throughout. **Stems** to 25 cm, erect to ascending, usually much branched from base and above. **Basal leaves** not fleshy, not rosulate, petiolate, to 6 cm, simple, narrowly oblanceolate, entire, base attenuate, sometimes pinnatisect and with 1–several, linear lateral lobes much smaller than the sublinear terminal lobe to 2 cm; cauline leaves several, similar to basal, petiolate, not auriculate at base, gradually reduced in size upwards. **Racemes** ebracteate, often few flowered; fruiting pedicels divaricate-ascending, 5–10 mm. **Sepals** ovate, 1.5–2 mm; petals white, cuneate, 3–5 mm; stamens 6. **Fruits** linear, erect, 0.9–2 cm × ca. 1 mm; style to 1 mm. **Seeds** elliptic, to 1.2 mm.

Flowering: Aug–Sep.

Habitat: lowland areas along stream banks, seasonally wet lowlands, swamps.

Elevation:

Distribution: Australia (South Australia, Victoria).

Cardamine lojanensis Al-Shehbaz, Novon 7: 6. 1997. TYPE: Ecuador, Loja, Parque nacional Podocarpus, Cerro Toledo E of Yangana, wet paramo around radio station, 3400–3450 m, 4°24'S, 76°6'W, 26 Feb 1985, B. Øllgaard, S. Laegaard, K. Thomsen, K. Korning & T. Illum 58147 (holotype, AAU!).

Herbs, perennial. **Rhizomes** tuberous, scaly, with persistent expanded petiolar bases of previous years. **Stems** 1 or 2, 15–40 cm, erect, somewhat striate, glabrous or sparsely puberulent. **Basal leaves** compound, with 13–23 leaflets; petiole 1.5–9 cm, 1–3× as long as leaf rachis, distinctly expanded into a triangular, winged, persistent base becoming scalelike in subsequent seasons; rachis grooved, 0.7–4 cm; lateral leaflets petiolulate, ovate or ovate-oblong to lanceolate in outline, 2–9 × 1–7 mm, pinnatifid, lacinate, to incised, the segments incised to dentate, margin sparsely ciliate with minute trichomes 0.06–0.12 mm, apex acute; petiolule grooved, (0.5–)1–3 mm; cauline leaves 2–6, with 13–19 leaflets, similar in morphology to basal leaves, reduced in size and division of leaflets upward; petiole 0.7–1.2 cm; leaflets short petiolulate to subsessile in uppermost leaves. **Racemes** basally bracteates, corymbose, elongated considerably

in fruit; bracts adnate to pedicel; fruiting pedicels ascending, straight, glabrous, striate, lowermost 2–2.5 cm. **Sepals** oblong, 3–4 × 1.2–1.5 mm, slightly saccate, erect or suberect, caducous, glabrous; petals white, broadly obovate to suborbicular, 8–11 × 6–7 mm, abruptly narrowed into a clawlike base to 1 mm, apex shallowly emarginate to subtruncate; filaments white, 3–5 mm; anthers oblong, ca. 1 mm. **Fruits** linear, 2.5–5 cm × ca. 2 mm; gynophore ca. 1 mm; style 3–4 mm. **Seeds** brown, oblong, ca. 2.4 × 1.2 mm.

Flowering: Nov–Feb.

Habitat: sandy rocky soil, wet paramo.

Elevation: 3150–3500 m

Distribution: Ecuador (Loja).

Specimens examined: **ECUADOR. Loja:** road from Yangana to Cerro Toledo, km 18–22 to the antennas, 79°6′40–42″W, 4°22′28″–4°24′13″S, *Jørgensen, Ulloa & Caranqui 2179* (LOJA, MO, QCA, QCNE).

Cardamine longii Fernald, *Rhodora* 19: 91. 1917. TYPE:

Herbs, perennial, glabrous throughout. **Rhizomes** slender, cylindrical, 0.8–1.5 mm in diam.; stolons absent. **Stems** 0.5–4(–6) dm, prostrate to decumbent or erect, simple or branched, glabrous. **Rhizomal leaves** absent; cauline leaves 3–10, simple or rarely 3–5-foliolate, somewhat fleshy; petiole 0.4–2.5 cm, base not auriculate; leaf blade or terminal leaflet of compound leaves orbicular to reniform or ovate to oblong, 0.4–3 × 0.3–2 cm, base subcordate to rounded or subtruncat, margin entire or repand or rarely undulate, apex rounded; lateral leaflets (when present) similar to terminal one but considerably smaller, sessile or with a petiolule to 2 mm. **Racemes** ebracteate; fruiting pedicels divaricate-ascending to spreading, 0.5–2(–4) mm. **Sepals** ovate, 0.7–1.2 × 0.5–0.7 mm, erect, base of lateral pair not saccate; petals absent or rudimentary and to 0.7 mm; filaments 0.5–0.8 mm; anthers ovate, 0.1–0.2 mm. **Fruit** narrowly oblong to linear, (3–)5–10(–15) × 0.8–1.2 mm; valves glabrous; style 0.2–0.5(–1) mm; ovules and seeds 6–22 per fruit. **Seeds** light or yellowish brown, oblong or ovate, 1–1.4 × 0.7–1 mm.

Flowering: Jun–Sep.

Habitat: tidal marshes, mud flats, tidal shores of rivers, shallow water, swampy areas, shady rocky crevices covered at high tide.

Elevation: sea level.

Distribution: United States (Florida, Maine, Maryland, Massachusetts, New Jersey, New York, North Carolina, South Carolina, Virginia).

Cardamine longipedicellata Rollins, *J. Arnold Arbor.* 21: 395. 1940. TYPE: Mexico, Nuevo Leon, San Francisco Canyon, about 15 miles SW of Pueblo Galeana, 11 May 1934, *C.H. & M.T. Mueller 298* (holotype, GH!).

Cardamine ramosa Rollins, *Cruciferae Continental N. Amer.* 295. 1993. TYPE: Mexico, San Luis Potosí, 3 miles E of Xilitla, 3000 ft, 18 Jul 1963, *R. L. McGregor, L. J. Harms, A. J. Robinson, R. del Rosario & R. Segal 903* (holotype, GH!).

Herbs, annual or rhizomatous perennial, glabrous or sparsely pubescent. **Stems** 10–30 cm, erect or decumbent, simple or branched above. **Cauline leaves** petiolate, not auriculate, pinnately compound; terminal leaflet 5–20 × 3–8 mm, suborbicular, broadly ovate, or obovate, base cuneate to subtruncate, margin entire or dentate, apex acute, petiolule to 2 cm; lateral leaflets 1–3(or 4) on each side of rachis, similar to terminal leaflet but smaller and often with shorter petiolules; uppermost leaves smaller. **Racemes** ebracteate, lax, few flowered, somewhat secund in fruit; fruiting pedicels (4–)9–20 mm, divaricate to ascending, slender, straight, glabrous or

pubescent. **Sepals** 2–2.5 × 0.8–1 mm, oblong, caducous; petals 4–6 × 1–2 mm, white, spatulate, apex obtuse; filaments 2–3 mm; anthers 0.6–0.7 mm, oblong; ovules 12–16(–18) per ovary.

Fruits 2.2–3 cm × 1–1.3 mm; style 0.5–2 mm. **Seeds** 1.2–1.5 × 0.8–1 mm, light brown, oblong. Flowering: Jul–Nov.

Habitat: slopes, roadsides.

Elevation: 1000–3200 m.

Distribution: Mexico (Chiapas, Hidalgo, Distrito Federal, Nuevo León, Puebla, San Luis Potosí, Veracruz), Guatemala.

Notes: the only difference in the original descriptions of *Cardamine longipedicellata* and *C. ramosa* is in the length of the fruiting pedicels, which was said to be 10–20 mm long in the former and 4–7(–10) mm in the latter. However, several paratypes cited by Rollins (1993) under *C. ramosa*, including *Matuda 4694*, clearly have fruiting pedicels to 17 mm.

Cardamine loxostemonoides O. E. Schulz, Notizbl. Bot. Gart. Berlin-Dahlem 9: 1069. 1926; *Loxostemon loxostemonoides* (O. E. Schulz) Y. C. Lan & T. Y. Cheo, Bull. Bot. Res., Harbin 1(3): 54. 1981. TYPE: NW India, Nipchang valley, 4300–4600 m, 31 Aug 1884, *Duthie 2724* (lectotype, designated by Rashid & Ohba (1993), ?B; isolectotype, K, DD).

Loxostemon incanus R. C. Fang ex T. Y. Cheo & Y. C. Lan, Bull. Bot. Res., Harbin 1(3): 54. 1981. TYPE: China, Yunnan, Chungtien Plateau, 7 Jul 1930, *K. M. Feng 1559* (holotype, KUN).

Cardamine tibetana Rashid & H. Ohba, J. Jap. Bot. 68: 206. 1993. TYPE: China, SE Tibet, Tse La, Langong, 94°00'N, 28°45'E, 14–15000 ft, open bare scree, 21 Jun 1938, *F. Ludlow & G. Sherriff 5618* (holotype, TI!; isotypes, BM!, E!).

Herbs, perennial, glabrous or sparsely to densely pilose. **Rhizomes** slender, with several bulbils and stolons; bulbils with fleshy, white, scaly leaves apically with rudimentary appendages. **Stems** (5–)12–30(–35) cm, somewhat decumbent and slender below, simple.

Rhizomal leaves glabrous or pilose, compound; petiole (0.7–)2–15(–20) cm; terminal leaflet with a petiolule 3–10 mm, blade undivided and suborbicular, oblanceolate, or linear, or trifid and suborbicular to broadly obovate in outline and with obovate or oblong lobes the basal pair of which sometimes with a tiny lobule, terminal lobe 0.6–2(–3) cm × 2–5 mm; lateral leaflets 2–5 pairs, sessile or petiolulate, similar in shape and division to terminal lobe but smaller. Cauline leaves 1–4; petiole (0.3–)1–3(–4) cm, not auriculate at base; terminal and lateral leaflets similar in shape, size, and number to those of basal leaves. **Racemes** ebracteate, 2–14-flowered; fruiting pedicels (5–)1–2.5 cm, ascending to suberect, glabrous. **Sepals** broadly ovate, 2.5–5 × 1.5–2.5 mm, glabrous, broadly membranous at margin and apex, base of lateral pair subsaccate; petals purple with darker veins, broadly obovate, 0.8–1.2(–1.4) cm × 5–8(–8.5) mm, not clawed, apex rounded; median filament pairs (3.5–)4.5–6 mm, lateral pair 2.5–4 mm; anthers narrowly oblong, 1.4–2 mm; ovules 14–20 per ovary. **Fruits** linear, 2.5–3.5 cm × 1.2–1.5 mm; valves glabrous; style 1–3 mm. **Seeds** brown, ovate, ca. 1.5 × 1 mm, wingless.

Flowering: Jun–Jul.

Habitat: mountains slopes, along ditches, damp grounds by streams, open grass and gravel, scree.

Elevation: 2900–5500 m.

Distribution: Bhutan, China (Xizang), India (Sikkim), Kashmir, Nepal.

Cardamine luxurians (O. E. Schulz) Rashid & H. Ohba, J. Jap. Bot. 68: 205. 1993; *C. loxostemonoides* O. E. Schulz var. *luxurians* O. E. Schulz, Notizbl. Bot. Gart. Berlin-Dahlem 9:

1070. 1927. TYPE: NW India, Tihri-Garwal, Nila Valley, 16 Aug 1883, *Duthie 912* (holotype, B!; isotype, K!).

Herbs, perennial. **Rhizomes** branched, stoloniferous, nontuberous, with membranous scales. **Stems** 11–25 cm; erect to procumbent, glabrous. **Basal leaves** and cauline leaves similar, with 5–11 leaflets; petiole 2–9 cm; lateral leaflets on petiolules 2–10 mm, broadly ovate to suborbicular, 13–18 mm, 6–13 mm wide, base cuneate to oblique, margin subentire or 3-toothed or lobed, apex acute and minutely mucronate; terminal leaflet slightly larger. **Racemes** ebracteate, 6–20-flowered; fruiting pedicels 1–2 cm, straight, ascending. **Sepals** 3–3.7 mm, 1.5–2.2 mm wide, oblong; petals purplish to pink with darker veins, obovate, 10–14 mm, 4–6 mm wide; median filaments 6–7.5 mm, lateral filaments 3.5–4 mm; anthers oblong, 0.9–1.2 mm; ovules 16–20. **Fruits** linear, 2.5–4.5 cm, 1–1.5 mm wide; valves glabrous; style ca. 1 mm. **Seeds** not seen. $2n = 32$.

Habitat: shade of boulders.

Elevation: ca. 3350 m.

Distribution: Kashmir.

Cardamine lyrata Bunge, Mém. Acad. Imp. Sci. St.-Pétersbourg, Sér. 6, Sci. Math. 2: 29. 1833. *Cardamine argyi* H. Léveillé, Mem. Real Acad. Cienc. Art., Barcelona 12: 547. 1916. TYPE.

China, Jiangsu, without locality and collection date, *d'Argy s.n.* (holotype, E).

Herbs, perennial, glabrous throughout. **Rhizomes** short, thick, not scaly; stolons from rhizome or lower to middle stem nodes to 80 cm. **Stems** (2–)3–7(–8) dm tall erect, simple, striate angled, 8–15-leaved. Leaves on stolons simple or rarely with a basal pair of auriclelike leaflets; petiole 3–12 mm; leaf blade suborbicular, cordate, or reniform, (0.7–)1–2.2(–3) × 0.7–2(–2.3) cm, margin repand or entire, apex rounded; cauline leaves sessile, middle ones (1.5–)3–5(–7) cm; terminal leaflet orbicular, ovate, or rarely oblong, 1–3 × (0.8–)1–3 cm, with a petiolule (0.3–)0.5–1.5(–2) cm, base cordate, subtruncate, or obtuse, margin repand or subentire, apex rounded; lateral leaflets 2–5 pairs, much smaller than terminal one, ovate, suborbicular, or oblong-ovate; proximal pair of lateral leaflets auriclelike, attached at or just above node, often giving appearance of amplexicaul leaf base. **Racemes** ebracteate; fruiting pedicels (0.7–)1–2(–2.5) cm, slender, divaricate, usually straight. **Sepals** ovate, 3–3.5 × 1–1.5 mm, margin membranous, lateral pair subsaccate; petals white, obovate, 7–10 × 3–4 mm, not clawed, apex rounded to emarginated; filaments slightly spreading, median pairs 4–5 mm, lateral pair 2.5–3.5 mm; anther narrowly oblong, 1–1.5 mm; ovules 14–18 per ovary. **Fruit** linear, strongly flattened, (1.5–)2–3(–3.5) cm × 1.5–2 mm; valves smooth, glabrous; styles slender, 1.5–3 mm. Seds brown, oblong, 2–3 × 1–2 mm, winged all around; wing to 1 mm wide.

Flowering: Apr–Jun.

Habitat: moist places, streamsides.

Elevation: 0–1000 m.

Distribution: China (Anhui, Fujian, Guangxi, Guizhou, Hebei, Heilongjiang, Henan, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Shandong, Sichuan, Zhejiang), Japan, Korea, Russia (Far East, Siberia).

Cardamine macrocarpa Brandege, Zoe 5: 233. 1906. TYPE:

Cardamine macrocarpa var. *texana* Rollins, J. Arnold Arbor. 21: 394. 1940. TYPE: United States, Texas, Brewster Co., Camp Mountain, Chisos Mountains, Sep 1933, *V. L. Cory 7141* (holotype, GH!).

Herbs, annual, glabrous or sparsely puberulent. **Rhizomes** absent; stolons absent. **Stems** (1.4–)2–4.5(5.3) dm, erect, or decumbent, 1 to or several from base, simple or often branched above, flexuous or straight, narrowly winged-angled. **Basal leaves** not rosulate, soon withered; cauline leaves 3–9, middle ones 5–9-foliolate, 3–8 cm; petiole 1–3 cm, base not auriculate; terminal leaflet broadly ovate to narrowly lanceolate or rarely oblong, 0.7–2 × 0.2–1 cm, base cuneate to rounded, margin repand, crenate, or 3-lobed, petiolule 2–8 mm; lateral lobes similar to terminal, often smaller and with oblique base, upper leaves gradually reduced in size and with narrower, subsessile leaflets. **Racemes** ebracteate; rachis slightly to strongly flexuous or geniculate; fruiting pedicels horizontal to divaricate or ascending, (3–)4–9(–12) mm. **Sepals** oblong, 2–3.5 × 0.7–1.2 mm, base of lateral pair not saccate; petals white, linear, 6–8 × 0.7–1 mm; median filament pairs 4–5 mm, lateral pair 3.5–4 mm; anthers oblong, 0.7–1 mm. **Fruit** linear, (2.5–)3–4.6 cm × 1.7–2.1 mm; valves glabrous; style 1–3 mm; ovules and seeds 14–22 per fruit. **Seeds** dark brown, oblong, 2–2.5 × 0.9–1.2 mm.

Flowering: Mar–Sep.

Habitat: rock crevices and ledges, gravel bars of mountain streams, moist rocky stream banks, shaded loamy forest floor.

Distribution: Mexico (Coahuila, Nuevo Leon), United States (Texas/Brewster Co.).

Cardamine macrophylla Willdenow, Sp. Pl. 3: 484. 1800; *D. macrophylla* (Willdenow) Bunge ex Maximowicz;

Cardamine macrophylla var. *crenata* Trautvetter;

Cardamine macrophylla var. *dentarifolia* J. D. Hooker & T. Anderson;

Cardamine macrophylla var. *diploidonta* T. Y. Cheo;

Cardamine macrophylla var. *foliosa* J. D. Hooker & T. Anderson;

Cardamine macrophylla var. *lobata* J. D. Hooker & T. Anderson;

Cardamine macrophylla var. *moupinensis* Franchet;

Cardamine polyphylla D. Don 1825, not O. E. Schulz (1903); *C. macrophylla* subsp. *polyphylla*

(D. Don) O. E. Schulz; *C. macrophylla* var. *polyphylla* (D. Don) T. Y. Cheo & R. C. Fang;

Cardamine macrophylla var. *sikkimensis* J. D. Hooker & T. Anderson;

Cardamine sachalinensis Miyabe & Miyake;

Cardamine sinomanshurica (Kitagawa) Kitagawa;

Cardamine urbaniana O. E. Schulz, Bot. Jahrb. Syst. 32: 396. 1903. TYPE: China, Sichan,

Augustine Henry 5635 (lectotype, here designated, B!; isolectotypes, GH!, US!).

Dentaria gmelinii Tausch,

Dentaria sinomanshurica Kitagawa,

Dentaria wallichii G. Don,

Dentaria willdenowii Tausch,

Herbs, perennial, **Rhizomes** creeping, not scaly, slender or stout and with tuberous knots, 2–10(–30) mm in diam., not stoloniferous **Stems** (2–)3–9.5(–11.5) dm, stout or slender, erect, simple or rarely branched above, glabrous, hirsute, or pilose. **Rhizomal leaves** (4–)10–40(–50) cm; petiole (1–)3–20(–25) cm; terminal leaflet lanceolate, elliptic, oblong, ovate, or obovate, (1–)2–15(–25) × (0.5–)1–3.5(–5) cm, sessile or petiolulate, base cuneate, margin serrate, crenate, dentate, or rarely 3–5-lobed, apex acuminate, acute, or subobtuse; lateral leaflets (1 or)2–6 pairs, similar to terminal but smaller; cauline leaves 3–12(–18); petiole (1–)2–5(–6.5) cm, not auriculate at base; terminal leaflet narrowly ovate, lanceolate, elliptic, or oblong, rarely obovate or lanceolate-linear, (2–)4–12(–20) × 1–4(–5) cm, glabrous or pubescent, with sessile or with a petiolule to 1 cm, base cuneate, margin ciliolate and crenate, serrate, or serrulate, rarely subentire or double serrate, apex acute, rarely acuminate; lateral leaflets 2–7(–11) pairs, sessile petiolulate,

base cuneate or terminal or all pairs obliquely decurrent, similar to but slightly smaller than terminal leaflet. **Racemes** ebracteate, 10–30-flowered; fruiting pedicels ascending or rarely divaricate, (0.3–)0.8–2.5(–3.1) cm, straight, stout. **Sepals** oblong, 3.5–6.5(–8) × 1.5–3 mm; petals purple or lilac, obovate to spatulate, (0.8–)1–1.7 cm × 3.5–8 mm, apex rounded or rarely subemarginate; median filament pairs 7–9(–11) mm, lateral pair 6–7 mm; anthers oblong, 1–2(–2.5) mm; ovules 8–12(–16) per ovary. **Fruit** linear, (2.2–)2.5–6(–7) cm × 1.5–2.5(–3) mm; gynophore 0.5–3 mm; valves smooth, sparsely pubescent or glabrous; style (1–)2–6.5(–9) mm. **Seeds** brown, ovoid to oblong, (1.5–)2–3(–4) × 1–1.7(–2) mm. $2n = 64, 80, 96$.

Flowering: (Mar–)Apr–Oct.

Habitat: damp forests, river banks, tundra, rock crevices, meadows, damp woodlands, thickets, streamsides, valleys, ravines, mountain slopes, amongst boulders.

Elevation: 500–4200 m.

Distribution: Bhutan, China (Anhui, Gansu, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangxi, Jilin, Liaoning, Nei Mongol, Qinghai, Shaanxi, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan, Zhejiang), India (Lahul, Sikkim), Japan, Kashmir, Kazakhstan, Mongolia, Nepal, Pakistan, Russia (Far East).

Cardamine majovskii Marhold & J. Záborský, *Preslia* 58: 194. 1986. TYPE:

Cardamine marginata Philippi, *Anal. Univ. Chile* 27(2): 324. 1865; *C. vulgaris* var. *marginata* (Philippi) O. E. Schulz, *Bot. Jarhb. Syst.* 545. 1903. TYPE: Chile, Región VIII, Near Chillán, Manuel Antonio de Solis Obando s.n. (lectotype, here designated, SGO-63903!, fragments, BAA!). Muñoz (1960) listed another collections that I have not seen, SGO-49376.

Herbs, perennial. **Rhizomes** much thickened, short, forming a tuberous stem base, not scaly. **Stems** solitary, 5–15 cm, erect, simple few branched at middle, glabrous or sparsely pubescent. **Basal leaves** and lowermost cauline compound or rarely first leaf simple, 2.5–4 cm, with 3–5-foliolate; petiole 1.5–3.5 cm; terminal leaflet 2.5–7 × 1–3 mm, ovate to obovate or suborbicular, entire, repand or obtusely 3–5-toothed, on a petiolule 1.5–4 mm; lateral leaflets oblanceolate to linear, 1.5–4 × 0.5–2 mm, sessile or on a petiolule 0.5–2 mm, entire or repand; upper cauline leaves 3–5-foliolate, smaller than basal; terminal lobe narrowly obovate to oblanceolate, usually obtusely 3-toothed; lateral lobes linear, sessile. **Racemes** ebracteate, 3–8-flowered; rachis flexuous; fruiting pedicels 3–7(–10) mm, divaricate-ascending, slender, straight slightly curved, forming a distinct angle with fruit. **Sepals** oblong, 1–1.5 × 0.5–0.7 mm; petals white, narrowly oblanceolate, 2.5–3.2 × 0.7–1 mm, gradually narrowed to base, apex obtuse; filaments 1.5–2 mm; anthers ovate, 0.2–0.3 mm; ovules 6–10 per ovary. **Fruits** linear-lanceolate, 1–1.5(–1.7) cm × 1.8–2.5 mm, attenuate to style; style slender, 1–2 mm. **Seeds** brown, orbicular to broadly ovate, 2–2.5 × 1.2–1.5 mm, winged all around; wing 0.1–0.2 mm wide.

Flowering: Sept–Oct.

Habitat: vernal pools.

Elevation: 100–2000 m

Distribution: endemic to Chile (Región VIII).

Specimens examined: **CHILE. VIII. Ñuble**: 2 km E Chillán on rd to EL Carmen, 36°37'S, 72°5'W, Bliss 512 (CONC), Keeley et al. 25824 (CONC). **IX**: Malleco, Mininco, [37°47'S,

72°28'W], Montero 5254 (CONC, SI), Montero 9416 (CONC). Bío Bío, Antuco, Barros 2790 (SI).

Cardamine marginata resembles the small-sized forms of *C. vulgaris*, including its type, by having tuberous stem base, attenuate styles, and fruits forming a distinct angle with the fruiting pedicels. However, this where the fundamental similarities stop and, indeed, the two species are very different in flower, infructescence, fruit, and seed morphology. Schulz (1903) reduced *C. marginata* to a variety of *C. vulgaris* and cited a specimen of the latter (Delfin s.n.; SGO) under the former. The two species are easily distinguished by the presence in *C. marginata* of much smaller flowers (sepals 1–1.5 × 0.5–0.7 mm and petals 2.5–3.2 × 0.7–1 mm), flexuous rachis of fruiting racemes, smaller and wider, linear-lanceolate fruits 1–1.5(–1.7) cm × 1.8–2.5 mm, fewer ovules (6–10 per ovary), and orbicular to broadly ovate seeds 2–2.5 × 1.2–1.5 mm and winged all around. By contrast, *C. variabilis* has larger flowers (sepals 2.5–3.5 × 1–1.5 mm and petals (5–)6–9 × 2–3.5 mm), straight rachis of fruiting racemes, larger and narrower, linear fruits 2–3.5(–4) cm × 1–1.5 mm, more ovules (20–34 per ovary), and ovate, wingless seeds 1.2–1.6 × 0.8–1.2 mm. Unfortunately, *C. marginata* is known from only the collections cited above, and a little can be said about its overall variability.

Cardamine matthioli Moretti, Giorn. Imp. Reale Ist. Lombardo Sci. 8: 623 & Giorn. Imp. Reale Ist. Lombardo Sci. & Bibliot. Ital. 16: 359. 1847; *C. pratensis* Linnaeus subsp. *matthioli* (Moretti) Nyman, Consp. Fl. Eur. 36. 1878. TYPE: Italy, “le Province di Lombardia,” *G. Moretti s.n.* (neotype designated by Marhold & Rayner (1994: 79), FI).

Cardamine maxima (Nuttall) A. Wood, Amer. Bot. & Fl. 38. 1870; *Dentaria maxima* Nuttall, Gen. N. Amer. Pl. 2: 66. 1818. TYPE:

Dentaria anomala Eames, Rhodora 5: 217. 1903; *Cardamine anomala* (Eames) Schumann, Bot. Jahresber. (Just) 31, pt. 1: 830. 1904. TYPE:

Herbs, perennial, glabrous except for leaflet margin and sometime the raceme rachis.

Rhizomes fleshy, cylindrical, 3–6 mm in diam., distinctly constricted at intervals, not uniform in diam., slightly fragile, with dentate leaf scars; stolons absent. **Stems** 0.9–3(–4) dm, erect, simple, glabrous. **Rhizomal leaves** 3-foliolate, 7–20 cm; petiole 4–15 cm; terminal leaflet broadly ovate to oblong, 2–7.5 × 1.2–3.7 cm, with a petiolule 0.2–1(–1.7) cm, base cuneate to obtuse, margin coarsely dentate to sharply incised or deeply cleft into 2 or 3 lobes, the lobes dentate or incised, puberulent along margin; lateral leaflets often similar to terminal one in shape, size and margin, base often oblique, subsessile or petiolulate; cauline leaves 2 or 3, 3-foliolate, alternate or rarely subopposite; petiole (0.5–)1–4(–6.5) cm, base not auriculate; terminal and lateral leaflets resembling those of basal leaves, uppermost sometimes much smaller. **Racemes** ebracteate; flowering pedicels horizontal to divaricate or deflexed, 0.7–2 cm. **Sepals** oblong, 5–7 × 2–3 mm, erect to ascending, base of lateral pair slightly saccate; petals white or pink, oblanceolate, 1–1.7 cm × 3–6 mm, not clawed, apex rounded; median filament pairs 4–8 mm, lateral pair 3–6.5 mm; anthers linear, 1.7–2.7 mm. **Fruit** (undeveloped) linear-lanceolate, to 3 cm × 2 mm; valves glabrous; style 3.5–7 mm; ovules and seeds 10–14 per fruit. **Seeds** not known. $2n = 120, 124, 132, 138, 156, 161, ca. 208.$

Flowering: Apr–Jun.

Habitat: rich woods, shady ravines, ledges, moist alluvial bottoms, steep forested slopes, ledges, stream banks.

Distribution: Canada (New Brunswick, Ontario, Quebec), United States (Connecticut, Maine, Massachusetts, Michigan, New Jersey, New York, Vermont).

Cardamine mexicana O. E. Schulz, Bot. Jahrb. Syst. 32: 461. 1903. TYPE:

Herbs, annual, hirsute nearly throughout. Stems 1–2 dm, branched about base. **Leaves** pinnately compound, 5-foliolate; petioles slender, not auriculate at base; leaflets broadly ovate to suborbicular or obovate, irregularly crenulate, petiolulate, terminal leaflet largest, 1–2 cm in diam. **Raceme** ebracteate, 6–10-flowered, elongated in fruit; fruiting pedicels erect to strongly ascending, 5–10 mm, slender. **Sepals** oblong, ca. 2 mm, hirsute; petals white, 3–4 mm; filaments – mm; ovules – per ovary. **Fruit** linear, 2–3 cm × 1–1.3 mm, glabrous, erect to ascending; style thick, < 1 mm. **Seeds** oblong, wingless.

Flowering Mar–Nov.

Habitat: shady limestone ledges, moist crevices, canyon walls, slopes.

Distribution: Mexico (Coahuila, Nuevo León, San Luis Potosí).

Cardamine micranthera Rollins, Castanea 5: 87. 1940. TYPE: United States, North Carolina, Stokes Co., Peter's Creek, near Campbell, 19 May 1940, *H. L. Blomquist & G. W. McDowell 11058* (holotype, GH!).

Herbs, perennial, glabrous throughout. **Rhizomes** very short, 2–3 mm wide, covered with extensive root system; stolons absent. Stems 0.9–4 dm, erect to ascending, simple, branched above, glabrous. **Rhizomal leaves** 3-foliolate or rarely simple, 1–8 cm; petiole 0.5–5 cm; terminal leaflet or blade as simple leaves orbicular to broadly ovate, 0.5–3 × 0.5–2.5 cm, with a petiolule 0.4–2 cm, base rounded, margin entire to repand or dentate; lateral leaflets often minute, subsessile; cauline leaves 5–10, middle ones often simple; petiole 0.3–1.5; blade rhombic to suborbicular or ovate, 1–3.5 × 0.6–2.2 cm, glabrous, base obtuse to cuneate, margin, entire, repand, or dentate; upper leaves gradually reduced in size and with shorter petioles. **Racemes** ebracteate; fruiting pedicels divaricate, 0.9–1.7 cm. **Sepals** oblong, 1.5–2.2 × 0.7–1 mm, ascending, base of lateral pair not saccate; petals white, oblanceolate, somewhat spreading, 3.5–5 × 1.2–1.8 mm, not clawed, apex rounded; filaments of median stamens 2.5–3 mm, lateral filaments 2–2.5 mm; anthers ovate, ca. 0.2 mm. **Fruit** linear, 0.8–1.6 cm × 0.8–1 mm; valves glabrous, not torulose; style 1.2–1.8 mm; ovules and seeds 16–22 per fruit. **Seeds** brown, oblong to ovate, 0.9–1.2 × 0.6–0.8 mm, wingless.

