A Taxonomic Revision of Anemone L. Section
Omalocarpus DC. sensu lato (Ranunculaceae): Part II

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This is part II of a taxonomic revision of Anemone sect. Omalocarpus. In this part, 10 species (A. demissa hook. f. & Thoms., A. robusta W. T. Wang, A. tapaiensis W. T. Wang, A. smithiana Lauener & Panigrahi, A. cathayensis Kitag. Ziman & Kadota, A. polyanthes D. Don, A. tetrasepala Royle, A. elongata D. Don, A. sikokiana (Makino) Makino and A. fuscopurpurea H. Hara) are revised. Anemone cathayensis Kitag. is typified and described here. Flower elements and achenes of all eleven species in this section are illustrated. Evolutionary trends in Anemone sect. Omalocarpus are also discussed here. Literatures cited are given in the part I of the taxonomic revision of Anemone sect. Omalocarpus which covered A. narcissiflora L.


Key words: Anemone cathayensis Kitag. ex Ziman & Kadota, Anemone sect. Omalocarpus DC., comparative morphology, taxonomy.


Anemonastrum demissum (Hook. f. &

Basal leaves 5–10(-15); petioles 5–30 cm long, spreading villous; blades 3-sec-ted, wide-ovate or reniform-pentagonal, 5–8 × 4–6 cm, villous or subglabrous, ciliate; bases cordate or subtruncate; central segments on petiolules 5–15 mm long, 3-parted, broadly rhombic or rhombic-ovate; margins lobulate-ciliate; bases cordate or subtruncate; central segments on petiolules 5–15 mm long, 3-parted, broadly rhombic or rhombic-ovate; margins lobulate-incipised, ultimate lobules ovate or triangular; lateral segments subsessile, unequally 2–3-parted, distinctly smaller than central one. Scapes 2–3(-5), 10–45(–80) cm long, spreading villous; cymes umbelliferous, 3–5(–8)-flowered. Involucral leaves 3–4; blades 3-parted or 3-lobed, broadly rhombic or narrowly obovate-oblong, 2–4 cm long, pubescent. Pedicels 2–6(–8) cm long, pubescent. Tepals 5–7, blue, purple, red or white, obovate or elliptic, 8–15 × 4–12 mm, sparsely puberulent, sometimes dimorphic (inner ones smaller and of different shape); basal veins 3–7, anastomosing veins 1–3. Stamens 3–6 mm long; filaments linear-lanceolate; anthers oblong, 1–2 mm long, apices rounded. Staminodes from stamens sometimes present. Ovaries ovoid, compressed, 1.4–1.8 mm long, glabrous or scarcely pubescent; styles bent, 0.5–1 mm long (Fig. 1i). Achene bodies broadly elliptic or obovate, 6–7 × 4–6 mm, glabrous or scarcely pubescent, wings 0.8–1.2 mm wide; styles curved, 1.8–2 mm long (Fig. 3i). Achene surface wrinkled (Fig. 4h) or tuberculate, according to Trifonova and Chaudkhary (1988).

Distr.: China (SW. Gansu, S. Qinghai, W. and SW. Sichuan, E. and S. Xizang, NW. and N. Yunnan and Tibet), Bhutan, N. India, Nepal, Sikkim, Burma, alt. 3000–4600 m, in grassy slopes and sparse forests.

Note: Hooker (1872) included A. demissa in sect. Omalocarpos and noted its ascending multi-stemmed habit, 3-sec-ted basal leaves with distinct petiolules of primary segments, few-flowered cymes, small 3-lobed involucral leaves, blue flowers, and compressed glabrous achenes with curved styles. Brühl (1896) later described its monopodial rhizomes, wide-ovate basal leaf blades, three sessile involucral leaves, five whitish-blue tepals, distinctly dilated filaments, and compressed achenes with wings. He described within A. demissa five varieties: vars. umbellata, macrantha, villosissima, connectens and monantha. Ulbrich (1906) noted many characters in common for A. narcissiflora and A. demissa, and he regarded them as “species collectiva”.

Our examination of many specimens confirmed the variability of this taxon, especially in leaf, stem, pedicel, flower and achene size, also of tepal colour and pubescence. But we found in this taxon several unique characters, e. g., dimorphic tepals [viz., specimen of Handel-Mazzetti 6672 (WU) from China, Yunnan, etc.], and staminodes from stamens [viz., holotype of Hooker, Sikkim (K)] and carpels [viz., specimen of Bartolomew & al. 1044 (GH) from Yunnan, Dali Xian, Mt. Diancang Shan, Yinglofeng Peak, west of Dali city].

Based on our examination of available herbarium materials, we recognized four varieties of A. demissa, vars. demissa, yunnanensis, villosissima and major.

**Key to infraspecific taxa of Anemone demissa**

1a. Basal leaf petioles densely villous or lanate .......................... 2c. var. villosissima
1b. Basal leaf petioles sparsely or densely villous .......................... 2
2a. Stems 5–10 cm long, flowers solitary................................. 2b. var. yunnanensis
2b. Stems 10–45 cm long, cymes few-flowered .......................... 3
3a. Stems 10–20 cm long; basal leaf blades ovate, up to 5 cm wide, lateral segments much smaller than central ones .... 3b. Stems 20–40 cm long; basal leaf
blades mainly rhombic-pentagonal, up to 12 cm wide, lateral segments slightly smaller than central ones ... 2d. var. major

2a. Anemone demissa Hooker f. & Thoms. var. demissa

A. narcissiflora var. demissa (Hook. f. & Thoms.) Finet & Gagnep. in Bull. Soc. Bot. Fr. 53: 74 (1906).

Plants are characterized by the features of A. demissa s. str.

