

REVISION OF *MECONOPSIS* SECTION *FORRESTIANAE* (PAPAVERACEAE)¹

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Abstract. *Meconopsis* section *Forrestianae* is revised. Three new species, *M. aprica*, *M. purpurea*, and *M. wengdaensis*; two new subspecies of *M. lancifolia*, subsp. *daliensis* and subsp. *shikaensis*; and a new variety of *M. yaoshanensis*, var. *luojiensis*, are described and illustrated. A new combination is proposed, *Meconopsis lancifolia* subsp. *xiangchengensis*. Distribution maps of the taxa treated are provided.

Keywords: *Meconopsis*, section *Forrestianae*, revision, new species, series *Barbisetae*, series *Forrestianae*, series *Henricanae*

Meconopsis lancifolia (Franch.) Franch. ex Prain of section *Forrestianae* C. Y. Wu & H. Chuang (Papaveraceae) was first collected on 7 June 1886 by Jean Marie Delavay, French missionary and botanist, on calcareous rocky hills around the depression of Yen-tze-hay, Lan-kong, at 3200 m in elevation according to the type specimen, *J. M. Delavay 2080* (P). On another sheet of *J. M. Delavay 2080* (P), which was not annotated as one of the type specimens, it is written on the label: “on a calcareous rocky hill above the pass of Konalapo (Ho-kin), 3500 m in elevation on 13 July 1886.” Ho-kin, or Heqing (鹤庆) in modern Chinese, is the main region where Delavay was engaged as a missionary and where he conducted many of his botanical activities. The exact location of the type locality of *M. lancifolia*, Yen-tze-hay, was unknown until one of us (Yoshida) discovered it in July 2018 through information provided by Siyuang Wang (王思源), committee secretary of Xiyi Village (西邑村), located at the eastern foot of Ma-er Shan (马耳山). According to Mr. Wang, Yen-tze-hay, or Yen-tzu-ai in more precise pronunciation, is a place name in the language of the local people, the Bai-zi (白族), referring to a depression with two lakes on Ma-er Shan. On the basis of the information from Mr. Wang, Yoshida successfully reached Yen-tze-hay with a key local person as a guide, and there on the slopes near Yen-tze-hay was a blue poppy resembling the plant in the photograph of *Meconopsis lancifolia* taken by him on Shika Xueshan. It was the first collection of *M. lancifolia* at the type locality in some 130 years since Delavay made his collections. New collections of *M. lancifolia* and field observation enabled us to compare the features to related taxa.

Plants resembling typical *Meconopsis lancifolia* have been collected in many places in northwest Yunnan, northeast Myanmar, southeast Xizang (Tibet), western Sichuan, and southern Gansu by others since Delavay’s time. Some were

described as new species, such as *M. eximia* Prain and *M. lepida* Prain, or included in *M. lancifolia*.

Taylor (1934) included *Meconopsis eximia* and *M. lepida* within *M. lancifolia* var. *solitariiflora* Fedde in his monograph of the genus. He treated *M. concinna* Prain as *M. lancifolia* var. *concinna* (Prain) G. Taylor in the monograph, but *M. concinna* is quite different from *M. lancifolia*, especially in often having pinnately or bi-pinnately lobed leaves. Grey-Wilson (2014) treated *M. eximia* as *M. lancifolia* subsp. *eximia* (Prain) Grey-Wilson, and *M. lepida* as *M. lancifolia* subsp. *lepida* (Prain) Grey-Wilson in his monograph of the genus. *Meconopsis lepida* in southern Gansu is, however, distinct from *M. lancifolia* in the elliptic or rounded anthers with incurved thecae (short oblong or ellipsoid anthers with straight thecae in the latter) and in the inflorescence with 1–4, most often 2, flowers, and without flowers at the base (3–7 flowers, often with basal flowers in the latter), as mentioned by Yoshida and Sun (2017).

On the basis of our studies of *Meconopsis lancifolia* and related plants using herbarium specimens, newly collected materials, and field observations, we present a revision of section *Forrestianae* in which we recognize three series; *Forrestianae* C.Y. Wu & H. Chuang, *Henricanae* C.Y. Wu & H. Chuang, and *Barbisetae* T. Yoshida & H. Sun, provided with descriptions of the included species, except those recently revised or described by T. Yoshida and H. Sun (2017, 2018).

In this paper, “scapose plant” refers to plants with the stem, peduncle, and rachis all contracted and not exposed above ground and with flowers borne on long erect or ascending pedicels; subscapose refers to plants with a short inflorescence rachis partly or entirely exposed above ground and with long ascending pedicels.

The taxa treated below are mapped to show their distributions (Fig. 1).

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¹ Corrections and comments by the authors are in square brackets. Figures 85–100 (S.E.M. images) are cited out of sequence throughout the text.

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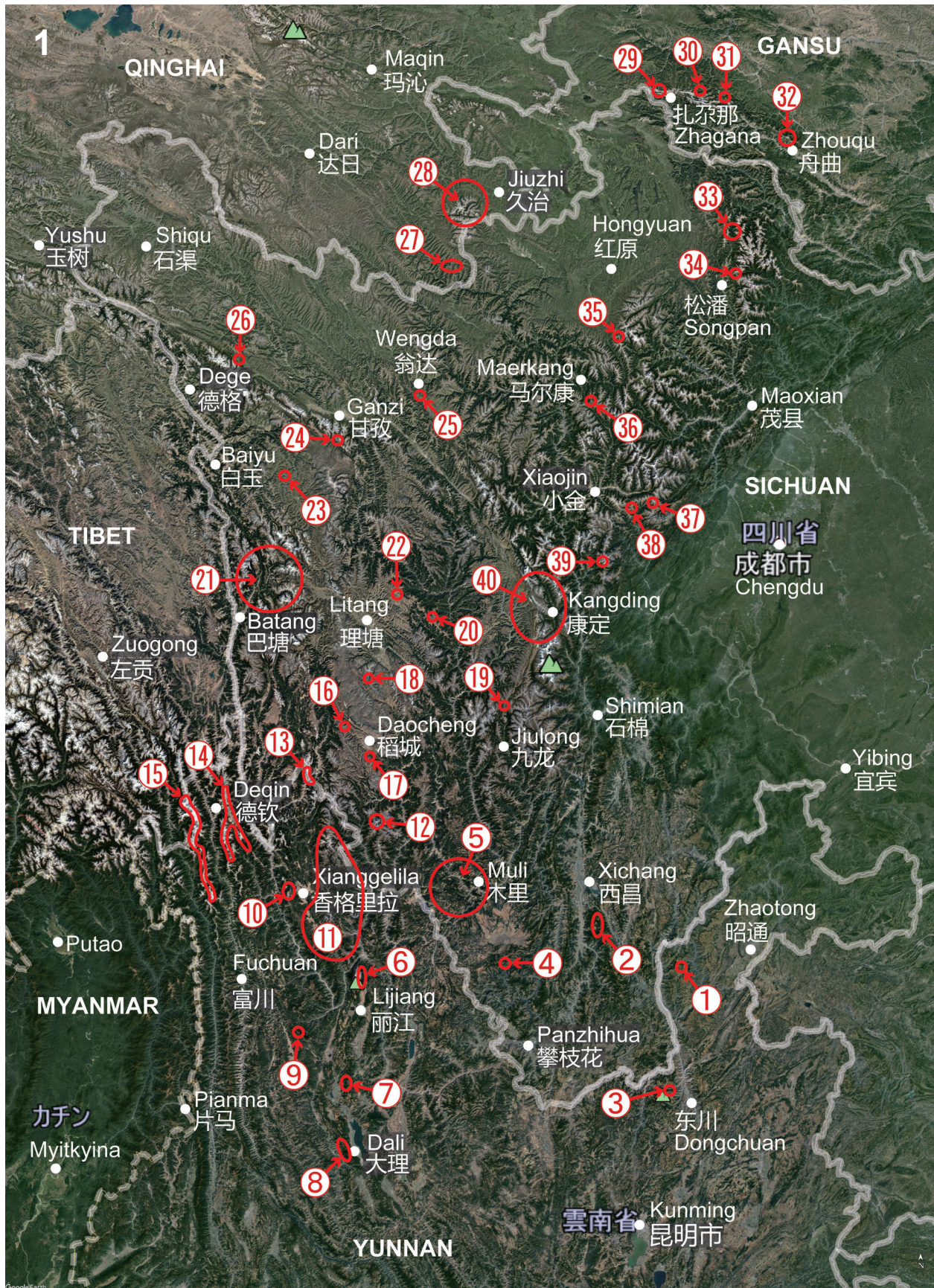


FIGURE 1. Distribution of taxa of *Meconopsis* Vig. section *Forrestianae* based on Google Earth with proposed delineation of 39 regions that include the locality of at least one specimen of the taxa of concern. **Region 1:** NE Yunnan, Qiaojia Xian, Yao Shan; **Region 2:** SW Sichuan, Luoji Shan; **Region 3:** NE Yunnan, Dongchuan Qu; **Region 4:** SW Sichuan, Yan-yuang Xian; **Region 5:** SW Sichuan, Muli Xian; **Region 6:** NW Yunnan, Lijiang Shi; **Region 7:** NW Yunnan, Heqing Xian; **Region 8:** NW Yunnan, Yangbi Xian and Dali Shi, Cang Shan; **Region 9:** NW Yunnan, Jianchuan Xian; **Region 10:** NW Yunnan, Xianggelila Shi, around Shika Xueshan; **Region 11:** NW Yunnan, Xianggelila Shi; **Region 12:** SW Sichuan, Daocheng Xian, Daocheng Gongga Shan; **Region 13:** NW Yunnan, Xianggelila Shi, and SW Sichuan, Xiangcheng Xian, Da Xueshan; **Region 14:** NW Yunnan, Deqin Xian, Yunling including Baima Xueshan; **Region 15:** NW Yunnan, Deqin Xian and Gongshan Xian, and SE Xizang, Chayu Xian, northern part of Nu Shan including Meili Xueshan; **Region 16:** SW Sichuan, Daocheng Xian and Xiangcheng Xian, Wuming Shan; **Region 17:** SW Sichuan, Daocheng Xian, Bowa Shan; **Region 18:** SW Sichuan, Litang Xian, Haizi Shan; **Region 19:** SW Sichuan, Jiulong Xian, Jichou Shan; **Region 20:** SW Sichuan, Yajiang Xian, west of Yajiang; **Region 21:** SW Sichuan, Batang Xian; **Region 22:** W Sichuan, Yajiang Xian, Kazi La Shan; **Region 23:** W Sichuan, Baiyu Xian, Ganbailu Yakou; **Region 24:** NW Sichuan, Ganzi Xian, around Zhuoda La; **Region 25:** NW Sichuan, Wengda Xian, Laozhe Shan; **Region 26:** NW Sichuan, Dege Xian, Dege Haizi Shan; **Region 27:** SE Qinghai, Banma Xian, Makehe; **Region 28:** SE Qinghai, jiuzhi Xian, around Nianbaoyuze Shan; **Region 29:** S Gansu, Diebu Xian, W of Zhagana; **Region 30:** S Gansu, Diebu Xian, Gansu Min Shan; **Region 31:** S Gansu, Zhuoni Xian, Gansu Min Shan; **Region 32:** S Gansu, Zhouqu Xian and Dangchang Xian, Leigu Shan; **Region 33:** N Sichuan, Songpan Xian, Gonggaling; **Region 34:** N Sichuan, Songpan Xian, around Xueshanliang; **Region 35:** N Sichuan, Heishui Xian and Hong-yuan Xian, Yanggong Shan; **Region 36:** NW Sichuan, Xiaojin Xian, Mengbi Shan; **Region 37:** W Sichuan, Xiaojin Xian, Balang Shan; **Region 38:** W Sichuan, Xiaojin Xian, Jiabin Shan; **Region 39:** W Sichuan, Kangding Shi, Baoding Shan; **Region 40:** W Sichuan, Kangding Shi. Taxa treated and their region(s) of distribution: *M. aprica* T. Yoshida & H. Sun: Region 24; *M. barbisetata* C.Y. Wu & H. Chuang ex L.H. Zhou: Region 27, 28; *M. forrestii* Prain: Region 5, 6, 8, 11; *M. henrici* Bureau & Franch.: Region 5, 40; *M. hispida* T. Yoshida & H. Sun: Region 35; *M. huanglongensis* T. Yoshida & H. Sun: Region 34; *M. inaperta* T. Yoshida & H. Sun: Region 22, 23; *M. lancifolia* (Franch.) Franch. ex Prain subsp. *daliensis* T. Yoshida & H. Sun: Region 3, 8; *M. lancifolia* subsp. *eximia* (Prain) Grey-Wilson: Region 11, 12, 13, 14, 15; *M. lancifolia* subsp. *lancifolia*: Region 7, 9; *M. lancifolia* subsp. *shikaensis* T. Yoshida & H. Sun: Region 10; *M. lancifolia* subsp. *xiangchengensis* (R. Li & Z.L. Dao) T. Yoshida & H. Sun: Region 4, 5, 16, 17, 18, 19, 20, 21; *M. lepida* Prain: Region 32; *M. pleurogyna* W.T. Wang: Region 28, 35, 36; *M. psilonomma* Farrer var. *calicicola* T. Yoshida & H. Sun: Region 29; *M. psilonomma* var. *psilonomma*: Region 30, 31; *M. psilonomma* var. *sinomaculata* (Grey-Wilson) H. Ohba: Region 33; *M. psilonomma* var. *zhaganaensis* T. Yoshida & H. Sun: Region 29; *M. purpurea* T. Yoshida & H. Sun: Region 37, 38, 39; *M. trichogyna* T. Yoshida & H. Sun: Region 26; *M. wengdaensis* T. Yoshida & H. Sun: Region 25; *M. yaoshanensis* T. Yoshida, H. Sun & Boufford var. *luojiensis* T. Yoshida & H. Sun: Region 2; *M. yaoshanensis* var. *yaoshanensis*: Region 1.