Flowering: Apr–May.

Habitat: wet grounds along streams, seepage, gravelly sand bars, moist crevices.

Distribution: United States (N North Carolina/Stokes Co.).

Cardamine microphylla J. Adams, Mém. Soc. Imp. Naturalistes Moscou 5: 111. 1817. TYPE: *Cardamine minuta* Willdenow ex O. E. Schulz

Herbs, perennial, glabrous or rarely sparsely hirtellous on leaves. **Rhizomes** slender, cylindrical, 0.7–1.5 mm in diam.; stolons absent. **Stems** 0.3–1.5(–2) dm, erect or ascending, simple, glabrous. **Rhizomal leaves** pinnately 5–7-foliolate, not fleshy, (1.3–)2.5–6.5 cm; petiole (0.5–)1.5–5.5 cm; terminal leaflet ovate to elliptic, (2–)4–12(–15) × (1–)2.5–6 mm, glabrous or rarely pubescent, base cuneate to obtuse, margin entire, apex apiculate, petiolule 1.5–7 mm; lateral leaflets about as large as or smaller than terminal leaflet, similar in other aspects; cauline leaves 1–3, 5–7-foliolate, alternate; petiole 2–15 mm, base not auriculate; terminal leaflet ovate to elliptic, 4–13 × 1–7 mm, subsessile or with a petiolule to 2 mm, base cuneate, margin entire, apex apiculate; lateral leaflets similar to terminal one. **Racemes** ebracteate; fruiting pedicels erect to ascending, 0.7–1.5(–2.5) cm. **Sepals** ovate to oblong, 3–4 × 1.8–2.5 mm, erect, base of lateral pair slightly saccate; petals white or rarely lavender, broadly obovate, 7–10 × 3–6 mm, clawed, apex rounded; median filament pairs 3–4.5 mm, lateral pair 2–3 mm; anthers oblong, 1–1.5 mm.

Fruit linear, 2–3 cm × 1.2–1.7 mm; valves glabrous; style 1–2 mm; ovules and seeds 12–16 per fruit. **Seeds** brown, oblong, ca. 1.5 × 1 mm. $2n = 28, 42, 64$.

Flowering: Jul–Aug.

Habitat: streamsides, sand and cobbles on gravel bars, shale banks, floodplains, alluvial sand between cobbles, moist moss, turf, seepage areas, meadows, wet grounds.

Elevation: 0–1600 m.

Distribution: Canada (NW Northwestern Territories, N Yukon), Russia (Far East, Siberia), United States (NE Alaska).

Cardamine microthrix I. Thompson, *Muelleria* 9: 165. 1996. TYPE: Australia, Victoria, Clarke Lagoon Wildlife Reserve, NE study area, 28 Oct 1987, A. C. Beauglehole 89710 (holotype, MEL).

Herbs, annual, glabrous or sparsely pubescent. **Stems** to 30 cm, often erect, glabrous or sparsely pubescent, branched at base and above. **Basal leaves** rosulate, long petiolate, to 8 cm, 3–5-foliolate, leaflets entire, crenate or shallowly lobed; terminal leaflet broadly ovate, cordate at base; lateral leaflets ovate, smaller than terminal, petiolulate; cauline leaves 2 or more, 3–5(–7)-foliolate, petiolate, not auriculate at base, leaflets minutely ciliate; terminal leaflet broadly ovate, often deeply and acutely (3–)5–9-lobed; lateral leaflets ovate, petiolulate, usually 3-lobed.

Racemes ebracteate, few to many flowered; fruiting pedicels suberect, 5–10 mm. **Sepals** ovate, ca. 1.5 mm; petals white, cuneate, ca. 3 mm; stamens 6. **Frutis** linear, erect to suberect, 2–3 cm × ca. 1 mm; style 0.5–1 mm. **Seeds** elliptic, ca. 1.2 mm.

Flowering: Sep–Mar.

Habitat: along banks of rivers, streams, and lagoons and adjacent low-lying areas.

Elevation:

Distribution: Australia (New South Wales, South Australia, Victoria).

Cardamine microzyga O. E. Schulz, *Bot. Jahrb. Syst.* 32: 545. 1903. TYPE: China, West Sichuan and Tibetan Frontier, Tachienlu, 9000–13,500 ft, A. E. Pratt 265 (holotype, B!; isotype, K!).

Cardamine prattii Hemsley & E. H. Wilson, *Bull. Misc. Inf. Kew* 1906: 153. 1906. TYPE: China, Sichuan, moist alpine meadows around Tchien Lu, *Wilson 3199* (holotype, K!; isotypes, A, MO!, P!, US!).

Herbs, perennial, sparsely pilose. **Rhizomes** slender, to 15 cm or longer, 1–1.5 mm in diam., without stolons. **Stems** 10–30(–45) cm, erect, simple, ridged, pilose. **Basal leaves** rosulate, 2–11 cm; petiole 0.5–5 cm, ciliate; terminal leaflet obovate, 2–8(–13) × 2–7(–10) mm, petiolule 0.5–4 mm, pilose, base cuneate, margin 1–3-toothed on each side, apex acute, submucronate; lateral leaflets 5–11 pairs, obovate or ovate, pilose, asymmetric, slightly smaller than terminal lobe, sessile or rarely with a petiolule to 5 mm, base oblique to subcuneate, proximal margin 1- or 2-toothed, rarely 1-lobed, distal margin often entire, apex acute; cauline leaves 1–3, (2–)4–10(–25) cm; petiole 0.5–4(–9) cm, ciliate, not auriculate at base; terminal leaflet and 6–9 pairs of lateral leaflets similar in morphology to those of basal leaves. **Racemes** ebracteate, 10–20-flowered. Fruiting pedicels erect to erect-ascending, (0.7–)1–2 cm, slender, pilose. **Sepals** oblong or ovate, 2.5–4 × 1–1.7 mm, sparsely pilose or glabrous, margin membranous, base of lateral pair saccate; petals purple or rarely white, broadly obovate, 6.5–10 × 3–6 mm, cuneate into a clawlike base to 2 mm, apex rounded; median filament pairs 3.5–5 mm, flattened; lateral pair 2.5–3.5 mm; anthers narrowly oblong, 0.8–1.1 mm; ovules 10–14 per ovary. **Fruit** linear, 2.5–4 cm × 1.5–2

mm; gynophore 0.5–2 mm; valves smooth, glabrous; style 1–2.5 mm. **Seeds** brown, oblong, 1.8–2.1 × 1–1.3 mm, wingless.

Flowering: (Apr–)Jun–Sep.

Habitat: moist alpine meadows, streamsides.

Elevation: 2600–4600 m.

Distribution: China (Sichuan, Xizang).

Cardamine moirensis I. Thompson, *Muelleria* 9: 167. 1996. TYPE: Australia, Victoria, Ulupna Isalnd, 10 km NW of Stranthmerton in the Murray Valley, eastern end of reserve, 35°51'E, 145°26'S, 20 Sep 1978, *T. B. Muir* 5965 (holotype, MEL; isotypes, AS, CANB, HO, NSW).

Herbs, annual, glabrous throughout. **Stems** to 30 cm, slender, erect to ascending, branching from base and above. **Basal leaves** rosulate, not fleshy, long petiolate, to 8 cm, 3–9-foliolate; terminal leaflet ovate, 3-lobed, truncate to cuneate at base; lateral leaflets elliptic to narrowly ovate, entire or with 1 or 2 lateral teeth; cauline leaves usually 3 or more, petiolate, not auriculate at base, similar to basal but smaller, leaflets narrowly obovate to filiform and entire in uppermost leaves. **Racemes** ebracteate, mostly 2–8-flowered; fruiting pedicels divaricate-ascending, 5–15 mm. **Sepals** ovate, 1.5–2 mm; petals white, cuneate, 2–3.5 mm; stamens 6. **Fruits** linear, 1.5–3 cm × ca. 1 mm, suberect; style to 1 mm. **Seeds** elliptic, 1–1.2 mm.

Flowering: Sep–Oct.

Habitat: low-lying areas near streams and swamps.

Elevation:

Distribution: Australia (New South Wales, Victoria).

Cardamine monteluccii

Cardamine multiflora T. Y. Cheo & R. C. Fang, *Bull. Bot. Lab. N. E. Forest. Inst., Harbin* 1980(6): 21. 1980. TYPE: China, Sichuan, Paohsin Hsiaen, Mupin, 28 May 1954, *Tzupu Soong* 38262 (holotype, NAS!; isotypes, KUN!, PE!).

Herbs, perennial. **Rhizomes** stout. **Stems** 35–75 cm, erect, angled, sparsely pilose, lower nodes sometimes producing stolons to 60 cm, branched above middle. **Basal leaves** withered by anthesis; middle cauline leaves pinnatisect; petiole (0.5–)1–3 cm, ciliate, gradually winged from apex to a much broader, auriculate or amplexicaul base; auricles oblong or ovate, (1.5–)2.5–10(–13) × 1–3(–5) mm, ciliate; terminal lobe broadly obovate or obovate-oblong, (0.5–)1–4.5(–6) × (0.6–)1–2.5(–3) cm, pilose, subsessile or with a petiolule 2–12 mm, base cuneate and often decurrent with adjacent lateral lobes, margin crenate, apex obtuse to subacute; lateral lobes 1–4 on each side of rachis, similar to terminal lobe but smaller; uppermost leaves and stolon leaves trifid, with oblanceolate or narrowly obovate terminal lobe decurrent with narrower and smaller lateral lobes; petiole rarely to 1 cm; auricles rarely to 2 mm or reduced to a tooth. **Racemes** ebracteate, many flowered, in panicles; fruiting pedicels divaricate or ascending, 1–2.5 cm, glabrous, straight. **Sepals** ovate or oblong, 2–3 × 1–1.5 mm, glabrous, lateral pair subsaccate; petals purple, spatulate, 6–8 × 2.5–3.5 mm, apex rounded; median filament pairs 3.5–5 mm, lateral pair 2.5–3.5 mm; anthers oblong, 0.9–1.3 mm; ovules 12–16 per ovary. **Fruit** linear, 1–2 cm × 1.2–1.5 mm; valves smooth, glabrous; style 1–3 mm. **Seeds** brown, oblong, 1.5–1.7 × 0.8–1 mm, wingless.

Flowering: May–Jul.

Habitat: mountain slopes, damp places, forests.

Elevation: 2100–3700 m.

Distribution: China (Sichuan, Yunnan).

Cardamine multijuga Franchet, Bull. Soc. Bot. France 33: 399. 1886; *C. griffithii* J. D. Hooker & Thomson subsp. *multijuga* (Franchet) O. E. Schulz, Bot. Jahrb. Syst. 32: 506. 1903. TYPE: China, Yunnan, Mo-soyn, near Lankong, 28 Jun 1884, *Delavay 697* (holotype, P!; isotypes, E!, GH!, P!, US!).

Herbs, perennial, glabrous throughout. **Rhizomes** creeping, without stolons. **Stems** (2–)4–10(–16) dm, erect, simple or branched above, rooting from lowermost nodes, striate angled, 11–25-leaved. **Leaves** sessile, cauline; lower and middle ones 2.2–6(–10) cm; terminal leaflet orbicular or broadly obovate, 3–12 × 3–11 mm, with a petiolule 0.5–6 mm, base subcordate or cuneate, margin repand and not ciliate, apex obtuse or rounded; lateral leaflets (7 or)8–11(–15) pairs, slightly smaller than terminal one, ovate or ovate-oblong, base obtuse, margin repand and not ciliate, apex obtuse or rounded; proximal pair of lateral leaflets auriclelike, attached at or just above node, often giving appearance of amplexicaul leaf base; uppermost leaves smaller.

Racemes ebracteate; fruiting pedicels divaricate, 1–2 cm, slender, straight. **Sepals** oblong, 2.5–3 × 1.5–2 mm, spreading; petals purple or lavender, obovate, 7–9 × 3–4 mm, not clawed, apex rounded; filaments spreading, subequal, 4–5 mm; anthers narrowly oblong, 1.5–1.7 mm; ovules 10–16 per ovary. **Fruits** (young) glabrous; styles 2–4 mm; stigma entire. **Seeds** (immature) wingless.

Flowering Jun–Jul.

Habitat: streamsides, marshy places.

Elevation: 200–2800 m.

Distribution: China (Yunnan).

Cardamine nepalensis Kurosaki & H. Ohba, J. Jap. Bot. 64: 135. 1989. TYPE: Nepal, Janakpur Zone, Ramechhap district, Serdingma–Dubikharka, 3400–3720 m, 7 Jul 1985, Abies forest, *H. Ohba, T. Kikuchi, M. Wakabayashi, M. Suzuki, N. Kurosaki, K. R. Rajbhandari & S. K. Wu 8570258* (holotype, TI!; isotype, KTM).

Herbs, perennial, shortly pilose or subglabrous. **Rhizomes** stout. **Stems** 6–10 dm, erect, simple, stout, glabrous, 10–18-leaved. **Basal leaves** not seen; middle cauline leaves petiolate, minutely auriculate; blade pinnatisect, 4–15 × 1.5–5.5 cm, sparsely pilose; terminal lobe lanceolate, base cuneate, margin coarsely and irregularly dentate, apex acuminate; lateral lobes 1–3 on each side of midvein, smaller than terminal lobe, decurrent at base, margin denticulate, apex acute. **Racemes** ebracteate, 5–25-flowered; flowering pedicels spreading to reflexed; fruiting pedicels to 1 cm, glabrous. **Sepals** oblong 4–6 × 1.5–2.5 mm, glabrous or subapically sparsely pilose, base of lateral pair saccate; petals purple, spatulate to obovate, 1–1.5 cm × 4–7 mm; median filament pairs 7–8 mm, lateral pairs 6–7 mm; anthers oblong, 1–1.5 mm; ovules 10–14 per ovary. **Fruit** linear, 2.5–4 cm × 1–2 mm; valves smooth, glabrous; style ... mm. **Seeds** brown, oblong, ca. 2 × 1 mm, wingless.

Flowering: Jul.

Habitat: Sandy forest floor and streamsides.

Elevation: 2600–3700 m.

Distribution: India (Sikkim), Nepal.

Cardamine niigatensis H. Hara, J. Jap. Bot. 58: 328. 1983. TYPE:

Herbs, perennial. **Rhizomes** short, creeping, somewhat thickened. **Stems** (3–)5–15(–20) cm, erect, glabrous or sparsely pubescent, branched above. **Cauline leaves** (lower) 1.8–5 cm,

trifoliolate or 5-foliolate, glabrous; terminal leaflet orbicular to lanceolate, 0.5–2.3 cm, 0.5–2.5 cm wide, base truncate or obtuse, margin obtusely few toothed, apex rounded; lateral leaflets elliptic to oblong, 2–10 mm, 1–7 mm wide, base cuneate, margin entire, apex subacute to obtuse; upper cauline leaves simple or trifoliolate, 2–5 cm; blade or terminal leaflet subsessile or short petiolate, elliptic, lanceolate, obovate to orbicular, 1.5–4 cm, 0.8–4 cm wide, base obtuse or subtruncate, entire or crenately 1- or 2-toothed on each side; lateral leaflets obovate to elliptic, 0.5–2 cm, 0.3–0.8 cm wide. **Racemes** ebracteate; fruiting pedicels 1–1.5 cm, ascending. **Sepals** 2–3 mm, 1–1.5 mm wide, glabrous; petals white, 4–7 mm, 2.5–3.5 mm wide; filaments 2.5–3.5 mm. **Fruits** linear, 2–3.5 cm, ca. 1.2 mm wide, glabrous; style 1–2 mm. **Seeds** 1–1.2 mm.

Flowering: Apr–May.

Habitat: wet places along streams.

Elevation: 0–1000 m.

Distribution: Japan (Honshu).

Cardamine nipponica Franchet & Savatier, Enum. Pl. Jap. 1: 281. 1879. TYPE: Japan, Kanga, Monte Hakousan, Ontake, *Savatier 2804* (holotype, P!).

Herbs, perennial, glabrous throughout. **Rhizomes** slender, many branched, with petiolar remains of previous years. **Stems** 3–10 cm, erect, 2- or 3-leaved. **Basal leaves** rosulate, (3 or)5- or 7-foliolate; petiole 0.7–2.5 cm; terminal leaflet suborbicular to broadly ovate or elliptic, 1.5–6 × 1–4 mm, base cuneate to obtuse, margin entire, apex acute and submucronate; lateral leaflets (1 or)2–4 pairs, subsessile, obovate, base cuneate, margin entire, slightly smaller than terminal one. Cauline leaves 3- or 5-foliolate; petiole 4–11 mm, base auriculate to amplexicaul; auricle lanceolate or toothlike, 0.2–2 × 0.1–0.4 mm, apex acute to subcaudate; terminal leaflet narrowly oblanceolate to linear, 2–10 × 0.5–1 mm; lateral leaflets 2 pairs, smaller than but similar to terminal lobe. **Racemes** ebracteate, 3–6-flowered; rachis flexuous in fruit; fruiting pedicels divaricate to ascending, 3–8 mm, straight. **Sepals** oblong, 1.7–2.2 × ca. 0.8 mm; petals white, spatulate, 5–6 × ca. 1.5 mm, apex rounded; median filament pairs ca. 2.5 mm, lateral pair ca. 1.5 mm; anthers ovate, 0.4–0.5 mm; ovules 10–16 per ovary. **Fruit** linear, 1.5–3 cm × 0.8–1.2 mm; valves smooth, glabrous; style 0.8–2 mm. **Seeds** brown, oblong, 1–1.5 × 0.6–0.9 mm, apically winged.

Flowering: Jul–Aug.

Habitat: alpine slopes.

Distribution: Japan (Honshu), Taiwan.

Cardamine nuttallii Greene, Bull. Calif. Acad. 2: 389. 1887. TYPE:

Cardamine gemmata Greene, Pittonia 1: 162. 1888; *C. californica* (Nuttall) Greene var.

gemma (Greene) O. E. Schulz, Bot. Jahrb. Syst. 32: 387. 1903; *C. nuttallii* var. *gemma*

(Greene) Rollins, Harvard Pap. Bot. 4: 45. 1993; *Dentaria gemmata* (Greene) T. J. Howell, Fl. Northw. Amer. 1: 49. 1897. TYPE:

Cardamine tenella var. *covilleana* O. E. Schulz, Bot. Jahrb. Syst. 32: 391. 1903; *C. nuttallii* var. *covilleana* (O. E. Schulz) Rollins, Harvard Pap. Bot. 4: 45. 1993. TYPE: United States, California, Siskiyou Mts., 17 Jun 1884, *Thomas Howell 30* (lectotype designated by Rollins (1993b: 285), GH!).

Cardamine tenella var. *dissecta* O. E. Schulz, Bot. Jahrb. Syst. 32: 391. 1903; *C. nuttallii* var. *dissecta* (O. E. Schulz) Rollins, Harvard Pap. Bot. 4: 45. 1993. TYPE: United States,

Washington, Klickitat Co., woods near the Columbia River, 11 Mar-20 Apr 1892, W. N. Suksdorf 1926 (lectotype designated by Rollins (1993b: 285), GH!).

Cardamine pulcherrima Greene, *Erythea* 1: 148. 1893; *C. nuttalli* var. *pulcherrima* (Greene) Taylor & Macbryde, *Canad. J. Bot.* 56: 185. 1978; *Dentaria macrocarpa* var. *pulcherrima* (Greene) B. L. Robinson in A. Gray & S. Watson, *Syn. Fl. N. Amer.* 1(1): 154. 1895; *D. tenella* var. *pulcherrima* (Greene) Detling, *Amer. J. Bot.* 23: 573. 1936. TYPE:

Cardamine quercetorum T. J. Howell, *Erythea* 3: 33. 1895; *C. tenella* var. *quercetorum* (Howell) O. E. Schulz, *Bot. Jahrb. Syst.* 32: 390. 1903; *D. quercetorum* (T. J. Howell) Greene *Pittonia* 3: 123. 1896; *Dentaria tenella* var. *quercetorum* (T. J. Howell) Detling, *Amer. J. Bot.* 23: 573. 1936. TYPE:

Dentaria macrocarpa Nuttall in Torrey & A. Gray, *Fl. N. Amer.* 1: 88. 1838, not *Cardamine macrocarpa* Brandege, *Zoe* 5: 233. 1906. TYPE:

Dentaria tenella Pursh, *Fl. Amer. Sept.* 2: 439. 1814; *Cardamine tenella* (Pursh) O. E. Schulz, *Bot. Jahrb. Syst.* 32: 389. 1903, not *C. tenella* E. D. Clarke, *Travels* 2(1): 117. 1812; *C. pulcherrima* var. *tenella* (Pursh) C. L. Hitchcock, *Univ. Wash. Publ. Biol.* 17(2): 472. 1964. TYPE:

Dentaria tenella var. *palmata* Detling, *Amer. J. Bot.* 23: 573. 1936. TYPE: United States, California, Plumas Co., 1877, Mrs. R. M. Austin s.n. (holotype, GH!).

Herbs, perennial, glabrous or sparsely pubescent. **Rhizomes** slender, producing fleshy, ovoid to oblong or cylindrical nodal swellings 2–5 mm in diam.; stolons absent. **Stems** 0.5–2(–3) dm, erect, simple, glabrous or sparsely pubescent distally. **Rhizomal leaves** simple or 3(or 5)-foliolate, (3–)4–20(–25) cm; petiole (2–)3–18(–21) cm; terminal leaflet or blade of simple leaf reniform to suborbicular or ovate to oblong, (0.9–)1.3–4(–5.2) × (0.8–)1.2–5(–7) cm, when compound subsessile or with a petiolule 0.2–3 cm, base cordate to obtuse, margin crenate, dentate, or 5–7-lobed, with apiculae terminating the teeth or lobes, glabrous; lateral leaflets (when present) or smaller than terminal leaflet, petiolulate to subsessile, margin same as terminal leaflet; cauline leaves 1–3, 3(or 5)-foliolate; petiole (0.2–)0.5–2(–3) cm, base not auriculate; terminal lobe broadly ovate to oblong or linear, (0.5–)1–3.5(–6) cm, petiolulate or sessile and leaves appearing palmate; lateral leaflets similar to terminal one but smaller, sessile, margin entire or dentate, rarely lobed. **Racemes** ebracteate; fruiting pedicels ascending to divaricate, 1–3.5 cm. **Sepals** oblong, 3.5–5 × 1.5–2 mm, erect, base of lateral pair saccate; petals purple to pale pink, rarely white, obovate, 10–15 × 4–7.5 mm, not clawed, apex rounded; median filament pairs 5–8 mm, lateral pair 3.5–5 mm; anthers oblong, 1.5–2 mm. **Fruit** linear, 2.5–5.6 cm × 2–2.3 mm; valves glabrous; style 4–8 mm; ovules and seeds 8–16 per fruit. **Seeds** dark brown, oblong, 2–2.5 × 1.4–1.6 mm.

Flowering Mar–May.

Habitat: open pine forests, damp woods, shaded bottomlands, mossy slopes, streamsides, shaded and moist hillsides.

Elevation: 150–1000 m.

Distribution: Canada (British Columbia), United States (California, Oregon, Washington).

Cardamine nymanii Gandoger, *Bull. Soc. Bot. France* 72: 1043. 1925. TYPE:

Cardamine pratensis Linnaeus var. *angustifolia* W. J. Hooker, *App. Parry J. Sec. Voy.* 389.

1825; *C. pratensis* subsp. *angustifolia* (W. J. Hooker) O. E. Schulz, *Bot. Jahrb. Syst.* 32: 529. 1903. TYPE:

Cardamine pratensis subsp. *polemonioides* Rouy

Herbs perennial, glabrous. **Rhizomes** caespitose; stolons absent. **Stems** 0.5–1.6(–3.5) dm, erect, simple, rarely branched. **Leaves** thick, with impressed veins; rhizomal leaves with terminal

leaflets of the same size and shape as lateral ones, orbicular, broadly ovate to lanceolate, base rounded to cuneate, mostly entire, petiolulate or sessile, (7 or)9–21-foliolate; cauline leaves 2–4(–7), pinnatisect or pinnately compound and (7 or)9–21-foliolate, glabrous; petiole base not auriculate; terminal segments or leaflets of the same shape as lateral ones, narrowly lanceolate to lanceolate, petiolulate or sessile, base cuneate, margin entire; lateral lobes or leaflets of lower leaves (4–)7–10 on each side of rachis, fewer upwards, upper leaves with 4 or 5 segments or leaflets on each side of rachis. **Racemes** ebracteate; fruiting pedicels erect-ascending, 5–15 mm. **Sepals** oblong or ovate, 3.6–4.4 mm, erect, base saccate, green with hyaline margin; petals white-lilac 9–12.3 × 4.8–6.8 mm, clawed, apex rounded or emarginate; median filament pairs 3.5–4.5 mm, lateral 2–3 mm; anthers narrowly oblong 0.9–1.4 mm. **Fruit** linear, 1–1.8 cm × ca. 1.5 mm; valves glabrous; style ca. 1 mm, stout; ovules and seeds ca. 16 per fruit. **Seeds** brown, oblong, ca. 1.5 mm. **2n** = 56, 60, 64, 80–100.

Flowering: Jun–Aug.

Habitat: wet meadows, marshes, margins of ponds, along rivers and streams, often along sea coasts, swamps.

Distribution: Canada (Labrador, N Manitoba, Newfoundland, Northwest Territories, Nunavut, Quebec, Yukon), Europe (Finland, Iceland, Norway, Sweden), Greenland, Russia (N European part, Siberia), United States (Alaska). n Eurasia.

Cardamine obliqua A. Richard, Tent. Fl. Abyss. 1: 19. 1847; *C. pratensis* Linnaeus var.

obliqua (A. Richard), Engler, Hochgebirgsfl. Trop. Afr. 225. 1892. TYPE: Ethiopia, Begemdir, Schimper II. 989 (holotype, P!; isotypes, B!, BM!, K!, S!, W!).

Cardamine johnstonii Oliver, Trans. Linn. Soc. Bot. 2: 328. 1887. TYPE: Tanzania, Kilimanjaro, Johnston 21 (holotype, K!; isotype, BM!).

Herbs, perennial, glabrous to densely pubescent. **Rhizome** creeping, producing few to numerous shoots. **Stems** 1–12 dm, decumbent to suberect, many branched basally, persistent, rooting. **Leaves** pinnately compound, 4–11-foliolate, 2–17 cm; petioles not auriculate at base; lateral leaflets elliptic to suborbicular, entire to dentate or incised, sessile or with petiolules to 2 cm; terminal leaflet larger; uppermost leaves with narrower leaflets. **Racemes** ebracteate, 5–30-flowered; fruiting pedicels ascending 1–2 cm. **Sepals** 2–4 mm, glabrous, purplish; petals white, pink or violet, spatulate, 5–9 mm, obtuse at apex; stamens 6; anthers 1–1.5 mm. **Fruits** linear, glabrous, 1.4–6 cm × 1–2.1 mm; style 1.8–4 mm. **Seeds** oblong to suborbicular, 1.2–2.2 × 1–1.5 mm.

Habitat: moist forests, lake shores, streams.

Elevation: 2000–4900 m.

Distribution: Ethiopia, Kenya, Rwanda, Tanzania, Uganda, Zaire.

Notes: the recognition in Rollins (1993b) of some Mexican plants as *Cardamine obliqua* var. *stylosa* Rollins is based on misidentified plants of another species, likely *C. ovata*.

Cardamine occidentalis (S. Watson ex B. L. Robinson) Howell, Fl. Northw. Amer. 50. 1897;

C. pratensis Linnaeus var. *occidentalis* S. Watson ex B. L. Robinson in A. Gray, Syn. Fl. N. Amer. 1: 158. 1895. TYPE: United States,

Cardamine neglecta Greene, Pittonia 3: 154. 1897. TYPE: United States,

Herbs, perennial, glabrous or hirsute. **Rhizomes** fleshy, ovoid or globose, at base of stem, 3–10 mm in diam; stolons absent. **Stems** 1–5 dm, erect to ascending, 1 from base, simple or branched above, not flexuous, glabrous or pubescent proximally. **Basal leaves** not rosulate, pinnately compound, (3 or)5(or 7)-foliolate, 2–10 cm, glabrous; petiole 0.5–6.5 cm; terminal leaflet orbicular to broadly ovate or subcordate, 0.5–2 × 0.7–2.5 cm, margin entire or repand,

base cordate to rounded, petiole 0.3–1.8 mm; lateral leaflets smaller than terminal, ovate, entire, petiolulate or sessile; cauline leaves 3–7, middle ones 5–7-foliolate, gradually reduced in size and becoming 3-foliolate upwards; petiole 0.5–3 cm, base not auriculate; terminal leaflet obovate to oblanceolate, 0.5–2.6 × 0.3–1.3 cm, shallowly toothed or entire to repand, lateral leaflets smaller. **Racemes** ebracteate; fruiting pedicels divaricate-ascending, 0.7–1.8 cm. **Sepals** oblong, 1.7–2 × 1–1.2 mm, base of lateral pair not saccate; petals white, oblanceolate, 4–6 × 1.5–2 mm, not clawed; median filament pairs 2–2.5 mm, lateral filaments 1–1.5 mm; anthers ovate, 0.3–0.5 mm. **Fruit** linear, 1.5–3.3 cm × 1.7–2.2 mm; valves glabrous or sparsely pubescent, torulose; style 0.5–1.5 mm; ovules and seeds 18–40 per fruit. **Seeds** brown, ovate, 1–1.6 × 1–1.2 mm, wingless. **2n** = 64.

Flowering: Apr–Jul.

Habitat: muddy grounds, lake margins, shallow streams and creeks, meadows.

Elevation: 150–1500 m.

Distribution: Canada (British Columbia), United States (Alaska, N California, Oregon, Washington).

Cardamine oligosperma Nuttall in Torrey & A. Gray, Fl. N. Amer. 1: 85. 1838; *C. hirsuta* Linnaeus subsp. *oligosperma* (Nuttall) O. E. Schulz, Bot. Jahrb. Syst. 32: 468. 1903. TYPE: United States, “shady woody of the Oregon,” *Thomas Nuttall s.n.* (holotype, K!; isotypes, GH!, NY!, PH!).

Cardamine hirsuta var. *acuminata* Nuttall in Torrey & A. Gray, Fl. N. Amer. 1: 85. 1838; *C. acuminata* (Nuttall) Rydberg, Bull. Torrey Bot. Club 29: 237. 1902. TYPE: United States, Oregon, wet places, *Thomas Nuttall s.n.* (lectotype here designated, BM).