Specimens examined: CHINA: Yunnan, E flank of the Tali Range, 10000 ft., 7.1906, Forrest 4366 (E); Yulong-Shan, Likiang, 6.1911, Handel-Mazzetti (WU); Yulong-Shan, Lilijiang, 7.6.1915, Handel-Mazzetti 1183 (BM); Si-la, inter fluvius Landsang-djiang (Mekong) and Lu-djiang (Salween), 17.6.1916, Handel-Mazzetti 8929 (WU); Mekong-Salwin Divide, 7.1917, Forrest 14177 (E); Fuchuan Range, W of Mekong-Salwin Divide, W of Wei-hsi, 5.6.1932, Rock 22725 (E); Pei Ma Shan, SE of Atunzte, 5.1932, Rock 22834 (BM); Likiang Snow Range, Yangzte loop, Bardar, 1932, Rock 24811 (BM); Likiang Snow Range, Mt. Satseto, 6.1932, Rock 24823 (BM); Pi-lo Shan, 4000 m, 18.8.1934, H. T. Tsai 58010 (PE); Likiang Snow Range, 23.5.1937, Yu 15055 (BM); Chung tien, Shian rentung, 3600 m, 18.10.1937, Yu 13749 (BM); Lichiashicla, 3200 m, 18.11.1937, Yu 10999 (BM); Wuli, Vachin, Deon Gomba, 3500 m, 11.11.1937, Yu 14759 (BM); Tali Range, 12000 ft., Forrest 4367 (K); Prov. Yangbi Xian, western side of Diancang Shan, vicinity of Baiyunfeng Peak above Malutang, 26.6.1984, Bartolomew & al. 566 (LE); Lijiang, Yulong Shan, Gangbaha, 3100 m, 22.5.1987, Chambarlain & al. (K); Ge Zao Distr., 12 km N of Zhongdian (Chungtien), 3440 m, 22.9.1990, Cdd-90 472 (K); Yulong Shan, Gang Ho Ba Valley, 3200 m, 4.10.1990, Cjd-90 745 (K); SW Sichuan, River Aropai, 11.8.1885, Potanin (LE); Da Dsienlu (= Taatsien-lu, Tibetic Tarsando), 15.6.1893, Potanin (LE); Kamsiki Plateau, Khun-Chao Pass, 10.8.1893, Potanin (LE); Pao-Hsing-Hsien, 19.9.1936, Cho 3894 (LE); Mt. Mitzuga, W of Muli Gomba, 3050-4875 m, 6.1928, J. F. Rock 16581 (E); Minya Konka Snow Range, E of Yulong Hsi, 7.1929, Rock 17527, 17528, 17632 (E); Djesi La and Djesi Longha, S of Tatsienlu, 7.1929, Rock 17705 (E); Mt. Siga, W of Yalong River, N of Karadi, 5.1932, Rock 23819 (BM); SE Tibet, Dosong La, 3600 m, 6.1924, Kingdon-Ward 5860 (K); Nyima La, 4800 m, 21.6.1924, Kingdon-Ward 5816 (K); Prov. Tsarung, Solo La, 6.1932, Rock 22256 (BM, E); Prov. Tsarung, Tjonatong, Upper Salvin River, 6.1932, Rock 22312 (BM, E); Lusha Chu, 125000 ft., 11.6.1938, Ludlow & al. 4793 (BM); Kongbo Prov., Tse La, 22.6.1938, Ludlow & al. (BM); Lhasa, 13000 ft., 1939, Richardson 247 (BM); Reting, 60 mile of Lhasa, 14500 ft., 12.7.1944, Ludlow & Sheriff 9983 (BM). Xizang (Kanting), Tachienlu distr, Taposhian, 22.8.1934, Handel-Mazzetti (K). E Kansu, Moule, Schagora, 1885, Potanin (LE). UPPER BURMA: N Maikha-Salwin Divide, 2600 ft., 6.1925, Forrest 26857 (E). BHUTAN: Mem La, 13500 ft., 15.5.1949, Ludlow & Sheriff 16242 (E); Thimbu, above Naha, near bridge, 13000 ft., 23.5.1949, Ludlow & Sheriff 16326 (E); Waitang Tsampa, 13500 ft., 19.6.1949, Ludlow & Sheriff 19201 (E); Me La, Cho La Valley, 13500 ft., 17.7.1949, Ludlow & Sheriff 20499 (E); Upper Mo Chu Distr., Valley SW of Lingshi Dzong. 29.9.1984, Sinclair & Long 5433 (E). NEPAL: Mukdha Hola, Chharkabbot, 1830 ft., 20.6.1952, Polunin & al. 1172 (BM); Chhairaogaon, N of Tukucha, 11500 ft, 31.5.1954, Stainton (GH); Inukhu Hola, Dudd Valley, 14000 ft., 17.6.1964, Bowes-Lyon 2041 (BM).

2b. Anemone demissa Hook. f. & Thoms. var. yunnanensis Franch. in Bull. Soc. Bot. Fr. 33: 167 (1887). Type: China, Yunnan, Mt. Wang-chan, super Cali, 6.5.1886, Delavay (K-isotype!).


Plants comparatively small (stems 10–20 cm long), with basal leaf blades ovate, up to 5 cm wide, and lateral segments much smaller than central ones.


Plants differ from others by basal leaf petiolo densely villous or lanate.

Distr.: China, Sikkim, Bhutan, E. Nepal and India.