TAXONOMY

Meconopsis section Forrestianae C. Y. Wu & H. Chuang, *nomen emend.*

Synonyms: *Meconopsis* section *Forrestii* C.Y. Wu & H. Chuang, *Acta Bot. Yunnan.* 2 (4): 375. 1980; *M.* section *Simplicifoliae* series *Henricanae* C.Y. Wu & H. Chuang, *Acta Bot. Yunnan.* 2 (4): 376. 1980, *pro parte, quoad M. henrici* Bureau & Franch. et *M. barbisetata* C.Y. Wu & H. Chuang ex L.H. Zhou; *M.* section *Forrestianae* sensu Grey-Wilson, *The Genus Meconopsis—Blue Poppies and Their Relatives*: 46. 2014.

Herbs, monocarpic, bristly; bristles hard but thin and brittle, composed of agglutinated long, thin cells, less than 6 mm long, simple except on ovary in series *Barbisetatae*, which are branched near the base. Leaves all basal; lamina entire. Inflorescence racemose, subscapose or scapose. Flowers 1–16, ebracteate except those near base of plant; petals 4–10, blue, violet, mauve, purple, or magenta-purple.

Three series are included: series *Forrestianae* C.Y. Wu & H. Chuang, series *Henricanae* C.Y. Wu & H. Chuang, and series *Barbisetatae* T. Yoshida & H. Sun.

Type species: *M. forrestii* Prain.

KEY TO SERIES OF SECTION *FORRESTIANAE*

- 1a. Hairs on ovary simple 2
 1b. Hairs on ovary branched near base series *Barbisetatae*
 2a. Filaments filiform throughout series *Forrestianae*
 2b. Filaments, at least innermost ones, dilated toward base series *Henricanae*

Series Forrestianae C.Y. Wu & H. Chuang, *nomen emend.*

Synonym: *Meconopsis* section *Forrestii* series *Forrestii* C.Y. Wu & H. Chuang, *Acta Bot. Yunnan.* 2 (4): 375. 1980.

Filaments filiform throughout. Hairs on ovary simple. Nine species are included: *Meconopsis aprica* T. Yoshida &

H. Sun, *sp. nov.*, *M. forrestii* Prain, *M. inaperta* T. Yoshida & H. Sun, *M. lancifolia* (Franch.) Franch. ex Prain, *M. lepida* Prain, *M. pleurogyna* W.T. Wang, *M. purpurea* T. Yoshida & H. Sun, *sp. nov.*, *M. wengdaensis* T. Yoshida & H. Sun, *sp. nov.*, and *M. yaoshanensis* T. Yoshida, H. Sun & Boufford.

KEY TO SPECIES OF SERIES *FORRESTIANAE*

- 1a. Inflorescence racemose, lowermost 2 or 3 flowers bracteate *M. yaoshanensis*
 1b. Inflorescence racemose, subscapose or scapose; flowers of raceme, except basal ones, ebracteate 2
 2a. Style indistinct, less than 1 mm long; capsules to 6 cm long; inflorescence without basal flowers *M. forrestii*
 2b. Style distinct, more than 1 mm long; capsules less than 4.5 cm long; inflorescence with or without basal flowers 3
 3a. Flowers cup-shaped, often half-closed at mouth *M. inaperta*
 3b. Flowers widely open 4

KEY TO SPECIES OF SERIES *FORRESTIANAE* CONT.

- 4a. Inflorescence racemose, occasionally subscapose with short rachis and long ascending pedicels 5
 4b. Inflorescence scapose 8
 5a. Anthers short oblong or ellipsoid, thecae straight 6
 5b. Anthers ellipsoid or rounded, thecae incurved 7
 6a. Taproot dauciform or elongate, inflorescence with or without basal flowers, ovary uniformly colored *M. lancifolia*
 6b. Taproot napiform, inflorescence without basal flowers, ovary with dark purple streaks *M. wengdaensis*
 7a. Taproot napiform, inflorescence without basal flowers, anthers uniformly colored *M. lepida*
 7b. Taproot elongate; inflorescence with basal flowers; anthers bicolored, with dark purple central part and pale yellow periphery *M. purpurea*
 8a. Leaves dimorphic, lamina to 19 mm wide, petals to 3.1 cm long, filaments to 8 mm long, ovary densely to sparsely bristly or occasionally glabrous *M. pleurogyna*
 8b. Leaves uniform, lamina to 9 mm wide, petals to 4.2 cm long, filaments to 12 mm long, ovary densely covered with bristles in close contact with each other *M. aprica*

Meconopsis yaoshanensis T. Yoshida, H. Sun & Boufford, *Plant Diversity and Resources* 34 (2): 145–149. 2012. TYPE: CHINA. NE Yunnan, Qiaojia Xian (巧家县): Yao Shan (药山), 27°12'40"N, 103°04'31"E, 3750 m, 7 July 2011, T. Yoshida K55 (Holotype: KUN; Isotype: KUN).

Herbs, monocarpic, 15–50 cm tall in flower, to 60 cm tall or more in fruit. *Taproot* elongate, 7–20 cm long, 5–13 mm across, sometimes few branched near head. Most part of plant bristly; *bristles* golden brown or reddish brown, to 4(–6) mm long, stiff but not spine-like. *Stem* (below uppermost leaf) simple, 1–8 cm long, 5–10 mm across. *Leaves* crowded on short stem; *petiole* broadly linear, 1.5–8 cm long, 1.5–5 mm wide; *lamina* oblong, oblanceolate, elliptic or ovate, 2–18 cm long, 0.7–3 cm wide, base cuneate or attenuate, margin entire, sometimes coarsely crenate or toothed, sometimes undulate, apex obtuse or acute, rarely acuminate, lower surface somewhat canescent, both surfaces covered with bristles. *Inflorescence* racemose, composing most of plant above ground, ebracteate except for few lowest flowers; *pedicels* erect along rachis, 1–7 cm long in flower, to 12 cm long or more in fruit, recurving distally, abruptly swollen at base of calyx. *Flowers* 5–16 per individual, half nodding, cup- or bowl-shaped, 2.0–3.5 cm across. *Calyx* 1.0–1.5 cm long. *Petals* 4–7, pale blue or violet, elliptic, obovate, broadly ovate or broadly obovate, 1.5–2.4 cm long, 0.7–1.7 cm wide, margin often coarsely and irregularly dentate near apex, apex triangularly obtuse, acute, or rounded. *Stamens* numerous; *filaments* filiform, 7–11 mm long, similar to or paler than petals; *anthers* dark purple, orange, yellow, pale brown, or white, ellipsoid, 0.8–1.5 mm long. *Ovary* ellipsoid, 5–9 mm long, densely hairy with ascending or patent bristles; *style* 1.0–2.5 mm long, to 7.0 mm long in fruit; *stigma* capitate, lobes 3–5, 0.5–1.5 mm long. *Capsules* ellipsoid, narrowly obovoid, or cylindrical-oblong, 1.5–5.2 cm long, 5–10 mm across, densely covered with patent or retrorse bristles; *carpels* 4–5.

Distribution: CHINA. NE Yunnan, Qiaojia Xian, Yao Shan. SW Sichuan: Xichang Shi, Puge Xian and Dechang Xian, Luoji Shan. 3650–3900 m elevation.

Habitat: stony or grassy slopes at edge of thickets.

Meconopsis yaoshanensis T. Yoshida, H. Sun & Boufford var. *yaoshanensis*. Fig. 1–4.

Herbs, monocarpic, 20–50 cm tall in flower, to 60 cm tall or more in fruit. *Taproot* elongate, 8–20 cm long, 6–13 mm across, sometimes few branched near head. Most parts

of plant bristly; *bristles* golden brown or reddish brown, to 5(–6) mm long, stiff but not spine-like, patent except those on fruit. *Stem* (below uppermost leaf) simple, 2–8 cm long, 5–10 mm across. *Leaves* 12–25 per individual, on short stem; *petiole* broadly linear, 2–8 cm long, 2–3 mm wide; *lamina* oblong or oblanceolate, rarely elliptic, 4–17 cm long, 1–3 cm wide, base cuneate or attenuate, margin entire, sometimes coarsely crenate and undulate, apex obtuse or acute, rarely acuminate, both surfaces somewhat yellowish green, covered with patent bristles, less densely so on lower surface; lower surface canescent in dried specimens. *Upper leaves* (bracts) short petiolate or sessile; *lamina* similar to basal leaves but gradually smaller. *Inflorescence* racemose, composing most of plant above ground, ebracteate except for few lowest flowers; *rachis* thick and hollow in lower part; *pedicels* erect, 2–7 cm long in flower, to 12 cm long or more in fruit, often winding around rachis in fruit, recurving distally, abruptly swollen at base of calyx; base of pedicel decurrent as rounded ridges on rachis. *Flowers* 8–16 per individual, half nodding, cup- or bowl-shaped in fine weather, 2.0–3.5 cm across. *Calyx* 1.0–1.5 cm long. *Petals* 4 or 5, rarely 6, pale blue or violet, elliptic, broadly ovate or obovate, 1.5–2.4 cm long, 0.7–1.7 cm wide, margin often coarsely and irregularly dentate near apex, apex triangularly obtuse, acute or rounded. *Stamens* numerous; *filaments* filiform, 7–11 mm long, similar to petals; *anthers* dark purple, yellow, or orange, ellipsoid, 1.0–1.5 mm long, often curved. *Ovary* ellipsoid, 5–7 mm long, with dense ascending hairs; *style* 1–2 mm long, to 7 mm long in fruit; *stigma* capitate, 1.0–1.5 mm long. *Capsules* cylindrical-oblong, 3.5–5.2 cm long, 6–10 mm across, narrowed at both ends, with 3–5 ridges, densely covered with retrorse bristles; mature fruits often spirally arranged around rachis, pedicel twisted, elongate. *Seeds* blackish, 2.3–2.9 mm long.

Distribution: CHINA. NE Yunnan: Qiaojia Xian, Yao Shan, only in the vicinity of the type locality, 3650–3800 m elevation.

Habitat and ecology: South-, southeast-, and east-facing steep slopes covered with basaltic debris and scattered grasses and herbs among the stones, subject to wet monsoon in summer.

Additional specimens examined: CHINA. NE Yunnan, Qiaojia Xian (巧家县), **Region 1:** Yao Shan (药山), 27°12'40"N, 103°04'31"E, 3750 m, 2 August 2010, T. Yoshida K46 (KUN); same locality, 7 July 2011, T. Yoshida K55 (KUN).



FIGURES 2–5. **2.** *Meconopsis yaoshanensis* T. Yoshida, H. Sun & Boufford var. *yaoshanensis* at the type locality. Photograph by T. Yoshida, July 6, 2011. **3.** *Meconopsis yaoshanensis* T. Yoshida, H. Sun & Boufford var. *yaoshanensis* at the type locality. Photograph by T. Yoshida, August 2, 2010. **4.** *Meconopsis yaoshanensis* T. Yoshida, H. Sun & Boufford var. *yaoshanensis* at the type locality. Photograph by T. Yoshida, August 2, 2010. **5.** *Meconopsis yaoshanensis* T. Yoshida, H. Sun & Boufford var. *luojiensis* T. Yoshida & H. Sun at the type locality. Photograph by T. Yoshida, July 1, 2013.

Meconopsis yaoshanensis var. **luojiensis** T. Yoshida & H. Sun, var. nov. TYPE: CHINA. SW Sichuan: Luoji Shan (螺髻山), near boundary of Xichang Shi (西昌市), Puge Xian (普格县), and Dechang Xian (德昌县), 27°36'57"N, 102°20'37"E, 3900 m, 1 July 2013, *T. Yoshida K91* (Holotype: KUN; Isotype: TI). Fig. 1, 5–7.

Var. *luojiensis* differs from var. *yaoshanensis* in the ellipsoid or narrowly obovoid capsules to 2.5 cm long (cylindrical-oblong, to 5.2 cm long in the latter), the lamina to 2.2 cm wide (to 3 cm wide in the latter), and petals (4 or) 5–8 (4 or 5, rarely 6, in the latter).

Herbs, monocarpic, 15–40 cm tall. *Taproot* elongate, to 18 cm long or more, 5–12 mm across. Most parts of plant with patent or retrorse bristles; *bristles* pale reddish brown except pale apex and pale green base, to 4(–5) mm long, dense on rachis, pedicels, calices and ovaries, less dense on leaves. *Stem* (below uppermost leaf) simple, usually less than 1.5 cm long, rarely to 6 cm long in plants growing among shrubs. *Leaves* crowded near base of stem; *petiole* broadly linear, 1.5–6.0 cm long, 1.5–5.0 mm wide; *lamina* oblong, oblanceolate, elliptic or ovate, 2–18 cm long, 0.7–2.2 cm wide, base cuneate or attenuate, margin entire, sometimes undulate and coarsely wavy or toothed, apex acute or obtuse, upper surface green, lower surface somewhat canescent, both surfaces with bristles. *Inflorescence* racemose, composing most of plant above ground, ebracteate except lowest 1 or 2 flower(s); *pedicels* mostly erect, curving downward near apex, 1–5 cm long in flower, to 9 cm long in fruit, abruptly swollen at base of calyx. *Flowers* (4 or) 5–7 per individual, half nodding, cup-shaped, 2–3 cm across. *Calyx* 1.2–1.5 cm long. *Petals* (4 or) 5–8, violet, obovate, broadly obovate or elliptic, 1.5–2.4 cm long, 0.7–1.7 cm wide, apex usually triangular, obtuse or rarely rounded. *Stamens* numerous; *filaments* filiform, 8–11 mm long, similar to or paler than petals; *anthers* white or pale brown, ellipsoid, 0.8–1.2 mm long. *Ovary* ellipsoid, 5–9 mm long, densely hairy with ascending or patent whitish bristles; *style* 2.0–2.5 mm long in flower, to 4 mm long in fruit; *stigma* capitate, 1.0–1.5 mm across; lobes 4–5, 0.5–1.0 mm long. *Capsules* ellipsoid or narrowly obovoid, 1.5–2.5 cm long, 5–8 mm across, with dense patent or retrorse bristles; carpels 4 or 5. *Seeds* unknown.