Cardamine hirsuta var. *bracteata* O. E. Schulz, Bot. Jahrb. Syst. 32: 470. 1903; *C. oligosperma* var. *bracteata* (O. E. Schulz) G. S. Torrey, Rhodora 17: 157. 1915; *C. bracteata* (O. E. Schulz) Suksdorf, Rhodora 20: 198. 1918. TYPE: United States, Washington, Klickitat Co., low wet places, 8 Apr 1885, *W. N. Suksdorf 723* (holotype, B; isotypes, MO!, NY, ORE, US

Cardamine hirsuta var. *parviflora* Nuttall in Torrey & A. Gray, Fl. N. Amer. 1: 85. 1838. TYPE: United States, Oregon, wet places, *Thomas Nuttall s.n.* (holotype, BM).

Cardamine oligosperma var. *lucens* G. S. Torrey, Rhodora 17: 157. 1915; *C. lucens* (G. S. Torrey) Suksdorf, Rhodora 20: 198. 1918. TYPE: United States, Washington, Klickitat Co., Bingen, 10–12 Apr 1912, *W. N. Suksdorf 7452* (holotype, GH!; isotypes, CAS!, MO!, NY!, ORE, OSC, RM, UTC).

Cardamine unijuga Rydberg, Bull. Torrey Bot. Club 24: 246. 1897; *C. hirsuta* prol. *unijuga* (Rydberg) O. E. Schulz, Bot. Jahrb. Syst. 32: 469. 1903; *C. oligosperma* var. *unijuga* (Rydberg) G. S. Torrey, Rhodora 17: 158. 1915. TYPE: United States, Montana, Gallatin Co., Spanish Basin, Madison Range, 6000 ft, 18 Jul 1896, *J. H. Foldman 494* (holotype, NY; isotype, US!).

Herbs, annual or biennial, sparsely hirsute at least proximally. **Rhizomes** absent; stolons absent. **Stems** (0.5–)0.8–3.2(–4.1) dm, erect to ascending, 1 or few from base, simple or branched above, not flexuous, pubescent throughout or only proximally, very rarely glabrous. **Basal leaves** rosulate, persistent by anthesis, pinnately compound, 5–9(–13)-foliolate, 2–8.5(–11) cm, hirsute or sometimes glabrous; petiole 1–6 cm; terminal leaflet orbicular to ovate or rarely oblong, 0.4–1.5(–2.3) × 0.3–1(–1.3) cm, margin entire or crenate-dentate to obscurely 3–5-lobed, base cordate to rounded, petiole 1–7 mm; lateral leaflets smaller than terminal, obovate to oblanceolate, entire or crenate, petiolulate or sessile; cauline leaves 3–8, pinnately compound, similar to basal leaves, gradually reduced in size and number of leaflets upwards; petiole 0.5–2 cm, base not auriculate. **Racemes** ebracteate; fruiting pedicels divaricate-ascending,

(2–)3–9(–12) mm. **Sepals** oblong, 1.3–1.8(–2) × 0.5–1 mm, base of lateral pair not saccate; petals white, narrowly spatulate to oblanceolate, 2.5–3.5 × 0.9–1.5 mm, not clawed; stamens 6, median filaments 1.7–2.5 mm, lateral filaments 1.2–2 mm; anthers ovate, 0.3–0.5 mm. **Fruit** linear, (1.3–)1.6–2.8 cm × 1–1.7 mm; valves glabrous or sparsely pubescent, torulose; style 0.4–1(–1.5) mm; ovules and seeds 16–36(–42) per fruit. **Seeds** brown, oblong, 1–1.6 × 0.8–1.2 mm, wingless. **2n** = 16.

Flowering: Mar–Jul.

Habitat: streambanks, shady banks, creek bottoms, lake shores, meadows, moist areas, wooded slopes.

Elevation: 50–3300 m.

Distribution: Canada (British Columbia), Mexico (Baja California), United States (California, Colorado, Idaho, Montana, W Nevada, Oregon, Utah, Washington, Wyoming).

Cardamine opizii

Cardamine ovata Bentham, Pl. Hartweg. 158. 1845. TYPE: Colombia, Bogota, Tena, *Hartweg 881* (holotype, K!; isotype, G-DEL!).

Cardamine ibaguensis Triana & Planchon, Annal. Sci. Nat. Bot. ser. 4, 17: 60. 1862. TYPE: Colombia, Antioquia, Manizales, 2700 m, 1851–1857, *J. Triana s.n.* (lectotype, here designated, P!).

Cardamine ecuadorensis Hieronymus, Bot. Jahrb. Syst., Beibl. 20: 19. 1895. TYPE: Ecuador, Loja, Andes, 3000–3200 m, *F. C. Lehmann 4826* (holotype, B!; isotype, K!).

Cardamine lehmannii Hieronymus, Bot. Jahrb. Syst., Beibl. 20: 19. 1895; *C. ovata* subsp. *lehmannii* (Hieronymus) O. E. Schulz, Bot. Jahrb. Syst. 32: 412. 1903. TYPE: Colombia, Cauca, Páramo de Guanacas, 2800–3200 m, *F. C. Lehmann 4759* (holotype, B?; isotypes, F!, GH!, K!, S!).

Cardamine ovata prol. *thamnophila* O. E. Schulz, Bot. Jahrb. Syst. 32: 413. 1903. TYPE: Ecuador, “in Silvis Pallataña Andium Quitensium, *Spruce 5555* (holotype, W!; isotype, K!).

Cardamine ovata var. *bracteata* O. E. Schulz, Bot. Jahrb. Syst. 32: 413. 1903. TYPE: Ecuador, Pichincha, 4000 m, ?*collector 45* (lectotype, here designated, B!).

Cardamine ovata var. *eriocarpa* O. E. Schulz, Bot. Jahrb. Syst. 32: 413. 1903. TYPE: Ecuador, Andes, 1857–1859, *R. Spruce 5097* (lectotype, here designated, G!; isolectotypes, BM!, NY!, W!).

Cardamine albertii O. E. Schulz, Notizbl. Bot. Gart. Berlin-Dahlem 10: 341. 1928. TYPE: Colombia, Sandtander, edge of Páramo de las Vegas, 3300–3700 m, 20–21 Dec 1926, *E. P. Killip & A. C. Smith 15595* (lectotype, here designated, B; isolectotypes, F!, GH!, K!, NY!).

Cardamine albertii var. *minor* O. E. Schulz, Notizbl. Bot. Gart. Berlin-Dahlem 10: 342. 1928. TYPE: Colombia, Sandtander, W slopes of Páramo Rico, 3300–3600 m, 15–19 Jan. 1927, *E. P. Killip & A. C. Smith 17766* (holotype, B; isotype, GH!).

Herbs, perennial. **Rhizomes** often short, neither tuberous nor scaly. **Stems** (1.5–)2.5–8(–10) dm, erect or decumbent, simple or branched above, glabrous or sparsely to densely pubescent. Lower and middle cauline leaves 5–18(–20) cm, (3–)5(–9)-foliolate; petiole 2–9(–13) cm; lateral leaflets (0.7–)1.5–5(–6) × (0.4–)1–2(–3) cm, lanceolate, oblong, elliptic, ovate, or obovate, glabrous or sparsely to densely hirsute with trichomes 0.2–0.8 mm, base oblique or cuneate to subobtuse, margin ciliolate with trichomes to 0.2 mm, serrate or crenate, teeth often mucronate, apex acute, petiolule absent or to 1.5 cm; terminal leaflets same size or slightly larger than lateral

ones, often or a longer a petiolule; uppermost leaves smaller, sometimes trifoliolate or simple and linear to linear-oblongate. **Racemes** bracteate throughout or basally, rarely only lowermost flower bracteate; rachis flexuous or straight; fruiting pedicels 1–2.8(–3.5) cm, divaricate, straight, stout, glabrous or pubescent. **Sepals** 2–4 × 1–1.5 mm, oblong; petals white or very rarely pale lavender, obovate to oblanceolate, 5–7 × 2–4 mm, not clawed; filaments 2.5–5 mm; anthers 0.7–1.4 mm, oblong; ovules 10–20 per ovary. **Fruits** (2.5–)3.5–5.5(–7) cm × 1.5–2.5(–3) mm; valves glabrous or sparsely pubescent; style (1–)2–4(–5.5) mm. **Seeds** 2–3 × 1–1.5 mm, brown, oblong.

Flowering: Jan–Dec.

Habitat: wet cliff, steep rocky slopes of crystalline schist, cloud forests, open sites, along creeks and trails in forests, woods, fields, streamsides.

Elevation: 500–3930 m.

Distribution: Bolivia (Cochabamba, La Paz, Larecaja, Santa Cruz), Colombia (Antioquia, Boyacá, Caldas, Cauca, Cundinamarca, Huila, Magdalena, Meta, Natioquia, Norte de Santander, Ocaña, Santander, Tolima, Valle), Costa Rica, Ecuador (Azuay, Carchi, Chimborazo, Cotopaxi, Imbabura, Loja, Napo, Pichincha, Zamora-Chinchi), Guatemala, Honduras, Panama, Peru (Amazonas, Cuzco, Puno) Venezuela (Anzoátegui, Lara, Mérida, Sucre, Tachira, Trujillo).

Specimens examined: **BOLIVIA. Cochabamba:** Ayopaya, 10 km NW InDep. endencia, Beck & Seidel 14435 (LPB, MO, SI). **La Paz:** Franz Tamayo, trail between Pelechuco and Pata, along Rio Pelechuco, 14°46'S, 69°01'W, Lewis 881704 (G, MO, NY); B. Saaverda, Charazani, 20 km hacia Apolo, Beck 11379 (MO); Inquisivi, along Río Oscalla between Aquilani-Choquetanga trail, 10 km N Choquetanga, 16°45'S, 67°17'W, Lewis 39726 (LPB, MO), Lewis 39954 (LPB, MO); Nor Yungas, near Unduavi, Eyerdam 25238 (F, K); Nor Yungas, between Unduavi and Chulumani, 12 km E of Unduavi, Croat 51500 (MO); Unduavi, Buchtein 455 (B, BAF, BM, E, F, G, GH, NY, S); Murillo, Zongo Valley, Solomon 17295 (GH, MO, NY), Solomon et al. 19073 (LPB, MO), Solomon 13100 (GH, MO, NY), Beck 13085 (MO); Murillo, Inca trail, ca. 2 km NE Challapampa, Ritter & Ritter 1455 (MO). **Larecaja:** vicinity of Sorata, Challasayo, Mandon 903 (BM, G, GH, K, NY, P, S, W). **Santa Cruz:** Yungas de San Mateo, Steinbach 8510 (GH) **COLOMBIA. Antioquia:** Mpio de Urao, Páramo de Frontino, between Llano Grande and Churrumblúm, 6°28'N, 76°5'W, MacDougal et al. 4379 (GH). **Boyacá:** Páramo de Belén, Rangel et al. 4049 (MO); ca. 1 km N of Hacienda Ritacuva, Grubb, Curry & Fernandez-Perez 254 (K, US); Nevado del Cocuy, Las Lagunillas, Tabloncito, Cuatrecasas 1589 (F). **Caldas:** above Salento, Pennell 9344 (GH). **Cauca:** Cabeceras del río Palo, quebrada de río López, Alto del Duende, Cuatrecasas 18876 (DS, F, GH, NA); Páramo de Las Paps, El Boquerón, Idrobo, Pinto & Bischler 3192 (P); Mt. Purace, Pennell & Killip 6675 (GH, NY). **Cundinamarca:** Macizo de Bogotá, Cuatrecasas 5384 (F); Muchindote Valley, Alto de Las Cruces, 15 km NE Gachetá, Grant 9551 (GH, NA); Salto de Tequendamama, Cuatrecasas 190 (F); W slopes of Páramo de Cruz Verde, Cuatrecasas 362 (F); Río San Francisco, above Bogotá, Pennell 1954 (GH, MO, NY); Zipaquira, Pennell 2561 (NY). **Huila:** near mouth of Quebrada la Candela, 25 km SW San Agustín, 1°45'N, 76°17'W, Fosberg 20079 (GH). **Magdalena:** Sierra Nevada de Sant Marta, Los Arroyitos, 73°58'W, 10°56'S, Kirkbride 2366 (NY, US); Quebrada Indiana, Kirkbride 1933 (US). **Meta:** Macizo de Sumapáz, quebrada El Buque, Díaz et al. 2719 (MO), Díaz et al. 2720 (MO); Sierra de Perijá, E of Manaure, Cuatrecasas & Romero Castaneda 25110 (NY). **Natioquia:** 4 km de Palmitas, Skolnik et al. 19An149 (GH). **Norte de Santander:** Loso and vicinity (N Toledo), Killip & Smith 20371 (B, GH, MO, NY, S); between Mutiscua and

Pamplona, Killip & Smith 19704 (GH) **Ocaña**: New Grenada, Schlim 303 (G, P). **Santander**: Páramo de romeral, Killip & Smith 18566 (GH, NY) 12 km N of Vélez, Fassett 25303 (GH). **Tolima**: Rosalito, near Páramo de Ruis, Pennell 3118 (MO, NY). **Valle**: Hoya del río Cali, confluence of río Pichindécito with el Pichindé, Cuatrecasas 18766 (US). **ECUADOR**. **Azuay**: Giron, Parroquia Asunción, Bosque seco Montano Bajo, 79°15'W, 03°09'S, Cerón 14463 (MO); Nudo de Portete, pass between headwaters of ríos Tarquic and Giron, Camp E-2170 (GH, NY). **Carchi**: Mira Canton, 30 Km al Oeste de San Isidro, 78°05'W, 0°35'S, Gudiño 441 (MO, QCNE); Espejo, Camino Libertad-Morán, Nacimiento del Río Morán, 78°02'W, 0°45'S, Palacios 11768 (MO, QCNE); Espejo, Reserva Ecológica El Angel, Palacios 11554 (MO, QCNE); Valle de Maldonado, km 53 on rd Tulcán-Maldonado, 0°50'N, 78°3'W, Holm-Nielsen et al. 5809 (NY). **Chimborazo**: Camino Pusucucho al Placer, Acosta Solís 7250 (F), Acosta Solís 7274 (F). **Cotopaxi**: Salcedo, Parque Nacional Llanganates, E of Salcedo, valley of Rio Anatenorio, km 56, 0°59'0"S, 78°17'2"W, Neil, Vargas, Freire & Narvaes 11903 (MO, NY); Cantón Sigchos, Orillas del Río Los Illinizas, dentro del Bosque, 78°47'W, 00°34'S, Ramos et al. 6007 (MO). **Imbabura**: Pimampiro Canton, Ibarra-Mariano Acosta, Loma Yanalpacunga, 78°01'W, 0°18'S, Palacios & Tipaz 9903 (MO, QCNE); between Las Toldadas and Río Arturo, 2 mile NE Cayambe Peak, Wiggins 10512 (DS, GH); shore of Laguna de San Marcos, Wiggins 10523 (DS, GH, NY); Río San Pedro, below mouth of Río Clavadero, Wiggins 10455 (DS, GH); Lago San Marcos, Cazalet & Pennington 5311 (B, K, NY, UC, US). **Loja**: Parque Nac. de Podocarpus, along trail to Lag. de Compadre, 79°08'W, 04°03'S, Laegaard 101900B (AAU); trails ca. 5 km ENE of San Pedro de Vilcabamba, from El Bosque to Quebrada Romerillos and Banderilla, 79°10'W, 04°14'S, Øllgaard & Navarrete 105966 (AAU). **Napo**: Cantón Quijos, 4 km al N de Papallacta, 78°09'W, 00°20'S, Yánez & Maza 906 (MO); Quito-Baeza road, 5 km NW of Laguna de Papallacta (Páramo de Guamani), 78°07'W, 0°19'S, Øllgaard & Balslev 8065 (AAU, MO, NY); Volcán Cayambe, 77°59'W, 0°03'S, Øllgaard et al. 34217 (AAU, MO, NY, QCA); Laguna San Marcos, 77°58'W, 0°07'S, Øllgaard et al. 34104 (AAU, MO, NY, QCA); S Cerro Sumaco, 0°36'S, 77°39'W, Løjtnant & Molau 13095 (NY). **Pichincha**: 2 km S Atahualpa, Asplund 20302 (NY, P, S); between Nono and Nanegal, Asplund 17324 (B, K, NY, S); Cayambe-Olmedo-Laguna San Marcos, 77°57'W, 0°07'S, Jørgensen 61958 (AAU, MO, NY, QCA), Cuamacás & Gudiño 467 (MO), Cuamacás & Gudiño 546 (MO); Parroquia Calacali, Reserva Geobotánica Pululahua, 78°30'W, 0°05'S, Cerón & Regalado 6156 (MO); Tbacundo, Lagunas Mojanda, Palacios, Tipas & Aulestia 10209 (MO, QCNE); Campamento Sigal between San Juan and Chiriboga, Asplund 16230 (NY). **Zamora-Chinchipec**: Km 17 on Loja-Zamora rd, 79°08'W 03°59'S, Holm-Nielsen et al. 3546 (AAU, MO, NY). **PERU**. **Amazonas**: Bagua Distr., Aramango, Catarata Numparket Claro, 78°19'W, 05°29'S, Vásquez, Rojas & Campos 27262 (MO); Bagua, Cordiller Colán SE La Peca, Barbour 3708 (F, MO, NY); Bagua, ca. 25 km E La Peca, Barbour 2878 (MO). **Cuzco**: Urubamba, 101 km from Cuzco, between Pampacahua and Cedrobamba, Quebrada and Rio Pachachoca, Núñez et al. 11090 (MO); Urubamba, Santuario Histórico Machu Pichu, 72°07'W, 13°18'S, Núñez & Pyrke 9211 (MO); Ollantaytambo, Huaytampo, 72°21'W, 13°10'S, Calatayud et al. 959 (MO); La Convención, Santa Teresa, Choqekiraw, 13°23'S, 72°52'W, Valenzuela et al. 3505 (MO). **Puno**: Prov Sandia, Limbani, Vargas 9652 (K, NA, UC). Dep. t.?: Tambo de Vaca, Macbride 4462 (F, GH, NY); Chaglla, Macbride 3637 (F, NY). **VENEZUELA**. **Anzoátegui**: along Río Zumbador, near base of Piedra Blanca, NE Bergantín, Steyermark 61316 (F). **Lara**: Dtto. Moran, trail from Humocaró to

Buenas Aires (Caserio), below Páramo Los Rosas, 70°05'W, 09°40'N, Liesner et al. 8161 (MO); between Buenos Aires and Páramo de las Rosas, Steyermark 55450 (F, GH); Parque Nac. Dinira, Páramo de Jabón, 70°06'W 09°34'N, Riina, Meier & Duno 913 (MO, VEN). **Merida:** from cabin at La Escalera to Puente de La Escalera, Luteyn, Lebrón-Luteyn & Ruíz-Terán 6227 (MO, NY); Del Puente de la Quebrada el Plan hacia Aricagua, Los Magos, Bernardi 6193 (MO); between Los Corales and Las Cuadras, Steyermark 55754 (F, K, S); Jiménez, 10-15 km SSE Sanare, between Encrucijada and rd of Parque Nacional Yacambú de El Blanquito, Steyermark et al. 10351 (W). **Sucre:** base of Cerro de Diablo, W extension of S peak of Cerro Turumuquire, Steyermark 62743 (F, GH). **Tachira:** along Quebrada Agua Azul, S El Reposo, 14 km SE Delicias, 72°24'W, 7°31'N, Steyermark & Liesner 118383 (GH, MO, NY); Quebrada La Lejía, 15 km SE Delicias, Steyermark & Liesner 118544 (GH, MO); Chorrejón de la Mota de la Peña de Ventana, Steyermark & Dunsterville 100800 (US). **Trujillo:** Parque Nacional Dinira, Mun. Carache, paramo de Jabón to Mesa Arriba, 70°8'W, 9°34'N, Meier, Riina & Duno 6271 (MO, VEN); between Mesa Arriba and Páramo de Las Rosas, Duno & Riina 1402 (MO, VEN); Boconó, Cerro Guaramacál, Stergios, Aymard & Smith 4745 (MO); Boconó, Paramo de Guaramacal, 25 km SE Boconó, 70°10'W, 9°13'N, Aymard, Ortega & Moran 2961 (MO, NY); 12 km E-SE Boconó, 70°9'W, 9°12'N, Liesner et al. 12936 (MO); Boconó, 20-22 km on rd to Guaramacal, 70°13'W, 9°13'N, Luteyn & Cotton 9745 (GH, MO, NY); Parque Nacional Guaramacal, rd from Boconó to Guaramacal, SE Boconó, 70°12'W, 9°13'N, Dorr & Barnett 8253 (MO, NY, US).

As in several other South American species of *Cardamine*, *C. ovata* is highly variable in leaflet shape, size, margin, and pubescence (see description above), and the synonymy above reflects taxa based on some of that variation. In some forms, the leaflets are completely glabrous, whereas in others (e.g., *Lehmann 4826*, the type collection of *C. ecuadorensis*) they are very densely pubescent. In rare occasions when the plants are pubescent, (but not in *Lehmann 4826*), the fruits too are pubescent, as in the types of the Ecuadorian infraspecific taxa *thamnophila* and *eriocapa*. Fruit pubescence is extremely rare in *Cardamine* as a whole, but these Ecuadorian plants are indistinguishable in other characters from the remainder of *C. ovata*.

These are annotated by Schulz as:

C. jamesonii prol. *decora* O.E. Schulz: Colombia, Cauca, Paramo de Guanacas, Lehmann 2116 (G).

C. johnstonii: Colombia, Pasto, Lehmann 525a (G)

C. ovata subsp. *lehmanniana* var. *bracteata* O. E. Schulz: Colombia, Cauca, Paramo del Ruiz, Lehmann 3108 (G).

Cardamine pachystigma (S. Watson) Rollins, Harvard Pap. Bot. 4: 45. 1993; *Dentaria californica* Nuttall var. *pachystigma* S. Watson, Proc. Amer. Acad. Arts 14: 289. 1879; *Cardamine californica* (Nuttall) Greene var. *pachystigma* (S. Watson) O. E. Schulz, Bot. Jahrb. Syst. 32: 388. 1903; *D. pachystigma* (S. Watson) S. Watson in A. Gray & S. Watson, Sy. Fl. N. Amer. 1(1): 155. 1895. TYPE: *Dentaria corymbosa* Jepson, Man. Fl. Pl. Calif. 426. 1925, non Matsumura, ... 1899. TYPE:

Dentaria corymbosa var. *grata* Jepson, Fl. Calif. 2: 57. 1936. TYPE:

Herbs, perennial, glabrous. **Rhizomes** fleshy, ovoid to oblong, (3–)4–18 mm in diam., deeply underground; stolons absent. **Stems** 1–3 dm, erect, simple, glabrous. **Rhizomal leaves** simple, 1.2–2.3 cm; petiole 6.7–19.5 cm; blade orbicular to reniform or cordate to broadly ovate, 2.7–5.5 × 3–6.8 cm, base cordate to subtruncate, margin with obtuse teeth terminated in apiculae; cauline leaves 2–5, crowded above middle of stem, simple; petiole 0.3–2.6 cm, base not auriculate; blade similar in shape and margin to that of basal leaves, 1.8–5.5 × 1.2–4.7 cm, glabrous, base cuneate or obtuse to subcordate, marginal teeth apiculate. **Racemes** ebracteate; fruiting pedicels divaricate to ascending, 0.7–2.4 cm. **Sepals** oblong, 4–7 × 2–2.5 mm, erect, base of lateral pair saccate; petals pink or purple or rarely white, obovate to oblanceolate, 14–18 × 5–7 mm, claws to 9 mm, apex rounded; median filament pairs 7–8 mm, lateral pair 5.5–6.5 mm; anthers oblong, ca. 1.5 mm. **Fruit** linear, 3.2–5.4 cm × 2.2–4 mm; valves glabrous; style 4–7 mm; ovules and seeds 10–14 per fruit. **Seeds** brown, broadly ovate, 2–2.8 × 1.8–2.5 mm.

Flowering: Mar–May.

Habitat: forests, lava slides, talus and cliffs.

Elevation: 700–2900 m.

Distribution: United States (E and NC California/Plumas, Tehama, and Tulare counties).

Cardamine papillata I. Thompson, Muelleria 9: 161. 1996. TYPE: Australia, Victoria,

Maramingo Creek area, ca. 4 km NE of Genoa P.O., 26 Dec 1969, A. C. Beauglehole 32819 (holotype, MEL).

Herbs, annual, glabrous or papillate. **Stems** to 25 cm, erect to ascending, slender, glabrous or minutely papillate, often branched below and above. **Basal leaves** rosulate, long petiolate, simple or 3–5-foliolate, to 7 cm; terminal leaflet orbicular, slightly cuneate or often shallowly cordate at base, entire; lateral leaflets much smaller than terminal, short petiolulate or sessile, orbicular; cauline leaves 0–3, sessile, not auriculate at base, lowermost similar to basal, simple or 3–5-foliolate, much reduced in size upwards, pinnatifid or pinnate. **Racemes** ebracteate, 1–10(–15)-flowered; fruiting pedicels divaricate-ascending, 5–15 mm, glabrous or minutely papillate.

Sepals ovate, 1.5–2.5 mm; petals white or pink outside, spatulate, cuneate, 3–4.5 mm; stamens 6. **Fruits** linear, erect to suberect, 2–3.5 cm × ca. 1 mm; style to 1 cm. **Seeds** elliptic, 1–1.2 mm.

Flowering: Aug–Feb.

Habitat: hilly, forested areas at lower altitudes, moist shaded areas often in rocky silts near streams.

Elevation: 0–450 m.

Distribution: Australia (New South Wales, South Australia, Tasmania, Victoria).

Cardamine papuana (Laut.) O. E. Schulz, Bot. Jahrb. Syst. 55: 271. 1903; *C. africana* Linnaeus

subsp. *borbonica* (Persoon) O. E. Schulz var. *papuana* Laut. in K. Sch. & Laut., Fl. Deut. Schutzgeb. Südsee, Nachtr. 271. 1905. TYPE:

Herbs, perennial, glabrous or rarely pubescent. **Rhizomes** short, not fleshy. **Stems** 1.5–5 dm, erect to ascending, simple or branched above. **Basal leaves** and lowermost cauline trifoliolate or unifoliolate, to 12 cm; petiole to 9 cm; cauline leaves few, petiole, 2–6 cm, minutely auriculate or not; terminal leaflet lanceolate, 3–12 × 1–4 cm, cuneate to rounded or rarely truncate at base, serrate-dentate, acute to acuminate at apex, with a petiolule 0.5–2 cm; lateral leaflets ovate, 0.5–3 × 0.2–2 cm, serrate to dentate, on a petiolule 1–4 mm. **Racemes** ebracteate, 5–15-flowered, elongated or not in fruit; fruiting pedicels ascending to divaricate. **Sepals** oblong, 2.5–4 mm; petals white, broadly spatulated, 8–12 × 3–5 mm, usually notched; stamens 6, anthers ca. 0.8

mm; ovules – per ovary. **Fruits** linear, 2–4 × 1.5–2 mm; style 0.5–1.7 mm. **Seeds** oblong, 2.7–2 × 1–1.3 mm, smooth.

Habitat: rocky banks of forest streams, wet cliffs.

Elevation: 500–3100 m.

Distribution: New Guinea.

Cardamine parviflora Linnaeus, Syst. Nat., ed. 10, 2: 1131. 1759. TYPE: Herb. Linn. 835.10 (lectotype designated by Jonsell (1982: 43), LINN).

Cardamine arenicola Britton, Bull. Torrey Bot. Club 19: 220. 1892; *C. parviflora* var. *arenicola* (Britton) O. E. Schulz, Bot. Jahrb. Syst. 32: 485. 1903. TYPE:

Cardamine brachycarpa Franchet, Bull. Soc. Bot. France 26: 82. 1879, not Opiz, Natural. 11: 411. 1826; *C. koshiensis* Koidzumi, Fl. Symb. Orient.-Asiat. 43. 1930. TYPE: Japan, Prov. Etchigo, near Niigata, *R. P. Faurie* 23 (holotype, P!; isotype, P!).

Cardamine flexuosa Withering var. *gracilis* O. E. Schulz, Bot. Jahrb. Syst. 32: 481. 1903. TYPE:

Cardamine manshurica (Komarov) Nakai, Tyosen-Syobubutu 113. 1914; *C. parviflora* Linnaeus var. *manshurica* Komarov, Trudy Imp. S.-Peterburgsk. Bot. Sada 22: 370. 1903. TYPE:

Herbs, annual, slender, glabrous or sparsely to densely pubescent throughout. **Rhizomes** absent; stolons absent. **Stems** (0.5–)1–3(–4) dm, erect, 1 to several from base, often branched above, somewhat flexuous. **Basal leaves** usually not rosulate, often withered by anthesis, pinnately (5–)7–13(–17)-foliolate, (2–)4–10 cm; petiole 0.5–2.5(–4.5) cm; terminal leaflet linear to oblong or oblanceolate to obovate or suborbicular, (1–)3–10 × 1–7 mm, base cuneate, margin entire, or 3(–5)-toothed or –lobed, sessile or petiolule to 5 mm; lateral leaflets similar to terminal or sometimes smaller; cauline leaves 5–10(–14), (5–)9–15(–17)-foliolate; petiole 3–10 mm, base not auriculate; terminal leaflet filiform, linear, or narrowly oblong, 3–10(–16) × 0.3–3 mm, sessile, entire or rarely 1–3-toothed; lateral leaflets similar to terminal or slightly smaller.

Racemes ebracteate; fruiting pedicels divaricate or ascending, 4–10 mm. **Sepals** oblong, 1–1.5(–2) × 0.3–0.5 mm, membranous at margin; petals white, oblanceolate, (1.5–)1.8–2.5(–3) × 0.4–0.8(–1) mm; stamens 6; filaments 1.4–2.5 mm; anthers ovate, 0.2–0.4 mm. **Fruit** linear, (0.5–)1–2(–2.5) cm × 0.6–0.9 mm; valves glabrous, torulose; style 0.3–0.7(–1) mm; ovules and seeds 20–50 per fruit. **Seeds** pale brown, oblong-ovate, 0.6–0.9 × 0.4–0.6 mm, narrowly margined or not. **2n** = 16.

Flowering: Mar–Jun.

Habitat: roadsides, river banks, rocky crests and outcrops, crevices of granitic bedrock, dry woods, glades, fallow fields, disturbed grounds, limestone barrens, marsh and swamp margins, floodplains, waste grounds, slopes, ledges and cliffs, meadows.

Elevation: 0–1500 m.

Distribution: Algeria, Austria, Azerbaijan, Bulgaria, Canada (Alberta, British Columbia, Manitoba, New Brunswick, Newfoundland, Northwest Territories, Ontario, Quebec, Saskatchewan), China (Anhui, Guangxi, Hebei, Heilongjiang, Hunan, Hubei, Jiangsu, Liaoning, Nei Mongol, Shaanxi, Shandong, Shanxi, Xinjiang, Zhejiang), Czech Republic, Finland, France, Georgia, Germany, Hungary, Iran, Italy, Japan, Kazakhstan, Korea, Mongolia, Poland, Portugal, Romania, Russia (European Part, Siberia), Spain, Sweden, Taiwan, Ukraine, United States (Alabama, Arkansas, Connecticut, Delaware, District of Columbia, Florida, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Hampshire, New Jersey, New York, North Carolina, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Vermont, Virginia, West Virginia, Wisconsin).