Specimens examined: CHINA: Yunnan, Shimenguang, evergreen forest and meadow, 3300 m,


Plants differ from others by large stems (20–40 cm long), and from var. demissa by basal leaf blades mainly rhombic-pentagonal, up to 12 cm wide, and lateral segments slightly smaller than central ones.


Basal leaves 4–7; petioles 15–30 cm long, subglabrous; blades 3 –sected, orbicular-ovate, 4–7 × 4–9 cm, adaxially appressed-puberulent, abaxially glabrous; central segments shortly petiolulate, 3-parted, rhombic, lobes lobulate and dentate; lateral segments subsessile, unequally 2-parted, oblique-flabellate. Scapes 70–120 cm long, subglabrous; cymes 5–10-flowered. Involucral leaves 3; blades 3-parted, obovate or obovate-rhombic, 2.5–5 cm long; lobes 3-lobulate, sparsely pubescent. Pedicels 5–12 cm long, sparsely puberulent. Tepals 6–7, white, oblong-obovate, with wide bases and apices, 15–25 × 7–10 mm, sparsely pubescent; basal veins 3–5, anastomosing veins 1–3. Stamens 3–5 mm long; filaments linear; anthers ellipsoid. Ovaries spherical-ellipsoid, compressed, 4–5 mm long, wings 0.2–0.4 mm wide, glabrous. Achene bodies broadly orbicular-ovate or broadly ovate, complanate, winged, 6–7 × 2.5–3 mm, glabrous; styles curved, 1–1.5 mm long.

Distr.: China (S. Shaanxi, Qinling Range, Taipaishan), alt. 2900–3700 m, in grassy or gravelly slopes.


Basal leaves 5–12; petioles 5–15 cm long, densely spreadingly puberulent; blades 3- sected, broadly ovate, 3–7 × 4–8 cm, adaxially glabrous, abaxially puberulent; bases subtruncate or subcordate; segments sessile; central segments 3-parted, broadly rhombic, lobes subcontiguous or obovate, ultimate lobules ovate; lateral segments 3-lobed, similar to central segments, but smaller. Scapes 2–4, 15–40 cm long, scarcely puberulent; cymes 1–5-flowered. Involucral leaves 3, 3-parted, broadly rhombic; lobes 3-dentate or entire, lanceolate, 2–4 cm long, puberulent. Pedicels 3–6 cm long, pubescent. Tepals 5, white, elliptic, with wide bases and narrow apices, 7–10 × 5–6 mm, sparsely puberulent; basal veins 3–7, anastomosing veins 3–5. Stamens 3–5 mm long; filaments linear; anthers ellipsoid. Ovaries spherical-ellipsoid, compressed, 4–5 mm long, wings 0.2–0.4 mm wide, glabrous. Achene bodies broadly orbicular-ovate or broadly ovate, complanate, winged, 6–7 × 2.5–3 mm, glabrous; styles curved, 1–1.5 mm long.

Distr.: China (NW. Yunnan, Weixi Xian), alt. 2500–3000 m, in mountain valleys.

Note: This species was described by Wang (1974) as a taxon close to A. demissa, but with longer stems and pedicels, and white tepals.

ft., 1930, Lall Dhwoj 460 (E–holotype!; BM–isotype!).

Basal leaves 4–9(–20); petioles 10–20 (–25) cm long, spreading-villos; blades 3- sected, orbicular- pentagonal, 4–8 × 6–12 cm, appressed-villos or pilose; bases cordate; segments sub sessile, slightly imbricate with each other; central segments 3-parted, broadly rhombic, pinnatisect, ultimate lobules ovate obtuse; lateral segments unequally 2­-parted, oblique-flabellate. Scapes 1–2, 20– 45 cm long, spreading-villos; cymes 3–7 (–10)­-flowered. Involucral leaves 3–5(–7); 3­-parted or 3­-lobed, broadly rhombic or flabellate-rhombic, 2–5 cm long. Pedicels 3–4(–10) cm long, pubescent. Tepals 5, purple-red or pink, broadly elliptic, with wide bases and narrow apices, 15–20 × 10–15 mm, pubescent, sometimes along central vein only; basal veins 5–7, anastomosing veins 1–3. Stamens 3–6 mm long; filaments linear; anthers ellipsoid. Ovaries ellipsoid, compressed, 2–3 mm long, glabrous; styles hooked, 1.2–1.5 mm long (Fig. 1j). Achene bodies subspherical or obovate, compressed, winged, glabrous, 4–8 × 4–5 mm; styles ca. 2 mm long, straight or slightly curved (Fig. 3j).

Distr.: China (Xizang and S. Tibet ), India (Assam), Bhutan, Nepal, Sikkim, alt. 3300–4600 m, in bushes and along streams.

Specimens examined: CHINA: Tibet, Nielamu, 4150 m, 19.6.1975, Tibet Expedition 5749 (E). BHUTAN: Phajudin Timpu, 13000 ft., 5.8.1914, Cooper (E); frontier to Assam, Orka La, 13000 ft., 8.6.1938, Kingdon-Ward 13178 (BM). NEPAL: Gossai Kunda, 16.6.1935, Bailey (BM); Bhurchula Lekh, near Jumla, 14400 ft., 13.7.1952, Polunin & al. 4630 (E); Shiar Khola, above Chum Gompa, 12–1400 0 ft., 1.5.1953, Audschnaider (BM); Sauwala Khola, 12000 ft., 4.6.1954, Stainton & al. 2981, 2982 (BM); Rambrong, Lamjung Himal, 13000 ft., 1.7.1954, Stainton & al. 6056 (E); Lete (S of Tukucha) Kali Gandaki, 12000 ft., 7.6.1954, Stainton & al. 1022 (BM; E); Khimti Khola, Pamek Pokhari, 16.07.1964, Stainton & al. 4800 (BM); Kali Gandaki, ESF Thini, 13000 ft., 19.7.1977, Miehe 246 (BM). INDIA: Sikkim, Megu, 14000 ft., 1.7.1913, Rhomoo & Lepeka 822 (E); Bokta, 13000 ft., 10.7.1913, Ribu & Rhomoo (E); Changu, 13000 ft., 28.6.1913, Cooper 43 (E); 21.8.1913, Cooper 564 (E); Assam, Tha Chu Valley, 4.7.1950, Kingdon-Ward 19572 (BM).