Distribution: CHINA. SW Sichuan: Xichang Shi, Puge Xian and Dechang Xian, Luoji Shan, only in the vicinity of the type locality, ca. 3900 m elevation.

Habitat and ecology: with other herbs at edge of thickets of *Berberis* L., *Spiraea* L., and *Rhododendron* L., on a gentle west-facing slope in calcareous soil.

Meconopsis forrestii Prain, *Bull. Misc. Inform., Kew*, 1907: 316. 1907. TYPE: CHINA. NW Yunnan, Lijiang Shi (丽江市): eastern flank of Lichiang Range [Yulong Xueshan, 玉龙雪山], 10,000–11,000 ft, June 1906, *G. Forrest 2314* (Lectotype: E, designated here; Isolectotypes: BM, E, K, P). Fig. 1, 8–10, 85–86.

Herbs, monocarpic, 15–42 cm tall in flower, to 47 cm tall in fruit. *Taproot* dauciform, napiform or slightly elongate, 2–7 cm long, 6–13 mm across, often fusiform with contracted head, distally gradually narrowed and with a slender extension. Most parts of plant bristly; *bristles* to

2.5(–3.5) mm long, sometimes tinged reddish brown except at base. *Stem* (below uppermost leaf) simple, 0.3–5.5 cm long. *Leaves* crowded near base of stem, petiolate; *petiole* linear or broadly linear, 1.5–7.0 cm long, 1.5–3.0 mm wide; *lamina* oblong, linear-oblong, narrowly oblanceolate or lanceolate, elliptic or ovate in small leaves, 1.5–14.0 cm long, 0.5–3.0 cm wide, base attenuate, occasionally cuneate in small leaves, margin entire, apex acute or obtuse, upper surface green, lower surface somewhat paler, both surfaces moderately or sparsely bristly. *Inflorescence* racemose, without basal flowers, ebracteate; *peduncle* 1–6 mm across in dried specimens; *pedicels* 1–7 cm long in flower, to 12 cm long in fruit, those of racemose flowers shorter; peduncle, rachis, and pedicels sparsely or moderately hairy with retrorse bristles, bristles denser on peduncle. *Flowers* (2 or) 3–7(–10), usually on upper half of plant, nodding, half nodding, or facing laterally, opening flat or dish-shaped, 2.5–3.8 cm across. *Calyx* 0.8–1.2 cm long, densely or moderately bristly. *Petals* 4, rarely 5, pale blue, occasionally tinged purple, ovate, broadly ovate or rhombic, 1.2–2.2 cm long, 1.0–1.8 cm wide, base rounded or cuneate, margin entire, occasionally crenulate near apex, apex triangular-acute or obtuse, rarely rounded. *Stamens* numerous; *filaments* darker than petals, paler near base, filiform, 4–7 mm long; *anthers* orange, ellipsoid, 0.7–1.1 mm long, thecae straight. *Ovary* narrowly ovoid or narrowly ellipsoid, 4–10 mm long, sparsely or moderately hairy with ascending bristles, occasionally glabrous; *style* less than 1 mm long, often negligible even in fruit; *stigma* capitate, 0.7–1.0 mm across; lobes 2–4, 0.8–1.5 mm long, erect in fruit. *Capsules* cylindrical-oblong, 3–6 cm long, 3.5–5.5 mm across, sparsely bristly or glabrous; carpels 2–4, upper 1/7–1/6 dehiscent. *Seeds* unknown.

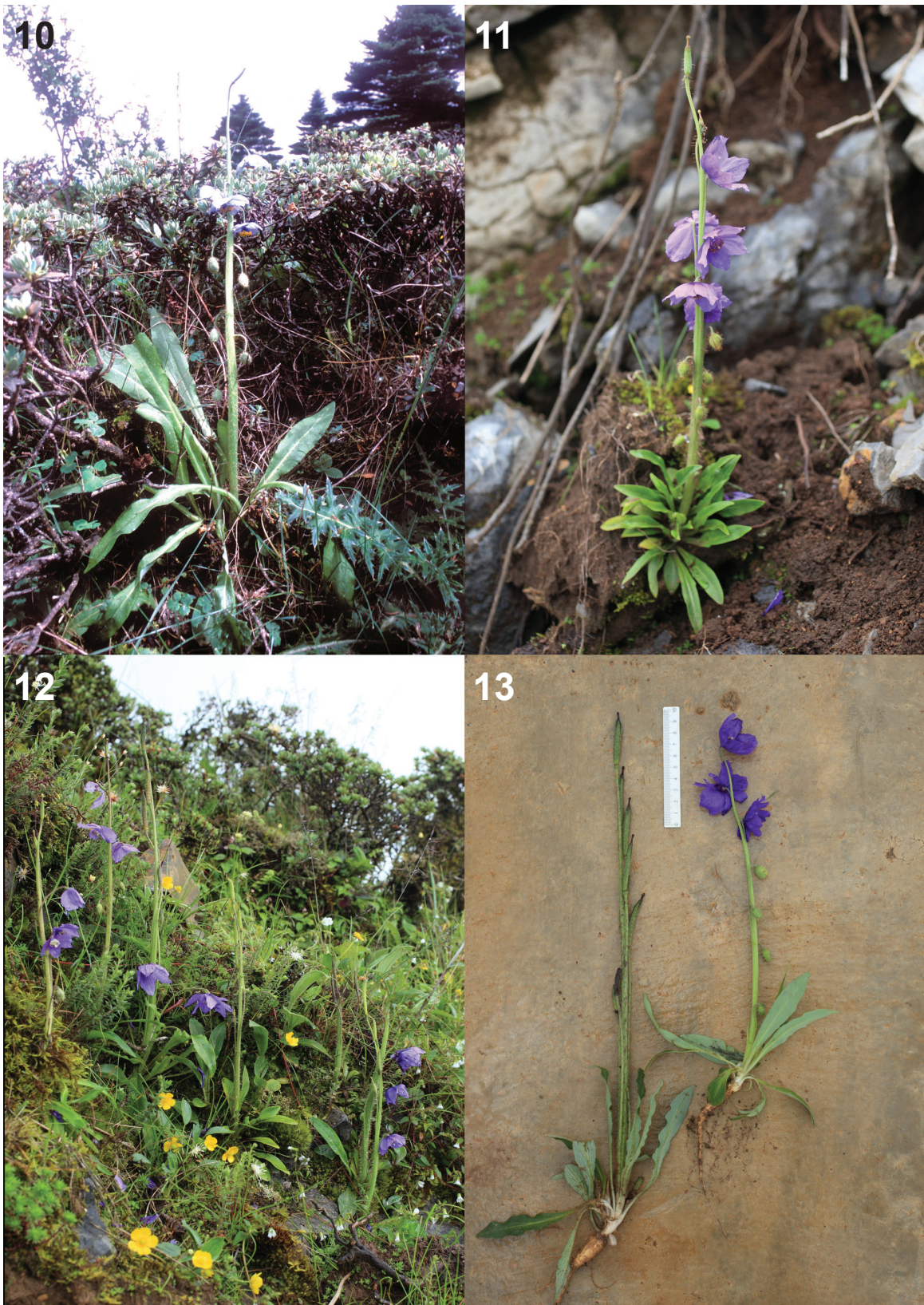
Distribution: CHINA. NW Yunnan: Lijiang Shi, Xianggelila Shi (香格里拉市, or Shangri-La County in English), Yangbi Xian (漾濞县). SW Sichuan: Muli Xian (木里县). 3300–3800 m elevation.

Habitat and ecology: humid grassy slopes with scattered dwarf shrubs, with or without moss; rooting in blackish, stony soil or sometimes growing close to or within dwarf shrubs with rachis protruding through canopy.

Additional specimens examined: CHINA. SW Sichuan, Muli Xian, **Region 5:** Muli, 28°12'N, 12,000 ft, June 1918, *G. Forrest 16309* (K); Muli, 18°12'N, 11–12,000 ft, August 1918, *G. Forrest 16799* (E); east of Yunging [Yongning, 永宁], 27°48'N, 101°E, 13,000 ft, June 1922, *G. Forrest 21251* (K); Szechuan aust. [probably in Muli Xian], 3200–3500 m, June 1913, *Schneider 1514* (A, K). NW Yunnan, Lijiang Shi, **Region 6:** NE of Yangtze bend, 27°45'N, 11,000–12,000 ft, August 1913, *G. Forrest 10799* (E); eastern slopes of Likiang Snow Range, Yangtze watershed, 11,500 ft, June 1923, *J. F. Rock 8681* (K); Lichung [Lijiang], July 1933, *McLaren collection 53* (K); Nguluko, Lichiang (丽江雪松村), 3400 m, 7 June 1937, *T. T. Yü* (俞德俊) *15136* (KUN); Sandaowan, Yulong Shan, Lijiang, 3500 m, 7 June 1985, *Chamberlain et al. 625* (E); Yulong Xueshan, 27°11'04"N, 100°13'18"E, 3700 m, 24 June 2010, *T. Yoshida K29* (KUN, TI). NW Yunnan, Yangbi Xian, **Region 8:** above Malutang [马鹿塘], W side of Diancang Shan [点苍山], Yangbi Xian, 54°46'N, 100°01'E, 3450 m, 26 June 1984, *Bartholomew et*



FIGURES 6–9. **6.** *Meconopsis yaoshanensis* T. Yoshida, H. Sun & Boufford var. *luojiensis* T. Yoshida & H. Sun at the type locality. Photograph by T. Yoshida, June 30, 2013. **7.** *Meconopsis yaoshanensis* T. Yoshida, H. Sun & Boufford var. *luojiensis* T. Yoshida & H. Sun at the type locality. Photograph by T. Yoshida, June 30, 2013. **8.** *Meconopsis forrestii* Prain, near Maoniuping (牦牛坪), eastern side of Yulong Xueshan, 3550 m. Photograph by T. Yoshida, June 16, 2015. **9.** *Meconopsis forrestii* Prain, near Maoniuping, eastern side of Yulong Xueshan, 3700 m. Photograph by T. Yoshida, June 24, 2010.



FIGURES 10–13. **10.** *Meconopsis forrestii* Prain, near Maoniuping, eastern side of Yulong Xueshan, 3700 m. Photograph by T. Yoshida, June 24, 2010. **11.** *Meconopsis lancifolia* (Franch.) Franch. ex Prain subsp. *lancifolia*, near the type locality on Ma-er Shan, 3500 m. Photograph by T. Yoshida, July 21, 2018. **12.** *Meconopsis lancifolia* (Franch.) Franch. ex Prain subsp. *lancifolia*, near the type locality on Ma-er Shan, 3500 m. Photograph by T. Yoshida, July 21, 2018. **13.** *Meconopsis lancifolia* (Franch.) Franch. ex Prain subsp. *lancifolia*, near the type locality on Ma-er Shan, 3500 m. Photograph by T. Yoshida, July 21, 2018.

al. 559 (KUN). NW Yunnan, Xianggelila Shi, **Region 11**: Chungtien [Zhongdian, 中甸] Plateau, 27°30'N, 12,000–13,000 ft, June 1914, *G. Forrest 12507* (E); Chungtien Plateau, 27°30'N, 12,000 ft, July 1914, *G. Forrest 12672* (E, K); Chungtien, 3200 m, 2 June 1937, *T. T. Yü 11601* (KUN); NW flank of Haba Snow Range (哈巴雪山), 22 June 1939, *K. M. Feng* (冯国楹) *1360* (KUN); Haba Shan, July 1943, *J. F. Rock 9635* (E); Tianbao Shan (天宝山), 27°37'55"N, 99°55'18"E, 3800 m, 8 July 2010, *T. Yoshida 4384* (TI); same locality, 24 June 2011, *T. Yoshida 4397* (TI).

The typification of *Meconopsis forrestii* has been ambiguous. To resolve this issue, lectotype and isolectotypes are designated here. Prain (1907) first described *M. forrestii* on the basis of a Forrest specimen but did not cite a collection number or the herbarium where it was deposited. When he redescribed it in 1915, he cited *G. Forrest 2314*, collected in 1906, *G. Forrest 10799*, collected in 1913, and *G. Forrest 12507* and *12672*, both collected in 1914, but again did not indicate the herbarium where the specimens were deposited. The collections from 1913 and 1914 were obviously not available in 1907 when the name *M. forrestii* was first proposed, leaving *Forrest 2314* as the only original material at the time of the original description. From the five sheets of *Forrest 2314* we have chosen the specimen at E, which was available to Prain and matches the original description well.

Meconopsis lancifolia (Franch.) Franch. ex Prain, *J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist.* 64 (2): 311. 1896.

Basionym: *Cathcartia lancifolia* Franch., *Bull. Soc. Bot. Fr.* 33: 391. 1886. TYPE: CHINA. NW Yunnan, Heqing Xian (鹤庆县): Yen-tze-hay, Lankong, 3200 m, 7 June 1886, *J. M. Delavay 2080* (Holotype: P; Isotypes: E, K, P).