Cardamine pattersonii L. F. Henderson, *Rhodora* 32: 25. 1930. TYPE:

Herbs, short-lived perennial or sometimes annual, glabrous throughout. **Rhizomes** slender, cylindrical, 0.5–1.5 mm in diam.; stolons absent. **Stems** 0.6–3 dm, erect, single, simple or branched near or at base, not flexuous, glabrous. **Basal leaves** rosulate or not, 3–5-foliolate, 1–6 cm; petiole 0.4–2.5 cm; terminal leaflet obovate to orbicular or subcordate, 3–15(–20) × 2.5–16(–18) mm, base obtuse to rounded or cordate, margin entire or dentate to slightly sinuately lobed, petiolule 1–4 mm; lateral leaflets similar to terminal but considerably smaller; cauline leaves 2–4 below the raceme, 3–5-foliolate, similar to basal leaves, gradually reduced in size as bracts, uppermost ones subtending pedicels of uppermost flowers almost always simple; leaflets or simple bracts linear to linear-oblongate, 2–8 mm. **Raceme** bracteate throughout; fruiting pedicels divaricate-ascending, (1–)1.5–3(–4.5) cm. **Sepals** oblong, (–2–3 × 0.7–1 mm, lateral pair not saccate; petals purple or pink, obovate, 6–9 × 3–4 mm, not clawed; median filaments 3–3.5 mm, lateral filaments 2–2.5 mm; anthers oblong, 0.7–1 mm. **Fruit** linear, 2–3 cm × 1–1.5 mm; valves glabrous, torulose; style 2–4 mm; ovules and seeds 14–20 per fruit. **Seeds** brown, oblong to ovate, 1.7–2.2 × 1–1.5 mm, distally winged.

Flowering: May–Jun.

Habitat: moist mossy cliffs, rocky slopes, mossy banks.

Elevation: 800–900 m.

Distribution: United States (NW Oregon/Clastop Co.).

Cardamine paucifolia Handel-Mazzetti, *Symb. Sin.* 7: 359. 1931. TYPE: China, Yunnan, near Yungbei, between Dawan and Gwangyilang, 2400–2600 m, 3 Jul 1914, *Handel-Mazzetti* 3432 (holotype, WU!; isotype, W!).

Cardamine yunnanensis Franchet var. *obtusata* C. Y. Wu ex T. Y. Cheo & R. C. Fang, *Bull. Bot. Lab. North-East. Forest. Inst., Harbin* (1980)6: 20. 1980. TYPE: China, Yunnan, Kang-pu, Wei-si Hsien, *C. W. Wang* 64172 (holotype, KUN!; isotypes, A!, NAS!).

Herbs, perennial, sparsely pilose or glabrescent. **Rhizomes** slender. **Stems** 15–40 cm, simple, slightly angled. **Basal leaves** often withered by flowering, trifoliolate; petiole 1.5–4.5 cm; leaflets similar to those of cauline leaves, smaller; cauline leaves 1–4, trifoliolate; petiole 1.5–6 cm, not auriculate at base; terminal leaflet lanceolate, ovate, or broadly elliptic, 3–6.5 × 1–3.5 cm, sparsely pilose or glabrous, with a petiolule 5–12 mm, base obtuse or cuneate, margin ciliate and dentate or crenate, apex acute or acuminate; lateral leaflets 2, shortly petiolulate or sessile and base decurrent to rachis, nearly as large as terminal one, base oblique; uppermost leaf often with a sessile terminal leaflet decurrent basally with lateral leaflets. **Racemes** ebracteate; fruiting pedicels ascending or divaricate, 7–11 mm, straight, slender. **Sepals** oblong, 3.5–4.5 × 1.2–1.5 mm, base not saccate; petals white, narrowly obovate, 6–8.5 × 1.5–3.5 mm, not clawed; median filament pairs 3.5–4 mm, lateral pair ca. 3 mm; anthers oblong, 1.1–1.6 mm; ovules 10–16 per ovary. **Fruit** linear, 3–5 cm × 1–1.5 mm; valves smooth, glabrous; style 1.5–2.5 mm. **Seeds** brown, narrowly oblong, 1.5–2 × 0.6–0.8 mm, apically winged.

Flowering: Mar–Jul.

Habitat: ravines, streamsides.

Elevation: 1500–2600 m.

Distribution: China (Yunnan).

Cardamine paucijuga Turczaninow, *Bull. Soc. Imp. Naturalistes Moscow* 27: 295. 1854.

TYPE: SW Australia, *J. Drummond* 5: 131 (holotype, KW; isotypes, G, K).

Cardamine inermis subsp. *antipodum* O. E. Schulz, Bot. Jahrb. Syst. 32: 486. 1903. TYPE:
Australia,

Herbs, annual, glabrous or sometimes pubescent. **Stems** 1–4 dm, slender, erect. **Basal leaves** and cauline pinnately compound, with 1–4 leaflet pairs; leaflets narrowly obovate to elliptic, not ciliate, terminal largest, not lobed, base cordate; cauline leaves 2 or more, petiolate, not auriculate at base, leaflets elliptic to narrowly obovate, entire. **Racemes** ebracteate, often more than 8-flowered; fruiting pedicels spreading to subhorizontal, slender, 3–15 mm. **Sepals** oblong, 1.5–2 mm; petals white or rarely pink, 3–6 mm; stamens 6; ovules – per ovary. Fruits linear, 1–3 cm × 0.7–1 mm, erect; style slender, to 2 mm. Seeds ovoid to oblong, 1–1.5 mm, flattened, very narrowly winged.

Flowering: Oct–Nov.

Habitat: dry to moist areas in rich grounds.

Distribution: Australia (all states except Northern Territories).

Cardamine pectinata

Cardamine pedata

Cardamine penduliflora O. E. Schulz, Bot. Jahrb. Syst. 32: 538. 1903. TYPE:

Cardamine rariflora M. E. Peck, Torreyia 32: 150. 1932. TYPE:

Herbs, perennial, glabrous throughout. **Rhizomes** fleshy, tuberous, 4–9(–11) mm in diam.; stolons absent. **Stems** 2–6(–7.5) dm, erect or decumbent at base, simple, glabrous. **Rhizomal leaves** 5–13-foliolate, (4–)10–18(–25) cm; petiole (3–)5–12(–17) cm; terminal leaflet oblong to elliptic or ovate, (0.4–)0.7–1.7(–2) cm, with a petiolule 4–7 mm, base cuneate or obtuse, margin entire or obscurely 3-lobed, glabrous; lateral leaflets about as large as or smaller than terminal leaflet, subsessile, margin same as terminal leaflet; cauline leaves 2–6, 5–11-foliolate; petiole 3–10 cm, base not auriculate; terminal lobe narrowly ovate or oblong to oblanceolate, 1.5–3.5 × 0.2–1.5 cm, glabrous, entire or toothed to 3-lobed, petiolule 0.5–1.5 cm; lateral leaflets similar to terminal one but smaller, sessile. **Racemes** ebracteate; fruiting pedicels ascending to divaricate, (1–)2–4(–6) cm. **Sepals** oblong to ovate, 3.5–5 × 1.8–2.5 mm, erect, base of lateral pair saccate; petals white, obovate, 12–16 × 6–8 mm, not clawed, apex rounded or subemarginate; median filament pairs 6–7 mm, lateral pair 4–5 mm; anthers oblong, 1.5–1.8 mm. **Fruit** linear, 2.5–4.5 cm × 1.4–2 mm; valves glabrous; style 4–6 mm; ovules and seeds 12–24 per fruit. **Seeds** brown, oblong, 1.8–2 × 1–1.5 mm.

Flowering: Mar–May.

Habitat: shallow pools, wet grounds, marshes, meadows, creeks, channels, swampy woods.

Elevation: 50–150 m.

Distribution: United States (W Oregon).

Cardamine pensylvanica Muhlenberg ex Willdenow, Sp. Pl. 3: 486. 1800; *C. flexuosa*

Withering subsp. *pensylvanica* (Muhlenberg ex Willdenow) O. E. Schulz in Urban, Symb.

Antill. 3: 521. 1903; *C. hirsuta* Linnaeus var. *pensylvanica* (Muhlenberg ex Willdenow) P. W.

Graff, Castanea 10: 95. 1945; *Dracamine pensylvanica* (Muhlenberg ex Willdenow)

Nieuwland, Amer. Midl. Naturalist 4: 40. 1915. TYPE: United States, Pennsylvania,

Muhlenberg s.n. (holotype, B-WILLD).

Cardamine oregana Piper, Proc. Biol. Soc. Wash. 37: 92. 1924; *C. breweri* var. *oregana* (Piper)

Detling, Amer. J. Bot. 24: 73. 1937. TYPE: United States, Oregon, near Little Meadows of the

Deschutes River, 1500 m, 25 Aug 1896, *J. B. Leiberger* 2614 (holotype, US!; isotypes, GH!, NY!).

Cardamine multifolia Rydberg, Bull. Torrey Bot. Club 29: 238. 1902. TYPE: United States, Utah, Wasatch Mts., 26 Jun 1869, *S. Watson* 80 (lectotype designated by Holmgren (2004b: 245), NY!).

Cardamine pensylvanica var. *brittoniana* Farwell, As Gray Bull. 2: 46. 1894. TYPE: United States,

Cardamine rotundifolia Michaux var. *diversifolia* O. E. Schulz, Bot. Jahrb. Syst. 32: 427. 1903. TYPE: United State,

Herbs, annual or biennial, glabrous above, sparsely hirsute near base. **Rhizomes** absent; stolons absent. Stems (0.5–)1.5–5.5(–7) dm, erect, single, simple or branched above, not flexuous, sparsely hirsute near base, glabrous above. **Basal leaves** soon withered, not rosulate, 4–15 cm, similar to lowermost cauline leaves; cauline leaves (3–)5–20(–35), pinnately (5–)7–13(–19)-foliolate, sometimes appearing pinnatisect and with lobe number similar to that of leaflets, middle and lower ones 2–11 cm; petiole (0.4–)1–3.5(–4.5) cm, often sparsely hirsute, base not auriculate; terminal leaflet suborbicular or obovate to oblanceolate or elliptic, 1.3–3(–4) × 0.6–2.5 cm, base often cuneate, margin entire to repand or obscurely 3–5-lobed, subsessile or petiole to 10 mm; lateral leaflets smaller than terminal, entire or crenate, short petiolulate or sessile and decurrent on rachis; uppermost leaves narrower and with fewer lobes or leaflets. **Racemes** ebracteate; fruiting pedicels divaricate-ascending, (3–)4–10(–13) mm. **Sepals** oblong, (1–)1.3–2.3 × 0.5–1 mm; petals white, narrowly spatulate to oblanceolate, 2–3.5(–4) × 0.8–1.5 mm, not clawed; stamens 6, median filaments 1.5–2.5 mm, lateral filaments 1–2 mm; anthers ovate, 0.2–0.3 mm. **Fruit** linear, (1.4–)1.7–2.7(–3.2) cm × 0.8–1.1 mm; valves glabrous, torulose; style 0.5–1 mm; ovules and seeds 40–80 per fruit. **Seeds** brown, oblong to ovate, 0.7–1.1 × 0.5–0.8 mm, wingless. $2n = 32, 64$.

Flowering: Apr–Jul.

Habitat: marshes, steams, swamps, ditches, seepage, springs, lake margins, mesic bottomland and upland forests, wet areas, ledges of sheltered bluffs, on banks and in shallow water of streams and spring branches, margins of crop fields, and waste ground.

Elevation: 0–2750 m.

Distribution: Canada (Alberta, British Columbia, Labrador, Manitoba, New Brunswick, Newfoundland, Northwest Territories, Nova Scotia, Ontario, Prince Edward Island, Quebec, Saskatchewan, Yukon), United States (Alabama, Alaska, Arkansas, California, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nevada, New Hampshire, New Jersey, New Mexico, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin, Wyoming).

Cardamine pentaphyllos (Linnaeus) Crantz, Cl. Crucif. Emend. 127. 1769; *Dentaria pentaphyllos* Linnaeus, Sp. Pl. 2: 654. 1753. TYPE: *Dentaria heptaphyllos* Bauhin in Horto Dei Galloprovinciae, Herb Burser no. XVIII(1): 80 (lectotype designated by Hedge in Jarvis et al. (1993: 42), UPS).

Cardamine penzesii Ančev & Marhold, Ann. Bot. Fenn. 36: 172. 1999. TYPE:

Cardamine picta W. J. Hooker, London J. Bot. 6: 292. 1847; *Porphyrocodon pictum* (W. J. Hooker) J. D. Hooker in Bentham & J. D. Hooker, Gen. Pl. 1: 79. 1862. TYPE: Colombia, New Granada, Paramo of Ruiz, Mar 1846, W. Purdie (holotype, K!; isotype, K!).

Herbs, perennial. **Rhizomes** slender, not scaly, with long internodes and nontuberous nodes. **Stems** (3–)4.5–11 dm, erect or decumbent, simple or branched above, glabrous or rarely pubescent. **Cauline leaves** (lower and middle) (7–)10–21(–25) cm, 7–11-foliolate; petiole 2.5–12 cm logn; lateral leaflet (1–)2–4(–5) × (0.7–)1.4–3 cm, broadly ovate to oblong-ovate, glabrous or sparsely pubescent, base strongly oblique-subcordate or rarely cuneate, margin incised-serrate, incised-crenate, or serrate, ciliolate with trichomes to 0.2 mm, teeth mucronate, apex acute; petiolule 0.5–2.2 cm; terminal leaflet about same size as lateral; uppermost leaves gradually smaller. **Racemes** bracteate throughout or rarely only basally; bracts compound, gradually reduced in size and number of leaflets upward; flowers prominently protogynous; fruiting pedicels (2–)2.5–4.2(–5) cm, divaricate-ascending, straight, stout. **Sepals** dark purple, broadly oblong, 6–7 × 2.5–3.5 mm, glabrous; petals dark purple, broadly obovate, 1.5–2.2 × 0.7–1 cm, base broadly cuneate, apex rounded to emarginated; filaments 6–7 mm; anthers oblong, 1.5–1.7 mm; ovules 12–16 per ovary. **Fruits** 4.5–7 cm × 2–2.5 mm; style slender, (6–)8–12(–20) mm. **Seeds** oblong, mm.

Flowering: Dec–Apr(–Aug).

Habitat: deep moss under *Polylepis*, paramo.

Elevation: 3300–3970 m.

Distribution: Colombia (Antioquia, Cauca), Ecuador (Pichincha).

Specimens examined: **COLOMBIA. Antioquia:** Termales, Páramo de Herveo, 3680 m, 1851–1857, *Triana s.n.* (G, P, W); Mpio de Urao, between Páramo de Frontino and Finca La Granada below El Quince, 6°25'N, 76°05'W, *MacDougal, Roldán & Betancur 4585* (MO).

Cauca: Cordiller Central, Cabeceras de río Palo, quebrada del río López, Alto de Duende, *Cuatrecasas 19036* (F). **ECUADOR. Pichincha:** Páramo de Guamaní, Pifo-Papallacta rd, 78°13'W, 00°18'S, *Øllgaard 98789* (AAU); Pifo-Papallacta rd, ca 1 km W of Paso de la Virgen, 78°13'W, 00°19'S, *Laegaard 102330* (AAU); 1 km before Pasco de La Virgen, 78°11'W, 00°209'S, *Laegaard 101371* (MO); Páramo de Guamani, Asplund 9643 (B, K, NY, S); Par. Papallacta, *Prescott 571* (DS, NY).

Seven sheets at K, all collected by Perdue from Paramo of Ruiz in New Granada, are authentic material of *Cardamine picta*. However, as indicated in the original description, the sheet collected on March 1846 should serve as the holotype.

Cardamine plumieri Villaris, Prosp. Hist. Pl. Dauphiné 38. 1779. TYPE: [France, Dauphiné], “Grande Chartreuse” (holotype, GRM).

Cardamine pratensis Linnaeus, Sp. Pl. 2: 656. 1753; *Dracamine pratensis* (Linnaeus) Nieuwland, Amer. Midl. Naturalist, 4: 40. 1915. TYPE: Herb. Linn. 835.15 (lectotype designated by Khatri (1989: 92), LINN).

Herbs perennial, glabrous or rarely sparsely pilose basally. **Rhizomes** not fleshy, cylindrical, not fragile; stolons absent. **Stems** (0.8–)1.5–5.5(–8) dm, erect, simple. **Leaves** thin, with raised veins; rhizomal leaves to 30 cm; petiole (1–)2–7(–10) cm; terminal leaflet orbicular or broadly obovate, 0.3–2 cm in diam., with a petiolule to 1.5 cm, base rounded, rarely subreniform or cuneate, margin repand, apex rounded; lateral leaflets (0 or)2–8(–15) on each side of rachis,

about as large as or smaller than terminal leaflet, orbicular, ovate, or obovate, petiolulate or sessile, margin crenate or repand; cauline leaves 2–12(–18), including petiole 2–17 cm, pinnatisect, glabrous; petiole base not auriculate; terminal lobe linear, oblong, ovate, or lanceolate, 1–2.5(–3.5) cm × 5–8(–10) mm, petiolulate or sessile; lateral lobes or leaflets 4–7(–13) on each side of rachis, similar to terminal lobe, base petiolulate or sessile and decurrent, margin entire or rarely dentate. **Racemes** ebracteate; fruiting pedicels erect-ascending or subdivaricate, (0.5–)1.2–2.5(–3) cm. **Sepals** oblong or ovate, (2.5–)3–5(–6) × 1–2 mm, erect or spreading, base saccate; petals purple or lilac, rarely white, obovate, (6–)8–15(–18) × 3–7.5(–10) mm, clawed, apex rounded or emarginate; median filament pairs 5–10 mm, lateral pair 3–6 mm; anthers narrowly oblong, (0.8–)1.2–2 mm. **Fruit** linear, (1.6–)2.5–4.5(–5) cm × (1.2–)1.5–2.3 mm; valves glabrous; style (0.5–)1–2.2(–2.7) mm, stout; ovules and seeds 20–30 per fruit. **Seeds** light brown, oblong, 1.2–1.8(–2) × 1–1.4 mm. **2n** = 16.

Flowering: May–Aug.

Habitat: Moist grounds, river or streamsides, limestone shores, sedge and grass meadows, marshy pond margins, mossy areas, wet hollow, boggy areas, turfy shores, damp creek banks, swamps, brooks and ditches, moist ravines, springy swales.

Elevation: 0–1000 m.

Distribution: all Europe, Canada (British Columbia, Newfoundland, New Brunswick, Nova Scotia, Ontario, Quebec), China (Heilongjiang, Nei Mongol, Xinjiang, W Xizang), Japan, Kazakhstan, Korea, Mongolia, Russia (European Part, Siberia, Far East), United States (Connecticut, Indiana, Maine, Massachusetts, Michigan, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Vermont).

Cardamine prorepens Fischer ex de Candolle, Syst. Nat. 2: 256. 1821; *C. pratensis* Linnaeus var. *prorepens* (Fischer ex de Candolle) Maximowicz, TYPE: “Hab. in Siberia, transbaikalensi, ad fl. Ingodem, c. Doroninsk in Dahuria, Fischer” (holotype, LE).

Cardamine borealis Andrzejowski ex de Candolle,

Cardamine pilosa Willdenow,

Cardamine pubescens Steven,

Herbs, perennial, glabrous or pubescent. **Rhizomes** prostrate, stoloniferous. **Stems** 1.5–5(–6) dm, stout, erect or decumbent, simple, glabrous or pubescent, 2–5(–8)-leaved. **Rhizomal leaves** 3–11-foliolate, 2–12 cm; petiole (0.5–)1.5–8(–10) cm; terminal leaflet ovate, oblong, or narrowly obovate, 0.5–2(–3) cm × 4–13(–20) mm, with a petiolule 2–10 mm, margin crenate to repand; lateral leaflets 1–5 pairs, often sessile, similar to terminal ones but smaller; cauline leaves 3–5-foliolate, often glabrous; petiole to 7 cm, not auriculate at base; terminal leaflet elliptic, oblong, or rhomboid, 1–3.5(–5) × 0.5–1.8(–2.5) cm, with a petiolule to 2.5 cm, base cuneate to obtuse, margin remotely crenate, dentate, or repand, apex obtuse; lateral lobes obliquely ovate or oblong, sessile or shortly petiolulate, similar to terminal one. **Racemes** ebracteate, 5–15-flowered; fruiting pedicels 0.5–3 cm. **Sepals** ovate, 3–4.5 × 1–2 mm; petals white, narrowly obovate, 0.9–1.5 cm × 5–7 mm, base cuneate, apex rounded or subemarginate; median filament pairs 5–7 mm, lateral pairs 3–5.5 mm; anthers oblong, 1–1.8 mm; ovules 12–16 per ovary. **Fruit** linear, 1.5–4 cm × 1.5–2 mm; valves flat, glabrous or pilose; style slender, 2–4 mm. **Seeds** brown, ovate to suboblong, 1.5–2.2 × 1–1.6 mm, wingless.

Flowering: May–Jul.

Habitat: river or stream banks, meadows.

Elevation: 1000–1700 m.

Distribution: China (Heilongjiang, Jilin, Nei Mongol), Korea, Mongolia, Russia (Far East).

Cardamine pulchella (J. D. Hooker & Thomson) Al-Shehbaz & G. Yang, Harvard Pap. Bot. 3(1): 77. 1998; *Loxostemon pulchellus* J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 5: 147. 1861. TYPE: "Sikkim graminosis humidis! alt. 10,000–13,000 ped.," J. D. Hooker, s.n. (holotype, K!).

Loxostemon incanus R. C. Fang ex T. Y. Cheo & Y. Z. Lan, Bull. Bot. Res. North-East. Forest Inst. 1(3): 52. 1981. TYPE: China, Yunnan, Chungtien Plateau, 7 Jul 1930, K. M. Feng 1559 (holotype, KUN!; listed as HKA).

Herbs, perennial, hirsute or glabrescent. **Rhizomes** to 1 cm, with stolons and numerous bulbils; bulbils whitish, fleshy scales ovoid or subglobose, with rudimentary apical appendages. **Stems** (5–)8–15(–20) cm, simple, erect; underground proximal part slender, glabrous; aboveground part green or purplish, slender or stout, pilose or glabrous; bulbils of leaf axils ovoid, to 3 × 2 mm. **Rhizomal leaves** 1(or 2), (1.5–)3–7 cm; petiole (1–)2.2–6 cm; terminal leaflet broadly ovate or oblong, 3–10 × 2–4(–7) mm, with a petiolule to 3 mm; lateral leaflets 1(or 2) pairs, similar to terminal one. Cauline leaves 1–3, 1.2–5 cm; petiole 0.5–3.5 cm, base not auriculate; terminal leaflet oblong or narrowly elliptic, (4–)6–12(–15) × (1–)1.5–4(–6) mm, ciliate or glabrous, base cuneate, margin entire, apex mucronate; lateral leaflets 1(or 2) pairs, similar to terminal one. **Racemes** ebracteate, 2–4(or 5)-flowered; fruiting pedicels ascending, 5–13 mm, straight. **Sepals** ovate, 1.5–3 × 1–1.5 mm, margin membranous; petals deep purple or mauve, broadly obovate, 5–8 × 2–4 mm, apex rounded. Median filament pairs 2–3 × 0.7–1.1 mm, flattened, extended apically into a tooth; lateral pair slender, 1–2 mm; anthers oblong, 0.5–0.6 mm; ovules 12–16 per ovary. **Fruit** linear, 1–1.7 cm × 1–1.2 mm; valves smooth, glabrous; style 0.5–1 mm. **Seeds** brown, broadly oblong, 1.3–1.6 × 0.8–1.1 mm, wingless.

Flowering: May–Aug.

Habitat: grassy marshlands, moist rocky places, stony streamsides, scree, mountain slopes.

Elevation: 3400–4600 m.

Distribution: Bhutan, China (Qinghai, Sichuan, Xizang, Yunnan), India (Sikkim), Nepal.

Cardamine purpurascens (O. E. Schulz) Al-Shehbaz, T. Y. Cheo, L. L. Lou & G. Yang, Novon 10: 324. 2000; *C. microzyga* O. E. Schulz var. *purpurascens* O. E. Schulz, Notizbl. Bot. Gart. Berlin-Dahlem 11: 225. 1931; *Loxostemon purpurascens* (O. E. Schulz) R. C. Fang ex Y. C. Lan & T. Y. Cheo, Bull. Bot. Res., Harbin 1(3): 54. 1981. LECTOTYPE (designated by Al-Shehbaz, 2000): China, SW Sichuan: Kulu Mountains, E of Muli Gomba, 4300 m, Jun 1928, J. R. Rock 16487 (hololectotype, B!; isolectotypes, E!, MO!, US!).

Herbs, perennial, pilose. **Rhizomes** stout, 0.5–1.5 cm, often with several stolons. **Stems** (8–)10–25(–30) cm, erect, simple, ridged, pilose, not flexuous. **Basal leaves** rosulate, 5–10 cm; petiole 1–3.5 cm, ciliate; terminal leaflet subreniform or orbicular, 4–8 × 4–10 mm, petiolule 1–3 mm, base rounded or cordate, margin entire or obscurely and obtusely 3–5-lobed; lateral leaflets 3–7 pairs, obovate or suborbicular, symmetric or not, slightly smaller than terminal lobe, entire or obscurely toothed, apex rounded; cauline leaves 2–10, 1–5 cm; petiole (2–)4–10(–15) mm, ciliate, not auriculate at base; terminal leaflet linear, oblong, or lanceolate, 3–9 × 0.5–2 mm, sessile or with a petiolule to 1.5 mm; lateral leaflets 4–7 pairs, narrowly oblong to oblong-ovate, subequaling terminal leaflet, symmetric or not, pilose, base oblique or cuneate, proximal margin entire or 1-toothed, distal margin entire, apex acute. **Racemes** ebracteate, many flowered; fruiting pedicels divaricate or ascending, (0.7–)1–2.2(–3) cm, slender, pilose. **Sepals** oblong or ovate, 3–4 × 1.5–2 mm, pilose, margin membranous, base of lateral pair saccate; petals magenta-red,

purple, or lavender, broadly obovate, 7–11 × 3–6 mm, cuneate into a clawlike base to 2 mm, apex rounded; median filament pairs 4–5 mm, flattened below anther, to 1 mm wide; lateral pair 2.5–3.5 mm; anthers narrowly oblong, 0.9–1.2 mm; ovules 10–16 per ovary. **Fruit** 1.6–2.5 cm × 1.2–1.8 mm; valves glabrous, smooth; style 1–2 mm. **Seeds** brown, broadly oblong, 1.2–1.5 × 0.9–1 mm, wingless.

Flowering: May–Jul.

Habitat: river banks, wood margins, marshy places, swampy meadows, *Rhododendron* scrub.;

Elevation: 3500–4400 m.

Distribution: China (Sichuan, Yunnan).

Cardamine purpurea Chamisso & Schlechtendal, *Linnaea* 1: 20. 1826. TYPE:

Cardamine purpurea var. *albiflos* Hultén, *Ark. Bot. (n.s.)* 7: 62. 1968. TYPE:

Cardamine purpurea var. *lactiflora* O. E. Schulz ex Steffen, *Beih. Bot. Centralbl.* 54, abt. B: 551. 1936. TYPE:

Herbs, perennial, often caespitose, hirsute. **Rhizomes** not fleshy, vertical, 1–3 mm in diam.; stolons absent. **Stems** (0.3–)0.5–1.2(–1.5) dm, most erect, 1 to several from base, simple, hirsute. **Basal leaves** sometimes rosulate, 3–5-foliolate or rarely simple, (1.5–)2.5–7 cm, hirsute; petiole (1.2–)2–5 cm; terminal leaflet reniform or suborbicular to broadly ovate, 3–10 × 4–15 mm, base subcordate to rounded, margin entire to repand or obscurely 2-toothed, petiolule 0.5–6 mm; lateral lobes distinctly smaller, sessile; cauline leaves 1–3, similar to basal leaves but smaller, compound or rarely simple; petiole (0.2–)0.5–2, base not auriculate. **Racemes** ebracteate; fruiting pedicels suberect or ascending or divaricate, 5–12 mm, pubescent. **Sepals** oblong, 2–3(–4) × 1.4–1.7 mm, erect, base of lateral pair not saccate; petals purple to pink or rarely white, obovate, 5–7(–9) × 3–4(–5) mm, clawed, apex rounded; filaments of median stamens 2.5–3.5 mm, lateral filaments 1.5–3.5 mm; anthers oblong, 0.6–0.9 mm. **Fruit** linear, 1.5–2.5 cm × 1.5–1.8 mm; valves glabrous; style 1–2.5 mm; ovules and seeds 10–14 per fruit. **Seeds** brown, oblong to broadly ovate, 1.7–2.1 × 1.4–1.7 mm, wingless. **2n** = 96.

Flowering: Jun–Aug.

Habitat: moist tundra, damp woods and ravines, alpine turf, river flats, peaty subarctic meadows, streamsides, moist slopes.

Elevation: 600–1800 m.

Distribution: Canada (Yukon), Russia (Far East), United States (Alaska).

Cardamine quinquefolia (M. Bieberstein) Schmalhausen, *Fl. Sredn. Juž. Rossii* 1: 51. 1895;

Dentaria quinquefolia M. Bieberstein, *Fl. Taur.-Caucas.* 2: 109. 1808. TYPE : Ex Tauria et Caucaso, [F. A. Marshall von Bieberstein] (lectotype designated by Marhold (2001: 45), LE, plant on upper right corner of sheet).

Cardamine raphanifolia

Cardamine repens (Franchet) Diels, *Notes Roy. Bot. Gard. Edinburgh* 5: 204. 1912; *Dentaria*

repens Franchet, *Bull. Soc. Bot. France* 32: 5. 1885; *Cardamine tenuifolia* (Ledebour)

Turczaninow var. *repens* (Franchet) Franchet, *Bull. Soc. Bot. France* 33: 399. 1886;

Loxostemon repens (Franchet) Handel-Mazzetti. TYPE: China, Yunnan: San-tchang-kiou, secus viam a Tali and Hokin, 27 May 1884, *Delavay* 65 (holotype, P!).

Herbs, perennial, glabrous throughout except for apices of leaf lobes. **Rhizomes** much elongated, with a few bulbils, 3–8 mm wide. **Stems** 10–45 cm, simple, erect, straight, stout.