Petioi l fere glabri. Laminae foliorum utrinque glabrae ternatae, lobis grosse dentatis. Rostrum acheniorum aliquantum curvata.

Folia basalia 4–8; petiolo 6–25 cm longi, sparse villosi sive glabri; lamina tripartita, orbicularia-reniformia, 3–6 × 4–9 cm, glabra sive glabrescentis; basi cordata; segmenta sub sessilia; segmenta centrale trilobata, late rhomboidalia sive rhomboidalia­­-obovata, lobi lobulati, lobi ultimi ovati sive anguste ovati; segmenta lateralia inaequalia-tripartita, oblique flabellata. Scapi 2–6, 15–40 cm longi, sparse pubescentis sive glabri; cymae 2–5­-flori. Involucris foliis 3–5; laminae tripartita sive trilobata, 4–7 cm longa, inaequalia, rhomboidalia­­-sive obovata, dentata sive integra. Pedicelli 2–5 cm longi, sparse pubescentia sive glabri. Tepala 5–6, alba sive roseola, anguste obovata, basale et apice lata, 10–18 × 5–10 mm, glabri.; nervi basalia 3–5, nervi anastomosantis 1–3. Stamina 4–5 mm longa; filamenta paulum dilatata; anthera anguste elliptica. Ovaria ovoidea, compressa, 3–5 mm longa, glabra. Achenia late­­-ovata sive suborbiculata, alata, 5–6 × 4–5 mm, sparse puberula; stylo paulum curvati, 1 mm longi.


A. narcissiflora L. var. pekinensis Shipcz.,
Basal leaves 4–8; petioles 6–25 cm long, sparsely villous or glabrous; blades 3-parted, orbicular-reniform, 3–6 × 4–9 cm, glabrous or glabrescent; bases cordate; segments subsessile; central segments 3-lobed, broadly rhombic or rhombic-obovate, lobes lobulate, ultimate lobules ovate or narrowly ovate; lateral segments unequally 3-parted, oblique-flabellate. Scapes 2–6, 15–40 cm long, sparsely pubescent or glabrous; cymes 2-5-flowered. Involucral leaves 3–5; blades 3-parted or 3-lobed, 4–7 cm long, unequal, rhombic or obovate, dentate or undivided. Pedicels 2–5 cm long, sparsely pubescent or glabrous. Tepals 5–6, white or pinkish, narrowly obovate, with wide bases and apices, 10–18 × 5–10 mm, glabrous; basal veins 3–5, anastomosing veins 1–3. Stamens 4–5 mm long; filaments slightly dilated;
anthers narrowly ellipsoid. Ovaries ovoid, compressed, 3–5 mm long, glabrous; styles hooked, ca. 1 mm long. Achene bodies wide-ovate or suborbicular, winged, 5–6 × 4–5 mm, sparsely puberulent; styles slightly curved, ca. 1 mm long.

Distr.: China (Hebei and Shanxi) and Korea, alt. 1000–2800 m, on grassy and rocky slopes.

Note: Ulbrich (1906) noted the nearly glabrous plants within A. demissa and separated them as variety glabrescens Ulbr. However, Shipchinski (1912) believed that this variety was closer to A. narcissiflora, but differed from it by their 3-parted reniform basal leaf blades, large involucral leaves, and numerous stems. Accordingly, he described these plants as A. narcissiflora var. pekinensis (because they occurred in the mountains close to Pekin [Beijing]). Kitagawa (1935) also included these plants in A. narcissiflora (as subsp. chinensis Kitag.), but later he (Kitagawa 1939) described them as A. cathayensis, and he noted the variability of the basal leaf blade shape and pubescence.

According to Tamura (1958), A. cathayensis var. cathayensis is characterized by glabrous ovaries and achene bodies, and A. cathayensis var. hispida with hairy ovaries and achene bodies.


A. longiscapa Wall., Cat. 4691 (1831), nom. nud.

Basal leaves 4–7; petioles 10–30 cm long, villous (hairs short silky); blades 3–5-parted (sometimes 3–7-lobed), rhombic-pentagonal, 5–10 × 5–12 cm, dark, sparsely puberulent; segments 3-lobed or 3-cleft; bases cordate; margins dentate. Scapes 25–60 cm long, villous; inflorescences compound, 7–15-flowered. Involutucral leaves 3–7; 3-lobed or 3-cleft, 3–5 cm long, sparsely puberulent; bracteoles small. Pedicels 3–7 cm long, puberulent. Tepals 5–10, white or yellowish, basally narrowed, apices rounded, mainly reflexed, sometimes apically with several teeth, 15–25 × 8–15 mm, sparsely puberulent; basal veins 3–5, with 1–5 anastomosing veins. Stamens 7–8 mm long; filaments slightly dilated, anthers ellipsoid. Ovaries oblong, compressed, 1.5–3 mm long, glabrous, styles substraight, 0.7–1.3 mm long (Fig. 1k). Achene bodies rounded-ovate, basally narrowed, 6–10 × 5–8 mm, with solitary hairs basally and apically, wings 1.1–1.3 mm wide; styles bent or substraight, 1.6–1.8 mm long (Fig. 3k). Achene surface wrinkled (Fig. 4j).
Distr.: Pakistan, India (Simla, Assam and Kumaon), Nepal, Sikkim and Bhutan, alt. 2700–4400 m, in sparse forests and meadows.