Herbs, monocarpic, 8–35 cm tall in flower. *Taproot* dauciform or elongate, 1.5–12.0 cm long, 4–15 mm across, distally gradually narrowed and with a slender extension. Most parts of plant bristly; *bristles* to 2.5–4.0(–5.0) mm long. *Stem* (below uppermost leaf) simple, 0.3–7.0 cm long. *Leaves* crowded near base of stem, petiolate; *petiole*

linear or broadly linear, 0.5–7.0 cm long, 1–5 mm wide; *lamina* oblong, linear-oblong, strap-shaped or oblanceolate, 2–13 cm long, 0.3–2.5 cm wide, smaller leaves elliptic or ovate, base attenuate, margin entire, occasionally undulate, apex acute, obtuse or rounded. *Inflorescence* racemose or subscapose, with or without basal flowers, ebracteate except lowermost flowers, occasionally with lowest flower bud(s) borne on diminutive pedicel and much smaller and abortive; *rachis* 2–9 mm across in dried specimens; *pedicels* (except those of abortive flower buds) 1–12 cm long in flower, to 15 cm long in fruit. *Flowers* 4–13, half nodding, occasionally nodding, or facing laterally, bowl- or dish-shaped, 2.3–7.0 cm across. *Calyx* 0.7–1.5 cm long. *Petals* 4–9, violet, purple, magenta-purple, deep purplish blue, pale purplish blue, obovate, broadly obovate, rhombic, elliptic or ovate, 1.5–4.0 cm long, 0.6–3.0 cm wide, base cuneate or rounded, margin entire, sometimes irregularly crenulate near apex, occasionally cleft in various degree, apex obtuse, rounded or triangular-acute. *Stamens* numerous; *filaments* filiform, 5–12 mm long; *anthers* pale yellow, yellow or orange, ellipsoid or oblong, 0.8–2.0 mm long, thecae straight. *Ovary* ovoid, ellipsoid or narrowly ellipsoid, 4–8 mm long; *style* 1–4 mm long in flower; *stigma* capitate or ovoid, ca. 1 mm across; lobes 3–5, ovate, 0.8–3.5 mm long in flower, erect, occasionally ascending, in fruit. *Capsules* cylindrical-oblong, oblong, narrowly ellipsoid, ellipsoid, broadly ellipsoid, ovoid, obovoid or narrowly obovoid, 1.0–4.5 cm long, 3–12 mm across; carpels 3–5, upper 1/7–2/3 dehiscent.

Distribution: CHINA. NW Yunnan: Heqing Xian (鹤庆县), Jianchuan Xian (剑川县), Dali Shi (大理市), Yangbi Xian (漾濞县), Xianggelila Shi (香格里拉市), Deqin Xian (德钦县), Gongshan Xian (贡山县). SE Xizang: Chayu Xian (察隅县), or Zayu County. SW Sichuan: Xiangcheng Xian (乡城县), Daocheng Xian (稻城县), Jiulong Xian (九龙县), Litang Xian (理塘县), Yan-yuang Xian (盐源县), and Muli Xian (木里县). 3200–4700 m.

We were unable to find a specimen to support Grey-Wilson's (2014) claim of *Meconopsis lancifolia* on Yulong Xueshan, or even from Lijiang Shi (丽江市), which includes Yulong Xueshan.

KEY TO SUBSPECIES OF *MECONOPSIS LANCIFOLIA*

- 1a. Petals 4 or more; inflorescence with or without basal flowers 2
 1b. Petals 5 or more; inflorescence always with basal flowers 3
 2a. Taproot dauciform; lamina to 1.2 cm wide; inflorescence racemose, usually without basal flowers; petals to 2.2 cm long; capsules cylindrical-oblong, to 4.5 cm long, 5.5 mm across subsp. *lancifolia*
 2b. Taproot elongate; lamina to 2.5 cm wide; inflorescence short racemose, sometimes appearing subscapose with short rachis and long ascending pedicels, with or without basal flowers; petals to 3.4 cm long; capsules ellipsoid, obovoid or narrowly obovoid, to 2.5 cm long, 7.5 mm across subsp. *daliensis*
 3a. Rachis 4–9 mm across in dried flowering specimens; petals to 4 cm long; capsules ellipsoid or broadly ellipsoid subsp. *eximia*
 3b. Rachis 2–4 mm across in dried flowering specimens; petals to 2.5 cm long; capsules narrowly ellipsoid or narrowly obovoid 4
 4a. Petals 5–7; anthers dull yellow; style 2–4 mm long in flower; capsules narrowly obovoid, to 3 cm long subsp. *shikaensis*
 4b. Petals 6–9; anthers yellow, pale orange, or orange; style 1.0–1.8 mm long in flower; capsules narrowly ellipsoid, to 1.8 cm long subsp. *xiangchengensis*

Meconopsis lancifolia (Franch.) Franch. ex Prain subsp. *lancifolia*. Fig. 1, 11–13, 87.

Herbs, monocarpic, 15–35 cm tall in flower, to 42 cm tall in fruit. *Taproot* dauciform, 1.5–4 cm long, 5–12 mm across, distally gradually narrowed and with a slender extension. Most parts of plant bristly; *bristles* to 2.5(–3.0) mm long, rather weak, sometimes on short purplish streaks

on surface of rachis and pedicels. *Stem* (below uppermost leaf) simple, 0.8–7.0 cm long. *Leaves* crowded near base of stem, petiolate; *petiole* membranous, linear or broadly linear, 1.5–5.0 cm long, 1–5 mm wide; *lamina* oblong or narrowly oblanceolate, or elliptic in small leaves, 2–8 cm long, 4–13 mm wide, base attenuate, margin entire, often undulate, apex acute or obtuse, upper surface green

or yellowish green, lower surface somewhat canescent, both surfaces sparsely or moderately bristly, occasionally glabrous. *Inflorescence* racemose, usually without basal flowers, ebracteate, lowest flower occasionally in axil of uppermost leaf (bract), occasionally with lowest flower bud borne on diminutive pedicel much smaller and abortive; *rachis* 2.8–5.5 mm across in dried specimens; *pedicels* 1–10 cm long in flower, to 13 cm long in fruit; rachis and pedicels densely hairy with patent or retrorse bristles. *Flowers* 5–12, half nodding, bowl- or dish-shaped, 2.3–3.8 cm across. *Calyx* 7–9 mm long, densely bristly. *Petals* 4–7, often 5 or 6, violet or purple, obovate, elliptic or ovate, 1.5–2.2 cm long, 0.6–1.5 cm wide, base cuneate or rounded, margin entire, sometimes irregularly crenulate near apex, occasionally cleft to various degrees, apex triangular-acute, obtuse or rounded. *Stamens* numerous; *filaments* similar to or paler than petals, filiform, 5–8 mm long; *anthers* pale yellow, ellipsoid, 0.8–1.3 mm long, thecae straight. *Ovary* ellipsoid, 4–5 mm long, sparsely or moderately hairy with ascending bristles, occasionally glabrous; *style* 1–2 mm long in flower, to 5 mm long in fruit; *stigma* capitate, ca. 1 mm across; lobes 3 or 4, ovate, 1.0–1.5 mm long, erect in fruit. *Capsules* cylindrical-oblong, 2.0–4.5 cm long, 3.0–5.5 mm across, sparsely or moderately hairy with patent or retrorse bristles, occasionally glabrous; carpels 3 or 4, upper 1/6–1/5 dehiscent. *Seeds* blackish, 1–1.3 mm long.

Distribution: CHINA. NW Yunnan: Heqing Xian (鹤庆县), Jianchuan Xian (剑川县), 3200–3900 m elevation.

Habitat and ecology: west-facing humid, steep, rocky slopes covered with mosses, often below lower margin of dwarf thickets; rooting in humus-rich soil among rocks.

Specimens examined: CHINA. NW Yunnan, Heqing Xian, **Region 7:** Yen-tze-hay, Lankong, 3200 m, 7 June 1886, *J. M. Delavay 2080* (E, K, P); same locality, 8 July 1886, *J. M. Delavay s.n.* (P); same locality, 9 May 1887, *J. M. Delavay s.n.* (E); same locality, 3300 m, 6 June 1888, *J. M. Delavay s.n.* (P); same locality, 3500 m, 6 June 1888, *J. M. Delavay s.n.* (P); same locality, 3200 m, 7 August 1888, *J. M. Delavay s.n.* (P); same locality, 3500 m, 7 August 1888, *J. M. Delavay s.n.* (P); Lao-long-tong, Yen-tze-hay [without elevation], 18 July 1889, *J. M. Delavay s.n.* (P); Yen-tze-hay, 3500 m [without collection date], *J. M. Delavay s.n.* (K); Kona-lo-po, Ho-kin, 3500 m, 13 July 1886, *J. M. Delavay 2080* [duplicated number assigned to a different collection] (P); Fang-yang-tchang, Mo-so-yn, 3200 m, 17 June 1887, *J. M. Delavay s.n.* (P); Maeulchan [probably Machang, 马厂], Gnou-kay, 9 July 1889, *J. M. Delavay s.n.* (P); Sung-kwe pass between Likiang and Ho-king, south of Likiang, 13,500 ft, July–August 1932, *J. F. Rock 25192* (KUN) [there are no mountains higher than 13,000 ft between Likiang (Lijiang) and Ho-king (Heqing)]. The locality, Sung-kwe pass, could be in the vicinity southwest of Songgui (松桂), south of Heqing.; Ma-er Shan (马耳山), 26°16'32"N, 100°06'05"E, 3500 m, 21 July 2018, *T. Yoshida K127* (KUN, TI). NW Yunnan, Jianchuan Xian (剑川县), **Region 9:** Chienchuan [Jianchuan, 剑川]–Mekong divide, 26°45'N, 99°40'E, 13,000 ft, *G. Forrest 21576* (E) [the locality seems to be on the northwestern spur of Laojun Shan (老君山), NW of Jianchuan (Chienchuan), according to the locality records].

Meconopsis lancifolia (Franch.) Franch. ex Prain **subsp. daliensis** T. Yoshida & H. Sun, *subsp. nov.* TYPE: CHINA. NW Yunnan, Yangbi Xian (漾濞县): western flank of Tali Range, 12,000 ft, July 1917, *G. Forrest 15502* (Holotype: K; Isotypes, BM, E). Fig. 1, 14–15.

Subsp. *daliensis* differs from subsp. *lancifolia* in the elongate taproot (dauciform in the latter), ellipsoid, obovoid or narrowly obovoid capsules (cylindrical-oblong in the latter), differs from subsp. *shikaensis*, subsp. *xiangchengensis*, and subsp. *eximia* in the petals 4 or more (5 or more in the latter three subspecies) and the lamina to 2.5 cm wide (less than 1.3 cm wide in the latter three subspecies).

Herbs, monocarpic, 13–25 cm tall in flower, to 35 cm tall in fruit, *Taproot* elongate, to 12 cm long or more, 5–12 mm across, distally gradually narrowed and with slender extensions. Most parts of plant bristly; *bristles* rather hard, to 4(–5) mm long. *Stem* (below uppermost leaf) simple, 1–5 cm long. *Leaves* crowded on short stem, distinctly petiolate; *petiole* membranous, linear or broadly linear, 1–5 cm long, 1–3 mm wide; *lamina* oblong, elliptic or narrowly oblanceolate, rarely ovate in small leaves, 2.5–13.0 cm long, 1.0–2.5 cm wide, base attenuate, rarely cuneate, margin entire, occasionally undulate, apex obtuse or acute, both surfaces sparsely or moderately bristly, occasionally glabrescent. *Inflorescence* short racemose, sometimes subscape with short rachis and long ascending rachis, with or without basal flowers, ebracteate except basal flowers; *rachis* 4–8 mm across in dried flowering specimens; *pedicels* (scapes) 1.5–12.0 cm long in flower, to 15 cm long in fruit; rachis and pedicels moderately, densely, or sparsely hairy with patent bristles. *Flowers* 4–11, three-dimensional shape unknown. *Calyx* 0.9–1.5 cm long, densely, moderately, or sparsely bristly. *Petals* 4, 5 or occasionally 6, deep satiny purple, deep purple, deep purplish blue, or pale purplish blue (according on *G. Forrest 1950, 1999, 2950, 13517, 13714, 15502*), obovate or broadly obovate, 2.2–3.4 cm long, 1.5–2.7 cm wide, base cuneate, margin entire, occasionally irregularly crenate near apex, apex rounded or occasionally obtuse. *Stamens* numerous; *filaments* filiform, 6–12 mm long; *anthers* ellipsoid or oblong, 1.0–1.7 mm long; thecae straight. *Ovary* ellipsoid, 4–8 mm long, densely hairy with ascending bristles; *style* 1.0–2.5 mm long in flower, to 5 mm long in fruit; *stigma* ovoid, c. 1 mm across; lobes 3 or 4, 1–2 mm long, erect in fruit. *Capsules* ellipsoid, obovoid or narrowly obovoid, 1.8–2.5 cm long, 5.0–7.5 mm across, moderately, densely, or sparsely hairy with patent stiff bristles; carpels 3 or 4, dehiscent in upper 1/4–1/3. *Seeds* unknown.

Distribution: CHINA. NW Yunnan: Dali Shi (大理市) and Yangbi Xian (漾濞县), Cang Shan (苍山). NE Yunnan: Kunming Shi (昆明市), Donchuan Qu (东川区). 3500–4100 m elevation.

Habitat and ecology: among shifting stones, among stones near ridge and on granite rocks near ridge, according to label data on specimens, *J. M. Delavay s.n.* 19 August 1887 (P) and *J. M. Delavay s.n.* 29 August 1889 (P).

Specimens examined: CHINA. NW Yunnan, Yangbi Xian and Dali Shi, **Region 8:** western flank of Tali Range [Cang Shan, 苍山], 12,000 ft, July 1917, *G. Forrest 15502*



FIGURES 14–17. **14.** Holotype of *Meconopsis lancifolia* (Franch.) Franch. ex Prain subsp. *daliensis* T. Yoshida & H. Sun, *G. Forrest* 15502 (K). **15.** Paratype of *Meconopsis lancifolia* (Franch.) Franch. ex Prain subsp. *daliensis* T. Yoshida & H. Sun, *G. Forrest* 13517 (K). **16.** Holotype of *Meconopsis lancifolia* (Franch.) Franch. ex Prain subsp. *shikaensis* T. Yoshida & H. Sun, *T. T. Yü* 12093 (KUN). **17.** *Meconopsis lancifolia* (Franch.) Franch. ex Prain subsp. *shikaensis* T. Yoshida & H. Sun on Shika Xueshan, 4400 m. Photograph by T. Yoshida, July 27, 2005.