Rhizomal leaves simple or trifoliolate; petiole 4–8 cm; leaf blade or terminal leaflet suborbicular

or broadly cordate, to 1.5 cm in diam., base cordate, margin entire or obscurely 5-lobed, terminal leaflet with a petiolule to 7 mm; cauline leaves 2–5, trifid or pinnatisect and with 2(or 3) lateral lobes on each side of midvein, lobes all decurrent, often 1- or 2-toothed, rarely entire; petiole 0.3–4 cm, winged, glabrous or ciliate, not auriculate or rarely with a small, toothlike, puberulent auricle to 0.3 mm; terminal lobe linear-lanceolate, 1.2–5 cm × 4–9 mm, base attenuate, margin entire, along distal half often minutely puberulent with stout trichomes rarely to 0.2 mm, apex acute; lateral lobes similar to terminal. **Racemes** ebracteate, 5–20-flowered; fruiting pedicels ascending, 0.8–2.2 cm, straight, glabrous. **Sepals** ovate, 2.5–3 × 1.2–1.7 mm, glabrous, margin and apex membranous, lateral pair subsaccate; petals white or lavender, broadly obovate or spatulate, 6–8 × 2.5–4 mm, apex rounded; median filament pairs 2.5–4, slightly flattened; lateral pair 1.5–3 mm; anthers oblong, 0.8–1 mm; ovules 8–14 per ovary. **Fruit** linear, 2–3 cm × ca. 1.5 mm; valves smooth, glabrous; style 1–5 mm. **Seeds** brown, oblong, 1.2–1.5 × ca. 0.7 mm, wingless.

Flowering: May–Jun.

Habitat: grassy slopes, moist rocky crevices.

Elevation: 2400–3400 m.

Distribution: China (Sichuan, Yunnan).

Cardamine resedifolia Linnaeus, Sp. Pl. 2: 656. 1753. TYPE: illustration in Bauhin (*Prodromus theatri botanici* 1620: 45) captioned “*Nasturtium alpinum minus Resedae foliis*” (lectotype designated by Marhold (1996: 125). Epitype designated by Marhold (1996: 125); Pyrenaen orient.: Porté Puymorens - Vallée de Lanous, E und W Col. de Lanoux, c. 2400 m, im Silikatschutt, 4-17 Aug 1974, A. Polatschek s.n. (W).

Cardamine rivularis

Cardamine robusta I. Thompson, *Muelleria* 9: 151. 1996. TYPE: Australia, New South Wales, Club Lake, Kosciusko area, 36°25'S, 148°16'E, 10 Jan 1960, B. G. Briggs s.n. (holotype, NSW).

Herbs, perennial, glabrous, forming dense clusters to 1 m wide. **Rhizomes** slender, frequently branched. **Stems** to 30 cm, slender, branched below, glabrous. **Basal leaves** rosulate, somewhat fleshy, long petiolate, to ca. 25 cm, 3–5(–7)-foliolate; terminal leaflet broadly ovate to oblong, base cuneate to slightly cordate; lateral leaflets smaller than and same shape as terminal leaflet, long petiolulate; cauline leaves 0–4, petiolate, not auriculate at base, similar to but smaller than basal leaves, with narrower leaflets, or divided and not compound. **Racemes** ebracteate, few to many flowered, condensed or sometimes elongated; fruiting pedicels stout, to 20 mm. **Sepals** ovate, 3–4.5 mm; petals white, differentiated into blade and claw, 8–12 × 5–7 mm; stamens 6. **Fruits** linear, 2–4 cm × 2–3 mm; style 1–3 mm. **Seeds** oblong-elliptic, 2–2.5 mm.

Flowering: Jan–Apr.

Habitat: alpine regions among granite boulders, moist slopes bordering melting snow, shores of glacial lakes.

Distribution: Australia (New South Wales).

Cardamine rockii O. E. Schulz, *Notizbl. Bot. Gart. Berlin-Dahlem* 9: 473. 1926. TYPE: China, SW Sichuan, Muli or Muli Kingdom, 10,000–14,000 m, Jun 1922, J. F. Rock 5585 (holotype, B!; isotypes, E!, GH!, P!, US!, W!).

Herbs, perennial, pilose or subhirsute. **Rhizomes** elongated, 1–3 mm in diam. **Stems** (9–)15–45(–55) cm, decumbent basally, erect, simple, ridged, pilose, 4–10-leaved. **Basal leaves** not

rosulate, similar to cauline ones; lower and middle cauline leaves (1.5–)3–12(–15) cm; petiole 0.5–4 cm, ciliate, not auriculate at base; terminal leaflet broadly ovate or suborbicular, (3–)5–12(–15) × (2–)4–8(–10) mm, symmetrical, with a petiolule 1–3 mm, base obtuse, truncate, or cuneate, margin 2–4-toothed on each side, teeth submucronate; lateral leaflets alternate or rarely opposite, 6–12 on each side of rachis, broadly to narrowly ovate or ovate-lanceolate, subequalling terminal leaflet, asymmetric, sessile or with a petiolule to 3 mm, pilose or rarely subglabrous, base oblique, proximal margin coarsely and unequally (2 or)3–5(or 6)-toothed, distal margin entire or 1–3-toothed, acute apex and teeth submucronate. **Racemes** ebracteate, many flowered; flowering pedicels divaricate or ascending, 1–2 cm, slender, pilose. **Sepals** oblong to narrowly ovate, (2.5–)3–4 × (1–)1.2–1.6 mm, margin membranous, base of lateral pair subsaccate; petals white, obovate, 7–9 × 2.5–4 mm, cuneate into a clawlike base to 2 mm, apex rounded or subemarginate; median filament pairs 4–5 mm, slightly dilated, not flattened; lateral pair 2.5–3.5 mm; anthers narrowly oblong, 1–1.5 mm; ovules 10–14 per ovary. **Fruit** and seeds not seen. Flowering May–Jul.

Habitat: moist grassy areas, boggy places by streams, alpine meadows.

Elevation: 3100–4700 m.

Distribution: China (Sichuan, Yunnan).

Cardamine rostrata Grisebach, Abh. Königl. Ges. Wiss. Göttingen 6: 115. 1854. TYPE: Chile, Cordillera de Ranco. *Lechler 841* (holotype, GOET, **not seen**, fragments, BAA!; isotypes, G!, K!, 3P!, W!).

Cardamine reniformis Philippi, Anal. Univ. Chile 27(2): 313. 1856; *C. rostrata* var. *reniformis* (Philippi) O. E. Schulz, Bot. Jahrb. Syst. 32: 434. 1903. TYPE: Chile, Valdivia: en el lugar llamado Hualleria, Oct 1864, *F. Philippi 55* (holotype, SGO-63900!; fragments, BAA!). **The type information was copied from Muñoz (1960) who listed also SGO-49343 as part of the type collection. I have not seen the latter sheet.**

Cardamine lechleriana Steudel, Flora 39: 409. 1856. TYPE: Chile, Corillera de Ranco, *Lechler 2249* (holotype, P!; isotypes,).

Cardamine rostrata var. *dichondroides* Spegazzini, Anal. Mus. Nac. Buenos Aires 7: 212. 1902. TYPE: Argentina, Dep. Languiñeo, Río Chubut, Dec 1900, *N. Illin s.n.* (holotype, LP #.....).

Herbs, perennial, glabrous throughout. **Rhizomes** not tuberous, rather slender, not scaly. **Stems** often 1 from rhizome, (8–)15–45(–60) cm, erect but subdecumbent at base, glabrous, simple or rarely branched above, remotely 3–7-leaved. **Basal leaves** not rosulate, they and lowermost cauline leaves simple or rarely with 1 or 2 pairs of lateral leaflets; petiole 2–7(–11) cm; leaf blade or terminal leaflet orbicular to cordate or reniform, (1–)1.5–3.5(–4) × 1.8–4(–5) cm, often wider than long, palmately veined, not fleshy, base often deeply cordate, 5–9-angled, the vein-ending angle terminating in a mucro, rarely margin repand; lateral leaflets (when present) on petiolules 1–3 mm, similar in shape and margin and considerably smaller than terminal leaflet, base usually oblique; middle and upper cauline leaves simple or rarely, 3–5-foliolate leaflets, smaller and narrower than lowermost leaves. **Racemes** ebracteate, corymbose, elongated considerably in fruit; rachis straight; fruiting pedicels (0.5–)0.8–1.7(–2) cm, ascending to divaricate, straight and often forming a straight line with fruit, glabrous. **Sepals** oblong, 2.5–4 × 1–1.5 mm, erect, caducous, glabrous; petals white, oblanceolate-obovate, (6–)7–10(–12) × 2.5–5 mm, apex obtuse; filaments 3.5–5 mm; anthers oblong, 0.7–1 mm; ovules 12–20 per

ovary. **Fruits** linear, (1.8–)2.5–4 cm × 1.2–1.7 mm, attenuate to apex; style slender (1.5–)2–5(–6) mm. **Seeds** brown, oblong to broadly ovate, 1.4–1.7 × 0.9–1.2 mm.

Flowering: Oct–Mar.

Habitat: Nothofagus woods, moist areas.

Elevation: 0–1600 m.

Distribution: Chile (Región VIII, IX, and X).

Specimens examined: **CHILE**. Cautin, Faldeos de Volcan Llaima, Muñoz 6415 (SGO), Volcan Llaima, Montaldo & Seeger 165 (SGO); Malleco, Dep. Curacautin, Cerros al N de Malalcahuello, Montaldo 386 (SGO). **VIII**: Dep. San Carlos, Camino de San Fabián de Alico a los Sauces, 4 km ade Los Sauces, [36°38'S, 71°24'W], Weldt 486 (CONC); Cordillera de Nahuelbuta, Bajo Pino Huacho, [37°43'S, 73°06'W], Marticorena, Quezada & Rodríguez 1719 (CONC); Reerva Forestal Pino Huacho, [37°42'S, 73°09'W], Marticorena, Quezada & Rodríguez 1600 (CONC); Parq Nac. Laguna del Laja, 37°25'S, 71°25'W, Godoy 341 (CONC). **IX**: Volcán Llaima, [38°43'S, 71°43'W], 30 Jan. 1942, Gunckel s.n. (CONC), Montero 4786, 4895 (CONC), Sparre 4887 (SGO), Garaventa 4520 (BACP, SI), Garaventa 4521 (BACP, CONC, SI); Dep. t. Victoria, Fundo San Elías, Sparre 3292 (SGO); rd to Laguna Malleco, Salto de la Culebra and Laguna Verde, Morrison & Wagenknecht 17531 (DS, UC); Camino de Curacautin a Lonquimay, km 46, [38°27'S, 71°26'W], Ricardi & Marticorena (CONC); Malalcahuello, [38°28'S, 71°35'W], Zöllner 7602 (CONC), Zöllner 8781 (MO); Camino de Termas de Manzanares a Lonquimay, km 26, [38°25'S, 71°25'W], Ricardi & Marticorena 5009/1393 (CONC); Orillas del Río Niblinto, [38°10'S, 71°45'W], Marticorena & Quezada 1531 (CONC); Paso de Lonquimay, [38°22'S, 71°34'W], Valle de Lonquimay, Montaldo 4546 (CONC); Zöllner 8142 (CONC, NA); Termas de Tolhuaca, [38°14'S, 71°44'W], Gunckel 16367 (CONC, US), Looser 2660 (BACP, SI); Curacautin, Cord. de Las Raices, [38°26'S, 71°29'W], Montero 10325 (CONC); Moleau Mocho, [39°56'S, 72°04'W], Montero 4994 (CONC); Cautín, Laguna Verde, Parq. Nac. Huerquehue, 39°08'S, 71°43'W, Godoy 414 (CONC). **X**: Dep. Unión, La Guallería, Sparre 3691 (S, SGO); Gualleria (as Hualleria), Philippi s.n. (B, SGO, W); Cumleufo (Trumao), [40°21'S, 73°10'W], Hollermayer 637 (CONC, SI); Lago Rinihue, [39°54'S, 72°10'W], Montero 5036 (CONC); Arededores de Osorno, [40°35'S, 73°08'W], Seki 82 (CONC); Chiloe, Piruquina, [42°24'S, 73°48'W], Junge 79 (CONC).

In the overall aspects of the plant, *Cardamine rostrata* resembles *C. tuberosa*, but it can be easily separated from that by the non-tuberous, slender rhizomes and often angled leaves. It also resembles *C. codata*, but differs in having non-fleshy leaves, angled instead or crenate leaves, and lax inflorescence conspicuously expanded in fruit.

Cardamine rotundifolia Michaux, Fl. Bor.-Amer. 2: 30. 1803; *Dentaria rotundifolia* (Michaux) Greene, Pittonia 3: 124. 1896. TYPE:

Herbs, perennial, glabrous throughout. **Rhizomes** slender, to 2 mm in diam; stolons absent. **Stems** (1–)1.5–3(–5) dm, most commonly procumbent, sometimes erect, simple or branched, not flexuous, glabrous. **Rhizomal leaves absent**, basal leaves not rosulate, soon withered; cauline leaves simple; petiole (0.3–)0.5–2.5(–4) cm; leaf blade of lower and middle ones oblong, ovate, suborbicular, or cordate, (0.5–)1–4.5(–5.5) × (0.5–)1–4(–5.4) cm, glabrous, base cordate, rounded, or truncate, margin, entire, repand, or sinuate; upper leaves gradually reduced in size and with shorter petioles. **Racemes** ebracteate; fruiting pedicels divaricate to ascending, (0.6–)1–

1.5(–2) cm. **Sepals** oblong, 2–3 × 1–1.7 mm, erect, base of lateral pair not saccate; petals white, broadly oblanceolate, spreading, 5–7(–8) × 2–3 mm, not clawed, apex rounded; filaments of median stamens 3.5–4.5 mm, lateral filaments 2.7–3.5 mm; anthers oblong, 0.8–1.2 mm. **Fruit** linear, 1–1.5(–2) cm × 0.8–1.1 mm; valves glabrous, torulose; style 1.5–2.5 mm; ovules and seeds 40–80 per fruit. **Seeds** brown, oblong to ovate, 0.9–1.1 × 0.5–0.6 mm, wingless.

Flowering: Apr–Jun.

Habitat: streambanks, swamps, low woodlands, wet rocky areas, seepage areas.

Elevation: 150–400.

Distribution: United States (Delaware, Georgia, Kentucky, Maryland, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia).

Cardamine rupicola (O. E. Schulz) C. L. Hitchcock, Univ. Wash. Publ. Biol. 17(2): 474. 1964;

C. californica Nuttall var. *rupicola* O. E. Schulz, Bot. Jahrb. Syst. 32: 388. 1903; *Dentaria rupicola* (O. E. Schulz) Rydberg, Fl. Rocky Mts. 348. 1917. TYPE:

Herbs, perennial, glabrous throughout. **Rhizomes** slender, cylindrical, 1–2 mm in diam.; stolons absent. **Stems** 0.6–2 dm, erect or decumbent at base, simple, glabrous. **Rhizomal leaves** palmately or subpalmately compound, 3–5(–7)-foliolate, 5.5–17(–22) cm, fleshy; petiole 4–14(–17) cm; terminal leaflet ovate to lanceolate or elliptic-oblong, 1–3 × 0.6–1.7 cm, with a petiolule 1–5 mm, glabrous, base cuneate or obtuse, margin entire, apex apiculate; lateral leaflets about as large as or smaller than terminal leaflet, subsessile, margin same as terminal leaflet; cauline leaves 2 or 3, 3–5-foliotate; petiole 0.7–4(–8) cm, base not auriculate; terminal lobe elliptic to oblong, or ovate, 1.2–3.5 × 0.4–2.5 cm, entire, petiolule 1–5 mm; lateral leaflets similar to terminal one but smaller, sessile. **Racemes** ebracteate; fruiting pedicels ascending to divaricate, 0.6–1.8 cm. **Sepals** oblong, 3–5 × 1.5–2 mm, erect, base of lateral pair saccate; petals white, obovate, 8–14 × 4–7 mm, short clawed, apex rounded or subemarginate; median filament pairs 4–5 mm, lateral pair 2.5–3.5 mm; anthers oblong, 1–1.2 mm. **Fruit** linear, 2–4 cm × 1.5–2.2 mm; valves glabrous; style 1–5 mm; ovules and seeds 10–14 per fruit. **Seeds** brown, oblong, 1.8–2.2 × 1.2–1.5 mm.

Flowering: Jul–Aug.

Habitat: limestone talus slopes, loose limy shale, moist banks.

Elevation: 2200–2700.

Distribution: United States (W Montana).

Cardamine scaposa Franchet, Pl. David. 1: 33. 1883. TYPE: China, Nei Mongol, Géhol, May–Jun 1865, A. J. P. David 1815 (holotype, P!; isotypes, LE!, P!).

Cardamine denudata O. E. Schulz, Bot. Jahrb. Syst. 36(Beibl. 82): 46. 1905. TYPE: China, Shaanxi. Sciu-ian-shan, Kanyhuo, 15 May 1899, G. Giraldi 5480 (holotype, B!).

Herbs, perennial, scapose, glabrous throughout. **Rhizomes** slender, with slender stolons. **Stems** (4–)8–18 cm, leafless, erect, simple. **Rhizomal leaves** simple; petiole (1–)2–9(–12) cm; leaf blade reniform or suborbicular, (0.3–)0.6–1.7(–2) × (0.5–)1–2.5(–3) cm, base cordate, margin repand-crenate or entire; cauline leaves absent. **Racemes** ebracteate, 2–7(–10)-flowered; fruiting pedicels erect or erect-ascending, 1–4 cm, proximal longest. **Sepals** ovate or oblong, 3–4 × 1.5–2.2 mm, margin membranous, lateral pair subsaccate; petals white, broadly obovate, (0.8–)0.9–1.3 cm × 5–7 mm, cuneate into a clawlike base to 2 mm, apex rounded or subemarginate; median filament pairs 4.5–8 mm, slightly dilated at base; lateral pair 2.5–4.5 mm; anthers narrowly oblong, 1.5–1.8 mm; ovules 8–14 per ovary. **Fruit** linear, 2–3.5 cm × 1.2–1.7 mm; valves glabrous, smooth; style 3–7.5 mm. **Seeds** brown, oblong, 2–3 × 1–1.5 mm, wingless.

Flowering: Apr–Jun.

Habitat: shrubby slopes, moist areas.

Elevation: 1400–2500 m.

Distribution: China (Hubei, Shaanxi, Shanxi, Sichuan).

Cardamine schinziana O. E. Schulz, Bot. Jahrb. Syst. 32: 503. 1903; *C. yezoensis* Maximowicz var. *schinziana* (O. E. Schulz) Ohwi, Fl. Jap. ed. 2, 1437. 1965. TYPE :

Cardamine nasturtiifolia H. Boissieu, Bull. Herb. Boiss. 7: 793. 1899; non Bertol. ex Steud., Nomencl. Bot. Ed. 2, 1: 281. 1840. TYPE: Japan, Forêt de Sarura, 1 Jul 1893, *Père Urbain Faurie* 10482 (holotype, P; isotype, MO!).

Cardamine nasturtiifolia H. Boissieu var. *lasiocarpa* H. Hara, Bot. Mag. (Tokyo) 49: 72. 1935.

Cardamine schinziana O. E. Schulz var. *lasiocarpa* (H. Hara) Koidzumi, Acta Phytotax. Geobot. 5: 121. 1936.

Herbs, perennial, glabrous. **Rhizomes** creeping, short, somewhat thickened. **Stems** 20–50 cm, erect to subdecumbent, branched above. **Lower leaves** and middle cauline 8–15, 4–15 cm; terminal leaflet obovate to orbicular, 1.5–2.5 cm, 1.3–2.1 cm wide, base truncate or obtuse, margin crenate, apex rounded to obtuse; lateral leaflets 2–5 on each side of rachis, elliptic-lanceolate to oblong, 0.4–1.8 cm, 0.3–1.3 cm wide, crenate or rarely entire; uppermost leaves with 2–6 lateral leaflets on each side of rachis; terminal leaflet narrowly lanceolate, oblanceolate, or suboblong, 0.8–3(–5) cm, 0.3–1.5 cm wide, base cuneate, margin entire or few toothed, apex acuminate to acute; lateral leaflets lanceolate to elliptic, 0.8–3 cm, 5–10(–15) mm wide, coarsely toothed or 1–4-shallowly lobed on each side. **Raceme** ebracteate; fruiting racemes 7–15 cm. Fruiting pedicels (1–)1.2–1.7(–2) cm, strongly patent. **Sepals** 2.5–3.5 mm, 1–1.5 mm wide; petals white, obovate, 6–9 mm, 3–4.5 mm wide; filaments of median staminal pairs 5–6 mm, those of lateral pair 3.5–4.5 mm; anthers 1–1.5 mm; ovules 16–20 per ovary. **Fruits** linear, (1.5–)2–3.5(–4) cm, 1.2–1.8 mm wide, glabrous or sparsely pubescent; style slender, (1–)1.5–3(–4) mm. **Seeds** light brown, oblong-ovate, 1.5–2.2 mm, 1–1.5 mm wide.

Flowering: Jun–Jul.

Habitat: wet places along streams, river banks.

Distribution: Japan (Hokkaido/Kurils), Russia (Far East).

Cardamine schulzii

Cardamine scutata Thunberg, Trans. Linn. Soc. London 2: 339. 1794; *C. flexuosa* Withering var. *scutata* (Thunberg) O. E. Schulz, Bot. Jahrb. Syst. 32: 477. 1903. TYPE:

Cardamine angulata W. J. Hooker var. *kamtschatica* Regel, Bull. Soc. Imp. Naturalistes Moscou 34: 172. 1861; *C. flexuosa* Withering var. *kamtschatica* (Regel) Matsumura, **publication** TYPE:

Cardamine autumnalis Koidzumi, Bot. Mag. (Tokyo) 43: 404. 1929. TYPE:

Cardamine baishanensis P. Y. Fu, Fl. Pl. Herb. China Bor.-Or. 4: 229. 1980. TYPE:

Cardamine dentipetala Matsumura, Bot. Mag. (Tokyo) 13: 51. 1899. TYPE:

Cardamine dentipetala var. *longifructus* (Ohwi) Hiyama, J. Jap. Bot. 38: 58. 1963. TYPE:

Cardamine drakeana H. Boissieu, Bull. Herb. Boiss. 7: 791. 1899. TYPE:

Cardamine hirsuta Linnaeus var. *latifolia* Maximowicz, Bull. Acad. Imp. Sci. Saint Pétersbourg 18: 279. 1873. *C. flexuosa* var. *latifolia* (Maximowicz) Makino, Shokubutsu-Dzukan 447.

1925; *C. scutata* var. *latifolia* (Maximowicz) H. Hara, J. Fac. Scil. Univ. Tokyo III, 6: 59. 1952. TYPE:

Cardamine regeliana Miquel, Ann. Mus. Bot. Lugduno-Batavi 2: 73. 1866. *C. flexuosa* Withering subsp. *regeliana* (Miquel) O. E. Schulz, Bot. Jahrb. Syst. 32: 476. 1903; *C. flexuosa* var. *regeliana* (Miquel) Matsumura, Bot. Mag. (Tokyo) 13: 73. 1899. *C. hirsuta* var. *regeliana* (Miquel) Maximowicz, Bull. Acad. Imp. Sci. Saint Pétersbourg 18: 279. 1873; *C. scutata* subsp. *regeliana* (Miquel) H. Hara, J. Fac. Sci. Univ. Tokyo, III, 6: 59. 1952; *C. sylvatica* Link var. *regeliana* (Miquel) Franchet & Savatier, Enum. Pl. Jap. 1: 35. 1875. TYPE:

Cardamine flexuosa Withering var. *manshurica* Komarov, Trudy Imp. St.-Peterburgsk. Bot. Sada 22: 269. 1903; *C. regeliana* Miquel var. *manshurica* (Komarov) Kitagawa, Lineam. Fl. Mansh. 228. 1939. TYPE:

Cardamine hirsuta Linnaeus var. *rotundiloba* Hayata, J. Coll. Sci. Univ. Tokyo 30: 31. 1911; *C. scutata* var. *rotundiloba* (Hayata) Liu & S. S. Ying, Fl. Taiwan 2: 686. 1976. TYPE:

Cardamine longifructus Ohwi, J. Jap. Bot. 33: 211. 1958. TYPE:

Cardamine scutata var. *longiloba* P. Y. Fu, Fl. Pl. Herb. China Bor.-Or. 4: 229. 1980. TYPE:

Cardamine taquetii H. Lévillé, Repert. Sp. Nov. Regni Veg. 8: 259. 1910. TYPE: Korea, Quelpaert, Hongno, Oct 1908, *Taquet* 563 (holotype, E!; isotype, K!).

Cardamine zhejiangensis T. Y. Cheo & R. C. Fang, Bull. Bot. Lab. North-East. Forest. Inst., Harbin 1980(6): 24. 1980. TYPE: China, Zhejiang, Xitianmu Shan, 4 May 1957, *Ho Hseyu* 20927 (holotype, HHBG; isotype, NAS!).

Cardamine zhejiangensis var. *huangshanensis* D. C. Zhang, Bull. Bot. Res., Harbin (11)1: 41. 1991. TYPE: China, Anhui: Huangshan, Tanglingguan, 900 m, 14 May 1989, *Shao Jianzhang* 89008 (holotype, ANU).

Herbs, annual or biennial, rarely short-lived perennial, glabrous or sparsely pilose. **Stems** (5–)15–50(–70) cm, erect, simple at base, simple or branched above, not flexuous. **Basal leaves** not rosulate, often withered by anthesis; petiole to 3.5 cm; leaf blade pinnatisect, with 1–4 lateral lobes on each side of midvein; terminal lobe subreniform, suborbicular, rhomboid-ovate, or broadly obovate, much larger than lateral ones, (1–)1.5–2.5 × 0.7–2 cm, repand, crenate, or 3–5-lobed; lateral lobes petiolulate or sessile, oblong, ovate, or suborbicular. Cauline leaves similar to basal ones; petiole to 3 cm, base not auriculate; lateral lobes 1–5 on each side of midvein, much smaller than terminal lobe; terminal lobe (0.7–)2–5(–6.5) × (0.5–)1.5–4(–5) cm, repand, crenate, or coarsely 3–5(–7)-lobed. Racemes ebracteate; rachis straight; fruiting pedicels divaricate or ascending, (0.3–)0.6–1.4(–1.8) cm, slender. **Sepals** oblong, 1.5–2.5(–3) × (0.7–)0.9–1.4 mm; petals white, spatulate, 2.5–4.5(–6) × (1–)1.5–2.5 mm; stamens 6; filaments 2–3.5 mm; anthers ovate, 0.3–0.6 mm; ovules 20–40 per ovary. **Fruit** linear, (0.9–)1.5–2.8(–3.5) cm × (0.8–)1–1.4 mm; valves glabrous or rarely sparsely puberulent or pilose, torulose; style (0.3–)0.6–1.5 mm. **Seeds** brown, oblong or subquadrate, 0.9–1.5 × 0.6–0.9 mm, narrowly margined or not. $2n = 32$.

Flowering: Apr–Jul.

Habitat: valleys, shady slopes, damp sites, along ditches, rock crevices, mountain slopes, roadsides, streamsides.

Elevation: 0–2100 m.

Distribution: China (Anhui, Guangdong, Guizhou, Jiangsu, Jilin, Sichuan, Taiwan, Zhejiang), Japan, Korea, Russia (Far East).

Cardamine seidlitziana

Cardamine seravschanica

Cardamine silana Marhold & Perný, *Willdenowia* 33: 69. 2003. TYPE:

Cardamine simplex Handel-Mazzetti, *Symb. Sin.* 7: 361. 1931. TYPE: China, Yunnan, above Ganhaidse, Lidjiang, 3200 m, 22 Jul 1914, *Handel-Mazzetti 4310* (holotype, WU!; isotypes, E!, GH!, NAS!, W!).

Cardamine truncatolobata W. T. Wang, *Acta Bot. Yunnan.* 9: 14. 1987. TYPE: China, Sichuan, Luding, Mons Gonggashan, Yanzigou, 3500–3800 m, 30 Jun 1982, *Lan Kaiyong, Li Liangqian & Fei Yong 341* (holotype, PE!; isotypes, KUN!, PE!).

Loxostemon axillus Y. C. Lan & T. Y. Cheo, *Bull. Bot. Res.*, Harbin 1(3): 52. 1981. TYPE: China, Sichuan, Tien-chuan-hsien, *Chu 2528* (holotype, HNWP; isotypes, E!, NAS!, W!).

Herbs perennial, glabrous throughout or sparsely pilose. **Rhizomes** slender, thickened at stem base, with 1 or few stolons. **Stems** (8–)13–35 cm, erect, slender, simple or 1- or 2-branched, flexuous. **Basal leaves** 1–3, 3- or 5(or 7)-foliolate; petiole (1.3–)2–6(–8) cm; terminal leaflet broadly obovate, 3–12 × 5–13 mm, with a petiolule 1–5(–8) mm, base subtruncate or rounded, margin entire or apically subtruncate or obtusely 3-lobed, ultimately mucronate; lateral leaflets 1 or 2(or 3) pairs, subsessile or petiolulate, somewhat similar to terminal leaflet but smaller. Cauline leaves (1 or)2–5(–7), 3- or 5-foliolate; petiole (0.8–)1.2–3 cm, not auriculate at base; terminal leaflet of uppermost leaves filiform, linear, or rarely narrowly oblanceolate, 0.5–2 cm × (0.3–)1–2 mm, attenuate at base, margin entire, apex acute. **Racemes** ebracteate, lax, (2–)5–14(–16)-flowered, rachis often flexuous; fruiting pedicels erect or ascending, (0.8–)1–2.5(–3) cm, straight, glabrous, proximal ones often much longer than distal. **Sepals** ovate or oblong, 2.5–3.5 × 1.3–1.8 mm, glabrous, lateral pair subsaccate; petals white, obovate, (6.5–)7–9 × 3.5–5 mm, not clawed, apex rounded; median filament pairs 4–5 mm, slender; lateral pair 3–3.5 mm; anthers oblong, 0.8–1.1 mm; ovules 8–14 per ovary. **Fruit** linear, (1–)1.5–2.5(–2.8) cm × 1–1.2 mm; valves glabrous, smooth; style (1–)1.5–3(–4) mm. **Seeds** brown, oblong, 1.2–1.6 × 0.8–1.2 mm, wingless.

Flowering: May–Jul.

Habitat: meadows, damp turf, marshy areas, stream or ditch sides.

Elevation: 2500–3800 m.

Distribution: China (Sichuan, Yunnan).

Cardamine speciosa Britton, *Bull. Torrey Bot. Club* 16: 16. 1889; *C. jamesonii* Hooker var. *speciosa* (Britton) O. E. Schulz, *Bot. Jahrb. Syst.* 32: 422. 1903. TYPE: Bolivia, La Paz, Undavi, 1885, 10,000 ft, *H. H. Rusby 1199* (holotype, NY!; isotype, NY!).