Note: Don (1825) described this species from the flora of the Himalaya and regarded it close to A. narcissiflora. Don characterized the species as having 3-parted pubescent basal and involucral leaves with wide pinnatifid segments and dentate margins, umbelliferous inflorescences, 5-leaved perianth and glabrous achenes. Meanwhile, Hooker (1872) noted the variability of its inflorescences (simple or compound) and wide-ovate achenes with straight styles. Hooker he presupposed that A. polyanthes may be only a form of A. narcissiflora with less dissected leaves and branched inflorescences.

This species was not recognized by some authors, beginning with Hooker (1872). This was partly due to Don’s (1825) inadequate description but mainly because of the variability of certain characters (e.g., peculiarities of leaf dissection, inflorescences, pubescence of sepals and achenes).

The results of our study confirm this variability. For instance, the holotype specimen examined by us in E (Himalaya, Wallich 4691) has simple umbelliferous cymes, 3-parted basal leaf blades, and puberulent tepals and achenes. However, in 1865 Hooker regarded the material of Royle (N 6840) from the Himalaya (K) as the type specimen. The plant has compound inflorescences, 3-sected basal leaf blades, and glabrous sepals and achenes.

Specimens examined: CHINA: Yunnan, Mt.Heechan-Men, Hyra Yankong, 6.5.1887, Delavay 110 (K).
NEPAL: Sialgarhi Chaudhabise Khola, 10000 ft., 16.5.1952, Polunin 2061 (GH); Jajale, 13500 ft., 22.7.1971, Einarsson 237 (BM); Saure Khola, 3200 m, 26.5.1973, Einarsson & al. 205 (BM); Jangla Banjang, 2400 m, 4.6.1973, Einarsson & al. (BM). INDIA: Kashmir, Lonzal Nala, Liddar Valley, 14000 ft., 31.7.1893, Duthie 13368 (BM); Sona Sar, 27.6.1914, Thackeray (BM); Sintan Pass, head of Beinghi Valley, 11500 m, 7.9.1940, Ludlow & Shefr 8184 (BM).


Basal leaves 3–7; petioles 15–30(–40) cm long, puberulent or glabrescent; blades deeply 5-lobed, coriaceous, reniform or cordate-reniform, 8–15 × 10–20 cm, adaxially sparsely pubescent, abaxially
appressed-pubescent mainly along veins; bases cordate; central segments 3-cleft, broadly rhombic, lobes with few acute lobules or teeth; lateral segments unequally 2-parted, oblique-flabellate. Scapes 1–2, 25–50 (–60) cm long, sparsely puberulent; cymes compound, 2–3-branched, 7–15-flowered. Involutral leaves 2–4 (–5), coriaceous, 3-parted or 3-lobed, 4–8 cm long, densely pubescent. Bracteoles 3-lobed or undivided, lanceolate, 1.5–2 cm long. Pedicels 4–10 cm long, pubescent. Tepals 4 (–5), white, obovate-oblong, with narrow bases and wide apices, 12–20 × 6–12 mm, glabrous; basal veins 5–9, anastomosing veins 5–7. Stamens 6–8 mm long; filaments slightly dilated; anthers narrowly ellipsoid. Ovaries ovate, basally narrowed, 7–10 × 4–5 mm, glabrous, wings 1–1.3 mm wide; styles hooked, 1.5–2 mm long (Fig. 3i). Achene surface folded (Fig. 4k).

Distr.: China (S. Xizang and W. Tibet), India (Kashmir), Afghanistan and Pakistan, alt. 2400–3800 m, mainly in Abies forests.

Note: In description of A. tetrasepala Royle (1839) noted the 4-merous perianth, coriaceous 5-lobed basal leaf blades with long petioles, four 3-lobed primary bracts and several small secondary bracts. In addition, Hooker (1872) described the compound inflorescences, white tepals and obovate-ovoid achenes with curved styles. Hooker regarded A. tetrasepala as allied to A. polyanthes. Other authors (e. g., Dhar and Kachroo 1983, Qureshi and Chaudhri 1988, Rechinger and Riedl 1992, Sharma et al. 1993) added to the characteristics of A. tetrasepala the large involucral leaves, slightly dilated filaments, and compressed winged glabrous achenes, and a chromosome number of \(x = 7\).


A. rivularis auct. non Buch.-Ham. ex DC.: Wallich Cat. 4692 (1831).

Basal leaves 5–15; petioles 15–30 cm long, more or less densely pubescent; blades 3-parted, rhombic-rounded, 8–15 × 6–12 cm, sparsely puberulent or subglabrous; segments 2–3-lobed, rhombic; margins acute-dentate. Scapes 40–80 cm long, glabrous or sparsely puberulent; inflorescences compound, elongate, 7–15-flowered. Involutral leaves 3–7 (–9); 3-parted, rhombic, 5–14 cm long, sparsely puberulent; bracteoles 3-cleft or entire, 2–4 cm long. Pedicels 3–15 cm long, basally villous. Tepals 5, white, oblong-ovate, with rounded apices and long-narrowed bases, 12–20 × 6–12 mm, sparsely puberulent or glabrous; basal veins 3–5, anastomosing veins absent or solitary. Stamens 3–4 mm long; filaments linear, anthers ellipsoid. Ovaries ovoid, compressed, 1–1.2 mm long; styles substraight, 0.3–0.5 mm long (Fig. 1m). Achene bodies ovate-elliptic, 6–9 × 4–7 mm, glabrous, wings 1.2–1.3 mm wide; styles straight or sometimes slightly curved, 1–1.5 mm long (Fig. 3m). Achene surface folded-wrinkled (Fig. 4l).
Distr.: India (Sikkim, Assam, Kumaon, Uttar Pradesh), Nepal (Khasi, Kathmandu, Rambrong, Annapurna) and N. Burma, alt. 1800–3700 m, in sparse forests and meadows.