(BM, E, K); same locality, 25°40'N, 12,000 ft, August 1914, *G. Forrest 13517* (E, K); same locality, 25°25'N, 12,000 ft, May 1917, *G. Forrest 13714* (E); parmi les pierres mouvants sur le Tsang-chan [Cang Shan, 苍山] au dessus de Ta-li [Dali, 大理], 4000 m, 19 August 1887, *J. M. Delavay s.n.* (P); parmi les pierres, sur le Tsang-chan, tout près de l'arête, 4000 m, 19 August 1887, *J. M. Delavay s.n.* (P); des rochers granitiques tout près de l'arête sur le Tsang chan, 4000 m, 29 August 1889, *J. M. Delavay s.n.* (P); eastern flank of the Tali range, 25°40'N, 11,000 ft, June 1906, *G. Forrest 1950* (BM, E); eastern flank of the Tali range, 25°40'N, 12–13,000 ft, July–August 1906, *G. Forrest 1999* (BM); Tali range, August 1929, *G. Forrest 28224* (BM, E); Tali range, 1931, *G. Forrest 30946* (BM); Tsangshan [Cang Shan, 苍山] range, west of Talifu [Dali-fu, 大理府], August 1922, *J. F. Rock 6324* (E); Dali, Top of Yingle Feng (应乐峰山顶), 1941, *Hanchen Wang* (王汉臣) 974 (KUN). NE Yunnan, Kunming Shi, Donchuan Qu (东川区), **Region 3**: Shekuai Xiang, Huoshi-liangzi, Baishi-ya, Jinfengkou, (舍块乡火石梁子白石崖紧风口), 26°09'21.5"N, 102°55'40.2"E, 4100 m, 18 July 2009, *Liu Ende & Fang Wei 2100* (KUN).

As far as known, there is no recent record of collection or photography of the subspecies from Cang Shan since the collection by *Hanchen Wang* in 1941.

The specimen collected from Dongchuan Qu, *Liu Ende & Fang Wei 2100* (KUN), is in fruit and with a note "Flower: blue." Identification of the specimen needs further studies, especially the inflorescence and the number and size of the petals.

Meconopsis lancifolia (Franch.) Franch. ex Prain **subsp. shikaensis** T. Yoshida & H. Sun, *subsp. nov.* TYPE: CHINA. NW Yunnan: Sianrentung (仙人洞雪山) [Shika Xueshan, 石卡雪山], Chungtien (Zhongdian, 中甸) [Xianggelila, 香格里拉], 3500–3550 m, 12 July 1937, *T. T. Yü* (俞德俊) 12093 (Holotype: KUN). Fig. 1, 16–20, 88.

Subsp. *shikaensis* differs from the related subsp. *lancifolia* in the taproot usually elongate, occasionally dauciform (dauciform in the latter), and the petals 5 or more (4 or more in the latter), the inflorescence always with basal flowers (usually without basal flowers in the latter). It differs from the related subsp. *xiangchengensis* in the petals 5–7 (6–9 in the latter), the style 2–4 mm long (1–1.8 mm long in the latter), and the capsules narrowly obovoid, to 3 cm long (narrowly ellipsoid, to 1.8 cm long in the latter).

Herbs, monocarpic, 12–28 cm tall in flower, to 34 cm tall in fruit. *Taproot* usually elongate, occasionally dauciform, to 8 cm long or more, 4–10 mm across, sometimes with a smaller branch, distally gradually narrowed and with slender extensions. Most parts of plant usually bristly; *bristles* to 2.5 mm long, occasionally to 3 or 4 mm long. *Stem* (below uppermost leaf) simple, 0.4–2.0 cm long. *Leaves* crowded on short stem, petiolate; *petiole* membranous, linear, 0.5–2.0 cm long, 1–2 mm wide; *lamina* linear-oblong or oblong, 2–7 cm long, 4–9 mm wide, base attenuate, margin entire, sometimes coarsely undulate, apex obtuse, rounded or acute, upper surface green, moderately bristly, lower

surface somewhat canescent, sparsely or moderately bristly. *Inflorescence* racemose, with basal flowers, occasionally subscapose with short rachis and long ascending pedicels in windy habitats, sometimes with a few lowest flower buds borne on diminutive pedicels much smaller and abortive, ebracteate except basal flowers; *rachis* 2–4 mm across in dried flowering specimens; *pedicels* (except those of abortive flower buds) 2–8 cm long in flower, to 15 cm long in fruit; rachis and pedicels moderately or sparsely hairy with retrorse or patent bristles, or rarely glabrous. *Flowers* 4–13 except abortive ones, half nodding or nodding, dish- or bowl-shaped in fine weather, 2.5–3.8 cm across. *Calyx* 8–10 mm long, moderately bristly. *Petals* 5–7, violet or purple, occasionally magenta-purple, obovate or broadly obovate, 1.8–2.3 cm long, 0.7–1.7 cm wide, base cuneate, margin entire, sometimes irregularly crenulate near apex, occasionally cleft in various degree, apex obtuse or rounded. *Stamens* numerous; *filaments* similar to or darker than petals, filiform, 7–9 mm long; *anthers* dull yellow, narrowly ellipsoid, 1.0–1.2 mm long; thecae straight. *Ovary* narrowly ellipsoid, 4–7 mm long, densely or moderately hairy with ascending bristles; *style* 2–4 mm long in flower, to 5 mm long in fruit; *stigma* capitate, ca. 1 mm across, lobes 3–4, ovate, 0.8–1.5 mm long, erect in fruit. *Capsules* narrowly obovoid, 1.5–3.0 cm long, 4–6 mm across, moderately or densely hairy with patent bristles, rarely glabrous; carpels 3 or 4, upper 1/6–1/7 dehiscent. *Seeds* brownish, 1.3–1.8 mm long.

Distribution: CHINA. NW Yunnan: Xianggelila Shi (香格里拉市), around Shika Xueshan (石卡雪山), 3400–4350 m elevation.

Habitat and ecology: on southwest- or south-facing stony slopes covered with thin layer of soil composed of old plants, partly covered with mosses; occasionally growing among dwarf shrubs.

Additional specimens examined: CHINA. NW Yunnan, Xianggelila Shi, around Shika Xueshan, **Region 10**: Sianrentung (仙人洞雪山) [Shika Xueshan], Chungtien (Zhongdian, 中甸), 3500–3550 m, 12 July 1937, *T. T. Yü* (俞德俊) 12093 (KUN); same locality, 3400 m, 12 July 1937, *T. T. Yü 12117* (KUN); same locality, 3400m, 12 July 1937, *T. T. Yü 12127* (KUN); Juatze, Chungtien, 3700 m, 20 July 1937, *T. T. Yü 12305* (KUN); Zhongdian Shigao Xueshan (中甸石膏雪山) [Shika Xueshan], Dege Niuchang Houshan (德哥牛场后山), 6 July 1939, *K. M. Feng* (冯国楣) 1519 (KUN); Zhongdian Chengjiao (中甸城郊), Buluzhai (布吕寨), near Songlu (松如), 4200 m, 20 July 1963, *Zhongdian Team* (中甸队) 3626 (KUN); Zhongdian Xian Shika Xueshan (中甸县石卡雪山), 4200 m, 21 June 1981, *Qinghai-Xizang Team* (青藏队) 1295 (KUN); Shika Xueshan, 27°47'41"N, 99°35'06"E, 4350 m, 24 July 2018, *T. Yoshida K128* (KUN); same locality, 27°48'10"N, 99°34'30"E, 4250 m, 24 July 2018, *T. Yoshida K129* (KUN, TI).

The plants in the photographs appearing in Grey-Wilson (2014: 322, middle right and below left; 323, above right), with captions of *Meconopsis lancifolia* subsp. *eximia*, are *M. lancifolia* subsp. *shikaensis* in this paper.



FIGURE 18. *Meconopsis lancifolia* (Franch.) Franch. ex Prain subsp. *shikaensis* T. Yoshida & H. Sun on Shika Xueshan, 4400 m. Photograph by T. Yoshida, July 27, 2005.



FIGURES 19–20. *Meconopsis lancifolia* (Franch.) Franch. ex Prain subsp. *shikaensis* T. Yoshida & H. Sun. **19**. On Shika Xueshan, 4350 m. Photograph by T. Yoshida, July 24, 2018. **20**. Capsules and seeds, from T. Yoshida K129.

Meconopsis lancifolia (Franch.) Franch. ex Prain subsp. *eximia* (Prain) Grey-Wilson, *The Genus Meconopsis—Blue Poppies and Their Relatives*: 324. 2014. TYPE: CHINA. NW Yunnan, Deqin Xian (德钦县): Kari Pass, Mekong-Yangtzi divide, 27°40'N, alt. 12,000 ft, August 1914, G. Forrest 13020 (Lectotype: E, designated by Grey-Wilson, 2014; Isolectotype: K). Fig. 1, 21–27, 89.

Basionym: *Meconopsis eximia* Prain, *Bull. Misc. Inform., Kew*, 1915: 159 (1915). TYPE: CHINA. NW Yunnan, Xiangelila Shi (香格里拉市): Chungtien [Zhongdian, 中甸] Plateau, 27°30'N, 12,000 ft, July 1914, G. Forrest 12691 (Syntypes: E, K); same locality, September 1914, G. Forrest 13352 (Syntype: K). NW Yunnan, Deqin Xian (德钦县): Kari Pass, Mekong-Yangtzi divide, 27°40'N, alt. 12,000 ft, August 1914, G. Forrest 13020 (Syntypes: E, K); Mekong-Salwin divide, 28°10'N, 14,000 ft, August 1914, G. Forrest 13238 (Syntypes: E, K).

Herbs, monocarpic, 15–35 cm tall in flower, to 40 cm tall in fruit, occasionally to 58 cm tall on lower edge of shrubberries (around Hong Shan) in fruit. *Taproot* hard and woody, elongate, to 10 cm long or more, 7–12 mm across, often fusiform, distally gradually narrowed and with slender extensions. Most parts of plant bristly; *bristles* to 3.5 mm long, occasionally to 4 or 5 mm long. *Stem* (below uppermost leaf) simple, 3–12 mm long. *Leaves* all

basal, petiolate; *petiole* not membranous, linear or broadly linear, 0.5–3.5 cm long, 1.5–3.0 mm wide; *lamina* rather thick, strap-shaped, oblong or oblanceolate, 2.5–6.0 cm long, 5–10 mm wide, base attenuate, margin entire, often undulate, apex obtuse or acute, upper surface green or dark green, densely or moderately bristly, lower surface pale green, moderately or sparsely bristly. *Inflorescence* racemose, with basal flowers, occasionally subscapose with short rachis and long ascending pedicels in windy habitats, ebracteate except basal flowers; *rachis* 4–9 mm across in dried flowering specimens; *pedicels* (scapes) 2–11 cm long in flower, to 13 cm long in fruit; rachis and pedicels densely or moderately hairy with retrorse or patent bristles. *Flowers* 6–11, half nodding or occasionally facing laterally, bowl-shaped or occasionally dish-shaped in fine weather, 3.5–7.0 cm across. *Calyx* 1.0–1.5 cm long, densely bristly. *Petals* 5–9, purple or magenta-purple, obovate or broadly obovate, 1.8–4.0 cm long, 0.8–3.0 cm wide, base cuneate, margin entire, occasionally crenulate near apex, sometimes cleft in various degree, apex rounded or obtuse. *Stamens* numerous; *filaments* darker than petals, filiform, rather thick, 7–12 mm long; *anthers* yellow, pale yellow or dull orange, oblong, 1.3–2.0 mm long; thecae straight. *Ovary* ovoid or ellipsoid, 4–8 mm long, densely hairy with ascending bristles; *style* 1–2 mm long in flower, to 3 mm long in fruit; *stigma* ovoid, 1–2 mm across; lobes 4–5, 2.0–3.5 mm long, erect or



FIGURES 21–24. 21. Syntype of *Meconopsis lancifolia* (Franch.) Franch. ex Prain subsp. *eximia* (Prain) Grey-Wilson, *G. Forrest* 12691 (E), collected on “Chungtien Plateau” [Zhongdian Plateau]. 22. Specimen of *Meconopsis lancifolia* (Franch.) Franch. ex Prain subsp. *eximia* (Prain) Grey-Wilson, *G. Forrest* 14087 (K), collected on “Mekong-Salween divide.” 23. Syntype of *Meconopsis lancifolia* (Franch.) Franch. ex Prain subsp. *eximia* (Prain) Grey-Wilson, *G. Forrest* 13238 (K), collected on “Mekong-Salwin divide.” 24. *Meconopsis lancifolia* (Franch.) Franch. ex Prain subsp. *eximia* (Prain) Grey-Wilson on Da Xueshan, 4300 m. Photograph by T. Yoshida, June 15, 1999.



FIGURES 25–26. **25.** *Meconopsis lancifolia* (Franch.) Franch. ex Prain subsp. *eximia* (Prain) Grey-Wilson on Baima Xueshan, 4650 m. Photograph by T. Yoshida, July 26, 2018. **26.** *Meconopsis lancifolia* (Franch.) Franch. ex Prain subsp. *eximia* (Prain) Grey-Wilson on Baima Xueshan, 4650 m. Photograph by T. Yoshida, July 25, 2018.



FIGURE 27. Habitat of *Meconopsis lancifolia* (Franch.) Franch. ex Prain subsp. *eximia* (Prain) Grey-Wilson on Baima Xueshan, 4650 m. Photograph by T. Yoshida, July 25, 2018.

ascending in fruit. *Capsules* ellipsoid or broadly ellipsoid, 1.2–2.2 cm long, 8–12 mm across, densely bristly; carpels 4–5, upper 1/3–2/3 dehiscent. *Seeds* unknown.

Distribution: CHINA. NW Yunnan: Xianggelila Shi (香格里拉市), Deqin Xian (德钦县), Gongshan Xian (贡山县). SE Xizang: Chayu Xian (察隅县). SW Sichuan: Xiangcheng Xian (乡城县), Daocheng Xian (稻城县). 3500–4700 m elevation.

Habitat and ecology: on southwest-, west-, or south-facing stony slopes or stable scree slopes covered with thin soil composed of old plants; occasionally growing among dwarf shrubs.