Herbs, perennial, with fleshy, elongated, non-scaly rhizomes. **Stems** 5–45 cm, erect or decumbent only at base, simple or branched above, often glabrous. **Rhizomal leaves** and lowermost cauline compound, pinnate, 2–15 cm; petiole 1–8 cm; lateral leaflets 2 or 3 pairs, sessile or nearly so, broadly to narrowly obovate, 0.6–25 × 0.4–1.7 cm, sparsely to pubescent or ciliate with trichomes 0.2–0.5 mm, base oblique or rarely cuneate, margin entire or obscurely 1-toothed, apex obtuse, distinctly mucronate; terminal leaflet same size or slightly larger than lateral ones, short petiolulate, obovate, entire or few toothed; cauline leaves 2–4, much smaller than those of basal leaves; leaflets oblong to oblong-linear, much different in size and shape than basal ones, entire, mucronate. **Racemes** ebracteate, many flowered, dense corymbose, slightly

elongated in fruit; rachis straight; fruiting pedicels 1–2.5 cm, stout, ascending, straight. **Sepals** purple, oblong, 3–4.5 × 2–2.5 mm, caducous, glabrous; petals purple, broadly obovate, 0.9–1.2 cm × 4–6 mm, apex obtuse or rounded; filaments 5–7 mm; anthers oblong, 1.2–1.5 mm; **ovules** ...–... per ovary. **Fruits** linear, 4–5 cm × ...–... mm, glabrous; **style**–5 mm. **Seeds** brown, oblong, ...–... × ...–... mm.

Flowering:.

Habitat: Wet mossy areas.

Elevation: 3000–3300 m.

Distribution: Bolivia (La Paz/Undavi).

Specimens examined: **BOLIVIA. La Paz:** Undavi, North Yungas, 3300 m, Nov. 1910, Buchtein 126 (E, F, G, GH, NY); Buchtien 585 (NY).

Schulz (1903) reduced *Cardamine speciosa* to a variety of *C. jamesonii*, but the two are quite different morphologically and disjunct geographically. The latter is distributed in Ecuador, Venezuela and Colombia, whereas *C. speciosa* is endemic to Bolivia, and the two taxa are separated by more than 2000 air kilometers. *Cardamine speciosa* can easily be separated from *C. jamesonii* by having ebracteate (vs. bracteate) racemes, entire or repand (vs. crenate, incised-crenate, or serrate leaflets), 2–4 (vs. 5–10) cauline leaves excluding bracts, petiolulate (vs. sessile) lateral leaflets, and leaflets of cauline leaves drastically narrower and smaller (vs. about the same shape and size) as the lowermost leaves.

Cardamine spenophylla

Cardamine stellata J. D. Hooker, *Fl. Antarct.*

Cardamine stenoloba Hemsley, *J. Linn. Soc., Bot.* 29: 303. 1892; *Loxostemon stenolobus* (Hemsley) Y. C. Lan & T. Y. Cheo, *Bull. Bot. Res., Harbin* 1(3): 56. 1981. TYPE China, W Sichuan, near Tachienlu [Kangding], *A. E. Pratt* 352 (lectotype designated by Cheo et al. (2001:...): K!).

Cardamine pratensis Linnaeus subsp. *chinensis* O. E. Schulz,

Herbs, perennial, slender, glabrous except for leaves. **Rhizomes** slender, stoloniferous. **Stems** 5–25 cm, simple, branched above, flexuous. **Basal leaves** not rosulate, often withered by anthesis; petiole 1–1.5 cm; terminal leaflet orbicular, 2–4 mm in diam., with a petiolule 1–4 mm, sparsely pilose, base rounded, margin entire or obscurely lobed; lateral lobes similar to terminal one. Middle and upper cauline leaves pinnatisect, margin scabrous with trichomes to 0.1 mm; petiole 3–8 mm, not auriculate at base; terminal lobe filiform, 1–2.5 cm × 0.4–0.7 mm, base attenuate and decurrent with adjacent lateral lobes, margin entire, apex acute, not mucronate; lateral lobes 1–3 pairs, sessile, decurrent, similar to terminal lobe but smaller. **Racemes** ebracteate; 2–8-flowered, rachis strongly flexuous; pedicels of young fruit divaricate, 8–14 mm, slender, soon recurved, glabrous. **Sepals** ovate, 1.5–2 × 0.8–1 mm, glabrous, membranous at margin and apex; petals white, obovate or broadly spatulate, 5–6 × 2.5–3 mm; median filament pairs 2.5–3 mm, filiform; lateral pair 1.5–2 mm; anthers oblong, 0.5–0.6 mm; ovules 8–12 per ovary. **Fruit** linear, 1.5–2.2 cm × ca. 1 mm; valves glabrous; style 1–1.5 mm. **Seeds** pale brown, oblong, ca. 1.8 × 0.8 mm, wingless.

Distribution: China (Shaanxi, Sichuan).

Cardamine subcarnosa (J. D. Hooker) Allan, Fl. New Zeal. 1: 184. 1961; *C. hirsuta* Linnaeus var. *subcarnosa* J. D. Hooker, Fl. Antarct. 1: 5. 1844; *C. glacialis* (G. Forster) de Candolle var. *subcarnosa* (J. D. Hooker) O. E. Schulz, Bot. Jahrb. Syst. 32: 542. 1903. TYPE: New Zealand, Campbell Islands, Antarctic Expedition 1839–1843, *J. D. Hooker s.n.* (lectotype designated by Heenan 2008: 564), BM!).

Herbs, perennial, caespitose. **Stems** erect to 30 cm. **Basal leaves** rosulate, pinnately compound, 5–7-foliolate, to 10(–14) cm; petiole 2–4(6) cm, ciliate; leaflets rarely overlapping towards leaf apex, entire to shallowly toothed, petiolule to 10 mm or rarely absent; terminal leaflet 5–25 × 5–20 mm, orbicular to broadly elliptic; lateral leaflets 3–2.2 × 2.5–12 mm, elliptic to obovate; cauline leaves similar to basal but progressively smaller upwards. **Racemes** bracteate throughout or basally, elongated in fruit; fruiting pedicels 2–12 mm, ascending to spreading. **Sepals** 1.3–2.4 mm, oblong, glabrous; petals white or pink to purple, 2.2–4.7 × 0.6–1.3 mm, obovate, apex obtuse to rounded; stamens 6, filaments 1.5–2.5 mm; anthers 0.3–0.4 mm; ovules – per ovary. Fruits 9–20 × 0.9–1.3 mm, ascending to spreading; style 1–1.4 mm. **Seeds** 0.8–1.4 mm, 0.8–1.4 × 0.5–0.9 mm.

Flowering: Nov–Dec.

Habitat: damp places on scree, rock crevices, grassland, peat, fellfields and rushlands in tundra zone.

Distribution: New Zealand (Campbell Island).

Cardamine tanakae Franchet & Savatier ex Maximowicz, Bull. Acad. Imp. Sci. Saint Pétersbourg 18: 280. 1873. TYPE:

Cardamine chelidonioides S. Moore, J. Bot. 16: 130. 1878.

Nasturtium tenue Miquel, Ann. Mus. Bot. Lugduno-Batavi 2: 71. 1866; *Cardamine tenuis* (Miquel) Koidzumi, Fl. Symb. Orient.-Asiat. 13. 1930. TYPE:

Herbs, biennial herbs, subglabrous or pubescent. **Stems** 6–25 cm, erect, often branched. **Cauline leaves** (lower) 1–6 cm, simple or with 1–3 lateral leaflets on each side of rachis; blade or terminal leaflet elliptic to orbicular or subreniform, 0.7–3 cm, 0.5–4 cm wide, base obtuse to subcordate, margin crenate, apex rounded; lateral leaflets ovate to suborbicular, 0.5–2 cm, 0.3–1.5 cm wide, base obtuse to subtruncate, margin crenate, apex rounded to obtuse; upper cauline leaves 2–14 cm, with 1–3 lateral lobes on each side of rachis, rarely simple; petiole auriculate at base; terminal leaflet lanceolate, ovate to orbicular, 0.6–4.2 cm, 0.3–3 cm wide, base cuneate to obtuse, margin crenate, apex rounded; lateral leaflets elliptic, oblong, or ovate, 0.5–2.2 cm, 0.3–1.6 cm wide, base cuneate to obtuse, margin crenate or rarely entire. **Racemes** ebracteate, 0.5–3.5 cm, densely pubescent or rarely subglabrous; fruiting pedicels 5–10(–12) mm. **Sepals** 2.5–3 mm, 1–1.5 mm wide; petals white (4–)5–6 mm, 2.5–3 mm wide; filaments 2.5–4 mm. **Fruits** linear, 1.5–2.7(–3.5) cm, 1–1.5 mm wide, often densely pubescent; style 1–2 mm. **Seeds** 1.2–1.5 mm.

Flowering: Apr–May.

Habitat: forests.

Elevation: to 1200 m.

Distribution: Japan (Honshu, Hyushu, Shikoku).

Cardamine tangutorum O. E. Schulz, Bot. Jahrb. Syst. 32: 360. 1903.

Herbs, perennial. **Rhizomes** creeping, sparsely scaly, not stoloniferous. **Stems** (8–)15–30(–40) cm simple, erect, strongly curved at base, glabrous throughout or sparsely pilose distally.

Rhizomal leaves 7–16(–22) cm; petiole 3.5–8(–12) cm; terminal leaflet oblong, oblong-lanceolate, or elliptic, (2–)3–5(–6) × 0.7–1.2(–2) cm, sessile, base cuneate, margin serrate and ciliolate, apex acute to subobtuse; lateral leaflets 3–5(or 6) pairs, not decurrent at base; Cauline

leaves 1–3(–5), (3–)5–10(–13) cm, subleathery; petiole (0.5–)1–2.5(–4) cm, not auriculate at base; terminal leaflet oblong, 2–4 cm × 3–10(–15) mm, subsessile, glabrous or rarely sparsely pilose, base cuneate, margin ciliolate and serrate, rarely subentire or double serrate, apex acute or acuminate; lateral leaflets 2–4 pairs, similar to terminal but slightly smaller, not decurrent at base. **Racemes** ebracteate, 10–15-flowered; fruiting pedicels ascending or divaricate, (0.7–)1–1.5 cm, straight, slender. **Sepals** oblong, 4–5 × (1–)1.5–2 mm, base of lateral pair saccate; petals purple, spatulate, 0.8–1.4 cm × (2–)3–5 mm, base not clawed, apex rounded; median filament pairs 6–8 mm, lateral pair 5–6 mm; anthers oblong, 1.2–2 mm; ovules 10–14 per ovary. **Fruit** linear, 3.5–4.5 cm × 2–3 mm; gynophore to 2.5 mm; valves smooth, glabrous; style 2–4 mm. **Seeds** brown, ovate or suborbicular, 2–2.8 × 1.5–1.8 mm. $2n = 42$.

Flowering: May–Jul.

Habitat: montane ditches, swampy meadows, river basins, woodlands.

Elevation: 1300–4400 m.

Distribution: China (Gansu, Hebei, Qinghai, Shaanxi, Shanxi, Sichuan, Xizang, Yunnan).

Cardamine tenera

Cardamine tenuifolia W. J. Hooker, J. Bot. London 1: 247. 1834. TYPE: Australia, Tasmania, marshes at Formosa, *R. W. Lawrence* 237 (holotype, K!).

Herbs, perennial. **Rhizomes** or stolons present, not fleshy. **Stems** weak, to 1 m. **Basal leaves** soon withered; cauline leaves pinnately compound, with 1–5 pairs of lateral leaflets, petiolate, not auriculate at base; terminal leaflet orbicular to ovate; lateral leaflets ovate to linear of filiform, reduced in size upwards. **Racemes** ebracteate; fruiting pedicels horizontal to spreading, 1–3 cm. **Sepals** oblong, 2–5 mm; petals white to lilac, 5–12 mm; stamens 6. **Fruits** linear, 1.5–4 cm × 1–1.5 mm, erect to spreading, rarely overtopping raceme; style 1.5–3 mm. **Seeds** ovoid to oblong, 1–2 mm, flattened, with or without a narrow wing.

Flowering: Dec–Jan.

Habitat: swamps, marshy areas.

Distribution: Australia (New South Wales, SE South Australia, Tasmania, Victoria).

Cardamine tenuirostris W. J. Hooker & Arnott, Bot. Beechey's Voy. 6. 1830. TYPE: Chile, Concepcion, collector? (holotype, K).

Cardamine affinis W. J. Hooker & Arnott, Bot. Miscell. 3: 137. 1833; *C. tenuirostris* subsp. *affinis* (Hooker & Arnott) O. E. Schulz, Bot. Jahrb. Syst. 32: 494. 1903. TYPE: Chile, Valparaiso, *Bridges s.n.* (holotype, E!).

Cardamine pentaphylla Philippi, Linnaea 33: 6. 1864, non *C. pentaphylla* W. T. Aiton, Hort. Kew. ed. II, 4: 101. 1812. TYPE: Chile, Valdivia, Lago Ranco, Jan 1860, *Philippi s.n.* (holotype, SGO-49337!).

Cardamine flavescens Philippi, Anales Univ. Chile 41: 667. 1872. TYPE: Chile, mas arriba de San Fernando, Sep 1864, *F. Philippi* 63 (lectotype, here designated, SGO-63909!, fragments, BAA!; isotype, B!).

Nasturtium stenophyllum F. Philippi, Anales Univ. Chile 81: 177. 1893, non *N. stenophyllum* Nyman, Consp. Fl. Eur. Suppl. 2, 1: 23. 1889. TYPE: Chile, Valdivia, Futaco, Oct 1865, *F. Philippi* 70 (holotype, SGO-45111!; isotype, B!).

Cardamine tenuirostris subsp. *reicheana* O. E. Schulz, Bot. Jahrb. Syst. 32: 495. 1903. TYPE: Chile, Ñuble, Oct 1878, *Puge s.n.* (lectotype, here designated, SGO-63911!).

Herbs, perennial. **Rhizomes** slender and sometimes swollen at nodes, not scaly, stem base not tuberous. **Stems** (10–)20–55(–75) cm, usually solitary, erect or decumbent, simple or branched above, glabrous or rarely pubescent above; lowermost nodes often with adventitious roots. **Basal leaves** and lowermost cauline compound, 3–9(–12) cm, with 5–17 leaflets; petiole 2–4(–7) cm; lateral leaflets oblong-linear, linear-lanceolate, linear or filiform, 0.8–2.5 cm × (2–)4–10(–20) mm, sessile or short petiolulate, entire or shallowly to coarsely dentate, apex acute to obtuse; upper cauline leaves with 5–15 leaflets, short petiolate to sessile; lateral leaflets linear to filiform, rarely narrowly oblanceolate, 0.7–3 cm × 0.2–4 mm, sessile, entire or 1–3-toothed, apex acute to acuminate. **Racemes** ebracteate; rachis straight; fruiting pedicels (0.5–)0.7–2(–3) cm, divaricate to ascending, slender, straight. **Sepals** oblong, (3.2–)3.5–4.5 × 1–1.5 mm; petals white, obovate to oblanceolate, (7–)8–10(–12) × 2–5(–6) mm, apex obtuse to emarginate, gradually narrowed to base; filaments 4–6 mm; anthers oblong, 1–1.5 mm; ovules (16–)20–32 per ovary. **Fruits** linear, (1.8–)2–4.5(–5) cm × 1.2–2 mm, attenuate to style; style slender, (2–)2.5–5(–5.5) mm. **Seeds** brown, ovate, 1–1.8 × 0.8–1.2 mm.

Flowering Oct–Jan.

Habitat: pools, wetlands.

Elevation: 0–1700 m.

Distribution: Argentina (Neuquén, Río Negro), Chile (Región V, VI, VII, VIII, IX, X).

Specimens examined: **ARGENTINA. Chubut:** Dep. Futaleufú, betw. Trevelin and Corcovado, *Soriano 2954* (BAA). **Neuquén:** Arroyo Catan-lil, arriba del Fortin, *Kurz 6338* (CORD). Dep. Minas, Dep. Alumine, Lago Norguenco, *Rossow et al. 1243* (BAB, BACP); Lago Quillén, *Rossow et al. 1386* (BAB); lags. Epu-Lauquen, *Boelcke et al. 10981* (BAA). Dep. Aluminé, lago Quillén, *Balla 3156* (BAA). Dep. Lácar, Parq. Nac. Lanín, *Dawson 1355* (BAB). Dep. Los Lagos, Ea. Fortín Chacabuco, *Boelcke & Correa 11738* (BAB). **Río Negro.** Dep. Bariloche, Parque Nac. Nahuel Huapi, Arroyo del Jucidio, *De Barba 707* (LIL); Bariloche, *Meyer 9231* (LIL). **CHILE. V.** Valparaiso, *Bridges s.n.* (E). **VI.** Colchagua, *Philippi s.n.* (G, W), *Bridges s.n.* (K); San Fernando, *Philippi s.n.* (G, W). **VII.** Talca, *Claude-Joseph 4338* (US); Linares, 2 km N camine entre Quirihue y Cauquenes, *Rodríguez 549* (CONC). **VIII.** Concepción, San Pedro, [36°50'S, 73°6'W], *Sparre 10003* (CONC); Concepción, Talcahuano, *Poeppig 627* (G, W); Lonquimay, [38°39'S, 70°54'W], 10 Jan. 1947, *Pfister s.n.* (CONC); Atacalco, [36°53'S, 71°38'W], 30 Nov. 1944, *Pfister s.n.* (CONC); Candelaria, Los Setenta, [37°22'S, 72°29'W], 2 Nov. 1935, *Junge s.n.* (CONC); Cordillera de Chillan, 1956–1957, *Germain s.n.* (G, W). **Bíobío:** Termas Los Pemehues-Mulchén, [38°3'S, 71°43'W], 12 Jan 2949, *Pinto s.n.* (CONC); 15 km N Cabrero, 37°0'S, 72°21'W, *Keeley et al. 25854* (CONC). **IX.** Temuco, *Gunckel 16549* (US), *Claude-Joseph 1007* (US); Cunco, *Calude-Joseph 5518* (CONC); Malleco, Termas de Tolhuaca, [38°14'S, 71°44'W], *Zöllner 10303* (MO, US); same area, 12 Dec. 1956, *Pfister s.n.* (CONC); between Curacautin and Cherquenco, *Smith & Sparre 113HE* (CONC, US); Saboya, *Montero 5346* (BACP, CONC, SI); Meninco [37°47'S, 72°28'W], *Montero 5257* (BACP, CONC); Pichi-Malleco, *Neger s.n.* (CONC). **X.** Futa, *Lechler 299* (G, K, P); Panguipulli, *Claude-Joseph 2369* (US), *Montero 4627* (SI), *Montero 6168* (CONC); Osorno, Pucatrihue, [40°32'S, 73°41'W], *Sparre & Smith 288* (CONC); Corral, Isla Manceras, [39°52'S, 73°23'W], 20 Sept. 1932, *Junge s.n.* (CONC); Dep. Ancud., Puntra, *Sparre 4159* (SGO); Lago Ranco, *Montero 3985* (SI).

A highly variable species in leaflet morphology, fruit and style length, and shape and size of petals. However, none of the taxa treated above as synonyms merit recognition. The

characteristic attenuate fruits and long styles easily distinguish the species from the other South American *Cardamine* with ebracteate racemes and stems rooting from lowermost nodes.

Except for the collection cited above, I have not yet seen any other material of the species from Argentina. Those cited by Boelcke & Romanczuk (1984) or annotated by Boelcke in BAA all represent a mixture of *Cardamine variabilis*, a few *C. vulgaris*, and still fewer *C. bonariensis*. For example, Boelcke et al. 14361 is *C. bonariensis*, Mallo et al. and Correa et al. 7707 are *C. vulgaris*, and Boelcke 8994, Boelcke & Correa 11738, Boelcke et al. 13717, and Soriano 2472 are *C. variabilis*. In one collection from Chila, Boelcke 8966 (BAA), most plants have broad leaflets of basal leaves and tuberous base, but others have narrow leaflets and nontuberous base. I suspect that *C. vulagris* and *C. tenuirostris* are hybridizing, but that needs to be confirmed too. It is likely that the three species integrate. Many plants have the leaflet form of *C. variabilis*, but for the number and width of leaflets, they clearly belong to the other two species. Furthermore, *C. vulgaris* has tuberous stem base, while *C. variabilis* does not, and one finds rhizomes only slightly and irregularly swollen. However, these morphological intermediates need to be tested experimentally and molecularly to see if indeed they represent hybrid derivatives.

Cardamine tianqingiae Al-Shehbaz & Boufford, Harvard Pap. Bot. 13: 89. 2008. TYPE: China, Gansu, Wen Xian: Motianling Shan, Baishui Jiang Nature Reserve, vicinity of town of Fanba, upstream from Muxüba, 32°41'59"N, 104°53'51"E, 1130–1250 m, remnant mixed deciduous forest, gravelly river margin, 10 May 2007, David E. Boufford, Qing Tian, Z. Y. Zhang & Y. Jia 37546 (Holotype: PE; Isotypes: A, GAUF, MO).

Herbs, perennial, sparsely pilose on lowermost leaves. **Rhizomes** thin, 0.5–1 mm wide. **Stems** 10–20 cm ascending, branched above, glabrous, flexuous. **Rhizomal leaves** not rosulate, pinnately compound, 5–7-foliolate; petiole 3–6 mm, ciliate, pilose adaxially; terminal leaflet 5-lobed or toothed, suborbicular to broadly ovate in outline, 3–7 × 3–10 mm, distinctly larger than lateral leaflets, ciliate, petiolule 3–6 mm; lateral leaflets ovate to subdeltoid, 1–4 × 0.5–3 mm, entire or obscurely 1- or 2-toothed, ciliate, petiolule 0.1–1 mm; lowermost cauline leaves 5–11-foliolate, adaxially sparsely pilose along rachis or glabrous, terminal lobe entire or subapically 3-toothed; uppermost cauline leaves 5–7-foliolate; leaflets linear to filiform, 1.5–3.3 cm × 0.5–1 mm, sessile, entire, glabrous, petiole 0.5–1 cm, not auriculate at base. **Racemes** ebracteate, 5–10-flowered; rachis flexuous; flowering pedicels slightly recurved after anthesis; fruiting pedicels divaricate-ascending, 0.7–1.4 cm, slender, straight, glabrous, not appressed to rachis. **Sepals** ovate, 1.5–2 mm, glabrous, subapically membranous, not saccate; petals white, fading pale lavender, obovate, 4–5 × 2–2.2 mm, flaring, apex obtuse; stamens exserted; median filament pairs 3–4 mm, not flattened; lateral pair 2–2.5 mm; anthers oblong, 0.5–0.6 mm. Fruit 1.3–2 cm × ca. 0.8 mm, ascending; valves glabrous; style 2–3 mm long. **Seeds** not seen. Flowering: May.

Habitat: gravelly river margin, remnant of mixed deciduous forests.

Elevation: 1130–1250 m.

Distribution: China (Gansu).

Notes: known only from the type gathering.

Cardamine trichocarpa A. Richard, Tent. Fl. Abyss. 1: 18. 1847. TYPE: Ethiopia, Begemdir, *Schimper II.1352* (lectotype here designated, P!; isolectotypes, K!, S!, Z).

Cardamine trichocarpa var. *elegans* Engler, Hochgebirgsfl. Trop. Afr. 225. 1892; *C. trichocarpa* subsp. *elegans* (Engler) O. E. Schulz, Bot. Jahrb. Syst. 32: 463. 1903. TYPE: Ethiopia, Begemdir/Tigre, Debra-Tabor, *Schimper 1162* (holotype, B!; isotypes, BM!, K!, Z).

Cardamine trichocarpa var. *usambarensis* Engler, Deutsch-Ostafrika V. Pars C: 183. 1892.

TYPE: not designated.

Cardamine talamontiana Chiov., Ann. Bot. Roma 9: 51. 1911. TYPE: Ethiopia, Semien, Debarek, *Chioventa* 884 (holotype, FI).

Cardamine hirsuta Linnaeus var. *subumbellata* Dalzell, Hooker's J. Bot. Kew Gard. Misc. 4: 294. 1852; *C. subumbellata* (Dalzell) J. D. Hooker & T. Anderson, Fl. Brit. India 1: 138. 1872. TYPE: Belyariss (spelling???) hills, south. (type, E!).

Herbs, annual, subglabrous or substrigose. **Stems** 5–50 cm, erect, simple or branched from base. Leaves (all) compound, 1–15 cm, not auriculate at base; lateral leaflets (1 or) 2–5 pairs, oblong to oblong-ovate, 0.5–4.8 cm, 0.4–1.5 cm wide, subsessile or on petiolules to 5.4 mm, base cuneate or slightly oblique, margin crenate to serrate, apex obtuse to subacute; terminal leaflet similar to and often larger than lateral ones, on a petiolule 3–12 mm. **Racemes** ebracteate, elongated or not in fruit; fruiting pedicels ascending to suberect, 1.4–7 mm. **Sepals** oblong 0.7–2 mm, sparsely pubescent; petals absent or rudimentary and shorter than sepals; stamens 4, all median, shorter than sepals; anthers ovate, ca. 0.5 mm; ovules 8–12. **Fruits** linear, 0.8–2.6 cm, 0.5–1.7 mm wide, erect to ascending, often subumbellate and overtopping flowers; valves sparsely pubescent or rarely glabrous, attenuate to apex; styles 0.5–1.3 mm. **Seeds** reddish brown, broadly oblong, 1.2–1.5 mm, 0.8–1 mm wide.

Habitat: roadsides, clearings, open slightly moist ground.

Elevation: 900–3000 m.

Distribution: Angola, Burundi, Ethiopia, India, Kenya, Sri Lanka, Tanzania, Uganda, Zaire.

Cardamine trifida (Lamarck ex Poiret) B. M. G. Jones, Feddes Repert. Spec. Nov. Regni Veg.

69: 57. 1964; *Dentaria trifida* Lamarck ex Poiret, Encycl. Méthod. Bot. Suppl. 2: 465. 1811;

Sphaerotorrhiza trifida (Lam. ex Poiret) Khokhrjakov, Fl. Magadan Reg. 235. 1985. TYPE:

Cardamine schulziana Baehni, Candollea 7: 281. 1937. TYPE:

Dentaria tenuifolia Ledeb., Mém. Acad. Imp. Sci. Saint Pétersbourg 5: 547. 1815; *Cardamine tenuifolia* (Ledeb.) Turczaninow, Bull. Soc. Imp. Naturalistes Moscou 15: 238. 1842; not W.

J. Hooker, J. Bot. 1: 247. 1834. TYPE:

Dentaria alaunica Golitsin, Del. Sem. Hort. Bot. Univ. Voroneg. 8: 48. 1947. TYPE:

Herbs, perennial. **Rhizomes** short, with many, slender petioles 0.5–10 cm that terminate into tubers; tubers fleshy, whitish, representing modified leaf blades, globose, ovoid, or subreniform, to 7 mm, sometimes slightly flattened and 3–7-toothed. **Stems** (7–)12–30 cm erect, simple, glabrous. Rhizomal leaves ternate, biternate, or palmately 5-foliolate; petiole 3–15 cm; terminal leaflet lanceolate, broadly ovate, or suborbicular in outline, to 2 × 1.3 cm, with a petiolule to 6 mm, base cuneate, margin crenate or dissected into 3 sublanceolate or ovate lobes, base cuneate or subcordate; cauline leaves 1–3, sometimes 2 and subopposite, often restricted to distal 1/3 of stem, minutely scabrid at least along margin with trichomes to 0.1 mm, rarely also pilose with trichomes to 0.4 mm; petiole 0.4–2 cm; terminal leaflet linear or narrowly lanceolate, 0.5–5 cm × 1–6 mm, base cuneate or attenuate, margin entire or 3-toothed or -lobed, apex acute and mucronate; lateral leaflets 1 or 2 pairs, similar to terminal one or entire. **Racemes** 5–20-flowered; fruiting pedicels ascending, 0.7–1.3 cm. **Sepals** oblong, 3.5–5 × 1.5–2 mm, glabrous; petals purple or pink, rarely white, obovate or spatulate, 8–11(–14) × 3.5–5 mm, apex rounded; median filament pairs 4–6 mm, slender; lateral pair 3.5–4.5 mm; anthers narrowly oblong 1.1–1.5 mm;

ovules 10–16 per ovary. **Fruit** linear, 2–3.5 cm × 1.2–1.6 mm; valves glabrous; style 1.5–4 mm. **Seeds** brown, oblong, 1–1.3 × 0.8–1 mm. $2n = 32, 48$.

Flowering: May–Jun.

Habitat: moist meadows or slopes, shady places, forests, among shrubs.

Distribution: China (Heilongjiang, Jilin, Nei Mongol), Japan, Kazakhstan, Korea, Mongolia, Russia (Far East, Siberia).

Cardamine trifolia Linnaeus, Sp. Pl. 2: 654. 1753. TYPE: Herb. Linn. 835.7 (lectotype designated by Marhold (1996: 127), LINN).

Cardamine trifoliolata J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 5: 145. 1861. TYPE: Bhutan, *Griffith 1757* (holotype, K; isotype, BM!).

Cardamine flexuosoides W. T. Wang, Acta Bot. Yunnan. 9: 14. 1977. TYPE: China, Sichuan, Baoxing, Dengchigou, 3300 m, 26 Jun 1933. *T. H. Tu 4291* (wrongly as 21010)(holotype, PE!).

Cardamine flexuosoides W. T. Wang var. *glabricaulis* W. T. Wang, Acta Bot. Yunnan. 9: 13. 1987. TYPE: China, Sichuan, Wenchuan, 2500, 28 May 1930, *Wang Fatsuan 21010* (holotype, PE!; isotype, KUN!). Same as below.

Loxostemon smithii O. E. Schulz var. *wenchuanensis* Y. C. Lan & T. Y. Cheo, Bull. Bot. Res., Harbin 1(3): 55. 1981. TYPE: China, Sichuan, Wenchuan, 2500, 28 May 1930, *Wang Fatsuan 21010* (holotype, KUN!; isotype, PE!).

Herbs, perennial, often sparsely pilose at least basally. **Rhizomes** slender, thickened at stem base, with 1 or few stolons. **Stems** (4–)6–18(–25) cm, erect or decumbent, slender, simple or few branched. **Basal leaves** 1–3, 3- or 5(or 7)-foliolate, rarely simple; petiole 1–4(–5.5) cm; terminal leaflet broadly obovate or rarely ovate, 2–12 × 3–14 mm, with a petiolule 1–6(–8) mm, base subtruncate to cordate or rounded, margin entire and obscurely 5-lobed or -crenate, apically subtruncate or obtusely 3-lobed; lateral leaflets 1(–3) pairs, subsessile or petiolulate, resembling terminal leaflet, or not lobed and oblong or ovate, smaller; cauline leaves 1 or 2(or 3), 3(or 5)-foliolate; petiole 0.5–1.5 cm, not auriculate at base; terminal leaflet similar to that of basal leaf, with a petiolule 0.5–3 mm; lateral leaflets similar to those of basal leaves. **Racemes** ebracteate, lax, 2–8-flowered, rachis straight; fruiting pedicels ascending to divaricate, 0.5–1.5(–2) cm, straight, glabrous. **Sepals** ovate to oblong, 2–3 × 1–1.4 mm, glabrous, lateral pair subsaccate; petals white, obovate to spatulate, 5–8 × 2.5–4 mm, not clawed, apex rounded; median filament pairs 3–4.5 mm, slender; lateral pair 2–3 mm; anthers oblong, 0.8–1 mm; ovules 8–12 per ovary. **Fruits** (young) glabrous. **Seeds** not seen.