Note: Don (1825) described this species from the flora of Nepal, and he noted its subglabrous basal leaves, paired 3-lobed basally connected bracts, long pubescent pedicels, and small white flowers with 5 ovate tepals, and glabrous achenes with distinct styles. Hooker (1872), the first author to include A. elongata in sect. Omalocarpus, noted its short rhizomes, thin stems 60–100 cm long, large basal leaves with 3-parted blades and acutely dentate margins, and elongated branched inflorescences with 2–3-flowered terminal cymes.

Briehl (1896) who worked out the most detailed characteristics of this taxon, described the rhombic-orbicular basal leaf blades, dimorphic bracts (2–3 large primary bracts having 3-parted blades and 1–2(–3)-lobed or entire bracteoles), five wide-ovate glabrous tepals, flat and slightly dilated filaments, large compressed achenes with narrow wings, a ribbed achene surface and short, nearly straight styles.

Specimens examined: CHINA: Tibet, Lende Khola, 9500 ft., 11.7.1939, Polunin 861 (BM). NEPAL: Dhduskund, 6 mi E of Timure, 12000 ft., 1939, Polunin 846 (BM); Rambrong, Lamjung Himal, 10500 ft., 27.6.1954, Stainton & al. 5976 (E); Annapurna Himal, Seti Khola, 14500 ft., cliff ledges, 22.8.1954, Stainton & al. 6589 (E); below Dhotbas, Quercus forest, 900 ft., 15.8.1952, Polunin & al. 445 (E); Kasuwa Khola, N of Num, 10000 ft., 10.6.1956, Stainton 3792 (E); Arum Valley, Barun Khola, N of Num, 10000 ft., 12.6.1956, Stainton & al. 624 (BM, E); Kali Gao, 29°40’N, 81°0’E, 10.6.1939, Polunin (BM). NW INDIA: Near Rainri, 10000 ft., 4.9.1885, Duthie 3792 (BM).


Basal leaves 4–8; petioles 15–25(–32) cm long, hirsute; blades 3-parted, broadly rhombic to orbicular-reniform, 3–6(–10) × 2–5 (–12) cm, ciliate and sericeous along veins or subglabrous; bases cordate; segments 3-cleft beyond middle or 3-cuspidate, flabellate-ovate, ultimate lobules obovate to narrowly ovate, sometimes falcate. Scapes 1–3, 25–40(–65) cm long, sparsely pubescent or subglabrous; inflorescences simple or compound, 4–12 cm long, 3–10-flowered. Involute leaves 3–7; 3-parted or 3-cleft, flabellate or rhombic-ovate, 3–6 cm long, ciliate or subglabrous. Bracteoles (if present) 3-lobed, 1.5–2 cm long. Pedicels 4–6(–15) cm long, hirsute. Tepals 4–5, white, oblong-elliptic, with wide bases and narrow apices, 10–12 × 4–5 mm, glabrous; basal veins 3–5, anastomosing veins absent. Stamens 3–4 mm long; filaments slightly diluted; anthers ellipsoid. Ovaries ovoid, compressed, 1–1.2 mm long, glabrous; styles substraight, 0.3–0.5 mm long (Fig. 1n). Achene bodies broadly elliptic, basally narrowed, 5–6 × 3–4 mm, glabrous, wings 0.5–0.6 mm wide; styles basally hooked, 0.6–1 mm long (Fig. 3n). Achene surface wrinkled (Fig. 4m).

Distr.: Japan (Shikoku) and China (E. Shandong), alt. 600–1700 m, in grassy meadows or rocky slopes.

Note: Makino (1894) described this taxon
in the flora of Japan as *A. narcissiflora* L. var. *sikokiana* Makino, and later he (Makino 1913) separated this variety from *A. narcissiflora* as *A. sikokiana* because of the compound inflorescences. Later Ohwi (1938) described closely related species from the flora of Japan as *A. chosenicola* Ohwi.

After examination of similar plants from China (Shantung, in montibus Chi-fu, 1891, Faber, B), Handel-Mazzetti (1939) described *A. schantungensis* which he regarded as close to both *A. tetrasepala* and *A. chosenicola*.

However, as a result of our analysis of the descriptions of *A. sikokiana*, *A. chosenicola* and *A. schantungensis*, we concluded that plants of all these species belong to the same taxon, viz., *A. sikokiana* as initially described by Makino.

Specimens examined: **JAPAN**: Shikoku, Ehime Pref., Mt. Ishizuchi, Shūsō-gun, 30.7.1921, Yamamoto (LE); Mt. Ishizuchi, Saijō-shi, Tsuchi-goya, 27.7.1984, Kawahara & Im 163 (K).