Additional specimens examined: CHINA. NW Yunnan, Xianggelila Shi, **Region 11:** mountains of Chungtien Plateau, 27°30'N, 12,000 ft, July 1914, *G. Forrest 12691* (E, K); same locality, September 1914, *G. Forrest 13352* (K); Geza (格咱) – Langdou (浪都), 4400 m, 25 June 1988, *Z. D. Fang & X. H. Li 753* (KUN); Shangri-La County, Geza Township, 28°08'23.7"N, 99°54'28.8"E, 4385m, 16 July 2007, *R. Li & Z. Dao 009C* (MO); Hon Shan (红山), 28°06'35"N, 99°53'59"E, 4200 m, 27 July 2018, *T. Yoshida K133* (KUN, TI). NW Yunnan, Xianggelila Shi, Da Xueshan (大雪山), **Region 13:** Da Xueshan Yakou (大雪山丫口), 4300 m, 5 June 1999, *T. Yoshida 2840* (TI); same locality, 4350 m, 22 June 1999, *T. Yoshida 2890* (TI). NW Yunnan, Deqin Xian, Yunling (云岭) including Baima Xueshan (白马雪山), **Region 14:** Kari Pass, Mekong-Yangtzi divide, 27°40'N, alt. 12,000 ft, August 1914, *G. Forrest 13020* (E, K); Beima Shan, 28°12'N, 11,000 ft, August 1917, *G. Forrest 14625* (BM, E, K); Mekong-Yangtzi divide, 27°36'N, 99°10'E, 14,000 ft, July 1921, *G. Forrest 19683* (BM, E); Beima Shan, 28°18'N, 99°10'E, 13,000 ft, September 1921, *G. Forrest 20406* (E); mountains east of Atuntzi, 28°36'N, 99°E, 14,000 ft, *G. Forrest 22642* (E); mountains of Moting [Maoding, 茂顶], NE of the Yangtze-Mekong watershed, June 1923, *J. F. Rock 10339* (E); Moting Shan, northeast of Atuntze, eastern slopes of Yangtze-Mekong divide, 15,000 ft, June 1932, *J. F. Rock 22768* (E); Deqen, Beima Shan, north side of road, 28°22'N, 99°02'E, 4322 m, 28 June 1994, *ACE 744* (E); Baima Xueshan, 28°28'57"N, 99°00'29"E, 4650 m, 26 July 2018, *T. Yoshida K132* (KUN, TI). NW Yunnan, Deqin Xian and Gongshan Xian, northern part of Nu Shan (怒山) including Meili Xueshan (梅里雪山), **Region 15:** Mekong-Salwin divide, 28°10'N, 14,000 ft, August 1914, *G. Forrest 13238* (E, K); Mekong-Salween divide, 28°20'N, 14,000 ft, July 1917, *G. Forrest 14087* (E, K); Londre pass [Kongque Shan Yakou, 孔雀山丫口], Mekong-Salwin divide, 28°14'N, 98°40'E, 14,000 ft, July 1921, *G. Forrest 19694* (BM, E); Mekong-Salwin divide, 27°30'N, 98°56'E, 14,000 ft, August 1921, *G. Forrest 20032* (E). SE Xizang, Chayu Xian, **Region 15:** Sarong [Chawalong, 察瓦龙, or Tsarong], Ka-gwr-pu [Meili Xueshan], Mekong-Salwin divide, 28°25'N, 14,000 ft, July 1917, *G. Forrest 14473* (BM, E, K). SW Sichuan, Daocheng Xian, **Region 12:** Daocheng Gongga Shan (稻城贡嘎山), Jiamairong Feng (贾迈荣峰), 4600 m, 29 Aug. 1981, *Qinghai-Xizang Team* (青藏队) 5544 (KUN). SW Sichuan, Xiangcheng Xian, **Region 13:** Rewu Gongshe (热乌公社) [located on the northern side of Da Xueshan], Balang (巴

朗), 4700 m, 6 August 1981, *Qinghai-Xizang Team* (青藏综合科学考察队) 3901 (KUN).

Kari Pass, where *G. Forrest 13020*, the lectotype of *Meconopsis lancifolia* subsp. *eximia* (Prain) Grey-Wilson, was collected, is an old pass located at 28°08'27"N, 99°13'34"E southeast of Baima Xueshan. "Kari" is written in Chinese as 更里 in Rock (1947, volume I: 349).

The mountain range written as Mekong-Salwin divide on the specimen labels of *G. Forrest* or other collectors appears in modern Chinese maps as Nu Shan (怒山). The northern part of Nu Shan is called Meili Xueshan, whereas the southern part of Nu Shan is often called Biluo Xueshan (碧罗雪山).

According to determination labels on specimens, Taylor (1934) included specimens collected in the southern part of Nu Shan, such as *G. Forrest 19490* (BM), 19790 (E) and *J. F. Rock 23253* (E), and those collected around Chimili valley on the western (Myanmar) side of Gaoligong Shan (高黎贡山), such as *R. Farrer 1159* (E), *G. Forrest 24886* (E) and *G. Forrest 27284* (K), in *Meconopsis lancifolia* var. *solitariifolia* Fedde. However, those specimens are not *M. lancifolia*. The specimens from the southern Nu Shan are *M. castanea* H. Ohba, T. Yoshida & H. Sun; those collected around Chimili valley are *M. bijiangensis* H. Ohba, T. Yoshida & H. Sun. Both Taylor (1934) and Grey-Wilson (2014) included northern Myanmar (Burma) in the distribution of *M. lancifolia*, but we have not found any specimens of *M. lancifolia* collected in Myanmar.

The photographs in Grey-Wilson (2014: 322, above right and below left; 323, above right), taken on Shika Shan, are not *Meconopsis lancifolia* subsp. *eximia* as indicated in the captions, but *M. lancifolia* subsp. *shikaensis* described above; the photographs in Grey-Wilson (2014: 323, above left, below middle, and below right), taken on Balang Shan, are not *M. lancifolia* subsp. *eximia* as indicated in the captions, but *M. purpurea* described below.

As far we know, there have been no collection or photograph of subsp. *eximia* on Nu Shan (Region 14) since the collection by *G. Forrest* in August 1921.

Meconopsis lancifolia (Franch.) Franch. ex Prain subsp. **xiangchengensis** (R. Li & Z.L. Dao) T. Yoshida & H. Sun, *stat. nov.* Fig. 1, 28–34, 90.

Basionym: *M. xiangchengensis* R. Li & Z.L. Dao, *Novon* 22 (2):180. 2012. TYPE: CHINA. SW Sichuan: Xiangcheng Xian (乡城县), Shagong (沙贡) township, Wuming Snow Mountains Pass [Wuming Shan, 无名山], 29°08'15.5"N, 100°02'38.6"E, 4684 m, 19 July 2007, *R. Li & Z. Dao 036* (Holotype: KUN).

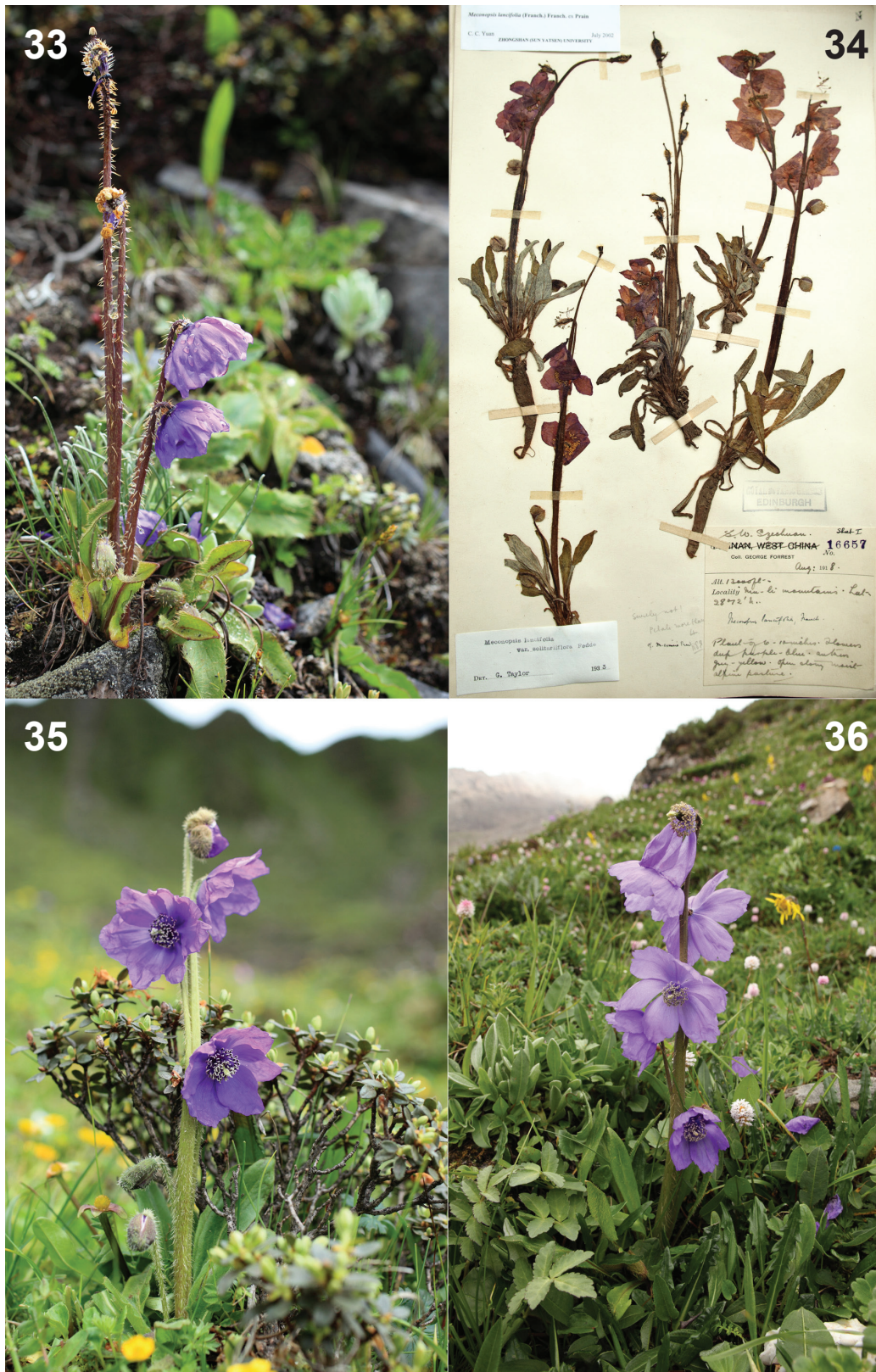
Subsp. *xiangchengensis* differs from the related subsp. *shikaensis* T. Yoshida & H. Sun in the petals 6–9 (5–7 in the latter), the style 1.0–1.8 mm long (2–4 mm long in the latter), and the capsules narrowly ellipsoid, to 1.8 cm long (narrowly obovoid, to 3 cm long, in the latter). It differs from the related subsp. *eximia* (Prain) Grey-Wilson in the petals to 2.5 cm long (to 4.0 cm long in the latter) and the capsules narrowly ellipsoid (ellipsoid or broadly ellipsoid in the latter).



FIGURE 28. Holotype of *Meconopsis xiangchengensis* R. Li & Z.L. Dao, *R. Li & Z. L. Dao 036* (KUN).



FIGURES 29–32. **29.** *Meconopsis lancifolia* (Franch.) Franch. ex Prain subsp. *xiangchengensis* (R. Li & Z.L. Dao) T. Yoshida & H. Sun on Wuming Shan, 4500 m. Photograph by T. Yoshida, June 21, 2017. **30.** *Meconopsis lancifolia* (Franch.) Franch. ex Prain subsp. *xiangchengensis* (R. Li & Z.L. Dao) T. Yoshida & H. Sun on Wuming Shan, 4500 m. Photograph by T. Yoshida, June 21, 2017. **31.** *Meconopsis lancifolia* (Franch.) Franch. ex Prain subsp. *xiangchengensis* (R. Li & Z.L. Dao) T. Yoshida & H. Sun on Jichou Shan, 4400 m. Photograph by T. Yoshida, June 30, 2018. **32.** *Meconopsis lancifolia* (Franch.) Franch. ex Prain subsp. *xiangchengensis* (R. Li & Z.L. Dao) T. Yoshida & H. Sun on Jichou Shan, 4350 m. Photograph by T. Yoshida, June 30, 2018.



FIGURES 33–36. **33.** *Meconopsis lancifolia* (Franch.) Franch. ex Prain subsp. *xiangchengensis* (R. Li & Z.L. Dao) T. Yoshida & H. Sun on Jichou Shan, 4400 m. Photograph by T. Yoshida, June 30, 2018. **34.** Specimen of *Meconopsis lancifolia* (Franch.) Franch. ex Prain subsp. *xiangchengensis* (R. Li & Z.L. Dao) T. Yoshida & H. Sun, G. Forrest 16657 (E), collected on “Mu-li mountains.” **35.** *Meconopsis purpurea* T. Yoshida & H. Sun at the type locality. Photograph by T. Yoshida, June 28, 2018. **36.** *Meconopsis purpurea* T. Yoshida & H. Sun on the western side of Balang Shan, 4250 m. Photograph by T. Yoshida, July 14, 2013.