Flowering: May–Jul.

Habitat: moist rocky crevices, meadows, moist forests, mossy banks, rocky areas.

Elevation: 2500–4300 m.

Distribution: Bhutan, China (Sichuan, Yunnan), India (Sikkim), Nepal.

Cardamine tryssa I. Thompson, Muelleria 18: 27. 2003. TYPE: Australia, Victoria, SW corner of major bridge on Princes Hwy crossing Toorloo Arm of Lake Tyers, between lakes entrance and Nowa Nowa, 17 Dec 1995, *I. R. Thompson 311* (holotype, MEL).

Herbs, annual, glabrous. **Stems** to 15 cm, erect, slender. **Basal leaves** rosulate, simple, 2–8 cm; petiole 1–6 cm; blade elliptic to oblong-elliptic or ovate, 0.7–2 × 0.5–1 cm, base cuneate, margin entire or 1–3 lobes or crenations on each side, apex obtuse to rounded; cauline leaves 0–2, subsessile or petiole to 3 mm, not auriculate at base, obovate to narrowly elliptic, entire or

with 1 or 2 crenations on each side. **Racemes** ebracteate, 3–15-flowered; fruiting pedicels ascending, 5–10 mm. **Sepals** ovate, 1.3–1.8 mm; petals white inside, pink outside, spatulate, 2.5–4 mm; stamens 6; ovules – per ovary. **Fruits** linear, erect or nearly so, 2–2.5 cm × 0.7–1 mm; style to 1.5 mm. **Seeds** elliptic, 0.8–1 mm.

Habitat: open forests near rivers, steep slopes.

Distribution: Australia (Australian Capital Territory, New South Wales, Tasmania, Victoria).

Cardamine tuberosa de Candolle, Syst. Nat. 2: 254. 1821; non *C. tuberosa* Penzes & Vida, Ann. Hist.-Nat. Mus. Nat. Hungar., Bot., 57: 174. 1965. TYPE: Chile, *Dombey s.n.* (holotype, G-DC; isotypes, B!, 2P!, G!).

Cardamine cognata Steudel, Flora 39: 409. 1856; *C. tuberosa* subsp. *cognata* (Steudel) O. E. Schulz, Bot. Jahrb. Syst. 32: 491. 1903. TYPE: Chile, Rancagua, *Bertero 146* (holotype, P!; isotypes, G!, 2GH!, 2P!).

Cardamine granulata Philippi, Linnaea 33: 8. 1864-1865; *C. tuberosa* var. *granulata* (Philippi) Reiche, Fl. Chile 1: 97. 1896. TYPE: Chile, Andes of Colchagua, *Landbeck s.n.* (holotype, SGO, not seen).

Cardamine tuberosa var. *velutina* Spegazzini, Anal. Mus. Nac. Buenos Aires 7: 212. 1902. TYPE: Argentina, near Putra-Choique, 1900, *N. Illin s.n.* (holotype, LP)

Cardamine thyrsoidea O. E. Schulz, Bot. Jahrb. Syst. 32: 591. 1903. TYPE: Chile, Antuco, *Pöppig 1829* (holotype, W!).

Herbs, perennial. Rhizomes tuberous, congested, not scaly, consisting of clusters to 6 × 3 cm. Stems (8–)15–45(–65) cm, often 1 from tuber, narrowest at base, erect, glabrous or pubescent, branched above, 3–7-leaved. **Basal leaves** simple or rarely with trifoliolate; petiole (2.5–)4–15(–25) cm; leaf blade or terminal leaflet orbicular to reniform, (1.2–)2–5(–7) cm wide, often wider than long, palmately veined, base often deeply cordate, rarely obtuse, margin crenate to repand, sometimes distinctly angled and mucronate at vein tips; lateral leaflets (when present) subsessile or on petiolules to 6 mm, similar in shape and margin and considerably smaller than terminal leaflet. Middle cauline leaves 3–7-foliolate leaflets; terminal leaflet variable in shape, 1–3.5 cm, subentire or dentate; lateral leaflets much smaller; uppermost leaves simple or compound, smaller and distinctly narrower, often entire. **Racemes** ebracteate, corymbose, elongated considerably in fruit; rachis usually straight; fruiting pedicels (0.4–)0.8–2(–3) cm, ascending to divaricate, straight and often forming a straight line with fruit, often glabrous. **Sepals** oblong, (2–)3–4 × 1.2–1.5 mm, erect, caducous, glabrous; petals white, broadly obovate, 8–14 × 4–7 mm, abruptly narrowed to base to, apex obtuse; filaments 4–6 mm; anthers oblong, 0.7–1 mm. **Fruits** linear, (1.8–)2–4(–4.5) cm × 1.2–2 mm, attenuate to apex; style slender (1.5)–2–4(–5) mm. **Seeds** brown, oblong to broadly ovate, 1.5–2 × 0.8–1 mm.

Flowering: (Jul–)Sep–Dec.

Habitat: among boulders, Nothofagus forests.

Elevation: 0–2700 m.

Distribution: Chile (Región IV, V, Santiago, VI, VII, VIII, IX, X, XI).

Specimens examined: **CHILE. IV:** Choapa, Cerro Silla del Gobernador, [32°08'S, 71°30'W], *Schlegel 3792* (CONC); Cordillera de Ovalle, La Hualtata, [30°39'S, 70°40'W], *Jiles 1224* (M); Dep. Illapel, Cerro Santa Inés-Centinela-Pichidangui, [31°56'S, 71°22'W], *Jiles 4605* (M); Riecille, *Zöllner 6794* (CONC, NA); Ovalle, Río Tascadero-El Polvo, [31°08'S, 70°35'W], *Jiles 6382* (CONC). **V:** El Pangal, *Levi 3043* (SGO); Valle El Sauce, near Melón, *Zöllner 9352* (MO);

Cerro negro, *Zöllner 8224* (MO, NY); Cerro La Campana, Hutchison 40 (UC, US), *Solbrig et al. 3616* (GH, NY); Cerro El Roble, [32°58'S, 71°00'W], *Garaventa 4599* (BAA, CONC, SI); Cajon de la Vega, [33°03'S, 71°06'W], *Garaventa 4612* (BAA, CONC, SI); Viña del Mar, 5 July 1935, [33°02'S, 71°34'W], *Behn s.n.* (CONC); Caleu, [33°00'S, 71°00'W], *Garaventa 4526* (BAA, CONC, SI); Laguna Verde, [32°05'S, 71°39'W], 1 Oct. 1922, *Behn s.n.* (CONC); Valle de Marga-Marga, *Jaffuel & Piron 3050* (GH), *Jaffuel s.n.* (CONC); Cerro Quebrada Verde, [33°03'S, 71°42'W], *Garaventa 2971* (BAA, CONC, SI); Cajón del Carretón, [32°15'S, 70°56'W], *Garaventa 3319* (BAA, CONC, SI); Quilpué, Cerro Buitre, [32°59'S, 71°26'W], 15 Sept. 1935, *Behn s.n.* (CONC); Cerro Caquicito, [32°45'S, 71°05'W], *Schlegel 215* (CONC); Quillota, Puerta Oca, [32°57'S, 71°05'W], *Schlegel 2677* (CONC). Quillota, *Bertero 889* (GH, MO, NY, P); Cerro La Campana, [32°57'S, 71°08'W], *Garaventa 2870* (B), *Garaventa 2871* (BAA, CONC, SI); El Cricket, [33°03'S, 71°38'W], *Garaventa 2226* (BAA, CONC, SI). **Santiago:** Quebrada de Macul, [33°30'S, 70°31'W], *Pisano & Baraona 1586* (CONC); Cajón del Maipo, [33°48'S, 70°17'W], *Grandjot 4858* (CONC); above jct. rds to La Disputada and Farellones, [33°20'S, 70°18'W], *J. & A. Solomon 4283* (MO, SGO); El Canelo, Cajón del Maipo, [33°34'S, 70°26'W], *Garaventa 2854* (BAA, CONC), *Looser 2441* (SI); Cerro Manguhue, [33°21'S, 70°34'W], *Looser 2180* (CONC, SI); Alhué, [33°50'S, 70°56'W], *Gunckel 608* (CONC); Mina Las Arañas im Arrayantal bei Los Condes, *Grandjot 3208* (CONC, GH); Santiago, *Claude-Joseph 1396* (US), *Philippi s.n.* (G); Cordillera de Santiago, 1856-1857, *Germain s.n.* (G); Río Colorado, Termas del Tupungato, *Looser 747* (GH, SI); Tiltil, [33°04'S, 70°58'W], Nov. 1950, *Barrientos s.n.* (CONC); Valle Macul, [33°30'S, 70°31'W], Sept. 1931, *Grandjot s.n.* (CONC, MO, S). **VI:** Pichilemu, Quebrada El Roble, *Villagrán & Pérez 3140* (SGO); Colchagua, Dec. 1869, *Philippi s.n.* (SGO). **VII:** Peteroa, Jan. 1933, *Grandjot s.n.* (MO); Rauco, [34°55'S, 71°19'W], *Barros 2755* (CONC). **VIII:** Cerros de La Toma, [36°50'S, 73°02'W], 14 Sept. 1935, *Junge s.n.* (CONC); Cerro Chepe, [36°49'S, 73°04'W], 7 Sept. 1933, *Junge s.n.* (CONC), *Philippi 1605b* (SGO); Atacalco, 18 sept. 1939, *Pfister s.n.* (CONC); Cerro Manchou Chico, 8 Sept. 1933, *Junge s.n.* (CONC); Concepción, *Philippi 252* (G); Orillas del rio Renegado, 2 km de Los Lleuques, [36°52'S, 71°38'W], *Rodríguez 199* (CONC). **IX:** Mininco, [37°47'S, 72°28'W], 13 Sept. 1952, *Schwabe s.n.* (CONC); Cordillera de la Costa, above Angol, *Dusén 320a* (S); Temuco, Cerro Vielol, [38°43'S, 72°35'W], *Montero 7312* (CONC); Fundo Solano, Los Alpes, Cordiller de Nahuelbuta, *Eyerdam 10181* (US). **X:** Valdivia, 1899, *Buchtein s.n.* (US). **XI:** Aysen, Caleta Vidal, 27 Oct. 1947, *Behn s.n.* (CONC). Region?: Vichuquen, *Zöllner 4501* (SI); Hualqui, Pichaco, *Junge & Zambrano 2056* (SI); Cor de Talca El Picazo, *Barros 2759* (SI)

Schulz (1903) recognized the laxer and taller form as subsp. cognata, but that distinction is unwarranted. The species is readily distinguished from the other Chilean Cardamine by having tuber clusters and stems narrowest at its point of attachment to the tubers. In its overall morphology, *C. cordata* is similar to *C. rostrata*, but the latter has non-tuberous rhizomes and often angled leaves prominently mucronate at the vein endings.

Cardamine uliginosa Bieberstein, Fl. Taur.-Cauc. 3: 438. 1818. TYPE: Caucasus, *Bieberstein s.n.* (holotype, LE).

Cardamine uniflora (J. D. Hooker) Allan, Fl. New Zealand 1: 183. 1961; *Cardamine hirsuta* Linnaeus var. *uniflora* J. D. Hooker, Handbook New Zeal. Fl. 12. 1864; *C. heterophylla* var. *uniflora* (J. D. Hooker) Ckn., Rep. Bot. Surv. St. Id. 54. 1909. TYPE: New Zealand, *Colenso 1813* (holotype K).

Herbs, perennial?, scapose, glabrous throughout. **Rhizomes** slender. **Stems** up to 5 cm, erect, leafless. **Basal leaves** rosulate; petiole slender, slightly flattened, to 4 cm; blade simple, ovate to suborbicular, 0.3–1 cm, entire; cauline leaves absent. **Racemes** ebracteate 1(–4)-flowered; fruiting pedicels erect to ascending. **Sepals** ovate-oblong, ca. 2 mm; petals white, ovate-oblong, to 7 mm, including claw to 2 mm. **Fruits** linear, to 2 cm. **Seeds** < 1 mm.

Habitat: coastal lowlands, montane boggy grounds.

Distribution: New Zealand.

Cardamine umbellata Greene, Pittonia 3: 154. 1897. TYPE:

Cardamine hirsuta Linnaeus subsp. *kamtschatica* (Regel) O. E. Schulz; *C. kamtschatica* (Regel) Piper; *C. oligosperma* Nuttall var. *kamtschatica* (Regel) Detling; *C. sylvatica* Link var. *kamtschatica* Regel. TYPE:

Herbs, perennial. **Rhizomes** often elongated, not fleshy, slender or rarely thickened, 1–2(–5) mm in diam.; stolons absent. **Stems** (0.3–)0.8–2.5(–3) dm, erect to ascending, 1 to several from base, simple, sometimes branched above, not flexuous, glabrous. **Basal leaves** rosulate, pinnately compound, (3–)5–7(–9)-foliolate, 2–5(–9) cm, sometime withered at anthesis; terminal leaflet reniform or orbicular, 0.4–0.8(–1.2) × 0.5–0.9(–1.6) cm, margin entire or 3–(5)-lobed or crenate; lateral leaflets smaller than terminal, broadly ovate, rarely broadly obovate or orbicular, mostly entire, rarely slightly 3–(5)-lobed or crenate, shortly petiolulate or sessile; cauline leaves 3–5(–7), 3–7(–9)-foliolate; leaflets mostly entire, sometimes 3-lobed or crenate, terminal leaflet narrowly obovate, ovate, oblanceolate, lanceolate, oblong, lateral ones narrowly obovate, oblanceolate to linear, sessile to sessile. **Racemes** ebracteate, both flowering and fruiting racemes subumbellate, 2–8(–14)-flowered, rachis usually only 0.3–2 cm; fruiting pedicels 3–8(–10) mm, suberect to ascending. **Sepals** oblong, greenish or purplish, 1–2 × 0.5–1 mm; petals white, narrowly obovate, 2.5–5 × 1–3 mm. **Fruit** linear, (1.3–)1.8–2.5(–3) cm × 0.8–1.5(–2) mm; valves glabrous or sparsely pubescent, torulose; style 0.5–2 mm. **Seeds** brown, oblong, 1–1.5 × 0.8–1 mm, wingless. $2n = 32, 36, 48$.

Flowering: Jun–Sep.

Habitat: streambanks, tundra, alpine slopes, wetlands, damp, swampy and mossy areas, beach gravel and sand, alpine stream margins.

Elevation: 0–1800 m.

Distribution: Canada (Alberta, British Columbia, Northwest Territories, Yukon), Russia (Far East/Kamtschka, Kuriles), United States (Alaska, Washington).

Cardamine variabilis Philippi, Linnaea 33: 5. 1864-1865. TYPE. Chile, Valdivia, Lago Rauco, 1860, *Philippi s.n.* (SGO-49329!, fragments, BAA!). **The type sheet has two collections, of which the one collected by F. Philippi from Rio Bueno in October 1872 is not the type.**

Cardamine ovata Philippi, Anal. Univ. Chile 81: 69. 1892; non *C. ovata* Bentham, Pl. Hartweg. 158. 1845. TYPE. Chile, valley of río Palena, Jan–Feb 1887, *Federico Delfin s.n.* (holotype, SGO-71452!). Although Muñoz (1960) listed SGO-63892! as part of the type collection, this sheet should not be considered as such because it does not carry Philippi's hand writing nor the collector's name.

Cardamine triphylla Philippi, Anal. Univ. Chile 81: 72. 1892. TYPE: Chile, Valley of río Palena, Jan–Feb 1887, *Federico Delfin s.n.* (holotype, SGO-49342!).

Cardamine integrifolia Philippi, Anal. Univ. Chile 81: 71. 1892, not *C. integrifolia* Greene, Bull. Calif. Acad. 389. 1887, nor *C. integrifolia* Nasaroff, Bull. Soc. Nat. Mosc. 1923–24, n.s. 32, 341. 1924; *Cardamine integrifolia* Philippi var. *diversifolia* O. E. Schulz, Bot. Jahrb. Syst. 32: 431. 1903; *Cardamine thermarum* Marticorena, Gayana, Bot. 57(2): 191. 2001. TYPE: Chile. Thermas de Chillán, Feb 1892, *Philippi s.n.* (holotype SGO-63907!; fragments, BAA!). Schulz (1903) cited the single collection of the species holotype under his var. *diversifolia*. *Cardamine integrifolia* var. *dichondroides* Spegazzini, Ann. Mus. Nac. Buenos Aires 7: 212. 1902. TYPE : Argentina, Chubut, prope Lago Blanco, Dec 1900, *C. Spegazzini s.n.* (holotype, LP #21135!).

Cardamine variabilis prol. *pinnatisecta* O. E. Schulz, Bot. Jahrb. Syst. 32: 432. 1903. TYPE: Chile, Antuco, 1928, *Pöpping s.n.* (lectotype, here designated, W!).

Sisymbrium simpsonii Philippi, Anal. Univ. Chile 81: 184. 1892. TYPE: Chile, Río Aisén, *E. Simpson s.n.* (holotype, SGO?).

Herbs, perennial. **Rhizomes** much slender, long, not tuberous or scaly. **Stems** solitary, (10–)15–41(–50) cm, erect, 1 to numerous from base, glabrous or sparsely to densely pubescent throughout, lowermost nodes without adventitious roots. **Basal leaves** and lowermost cauline simple and dentate, or compound and 3–7-foliolate, 5–15 cm, glabrous to densely pubescent; petiole (1–)1.5–6(–7.4) cm; terminal leaflet or blade of simple leaves (1.4–)2–5.8(–7) × (0.5–)1–3(–4.2) cm, ovate to obovate or oblong, obtusely to sharply dentate or incised, sometimes subapically 3-toothed or 3-lobed, rarely repand, petiolule 0.4–1.7 cm; lateral leaflets ovate to oblong or narrowly oblanceolate to sublinear, 1–3.5 × 0.2–1.5 cm, sessile or on a petiolule to 5 mm, entire to repand or dentate; upper cauline leaves similar to lower ones in size or larger, varying from simple to compound, sometimes with 1 lateral leaflet. **Racemes** ebracteate; rachis straight; fruiting pedicels (0.6–)0.8–1.5(–2.2) cm, divaricate-ascending to horizontal, slender or stout, straight, often forming a distinct angle with fruit. **Sepals** oblong to broadly ovate, 3–4 × 1–1.5 mm; petals white, narrowly obovate to oblanceolate, 6–8(–10) × 2–4 mm, gradually narrowed to base, apex obtuse; filaments 4–5 mm; anthers ovate, 0.8–1 mm; ovules 22–44 per ovary. **Fruits** linear, (2–)2.5–3.5(–4.7) cm × 1.2–2 mm, attenuate or not at apex; style slender or rarely stout, 1–2.5(–3) mm. **Seeds** brown, ovate, 1–1.5 × 0.7–1 mm, wingless.

Flowering: Oct–Mar.

Elevation: 0–1800 m.

Habitat: rocky areas, wet places.

Specimens examined: **ARGENTINA. Chubut:** Dep. Cushamen, Lago Puelo, *Boelcke et al. 13004* (BAA, BAB, SI), *Vallerini 1643* (BAA); Grl. Vintter, *Eskuche et al. 1387* (BAA). Dep. Futalufú, Ea. Pampa Chica, *Soriano 2472* (BAA); Tecka, *Meyer 9596* (GH, LIL); 22 km W El Corcovado, arroyo Carbón, *Correa et al. 9062* (BAB, BACP); ruta 258, 24 km S del desierto al lago Rosario, *Correa 8995* (BAB, BACP); Trevelin, Estancia Río Frio, *Krapovickas 4006* (BAA, BAB); entre Trevelin y Corcorado, Ea. Río Frio, *Soriano 2954* (BAA); ruta Nac. 40 y arroyo Caquel, *Correa et al. 9107* (BAA, BAB). Dep. Tehuelches, Lago Vintter, *Nicora 9625* (MO, SI), *Nicora 10008* (SI); río Corcorado, *Illin 62* (SI), *Illin 159* (SI). **Neuquén.** Hua Hum, *Cabrera 11250* (GH). Dep. Catan Lil, Casa de Lata, *Cabrera 21895* (SI). Dep. Hiliches, Parq. Nac. Lanín, *Correa et al. 5653* (BAB, BACP); Parque Lanín, San Martín de los Andes, *Leal 18164* (BACP). Dep. Lácar, 32 km SW San Martín de Los Andes, ruta Nac. 234, *Fortunato et al. 5768* (BAB); lago Queñi, *Rossow et al. 2088* (BAB). Dep. Los Lagos, Estancia Fortín Chacabuco, Arroyo Tranquera Colorada, *Vallerini 1275* (SI); Los Lagos, Ao Pso de la Cruz, *Boelcke 8993* (BAA);

Ea. Fortín Chacabuco, Potrero Mula, *Boelcke* 9030 (BAA); Paso del Córdoba, limits between Dep. Lácar and Los Lagos, *Rossow et al.* 2137 (BACP); Los Lagos, Ea. Fortín Chacabuco, *Boelcke & Correa* 11738 (BAA); Pto. Manzano, *Boelcke et al.* 10438 (BAA, BAB). Dep. Minas, ca. 21 km de Las Ovejas camino a las lagunas Epu-Lauquén, Arroyo de las Bandurrias, *Boelcke et al.* 10793 (BAA); between Gendarmería Puerto and Lagunas Epulauquén, *Boelcke et al.* 11026 (BAA, LIL, MO); Ea. Fortín Chacabuco, *Boelcke* 8983 (BAA, LIL, MO, SI), *Boelcke* 8994 (SI); confluence of rivers Pichi-Nequén and Nequén, cerro de las Yeguas, 36°35'S, 70°45'W, *Boelcke et al.* 13717 (BAA, BAB, BACP, SI); Lagunas Epu-Lauquén, *Boelcke et al.* 10902 (BAA, BAB, G); Lagunas Epu-Lauquén, Aduana Vieja, 36°50'S, 71°04'W, *Boelcke et al.* 10821 (BAA, BAB, LIL, SI). **Rio Negro:** Dep. Bariloche, San Carlos de Bariloche, 11 Mar 1934, *Spegazzini s.n.* (BAA), *Buchtein* 3 (US); Par. Nac. Nahuel Huapi, Valle de Río Alerce, *Boelcke* 2084 (SI), *Fabris & Solbrig* 670 (LP); Lago Hess, *Boelcke* 2029 (SI); Pampa Luida, *Boelcke & Correa* 5670 (BAA, BAB, BACP, SI); Laguna Frias, *Boelcke & Correa* 5381 (BAA, BAB, SI); Bariloche, rta 258, río Foyel, *Correa et al.* 9113 (BAB, BACP). **CHILE. VIII:** Puerto de Biobueno, oct. 1871, *Philippi s.n.* (SGO); Dep. to La Laja, Sierra Velluda, [37°20'S, 71°41'W], *Ricardi* 2360 (CONC). **IX:** Laguna Icalma, [38°47'S, 71°20'W], 13 Jan. 1947, *Pfister s.n.* (CONC). **X:** Riñhué, 1897, *Selle s.n.* (SGO); Rolecha, [41°55'S, 72°50'W], 5 Jan 1951, *Pfister s.n.* (CONC, SI); Pucatrihue, [40°32'S, 73°41'W], *Sparre & Smith* 289 (CONC), *Eyerdam* 10538 (UC, US); La Barra del Río Bueno, *Sparre* 4555 (SGO); Río Blanco, *Andreas* 366 (B); Chiloé, Isla Lagartija, [41°48'S, 72°50'W], *Junge* 402 (CONC). **Valdivia:** Llifén-Lago Ronco, [40°19'S, 72°27'W], *Montero* 3985 (CONC). **XI:** Lago San Rafael, [46°40'S, 73°50'W], *Schlegel* 1829 (CONC); Puerto Aysén, *Santesson* 1236 (S); Aysén Exped., 12 Jan. 1897, *Dusén s.n.* (S), *Dusén* 463 (SGO); Puyuhuapi, río Pascua, 10 Oct. 1939, [44°19'S, 72°24'W], *Schuabe s.n.* (CONC). Region?: Lago Gullelma, San Carlos de Bariloche, *Garaventa* 4603 (BACP, SI); Valle Simpson, 16 Dec 1954, *Pfister s.n.* (CONC).

A highly variable species, as the specific epithet indicates, especially in leaf division, style length, and number of ovules per ovary. Indeed, a study of the types of the four “species” included here reveals that the basic differences among them rests solely on leaf shape. The type of *Cardamine triphylla* has trifoliolate leaves with narrowly oblanceolate leaflets the terminal one of which is entire to laterally one-toothed. The type of *C. integrifolia* is a slender plant with simple leaves or with a lateral leaflet, and the blade ranges from narrowly obovate to suboblong and obscurely toothed, whereas the type of *C. ovata*, annotated by Schulz as *C. variabilis*, also has simple leaves or laterally with one leaflet, but the leaves are coarsely dentate, and the plant is stouter. Finally, the type of *C. variabilis* consists of slender plants with 3–5-foliolate lower leaves the terminal leaflet of which is distinctly larger and strongly toothed but the uppermost leaves resemble those of types of *C. ovata* and *C. integrifolia* in being simple and dentate. On the type sheet of *C. variabilis* is mounted a second collection with two plants one of which has trifoliolate leaves and the other with simple leaves. In my opinion, the leaf variation reflected by the types of these four species represents on a small fraction of what appears to be a complex species with enormous leaf variation sometimes reflected in the same collection. For example, *Santesson* 1236 has four plants of which one has pinnatisect leaves with narrowly lanceolate segments, another with coarsely dentate leaves, and two with strongly incised leaves. It should be admitted, however, that as delimited here, *C. variabilis* is not as cleanly defined as the other Chilean and Argentinian species, and the complex is in need of further studies to elucidate whether one or more taxon is involved.

I had the chance to examine almost every specimen cited by Boelcke & Romanczuk (1984) under *Cardamine integrifolia*. In almost every case, the plants belonged either to *C. variabilis* or *C. cordate*.

Cardamine victoris

Cardamine violacea (D. Don) Wallich ex J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 5: 144. 1861; *Erysimum violaceum* D. Don, Prodr. Fl. Nepal. 202. 1825. TYPE: Nepal, Gossain-Than, *Wallich 4782* (holotype, K; isotype, E!).

Cardamine violacea subsp. *bhutanica* Grierson. TYPE: Bhutan. Pele La, *Grierson & Long 546* (holotype, E!).

Herbs, perennial, shortly pilose or subglabrous. **Rhizomes** stout, to 1 cm in diam. **Stems** 20–100 cm, erect, simple, stout, glabrous. **Basal leaves** not seen, often withered by anthesis; middle cauline leaves sessile, strongly auriculate, sagittate, to amplexicaul at base; blade lanceolate to linear-lanceolate or ovate-lanceolate, 3.5–20 × 0.7–3.5 cm, abaxially glabrous, adaxially puberulent to subpilose, margin ciliolate and dentate, denticulate, or entire, apex acuminate to caudate; auricles oblong to ovate, 2–10 × 2–7 mm. **Racemes** ebracteate, 5–25-flowered; flowering pedicels spreading to reflexed; fruiting pedicels divaricate to ascending, 0.8–3 cm, glabrous, straight. **Sepals** oblong 5–7 × 1.5–3 mm, glabrous or sparsely pilose, base of lateral pair saccate; petals purple, spatulate to obovate, 1–1.7 cm × 4.5–7 mm; median filament pairs 7–9 mm, lateral pairs 6–7 mm; anthers oblong, 1.5–2 mm; ovules 10–16 per ovary. **Fruit** linear, 2–6 cm × 1.4–2.5 mm; gynophore 0.5–1 mm; valves smooth, glabrous; style 3–8 mm. **Seeds** brown, oblong, 2–3 × 1.4–1.8 mm, wingless.

Flowering: May–Aug.

Habitat: grassy slopes, streamsides, open forests, pastures, thickets, roadside banks, sandy moist forests, forest ravines.

Elevation: 1800–4000 m.

Distribution: Bhutan, China (Yunnan), India (Sikkim), Nepal.

Cardamine volckmannii Philippi, Linnaea 33: 7. 1864–1865. TYPE: Chile. Coquimbo: Baños del Toro, [29°50'S, 70°02'W], [3260 m], 1860, *Volckmann s.n.* (holotype, not at SGO (Muñoz-Schick, pers. com.); isotype, CONC-63192!). No specimens were listed by Muñoz Pizarro (1960).

Cardamine nivalis Gillies in W. J. Hooker, Bot. Miscell. 3: 136. 1833; *C. hirsuta* Linnaeus var. *nivalis* (Gillies) J. D. Hooker, Fl. Antarct. 3: 232. 1845; non *C. nivalis* Pallas, Reise Russ.

Reich. 2: 113. 1773. TYPE: Chile, upper spring below the Cumbre, *Gillies s.n.* (holotype, E!).

Cardamine stricta Philippi, Anal. Univ. Chile 81: 77. 1892. TYPE: Chile, Andes of Prov.

O'Higgins, Cordillera del Peuco, [33°56'S, 70°30'W], 1886, *Cádiz s.n.* (lectotype, here designated, SGO-71637!). Another sheet of the type collection, SGO-71638!, carries the handwriting of F.E. Philippi instead of R. A. Philippi, and it should serve as the isolectotype. Both sheets lack the lowermost portion of the plant and doubtfully belong to *C. volckmannii* because the lateral leaflets are dentate, pubescent, and sessile. Muñoz (1960), listed a third specimen, SGO-63884!, as part of the type collection under both *C. stricta* and *C. andina*, but that number clearly belongs to the latter taxon, which treated in this account as a synonym of *C. variabilis*.

Cardamine petiolulata Philippi ex O. E. Schulz, Bot. Jahrb. Syst. 32: 520. 1903. TYPE: Chile, Cordillera of Santiago, Valle del Yeso, Jan 1866, *Philippi s.n.* (lectotype, here designated, SGO-63905!).

Cardamine nivalis subsp. *Dep. auperata* O. E. Schulz, (check his monograph and citations). GH has one collection: las Condes, Nov 1871, *Reed s.n.* (GH!).

Herbs, perennial, glabrous throughout. **Rhizomes** not tuberous, slender, not scaly. **Stems** often single from base, 8–26(–35) cm, erect, glabrous, unbranched above. **Basal leaves** absent; lowermost cauline leaves pinnately compound, 2–12(–27) cm, with 2–4(–5) pairs of lateral leaflets, always glabrous; petiole (1–)2–14(–25) cm; terminal leaflet orbicular to broadly obovate or ovate, (0.8–)1–2.5(–3) × (0.7–)1–2 cm, base obtuse to cuneate, margin entire or repand, sometimes obtusely 3-lobed with minutely mucronate tips, apex rounded, petiolule 2–10 mm; lateral leaflets distinctly smaller or subequalling terminal one, opposite or alternate, 0.5–1.5(–2) × 0.2–1.4(–1.7) cm, obovate to ovate or suboblong, base cuneate, entire or repand, apex rounded; uppermost leaves similar to lower ones but smaller and sessile or with petiolules 1–5(–10) mm. **Racemes** ebracteate, corymbose, elongated considerably in fruit; rachis straight; fruiting pedicels 4–10 mm, suberect to ascending, straight, glabrous. **Sepals** oblong, 2.5–4 × 1–1.5 mm, erect, caducous, glabrous; petals white, oblong-obovate, 6–9(–12) × 2.5–4(–5) mm, not clawed, apex obtuse; filaments 3–6 mm; anthers oblong, 0.7–1 mm; ovules 20–34 per ovary. **Fruits** linear, (2–)2.5–3.5 cm × 1–1.3 mm, attenuate to apex; style 1–2 mm. **Seeds** brown, oblong to broadly ovate, 1–1.5 × 0.8–1 mm.