Basal leaves 5–7; petioles 5–10 cm long, sparsely puberulent; blades 3-sected, rounded-ovate, 2–3 × 2–4 cm, glabrous, ciliate; segments subsessile; central segments 3-lobed, oblong-rhombic; bases cuneate; margins incised-dentate; lateral segments similar to central ones, but smaller. Stems 2–4, mainly ascending, 5–15 cm long, basally villous; cymes 2–5-flowered. Involuclar leaves 3–4, 3-lobed; bases cuneate; margins dentate; 2–3 cm long, sparsely puberulent. Pedicels 4–5 cm long, villous. Tepals 4–5, purple, oblong, basally narrowed, apically rounded, 6–10 × 2–5 mm, puberulent; basal veins 3–5, anastomosing veins 1–3. Stamens 2–2.5 mm long; filaments slightly dilated; anthers oblong. Carpels ovate, glabrous, styles curved, ca. 1 mm. Data on achenes lacking.

**Distr.**: E. Nepal (Pokhari and Topke Gola), alt. 3600–4400 m.

Note: *Anemone fuscopurpurea* was described (Hara 1973) from the flora of the Himalaya (E. Nepal) on the basis of several herbarium specimens without achenes. Hara regarded this taxon as close to both *A. obtusiloba* (sect. Himalayicae) and *A. demissa* (sect. Omalocarpus). Tarasevich and Chaudkhary (1988) examined its pollen grains and concluded that *A. fuscopurpurea* should be placed in a monotypic section, Fuscopurpurea. After examination of the available herbarium material in E, we considered that by the characteristic morphological features this species is very close to the members of sect. Omalocarpus, where it is closer to *A. smithiana* than to *A. narcissiflora*. Until the achenes of this taxon are known and scanning microscopy data on the other Omalocarpus taxa exist, it is more expedient to regard *A. fuscopurpurea* as belonging to series Omalocarpus.

Specimens examined: **E. NEPAL**: Arun-Tamur, Topke Gola, 13500 ft., 11.5.1956, Stainton 253 (E); Topke Gola, 14000 ft., 8.7.1971, Beer 8305 (E).

**Taxonomy and Evolutionary Trends within Sect. Omalocarpus**

As a whole, the geographic area of sect. Omalocarpus is palearctic, but such an area is characteristic for only the aggregate species *A. narcissiflora* (distributed disjunctively in Eurasia and N. America). The other 10 species occur in E. Asia (China, N. India, Nepal, Sikkim, Bhutan, part of Pakistan and W. Afghanistan), and several species are narrow endemics of China.

The main localities of these plants are open mountain slopes. Several species (e. g., *A. elongata*, *A. tetrasepala* and *A. smithiana*) occur in both forest and meadow localities. Only three species (*A. narcissiflora*, *A. cathayensis* and *A.
sikokiana) have wide limits of elevation (600–3000 m), but most plants grow at the higher elevation (e. g., over 2500 m). Two species (A. demissa and A. smithiana) grow at the heights of over 3000 m.

After an examination of considerable numbers of specimens, we recognize 11 species within sect. Omalocarpus. According to our analysis, A. narcissiflora is an aggregate species and it consists of eight subspecies: subsp. narcissiflora, zephyra, fasciculata, protracta, sibirica, villosissima, alaskana and nipponica. In line with our previous conclusions (Ziman et al. 1997), we are including in A. narcissiflora a number of narrow species (races) described by Juzepchuk (A. crinita, A. biarmiensis and others) and other authors. Moreover, we are not recognizing several narrow endemics (A. multilobulata, A. nutantiflora and A. tengchongensis) and accordingly we are reducing these species as synonyms of A. narcissiflora.

We regard A. demissa as a variable species with four varieties (vars. demissa, major, villosissima and yunnanensis), but we are not recognizing varieties macrantha, monantha, grandiflora, connectens and glabrescens. On the basis of a number of characters pertaining to the flowers, achenes, and leaves, Anemone demissa is close to A. narcissiflora and it is sometimes confused with the latter in herbarium collections. Nevertheless, important distinctions between A. demissa and A. narcissiflora include the fact that A. demissa has more numerous ascending stems, basal leaf blades longer than wide, multiple flowers with mainly blue tepals always having anastomosing veins, and achenes with longer styles (0.8–1.4 and 1.8–2 mm). It is also remarkable that in most high mountain floras of E. Asia A. narcissiflora is replaced by A. demissa.

Anemone robusta is close to A. narcissiflora and A. demissa, but it differs from them by the larger sizes of leaves, stems and other organs, its monomorphic perianth and glabrous achenes.

Anemone cathayensis was also regarded as close to both A. narcissiflora and A. demissa. According to our data, this taxon is rather distant from these and other taxa of sect. Omalocarpus because of its numerous stems and tepals (blue or pink and glabrous), involucral leaves larger than basal leaves, and sparsely puberulent achenes.

Anemone taipaensis was described as close to A. demissa, but, in our opinion, it is close to both A. narcissiflora and A. demissa (9–10 common characters), but differs from them by five smaller tepals and narrower glabrous achenes with short styles.

Anemone smithiana has 12 essential characters in common with A. narcissiflora and differs from it mainly by its 3-parted basal leaf blades and five red larger tepals of perianth.

Within ser. Involucellatae the most distinct species is A. polyanthes, which has tall stems, compound, many-flowered inflorescences, 5–10 large reflexed pubescent tepals, and large, sparsely puberulent achenes.

Three local endemics of Pakistan (A. mirajabii, A. lowariensis and A. abdurrehmanii) were described as close to A. polyanthes, but their distinctions (mainly basal leaf shape) are variable, and, in the opinion of the authors of the treatment of Anemone in the flora of Pakistan (Riedl and Nasir 1991), basal leaf shape is not a sufficient basis for recognizing any of these taxa. In following Riedl and Nasir, we are regarding them as synonyms of A. polyanthes.