Herbs, monocarpic, 8–27 cm tall in flower, to 30 cm tall in fruit. *Taproot* often elongate, occasionally dauciform in milder habitats, to 10 cm long or more, 7–15 mm across, distally gradually narrowed and with slender extensions. Most parts of plant bristly; *bristles* to 3.5 mm long, occasionally to 4 or 5 mm long. *Stem* (below uppermost leaf) simple, 0.5–2.2 cm long. *Leaves* all basal, petiolate; *petiole* membranous, linear, 1–7 cm long, 1–2 mm wide; *lamina* linear-oblong or oblanceolate, 2–8 cm long, 3–11 mm wide, base attenuate, margin entire, usually coarsely undulate, apex obtuse, occasionally acute, upper surface green or yellowish green, lower surface somewhat paler, both surfaces densely, moderately, or occasionally sparsely bristly. *Inflorescence* racemose often with basal flowers or occasionally without basal flowers in milder habitats, occasionally subscapose with short rachis and long ascending pedicels in windy habitats especially when uppermost flower buds are damaged or removed, ebracteate except in basal flowers; *rachis* 2.0–3.5 mm across in flower, to 4.5 mm across in fruit; *pedicels* (scapes) 1–10 cm long in flower, to 13 cm long in fruit; rachis and pedicels densely, moderately or occasionally sparsely hairy with retrorse or patent bristles. *Flowers* 6–11, rarely 4 or 5, half nodding or facing laterally, dish- or occasionally bowl-shaped, 2.8–4.5 cm across. *Calyx* 8–12 mm long, densely bristly. *Petals* 6–9, often 6 or 7, violet or purple, occasionally magenta purple, obovate, rhombic, broadly obovate or elliptic, 1.7–2.5 cm long, 0.7–2.2 cm wide, base cuneate, margin entire, apex triangular-obtuse or rounded, occasionally irregularly crenulate, scarcely cleft. *Stamens* numerous; *filaments* similar to or darker than petals, filiform, 7–11 mm long; *anthers* yellow, pale orange, or orange, ellipsoid or oblong, 0.8–1.5 mm long. *Ovary* ellipsoid, 5–7 mm long, densely hairy with ascending bristles; *style* 1.0–1.8 mm long in flower; *stigma* capitate, ca. 1 mm across; lobes 3–4, rarely 5, to 2.5 mm long in fruit, erect in fruit. *Capsules* narrowly ellipsoid, 1.0–1.8 cm long, 3–6 mm across, moderately or densely hairy with patent or ascending bristles; carpels 3 or 4, rarely 5. *Seeds* unknown.

Distribution: CHINA. SW Sichuan: Daocheng Xian (稻城县), Xiangcheng Xian (乡城县), Jiulong Xian (九龙县), Yajiang Xian (雅江县), Litang Xian (理塘县), Batang Xian (巴塘县), Yan-yuang Xian (盐源县), Muli Xian (木里县), 3500–4650 m elevation.

Habitat and ecology: on rocky slopes covered with humid blackish soil composed of old plants and partly covered with moss; with other herbs and grasses, often among dwarf shrubs of *Rhododendron* or *Potentilla* L. (*Dasiphora* Raf.).

Additional specimens examined: CHINA. SW Sichuan, Yan-yuang Xian, **Region 4:** at foot of Huolu Shan (火炉山脚), Yan-yuan Yuanbao Qu (盐源元宝区) [Yuanbao is located at 27°16'15"N, 101°26'15"E, southwest of town of Yan-yuan], 3600 m, 21 July 1983, *Qinghai-Xizang Team* (青藏队) 12816 (KUN). SW Sichuan, Muli Xian, **Region 5:** Muli mountains, 28°12'N, 13,000 ft, August 1918, *G. Forrest* 16657 (BM, E, K); mountains around Muli, 28°12'N, 100°E, 14,000 ft, July 1930, *G. Forrest* 28388 (E); Yenching Shan, N. 6 days from Muli, 1931, *G. Forrest* 30086 (BM); Litang River divide, just below the pass south of Muli,

12,000 ft, 6 June 1921, *F. Kingdon-Ward* 4008 (E); Muli Kingdom, 10,000–14,000 ft, June 1922, *J. F. Rock* 5501 (E, K); same locality and date, *J. F. Rock* 5557 (E); Muti Konka, snow range east of the Yalung, Mutirong, territory of Muli, 14,000–15,000 ft, May–June 1932, *J. F. Rock* 23711 (BM, E, K); mountains of Kulu, Muli territory, 13,000 ft, June 1932, *J. F. Rock* 23946 (BM, E); Muli, 21 June 1937, *T. T. Yü* (俞德俊) 6524 (KUN). SW Sichuan, Daocheng Xian and Xiangcheng Xian, **Region 16:** Xiangcheng Xian, Shagong (沙贡) township, Wuming Snow Mountains Pass [无名山], 29°08'15.5"N, 100°02'38.6"E, 4684 m, 19 July 2007, *R. Li & Z. Dao* 039 (KUN); Daocheng Xian, Wuming Shan (无名山), 29°08'42"N, 100°04'15"E, 4550 m, 21 June 2017, *T. Yoshida* K114 (KUN, TI); same locality, 29°08'02"N, 100°02'33"E, 4600–4700 m, 2 July 1998, *D. E. Boufford et al.* 28160 (A, KUN). SW Sichuan, Daocheng Xian, **Region 17:** near pass of Daocheng Bowa Shan (稻城波瓦山丫口附近), 4600 m, 29 June 1973, *Sichuan Team* (四川省植被调查队) 1934 (KUN). SW Sichuan, Litang Xian, **Region 18:** Haizi Shan (海子山), 29°31'00"N, 100°16'22"E, 4550 m, 20 June 2017, *T. Yoshida* K133 (KUN). SW Sichuan, Jiulong Xian, **Region 19:** Jichou Shan [鸡丑山], 29°20'03"N, 101°29'58"E, 4365–4620 m, 21 July 2005, *Boufford et al.* 33308 (A); Jichou Shan, 29°20'00"N, 101°30'11"E, 4400 m, 30 June 2018, *T. Yoshida* K126 (KUN, TI). SW Sichuan, Yajiang Xian, **Region 20:** Yajiang County, Jian Zikou pass west of Yajiang [雅江], 30°00'15"N, 100°51'40"E, 4380 m, 2 September 2010, *Kunming & Edinburgh Expedition to Sichuan* 126 (E). SW Sichuan, Batang Xian, **Region 21:** Thibet oriental, province de Batang [巴塘], Yar-gong, 1903, *J. A. Soulié* 3919 (P).

On Wuming Shan, which is located along the boundary between Xiangcheng Xian and Daocheng Xian, SW Sichuan, subsp. *xiangchengensis* grows around the pass on the main ridge of the mountain and adjacent eastern (Daocheng-side) slopes from 4400 m to 4650 m in elevation. The inflorescence in this population is racemose with basal flowers, or occasionally subscapose with a short rachis and long ascending pedicels in windy habitats especially when the uppermost flower buds are damaged or removed.

The holotype of *Meconopsis xiangchengensis* was collected near the pass on Wuming Shan. According to the description, the plant has a scapose inflorescences with solitary flowers borne on slender pedicels arising from the basal rosette. In the type specimens of *M. xiangchengensis*, *R. Li & Z. Dao* 036 (Holotype: KUN) and *R. Li & Z. Dao* 039 (Paratype: KUN), however, it is discernible that a few central pedicels were removed above the base. In the photograph of the fresh plants before pressing in Grey-Wilson (2014: 289), they appear to have been damaged by animal grazing. The thicker pedicels in the damaged center of each plant could possibly be peduncles with a few flowers.

Meconopsis purpurea T. Yoshida & H. Sun, *sp. nov.*
TYPE: CHINA. W Sichuan, Xiaojin Xian (小金县): northern side of Jiajin Shan Yakou (夹金山丫口), 30°52'16"N, 102°41'02"E, 3950 m, 28 June 2018, *T. Yoshida* K124 (Holotype: KUN; Isotypes: KUN, TI). Fig. 1, 35–39, 91.



FIGURES 37–40. **37.** *Meconopsis purpurea* T. Yoshida & H. Sun at the type locality; scapose plant with 4-petaled flower. Photograph by T. Yoshida, June 28, 2018. **38.** Flower of *Meconopsis purpurea* T. Yoshida & H. Sun at the type locality. Photograph by T. Yoshida, June 28, 2018. **39.** *Meconopsis purpurea* T. Yoshida & H. Sun at the type locality. Photograph by T. Yoshida, August 26, 2011. **40.** *Meconopsis lepida* Prain on northern side of Leigu Shan, 3500 m. Photograph by T. Yoshida, July 16, 2016.

Meconopsis purpurea differs from the related *M. lancifolia* in having both surfaces of the lamina covered with bristles shorter and thinner than those on other parts of the plant (with similar bristles on all parts of the plant in the latter); anthers bicolored with a dark purple central part and pale yellow periphery (unicolor in the latter), ellipsoid or rounded (ellipsoid or short oblong in the latter); and thecae incurved (straight in the latter).

Herbs, monocarpic, 12–30 cm tall in flower, to 38 cm tall in fruit. **Taproot** elongate, to 20 cm long or more, 4–10 mm across, distally gradually narrowed and with a slender extension. Most parts of plant bristly; **bristles** to 3(–4) mm long, often tinged reddish brown. **Stem** (below uppermost leaf) simple, 0.3–2.0 cm long. **Leaves** all basal, petiolate; **petiole** linear or broadly linear, 1.5–4.0 cm long, 1.0–3.5 mm wide; **lamina** oblong, narrowly lanceolate, narrowly elliptic, elliptic, or small leaves occasionally ovate, 1.5–7.0 cm long, 0.5–1.5 cm wide, base cuneate or attenuate, margin entire, sometimes undulate, occasionally coarsely toothed, apex obtuse, triangular or subacute, both surfaces moderately or sparsely covered with shorter and thinner bristles (as seen in Fig. 91). **Inflorescence** racemose with basal flower(s) or entirely scapose, ebracteate except in basal flowers, occasionally with lowest flower bud borne on diminutive pedicel and much smaller and abortive; **rachis** 2–4 mm across in dried flowering specimens; **pedicels** (scapes) 1.5–13.0 cm long in flower, to 20 cm long in fruit; rachis and pedicels moderately, densely, or sparsely hairy with retrorse or patent bristles. **Flowers** including abortive ones (3 or) 4–9, facing laterally or half nodding, dish- or bowl-shaped in fine weather, 3–5 cm across. **Calyx** 10–13 mm long, densely or moderately bristly. **Petals** 4–10, purple or occasionally magenta-purple, obovate, broadly obovate or elliptic, 2.0–3.3 cm long, 0.9–2.2 cm wide, base cuneate, margin entire, occasionally irregularly crenulate near apex, apex rounded or occasionally triangular. **Stamens** numerous; **filaments** similar to petals, filiform, 6–12 mm long; **anthers** bicolored with dark purple central part and pale yellow periphery, ellipsoid or globose, 0.7–1.0 mm long, thecae incurved. **Ovary** pale green, often with 3–5 dark purple streaks, occasionally entirely tinged dark purple, ellipsoid or obovoid, 6–9 mm long, densely, moderately or occasionally sparsely bristly, rarely glabrous; **style** pale green, sometimes tinged dark purple, 1.5–3.0 mm long in flower, to 4 mm long in fruit; **stigma** capitate, ca. 1 mm across; lobes 3–5, 0.8–1.5 mm long, to 2.2 mm long in fruit. **Capsules** obovoid or narrowly obovoid, 1.2–2.2 cm long, 3.5–10.0 mm across, densely, moderately, or sparsely hairy with retrorse or patent bristles, rarely glabrous; **carpels** 3–5, dehiscent in upper 1/4–1/3. **Seeds** blackish, 1.3–2.0 mm long.

Distribution: CHINA. W Sichuan: Xiaojin Xian (小金县), Wenchuan Xian (汶川县), Baoxing Xian (宝兴县), Kangding Shi (康定市), 3900–4500 m elevation.

Habitat and ecology: southwest-, south-, and southeast-facing rocky slopes in blackish soil of old plants; growing together with other herbs, occasionally close to cushion plants of *Arenaria*, dwarf shrubs of *Rhododendron* or *Potentilla* (*Dasiphora*), or prostrate shrubs of *Salix*; rooting deeply in thin soil among rocks.

Additional specimens examined: CHINA. W Sichuan, Xiaojin Xian, **Region 37:** western side of Balang Shan Yakou (巴朗山丫口), 30°54'49"N, 102°53'21"E, 4300 m, 19 July 2010, *T. Yoshida K40* (KUN, TI); same locality, 17 July 2013, *T. Yoshida K93* (KUN, TI). W Sichuan, Xiaojin Xian, **Region 38:** northern side of Jiajin Shan Yakou (夹金山丫口), 30°52'16"N, 102°41'02"E, 3950 m, 20 July 2010, *T. Yoshida K42* (KUN, TI); same locality, 26 August 2011, *T. Yoshida K78* (KUN, TI); same locality, 18 July 2013, *T. Yoshida K94* (KUN, TI); same locality, 28 June 2018, *T. Yoshida K124* (KUN, TI). W Sichuan, Kangding Shi, **Region 39:** Baoding Shan (宝顶山), southern part of Jiajin Shan range, east of Pengta (捧塔), 30°26'23"N, 102°24'40"E, 4200 m, 24 July 2010, *T. Yoshida K44a* (KUN).

The plants in the photographs in Grey-Wilson (2014: 323, above left, below center, and below right), cited as *Meconopsis lancifolia* subsp. *eximia*, are *M. purpurea*; the upper plant on the same publication, on page 296, cited as *M. pulchella* and on page 297, cited as *M. aff. pulchella*, are not *M. pulchella*, but *M. purpurea*.

Meconopsis lepida Prain, *Bull. Misc. Inform. Kew*, 1915, No. 4: 158. 1915. TYPE: CHINA. S Gansu: Mountains of Thundercrown (Lei-go-shan) [Leigu Shan, 雷古山], Siku Alps, 12,000–13,000 ft, June 1914, *R. Farrer 123* (Holotype: E; Isotypes, BM, K). Fig. 1, 40, 41.

Synonyms: *Meconopsis lancifolia* (Franch.) Franch. ex Prain subsp. *lepida* (Prain) Grey-Wilson, *The Genus Meconopsis—Blue Poppies and Their Relatives*: 324. 2014.

See revision of *Meconopsis lepida* Prain by Yoshida and Sun (2017).