Flowering: Dec–Mar.

Habitat: wet soil in bogs near streams, very wet stream banks, seepy places, floodplains.

Elevation: 2000–3800 m.

Distribution: Argentina (La Rioja, Mendoza, Neuquén, San Juan), Chile (Región III, IV, Santiago).

Specimens examined: **ARGENTINA: La Rioja.** San Juan, *Hosseus 1559* (CORD). **Mendoza:** Mt. Aoncagua, Puente del Inca, 21 Dec. 1946, *Wall s.n.* (A), *Malme 2851* (S), *Boelcke 8912* (BAA). Dep. Las Heras, Puente del Inca, *Sparre 1558* (LIL, S), *Hauman 116* (G), *F. Philippi 61* (SGO); Puente del Inca, Banderita Norte, *Boelcke et al. 9787* (BAA, BAB, SI), *Boelcke 9809* (BAA, BAB, SI); Las Cuevas, Quebrada de Matienzo, *Wingenroth et al. 88* (SI); Tunuyán, arroyo de la cascada La Vieja, *Boelcke et al. 10114* (BAA, BAB, SI); Tupungate, Estancia La Carrera a Tupungate, *Melis & Paci 9* (GH). **Neuquén:** Minas, Cajón d los Chenques, 26°28'S, 70°48'W, *Boelcke et al. 13963* (BAA, BACP, SI). **San Juan:** Iglesia, Quebrada del Agua Negra, *Cabrera et al. 27065* (BAA, BAB, LP, MO), *Cabrera et al. 31147* (SI), *Kiesling 6729* (NY, SI). Dep. Calingasta, El Pachon, de casa Amarilla a Casilla Naranja, *Kiesling & Sáenz 1413* (SI); Los Patillos, *Kurtz 9671* (CORD). Dep. Calingasta, Sapitos, Valle Santa Cruz, *Luti 10003* (SI); entre “El Molle” y “Ojo de Agua,” *Luti et al. 5575* (SI). **CHILE.** Los Andes, Potrero Escondido, *Boelcke 2459* (BAA). Valle del Río Blanck, *Boelcke 2434* (BAA) **III:** Vallenar, Cordillera Laguna Chica, [29°51'S, 69°42'W], *Werdermann 257* (CAS, CONC, E, F, G, GH, LIL, MO, S, SI, UC); vicinity of Laguna Chica, 28°48'S, 69°52'W, *Johnston 5968* (GH); Rio Sancarron at Corrales, *Johnston 6212* (GH); Laguna Grande, 28°43'S, 69°56'W, *Johnston 5920* (GH); Quebrada Los Barriales, [29°16'S, 70°09'W], *Arancio et al. 94025* (CONC). **IV:** Cordillera Doña ana, Cancha de Sky, [28°48'S, 70°03'W], *Squeo & Marticorena 88163* (MO); Dep. Elqui, camino San Juan, Lado sur del Embalse La Laguna, [30°38'S, 70°17'W], *Ricardi et al. 1753*

(CONC); Borde del Cerro Tapado, [30°12'S, 70°02'W], Arroyo 81089A (CONC); Limari, Cordillera de Ovalle, Río Gordito, [31°02'S, 70°20'W], *Jiles* 2542 (CONC); Cordillera de Ovalle, Quebrada Calabozos, *Jiles* 2940 (CONC); Cord. Río Tascadero, [31°05'S, 70°35'W], *Jiles* 6430 (CONC); Bocatoma, Los Molles, *Ruthsatz* 6083 (MO); Dep. to Illapel, La Vega Escondida, E Cuncumen, *Morrison* 16554 (DS), *Morrison* 16954 (DS, UC, US); Cerro Curimahuida, 10 km E Matancilla, *Worth & Morrison* 16676 (DS, G, UC, US); Illapel, Philippi 1605a (SGO); Valle del Choapa, Hacienda de Cuncumen, *Looser* 2407 (SI). Dep. Elqui, La Laguna, 25 Apr 1947, *Wagenknecht* s.n. (SI). **Elqui.** Canchas de Sky, 29°51'S, 70°3'W, *Squeo* 88163 (CONC). **V:** Dep. La Ligua, Junta de Piuquenes, *Morrison* 17315 (DS, UC, US); Caracoles, *Pennell* 13006 (F, GH, NY, SGO); Los Maitenes near Río Colorado, [32°42'S, 70°25'W], *Zöllner* 6579 (CONC, MO), *Zöllner* 4388 (SI); Quebrada al fondo de Lag. del Inca, [32°50'S, 70°08'W], *Ricardi* 2974 (CONC); Valle Juncal, [32°53'S, 70°10'W], *Schlegel* 1476 (CONC), *Zöllner* 9145 (CONC). **Santiago:** 2.5 km from Villa Paulina, *Sweeney* 270 (MO); Lo Valdés, [33°50'S, 70°05'W], Jan 1950, *Barros* s.n. (CONC), *Gunckel* 57035 (CONC); Valdés tál, Jan 1936, *Grandjot* s.n. (MO); Valle de Maipo, [33°50'S, 70°05'W], *Garaventa* 6284 (BACP, CONC, SI), *Ruthsatz* 6815 (MO); Cord. Vale Morales, 30 Dec. 1940, [33°50'S, 70°05'W], *Schwabe* s.n. (CONC); Los Condes, Fierro Carrera, [33°12'S, 70°14'W], *Garaventa* 551 (BAA, BACP, CONC, SI), *Garaventa* 1638 (BAA, BACP); between Disputada and Perez Caldera, [33°10'S, 71°18'W], *Sparre* 11038 (CONC); Potrero Grande, *Zöllner* 4620 (SI); Fierro Carrera, *Garaventa* 1714 (SI), *Garaventa* 1717 (SI); S. José de Maipo, Cajón del río Morales, 33°30'S, 70°0'W, *Saavedra & Pauchard* 80 (CONC); San José de Maipo, Cajón del Morales, 33°46'S, 70°40'W, *Teillier & Márquez* 5332 (CONC); Farellones, *Böcher et al.* 664 (BAA).

Schulz (1903) adopted the later homonym *Cardamine nivalis* as a legitimate name apparently because the earlier homonym has been considered as *Macropodium nivale* (Pallas) R.Br. since its transfer by Brown in 1812. However, that handling of the nomenclature is erroneous, and the earliest name for the present species is *C. volckmannii*.

Schulz also listed *Cardamine glacialis* (G. Forster) DC. var. *elatior* A. Gray in the synonymy of *C. nivalis*, but the latter, recognized herein as, does not occur in Tierra del Fuego, where the type of var. *elatior* was collected, nor does *C. volckmannii*, a species that Schulz reduced to synonymy of *C. glacialis*.

Morrison 16954 is a mixed collection of *Cardamine volckmannii* and *C. bonariensis*.

Cardamine vulgaris Philippi, *Linnaea* 28: 665. 1856; *C. hirsuta* Linnaeus var. *vulgaris* (Philippi) Reiche, *Fl. Chile* 1: 100. 1896. TYPE: Chile, Valdivia, *Philippi* s.n. (lectotype, designated by Muñoz (1960), SGO-49363!).

Cardamine intermedia Steudel, *Flora* 39: 410. 1856; non *C. intermedia* Hornemann, Fors. *Dansk. Oecon. Pl* 3, ed. 1, 714. 1821; nec *C. intermedia* W. J. Hooker, *Icon. Pl.* 3: 258. 1840. TYPE: Chile, Valparaíso, Aug 1829, *Bertero* 1793 (holotype, P!; isotypes, 3G!, GH!, NY!).

Cardamine macrostachya Philippi, *Anal. Univ. Chile* 81: 75. 1892. TYPE: Chile, Araucanía, Nov 1887, *Philippi* s.n. (holotype, SGO-63906!). Muñoz (1960) also listed SGO-49420 (fragments, BAA!) as part of the type collection, but I have not seen that.

Cardamine vulgaris Philippi var. *oligozyga* O. E. Schulz, *Bot. Jahrb. Syst.* 32: 544. 1903. TYPE: Chile, Araucanía, Nov 1887, *Philippi* s.n. (lectotype, here designated, SGO!).

Cardamine grandijotii O. E. Schulz, *Notizbl. Bot. Gart. Berlin-Dahlem* 12: 39. 1934. TYPE: Chile, Cordillera of Santiago, Potrero grande, am sumpfigen Bach, 2200 m, 9 Dec 1933, *C. Grandijot* 1 (holotype, B!).

Cardamine garaventae O. E. Schulz, Notizbl. Bot. Gart. Berlin-Dahlem: 12: 208. 1934. TYPE: Chile, Cerro de la Campana, cerca del lugar denominado "La Gotera," 1600 m, 2 Oct 1932, *Augustin Garaventa* 2872 (holotype, B!; isotypes, BAA!, BACP, 2SI!).

Herbs, perennial. **Rhizomes** much thickened, short, forming a tuberous stem base, not scaly. **Stems** solitary, 10–45(–60) cm, erect, simple or branched above, glabrous or sparsely to densely pubescent, lowermost nodes without adventitious roots. **Basal leaves** and lowermost cauline compound, 2.5–20 cm, with (3–)5–11(–19) leaflets; petiole (1–)2–8(–11) cm; terminal leaflet (0.5–)1–2.5(–3.5) × 0.9–3(–3.5) cm, ovate to obovate or suborbicular or subreniform, dentate to subcrenate or repand, rarely entire, often petiolule 2–13(–20) mm; lateral leaflets similar or broadly ovate to oblong, 4–12(–17) × 1–7(–10) mm, sessile or on a petiolule 1–5(–10) mm, entire or shallowly to coarsely dentate; upper cauline leaves similar to lower ones but smaller and with sessile or subsessile, narrowly ovate or oblong to linear leaflets. **Racemes** ebracteate; rachis straight; fruiting pedicels (4–)6–15(–20) mm, divaricate to ascending, slender, straight, forming a distinct angle with fruit. **Sepals** oblong, 2.5–3.5 × 1–1.5 mm; petals white, narrowly obovate to oblanceolate, (5–)6–9 × 2–3.5 mm, gradually narrowed to base, apex obtuse; filaments 3.5–5 mm; anthers oblong, 0.9–1.1 mm; ovules 20–34 per ovary. **Fruits** linear, 2–3.5(–4) cm × 1–1.5 mm, attenuate to style; style slender, (1.5–)2–3(–3.5) mm. **Seeds** brown, ovate, 1.2–1.6 × 0.8–1.2 mm, wingless.

Flowering: Oct–Mar.

Elevation: 0–3400 m.

Habitat: banks of ditches, freshwater marsh, shrubby areas, disturbed ground in moist Northofagus forest, wet areas among boulders.

Distribution: Argentina (Chubut, Neuquén, Río Negro, Tucumán), Chile (Región V, VI, VII, IX, X, XI, Juan Fernandez Is.).

Specimens examined: **ARGENTINA**. Lago Machónico, *Garaventa* 4608 (SI). **Chubut**: Curatel Epujín, *Lourteig & Buchinger* 47 (P). Dep. Futaleufú, lago Futaleufú, *Correa et al.* 4168 (BACP); Lago Rivadavia, *Correa et al.* 8960 (BAA, BAB); Río Tecka, Ea. Pampa Chica, *Soriano* 3819 (BAA). Dep. to Río Senguir, Lago Blanco, 4 Dec 1903, *Koslowsky s.n.* (NA); Lago La Plata, *Soriano* 3150 (BAA). Dep. Tehuelches, Lago Vintter, *Nicora* 7420 (SI), *Nicora* 9477 (SI); Río Corcorado, *Illin* 132 (SI, UC). **Neuquén**: Dep. Huiliches, Hosteria Lolog, *Boelcke et al.* 6646 (BAA); Parq Nac Lanín, volcán Lanín, *Correa et al.* 5597 (BAA, BAB); Lago Quillén, 31 Jan 1963, *Valla et al. s.n.* (BAA); between Pichi Traful and Lago Villarino, *Correa et al.* 7797 (BAB, BACP); Va. La Angostura, area alberque Inacayal, orilla Nahuel Huapi, 27 Jan 1982, *Mallo et al.* 18172 (BAA, LIL, MO); Lago Correntoso, *Cabrera* 5070 (F); Lago Aluminé, *Correa et al.* 8114 (BAA, BAB, BACP); Lago Quñi, *Gentili* 810 (SI). Dep. Catan Lil, Paso de Rahue Vega, *Cabrera et al.* 32982 (SI); Puerto Manzano, 4 Feb. 1967, *Diem s.n.* (SI). Dep. Lácar, RP 23, camino a los baños del Queñi, *Correa et al.* 9360 (BAA, BAB). Dep. Los Lagos, Ea. Fortín Chacabuco, Mallín Medio, *Boelcke & Correa* 11741 (BAA); Ea. Fortín Chacabuco, *Boelcke* 8988 (BAA, G, MO, SI); ruta J, 0.5 km N del arroyo Cla-Clo, *Rossow & Gómez* 412 (BAA); Parq. Nac. Nahuel Huapi, Ea. Fortín Chacabuco, *Boelcke & Hunziker* 3571 (BAA); Parq. Nac. Nahuel Huapi, Isla Victoria, *Boelcke* 1794 (BAA, SI). Dep. Picunches, Pino achado, Puest Gendarmería, 24 Jan 1963, *Valla et al. s.n.* (BAA); Cerro Otto, *Boelcke & Hunziker* 3706 (BAA). **Río Negro**: Dep. Bariloche, Bariloche, *Hermann* 3469 (NY, SI); El Bolsón, Rasp 13 (SI); Los Cantaros, *Boelcke & Correa* 5269 (BAB, SI); Valle del Río Alerce, *Boelcke* 2048 (BAA); Lago Guiterrez, *Boelcke & Hunziker* 3332 (BAA); Pto Manzano, *Boelcke & Correa* 11734 (BAA). **Tucumán**: Dep. Chiclgasta, arroyo Celeste, R 65, km 28, 27°20'S, 65°50'W,

Boelcke et al. 5465 (BAA), *Boelcke et al. 5464* (BAA); Estancia Las Povas, *Venturi 4618* (CAS, GH, LIL, LP, MO, NY, SI). **CHILE.** Fundo Trafún, orillas Río Reyhueico, *Boelcke 8966* (BAA); this collection is cited in the text of *C. tenuirostris*. **V:** Valparaíso, *Claude-Joseph 3629* (US); Cerro de la Campana, [32°57'S, 71°08'W], Nov. 1950, *Collantes s.n.* (CONC), *Garaventa 3054* (BACP, CONC, SI), *Hutchison 40* (GH); San Felipe, Cerro Tabaco, [32°39'S, 70°49'W], *Schlegel 813* (CONC); Quebrada del Cricket, [33°03'S, 71°38'W], 4 Oct 1936, *Behn s.n.* (CONC), *Garaventa 8272* (SI); Cerro la Campana, Trayecto Placa Darwin a Mina, *Villagrán & Meza 3182* (SGO). **Santiago:** Farellons, *Villagrán & Meza 370* (SGO); Potrero Grande, *Zöllner 4621* (SI); Volcán San José, Feb. 1950, [33°47'S, 69°55'W], *Castillo s.n.* (CONC); Potrero Grande, Jan 1936, *Grandjot s.n.* (MO, SI); San Gabriel, Valle Maipo, [33°26'S, 70°14'W], *Schlegel 4409* (CONC). **VI:** San Fernando, [24°56'S, 70°25'W], *Montero 7391* (CONC). **VII:** Constitución, [35°20'S, 72°25'W], *Barnier 109* (CONC). **VIII.** Concepción, *Gunckel 671* (CONC); Camino de Concepción a Copiulemu, Fdo. San Nicolás, [36°54'S, 72°44'W], *Montero & Montero 34* (CONC); Atacalco, 35 Nov. 1944, [36°53'S, 71°38'W], *Pfister s.n.* (CONC); Santa Barbara, Puente Mininco, 1 Nov. 1943, [37°40'S, 71°59'W], *Pfister s.n.* (CONC); ca. 10 km S rd to Curanilahue along rte 160, 37°30'S, 73°30'W, *Taylor 10595* (CONC, MO); San Pedro, *Sparre 9943* (CONC); Talcahuano, San Vicente, [36°46'S, 73°08'W], *Sparre 9952* (CONC), *Philippi s.n.* (SGO); E Chillán from Refugio El Aserradero on rd to Termas de Chillán, 36°54'S, 71°27'W, *Taylor et al. 10247* (MO); Mulchén, [37°44'S, 72°14'W], *Garaventa 4617* (BAA, CONC, SI); Florida, Fundo Colico, 20 Sept. 1977, [36°49'S, 72°43'W], *Oehrens s.n.* (CONC); Termas de Chillán, 36°50'S, 71°25'W, *Taylor & Taylor 10847* (CONC, MO), road from Hualpencillo to Museo de Hualpen, [36°47'S, 73°08'W], *Lammers et al. 7511* (CONC, MO); Chillán, Bureo, *Garaventa 2788* (SI). **IX:** Isla Moscha, [38°22'S, 72°55'W], *Gunckel 33265* (CONC); Puerto Saavedra, [38°47'S, 73°23'W], *Hollermayer 173* (CONC); Lumaco (Santa Clara), [38°12'S, 72°49'W], *Kunkel 543* (CONC); Pucon, Caburga, [39°12'S, 71°49'W], *Montero 9313* (CONC); Contulmo, [37°59'S, 73°15'W], Nov. 1942, *Gunckel s.n.* (CONC); Santa Barbara, Lomas a la izquierda del Pte. Mininco, [37°40'S, 71°55'W], *Pfister 680* (CONC); Reserva Forestal Malleco, Orillas del río Niblinto, [39°10'S, 71°45'W], *Marticorena & Quezada 1537* (CONC); Reserva Forestal Huerquehue, [39°10'S, 71°42'W], *Baeza 137* (CONC); Pillanlelún, [38°38'S, 72°27'W], *Montero 5378* (CONC); Pass Longuimay, *Zöllner 8142* (MO); Dep. Victoria, road to Banos Calientes, *Morrison & Wagnecht 17507* (UC). **X.** Valdivia, Isal Teja, *Gunckel 16943* (CONC); Rio Palena, Fan-Feb 1887, *Delfin s.n.* (SGO); San Juan, Sept. 1872, *F. Philippi s.n.* (SGO); Collico, Santesson 973 (S), *Buchtein s.n.* (F), *Gunckel 2495* (CONC, GH); Cerro Marina, [39°53'S, 73°25'W], *Gunckel 1800* (CONC, GH); La Aguada, same coordinates, *Gunckel 1855* (CONC, GH); Llanquihue, Lago Tods los Santos, March 1974, [41°08'S, 72°25'W], *Villagrán s.n.* (CONC); Rolecha, [41°55'S, 72°50'W], 5 Jan 1951, *Pfister s.n.* (CONC); Dep. to Castro, Lago Huillinco, [42°42'S, 73°50'W], *Marticorena et al. 136* (CONC); Cuesta de Soto, [39°47'S, 73°11'W], *Gunckel 1801* (CONC, GH); Quitaluto, [39°57'S, 73°27'W], *Gunckel 1538* (CONC); Corral, *Gunckel 1846* (CONC, GH); Quebrada del Bolsón, [39°54'S, 73°26'W], *Gunckel 2596* (CONC, GH). **XI:** Aysen, Puyuhuapi, [44°21'S, 72°34'W], 13 Apr. 1939, *Schwabe s.n.* (CONC); Estancia Ñirehuao, 20-30 km N Rio Coyhaique, *Santesson 1312* (S). **Juan Fernandez Is.:** Masafuera, *Skottsberg 479* (B); Quebrada Pasto, *Stuessy & Lammers 9397* (CONC).

The type of *Cardamine vulgaris* is a small plant in flower, and except for its larger flowers, it can be confused *C. marginata* (see below). On the other hand, *C. macrostachya* is a robust form of *C. vulgaris*, a species in which plant size is highly variable as judged from the description above. The type collection of *C. intermedia* can hardly be different from that of *C. macrostachya*, but the name, though is the earliest published for the species, cannot be taken up because it is a later homonym. The overall aspects of the type collection *C. garaventae* in flowers and young fruits is not any different from those of *C. macrostachya* and *C. intermedia*, and the major difference is that the lower leaves have larger and wider leaflets and longer petiolules than those of the latter two “species.” Finally, the holotype of *C. gandjotii* is a pubescent form of *C. vulgaris*, and the leaves have larger terminal leaflets and sessile lateral ones. It can easily be concluded that the variation represented by the type collections of the above taxa is only in the leaves, and a comparison of the flowers and fruits clearly support the placement of these taxa in one species. In fact, the overall variation of the species in leaflet morphology is much higher than what is represented by those in the types of the above synonyms.

Schulz (1903) treated *Cardamine macrostachya* and *C. vulgaris* as independent species, but a comparison of their types show that the former is robust and the latter is slender plant. In their overall aspects of morphology, the two cannot be maintained as distinct taxa, especially if a large series of plants are critically examined. He also associated *C. macrostachya* with *C. tuberosa* and *C. vulgaris* with *C. glacialis*. However, in *C. tuberosa* the tubers are clustered, whereas in *C. vulgaris* (including *C. macrostachya*) and *C. glacialis* only the stem base is tuberous, though both sometimes do not produce the typically tuberous base. *Cardamine vulgaris* can easily be distinguished from *C. glacialis* by having attenuate fruits with slender styles, divaricate to divaricate-ascending fruiting pedicels that often form a distinct angle at their attachment with fruit, and basal and cauline leaves drastically different in leaflets width. In *C. glacialis* the styles are blunt, the fruits and fruiting pedicels are often appressed to stem and predominantly forming a straight line or so, and cauline and basal leaflets not drastically different morphologically.

Because of their slender styles, narrowly oblong to linear or filiform uppermost leaflets, and divaricate or divaricate-ascending fruiting pedicels, *Cardamine vulgaris* can be confused with *C. tenuirostris*. However, *C. vulgaris* has tuberous stem base, short rhizomes, ovate to broadly oblong leaflets of basal and lowermost cauline leaves, fruiting pedicels forming an angle with stem, and styles (1.5–)2–3(–3.5) mm long. *Cardamine tenuirostris* often has slender rhizomes very rarely swollen at nodes, oblong-linear, lanceolate-linear, linear to filiform leaflets of basal and lowermost cauline leaves, fruiting pedicels forming a straight line with fruits, and styles (2–)2.5–5(–5.5) mm long.

Cardamine vulgaris is highly variable in leaf divisions, and forms with the broadest leaflets were described by Schulz (1934) as *C. garaventae*. Although this form occupies the northernmost range of the species in Región V and its leaflets of upper leaves are not much narrower than those of the lower and basal leaves, it is indistinguishable from typical plants of *C. vulgaris* especially in flowers, fruits, styles, ovule number, and presence of tuberous stem base. Schulz divided this species and the others (e.g., *C. glacialis* and *C. bonariensis*), which are highly variable in leaf morphology, into several infraspecific taxa (e.g., subspecies, proles, varieties, forms) and species regardless to their similarities in other structure. In my opinion, in the absence of detailed systematic studies, this fine splitting of species is unwarranted.

Cardamine waldsteinii Dyer, Kew Handlist Herb. Pl. 97. 1891; *Dentaria trifolia* Waldstein & Kitaibel, Descr. Icon. Pl. Hung. 2: 148. 1805. TYPE: “in subalpinis Croatiae,” (lectotype

designated by Chrtek & Skočdoplová (Sborn. Nár. Mus. Praze, Řada B, Přír Vědy 38B: 222. 1982), PR no. 155765/750).

Cardamine yezoensis Maximowicz, Bull. Acad. Imp. Sci. Saint Pétersbourg 18: 277. 1873.

TYPE: Japan, Hakodate, Monidzi, May 1861, *Maximowicz s.n.* (holotype, LE!; isotype, P!).

Cardamine akitensis Mochizuki, J. Jap. Bot. 44: 340. 1969.

Cardamine fauriae Franchet, Bull. Soc. Philon. Paris, Ser. VII. 12: 83 (1888), not *C. fauriei* H. Léveillé (1912). TYPE: Japan, Yeso, Mt. Otaru, 27 May 1885, *Faurie 183* (lectotype here designated, P!; isolectotype, P!).

Cardamine fauriae Franchet var. *incisa* H. Boissieu, Bull. Herb. Boiss. 7: 783. 1899.

Cardamine fauriae Franchet var. *oblonga* H. Boissieu, Bull. Herb. Boiss. 7: 783. 1899.

Cardamine fauriei H. Léveillé, Repert. Sp. Nov. Regni Veg. 10: 350. 1912, not *C. fauriae*

Franchet (1888); *C. mariformis* Nakai, Bot. Mag. (Tokyo) 26: 324. 1912. TYPE: Korea, secus torrents montis des diamants, 23 Jun 1906, *P. U. Faurie 557* (holotype, E! ; isotype, BM!).

Cardamine geifolia Koidzumi, Ic. Pl. Koiz. 2: t. 97. 1914.

Cardamine kiusiana H. Hara, J. Jap. Bot. 14: 516. 1938.

Cardamine torrentis Nakai, Bot. Mag. (Tokyo) 42: 479. 1928; *Cardamine yezoensis*

Maximowicz var. *torrentis* (Nakai) Ohwi, Fl. Jap., ed. 2, 671. 1965.

Cardamine valida (Takeda) Nakai, Bot. Mag. (Tokyo) 42: 26. 1928. (**basionym??**)

Cardamine yezoensis Maximowicz var. *kiusiana* (H. Hara) Ohwi, F. Jap., ed. 2, 671. 1965.

Herbs, perennial glabrous or sparsely hairy above, sometimes stoloniferous. **Rhizomes** slender or thickened, creeping. **Stems** (15–)25–60(–80) cm, erect, branched above. **Cauline leaves** (3–)6–20 cm; lateral leaflets (1 or)2–4(–6) on each side of rachis, oblong-lanceolate, elliptic, ovate to suborbicular, (0.5–)0.2–3(–3.5) cm, (0.3–)1.5–2.5 cm wide, base obtuse to subcordate, margin subentire or coarsely few toothed, apex obtuse to rounded; petiolules obsolete or distinct and to 15 mm; terminal leaflet subequaling lateral ones or larger and to 6.5 cm and to 7 cm wide, sometimes suborbicular or subreniform. **Racemes** ebracteate; fruiting racemes 3–17(–25) cm. Fruiting pedicels (8–)10–18(–22) mm. **Sepals** (1.5–)3–4 mm, 1–1.5 mm wide; petals white, obovate, (6–)8–10 mm, 4–6.5 mm wide; filaments of median stamens 5–6.5 mm, those of lateral pair 4–5 mm; anthers 1.4–1.8 mm; ovules 12–16 per ovary. **Fruits** linear, (1.3–)1.5–3.2(–4) cm, 1.4–2 mm wide, attenuate at apex; style 1.5–2(–2.5) mm. **Seeds** (1.2–)1.6–2.2 mm, 1.2–1.6 mm wide, ovate, light brown. $2n = 16, 32, 46–48, 56, 72$.

Flowering: May–Aug.

Habitat: wet meadows or open areas along mountain streams.

Elevation: 200–2000 m.

Distribution: China (Jilin), Japan (Hokkaido, N Honshu, Kyushu), Russia (Far East).

Cardamine yunnanensis Franchet, Bull. Soc. Bot. France 33: 398. 1886. TYPE: China,

Yunnan, Ta-long-tan, near Tapin-tze, 1800 m, 26 Jul 1885, *J. M. Delavay 1843* (holotype, P!; isotypes, E!, F!, P!, US!).

Cardamine bijiangensis W. T. Wang, Acta Bot. Yunnan. 9: 12. 1987. TYPE: China, Yunnan,

Bijiang, Kungdung, 2800 m, 9 Jul 1978, *Nujiang Expedition 943* (holotype, KUN!; isotype, KUN!).

Cardamine hirsuta var. *oxycarpa* J. D. Hooker & T. Anderson,

Cardamine heterophylla T. Y. Cheo & R. C. Fang, Bull. Bot. Lab. North-East. Forest. Inst.,

Harbin 1980(6): 27. 1980; not Host, Syn. P. Austral. 366. 1797; not Lapeyrouse, Hist. Abr. Pl.

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Herbs, short-lived perennial, rarely annual. **Rhizomes** slender. **Stems** (1–)1.5–4.5(–6) dm, often pilose or puberulent, sometimes glabrescent distally, simple or branched from base, angled. **Basal leaves** petiolate, often withered by flowering, 3–5-foliolate, rarely simple; petiole 1–6(–8) cm; leaf blade or terminal leaflet suborbicular, ovate, or lanceolate, 0.5–3 × 0.5–2.5 cm, dentate, crenate, or rarely subsinuate; lateral leaflets absent or 1 or 2 pairs. Middle cauline leaves 3–7-foliolate; petiole (1–)2–7(–8.5) cm, basally auriculate; auricles toothlike, linear, or lanceolate, (0.4–)1–3(–4) × 0.2–1(–1.5) mm; terminal leaflet lanceolate, elliptic, oblong, ovate, or suborbicular, (1–)1.3–4.5(–6) × (0.4–)0.6–2(–3) cm, sparsely pilose adaxially, often glabrous abaxially, with a petiolule (2–)4–14(–20) mm, base obtuse or cuneate, margin ciliate to ciliolate and dentate, crenate, sinuate, or rarely repand, apex acute or acuminate; lateral leaflets 1–3 pairs, shortly petiolulate to sessile, similar to terminal one and often oblique at base; uppermost leaves often trifoliolate, rarely simple. **Raceme** ebracteate; fruiting pedicels ascending or divaricate, 0.5–1.8(–2.3) cm, straight, slender. **Sepals** oblong or nearly ovate, 2–3 × 1–1.5 mm, base not saccate; petals white, obovate, (2.5–)3.5–5(–6) × 2–3 mm, not clawed; median filament pairs 2.5–4 mm, lateral pair 2–3 mm; anthers oblong, 0.5–0.8 mm; ovules 8–18 per ovary. **Fruit** linear, 1.5–2.8(–3) cm × 1–1.3 mm; valves smooth, sparsely pilose; style (0.5–)1–2.5(–3.5) mm. **Seeds** brown, narrowly oblong, 1.3–1.8 × 0.7–1 mm, wingless.

Flowering: Mar–Jul.

Habitat: moist shady places, mountain slopes, valleys, grasslands, meadows, thickets, forest openings, damp stream beds.

Elevation: 900–4200 m.

Distribution: Bhutan, China (Sichuan, Xizang, Yunnan), India (Sikkim), Nepal.