The most characteristic features of A. elongata are its elongate many-flowered inflorescences, large 3-parted basal leaves, and five glabrous, basally long-narrowed tepals mainly without anastomosing veins. This species is close to both A. polyanthes (12 common essential characters) and A. tetrasepala (11 common characters).

Anemone tetrasepala is rather close to A.
Polyanthes having 14 common essential characters, but differs from the latter by its 3-lobed coriaceous basal leaf blades, four glabrous tepals, and longer achene styles.

Anemone sikokiana was separated from A. narcissiflora on the basis of its compound inflorescences. It is also characterized by five rather small glabrous tepals with acute apices and without anastomosing veins, and its achenes have the smallest wings (0.5–0.6 mm wide) and styles (0.6–1 mm long) in sect. Omalocarpus.

Anemone sikokiana, A. chosenicola and A. schantungensis are sufficiently similar to warrant classifying all three taxa as one species, viz., A. sikokiana. Accordingly we regard A. chosenicola and A. schantungensis as synonyms of A. sikokiana. We also confirm that this species has to be included in ser. Involucellatae mainly because of the compound inflorescences and 3-parted (not 3-sected) basal leaves.

Anemone fuscopurpurea, a narrow endemic of E. Nepal, has many essential characters in common with other high-mountain Nepalese plants classified in sect. Omalocarpus, especially in leaves and flowers. But distinctions between this and other species are noticeable, including small linear-lanceolate tepals, glabrous basal leaves, and the presence of peculiar tubercules on the pollen grain surface. These differences have been the basis for describing the monotypic sect. Fuscopurpurea. However, until data on microsculpture of the pollen grain surface of other species of sect. Omalocarpus are obtained, it would be better to regard its status as corresponding to series (not section) Omalocarpus.


The fact that sect. Omalocarpus is represented within Eurasia and N. America by only one species (A. narcissiflora) and in the Himalayas and adjacent territories by several species, probably indicates that E. Asia was the most important center of the differentiation and later migration of the species referred to this section. The occurrence of most taxa of sect. Omalocarpus in the high mountain localities, reflects possible development of the ancestral group in the high mountains of E. Asia and later distribution and differentiation of A. narcissiflora in Eurasia and North America.

The great similarity of all plants within the A. narcissiflora complex led us to conclude that this complex has had an ancient origin coupled with a long-term segregation from other species of Anemone. Thus, our analysis of the distinctions between the infraspecific taxa helped us to hypothesize a possible evolutionary differentiation within this complex.

We believe the ancestor of A. narcissiflora evolved within the center of differentiation, in E. Asia, of Anemone sect. Omalocarpus and, like modern Anemone species, it was a perennial herbaceous plant with a distinct basal rosette and involucre of 3-sected leaves. Its flowers had a simple perianth with pubescent tepals having many anastomosing veins, and slightly puberulent suborbicular achenes with smoothed or wrinkled surface.

The main directions of evolution included the development of a glabrous perianth, reduction of tepal anastomosing veins and development of folded or tuberculate achene surface.

Migration of derivative plants southwestward from the center of evolution in East Asia led to a differentiation of populations now regarded as subspp. protracta, characterized by a pubescent perianth with reduced anastomosing veins and small-folded achene surface.

Populations here classified as subspp.
narcissiflora and fasciculata were the result of a further migration and differentiation of plants of A. narcissiflora to the West. These populations have the ancestral pilose tepals and large number of tepal anastomosing veins, plus folded-wrinkled achene surface. Plants belonging to subsp. narcissiflora are distributed in Europe and differ from those of subsp. fasciculata occurring in the Caucasus by their larger number of tepal anastomosing veins, and presence of several types of petiolar vascular bundle arrangement.

Migration of derivative plants to the Northwest, Far East and Siberia involved populations with a reduced tepal pubescence and a transformation of achene surface microsculpture, leading eventually to a distribution throughout this vast territory, of plants with glabrous tepals, without (or nearly so) tepal anastomosing veins, and a tuberculate achene surface which we now recognize as subsp. sibirica.

Meanwhile, plants distributed in Japan (subsp. nipponica) have mixed essential characters: derived glabrous tepals without anastomosing veins and plesiomorphic wrinkled-folded achene surface. We also noted this phenomenon of mixed characters for plants in Alaska and neighboring territories (subsp. alaskana): glabrous tepals without anastomosing veins (as in Siberian plants), but with a folded achene surface (like in plants in E. Asia).

Finally, all plants in the Rocky Mountains of U. S. A. (subsp. zephyra) have plesiomorphic pubescent tepals with anastomosing veins and folded-tuberculate achene surface.

The evolutionary trends within sect. Omalocarpus thus appear to include a decrease in flower size (A. sikokiana), development of 4-5-leaved perianth (A. tetrasepala, A. smithiana, etc.), dimorphic tepals (A. demissa, A. polyanthes) and staminodes (A. demissa), reduced tepal pubescence (A. tetrasepala).

Achene trends include mainly transformation of styles from straight (A. elongata) to curved and compressed (A. narcissiflora). Achene surface changed from wrinkled type via folded one to a tuberculate type.

Evolutionary trends of vegetative organs include decrease of stem and leaf length (A. fuscopurpurea), a reduction of compound inflorescences (ser. Involucellatae) into simple few-flowered cymes (ser. Involucratae) to solitary flowers, change of 3-lobed and 3-parted basal leaves (ser. Involucellatae) into 3-sected leaves (ser. Involucratae).

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