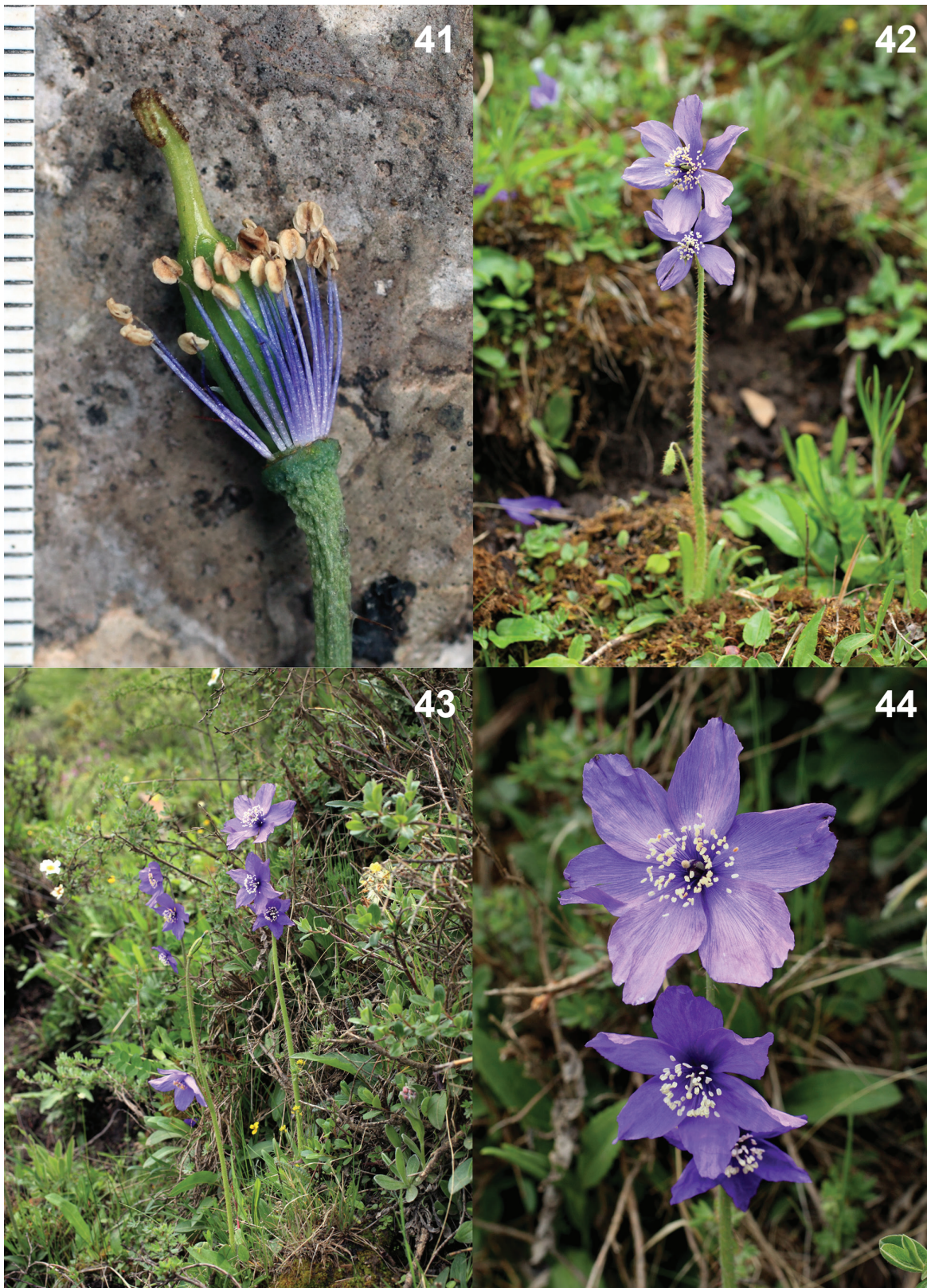
Distribution: CHINA. S Gansu: Zhouqu Xian (舟曲县) and Dangchang Xian (宕昌县), around Leigu Shan (雷古山), 3450–3900 m elevation.

Additional specimens examined: CHINA. S Gansu, Zhouqu Xian and Dangchang Xian, around Leigu Shan, **Region 32:** mountains of Thundercrown (Lei-gu-shan), Siku Alps, 12,000–13,000 ft, June 1914, *R. Farrer 123* (BM, E, K); Dangchang Xian, northern side of Leigu Shan [Thundercrown in Farrer], 33°53'36"N, 104°19'01"E, 3500 m, 16 July 2016, *T. Yoshida K108* (KUN, TI).

Meconopsis wengdaensis T. Yoshida & H. Sun, *sp. nov.* TYPE: CHINA. NW Sichuan, Wengda Xian (翁达县): northern side of Laozhe Shan (老折山), 31°46'15"N, 100°45'19"E, 3950 m, 27 June 2016, *T. Yoshida K104* (Holotype: KUN; Isotypes: KUN, TI). Fig. 1, 42–46, 92.

Meconopsis wengdaensis differs from the related *M. lepida* in its larger size, to 40 cm tall (to 33 cm tall in the latter), rachis to 4.5 mm across (to 3.0 mm across in the latter), longer bristles to 4.0(–5.0) mm long (to 2.5 mm long in the latter), pedicels scarcely warty distally (prominently warty distally in the latter), petals 4–8 (6–9 in the latter), to 3.2 cm long (to 2.5 cm long in the latter), straight thecae (incurved thecae in the latter), and ovary streaked with dark purple (scarcely streaked with dark purple in the latter).

Herbs, monocarpic, 17–40 cm tall in flower, to 45 cm tall in fruit. **Taproot** napiform, 1.0–2.5 cm long, 7–10



FIGURES 41–44. **41.** Flower of *Meconopsis lepida* Prain with petals removed; on northern side of Leigu Shan, 3500 m. Photograph by T. Yoshida, July 16, 2016. **42.** *Meconopsis wengdaensis* T. Yoshida & H. Sun at the type locality. Photograph by T. Yoshida, June 27, 2016. **43.** *Meconopsis wengdaensis* T. Yoshida & H. Sun at the type locality. Photograph by T. Yoshida, June 29, 2016. **44.** *Meconopsis wengdaensis* T. Yoshida & H. Sun at the type locality. Photograph by T. Yoshida, June 29, 2016.



FIGURES 45–48. **45.** Young fruit of *Meconopsis wengdaensis* T. Yoshida & H. Sun at the type locality. Photograph by T. Kobayashi, June 27, 2016. **46.** Napiform taproots of *Meconopsis wengdaensis* T. Yoshida & H. Sun, from T. Yoshida K104. **47.** *Meconopsis pleurogyna* W.T. Wang on eastern side of Yanggong Shan, 3900 m. Photograph by T. Yoshida, June 26, 2018. **48.** *Meconopsis pleurogyna* W.T. Wang on eastern side of Yanggong Shan, 3900 m. Rosette leaves of young plant with ovate lamina are on the left. Photograph by T. Yoshida, June 26, 2018.

mm across, distally abruptly narrowed and with a slender extension. Most parts of plant bristly; *bristles* to 4(–5) mm long, often tinged purple except near base. *Stem* (below uppermost leaf) simple, 0.8–2.0 cm long. *Leaves* all basal, petiolate; *petiole* membranous, linear or broadly linear, 2.0–4.5 cm long, 1–3 mm wide; *lamina* narrowly oblanceolate, oblong or narrowly elliptic, or small leaves elliptic, 1.5–6.0 cm long, 5–13 mm wide, base attenuate or cuneate, margin entire, apex obtuse or acute, upper surface green, lower surface somewhat paler or canescent, both surfaces moderately, densely, or sparsely bristly. *Inflorescence* short racemose, without basal flowers, ebracteate; *rachis* 2.0–4.5 mm across in dried specimens; *pedicels* 0.8–3.0 cm long in lateral flowers, to 6 cm long in terminal flowers, to 10 cm long in terminal flowers in fruit, scarcely warty toward apex; rachis and pedicels densely or moderately hairy with retrorse or patent bristles. *Flowers* 2–5, usually on upper half of plant, facing laterally or half nodding, opening flat or dish-shaped in fine weather, 3.0–5.5 cm across. *Calyx* 9–11 mm long, densely or moderately bristly. *Petals* 4–8, violet or purple, sometimes more deeply colored near base, obovate, elliptic or broadly obovate, 1.8–3.2 cm long, 0.7–2.0 cm wide, base cuneate or rounded, margin entire, sometimes irregularly crenulate near apex, occasionally cleft in various degree, apex rounded or obtuse. *Stamens* numerous; *filaments* similar to or more deeper colored than petals, filiform, 6–10 mm long; *anthers* pale yellow or dull orange, ellipsoid, 0.8–1.2 mm long; thecae straight. *Ovary* pale green with (3 or)4 or 5 dark purple streaks, ovoid or ellipsoid, 4–6 mm long, moderately or sparsely hairy with ascending bristles, occasionally glabrous; *style* pale green sometimes tinged dark purple near base, 1.0–2.5 mm long in flower, to 4 mm long in fruit; *stigma* capitate, ca. 1 mm across; lobes (3 or)4 or 5, 1–2 mm long, to 3 mm long in fruit, erect in fruit. *Capsules* narrowly ellipsoid or narrowly obovoid, 1.5–2.0 cm long, sparsely to moderately bristly, occasionally glabrous; carpels (3 or)4 or 5. *Seeds* unknown.

Distribution: CHINA. NW Sichuan: Wengda Xian (翁达县), known only from the vicinity of the type locality, 3950 m elevation.

Habitat and ecology: among shrubs such as *Salix* and *Potentilla* (*Dasiphora*) on southwest-facing, moist, moss-clad slopes; with other herbs and grasses; rooting in humus-rich soil.

Meconopsis pleurogyna W.T. Wang, *Guihaia* 30 (1): 2. 2019. TYPE: CHINA, N Sichuan: Maerkang Xian (马尔康县), Mengbi Shan (梦笔山), 4150 m, 29 June 1983, Z. X. Tang (汤宗孝) 1201 (Holotype: PE; Isotype: PE). Fig. 1, 47–56, 93–96.

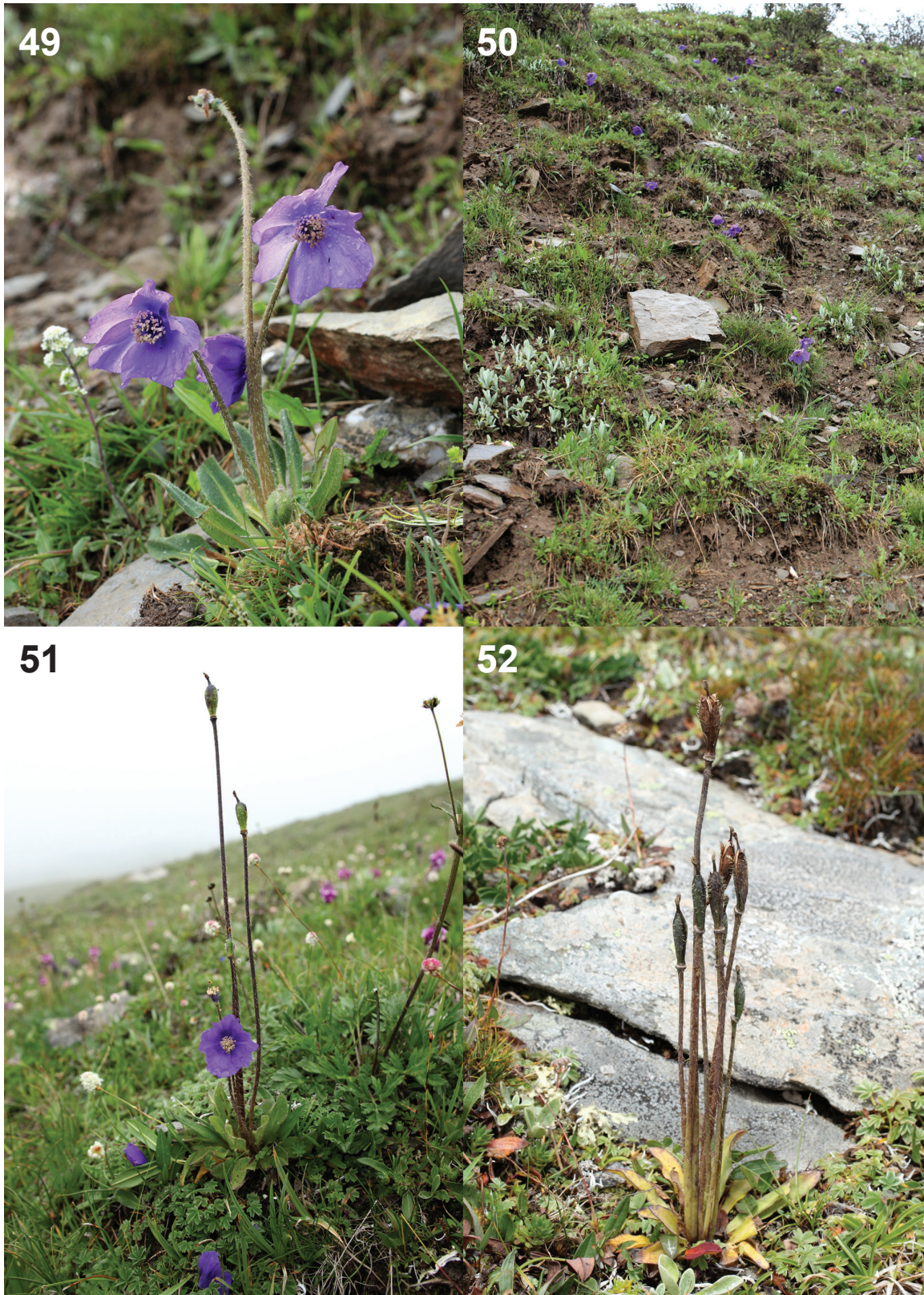
Herbs, monocarpic, 7–25 cm tall in flower, to 35 cm tall in fruit. *Taproot* hard and woody, elongate, to 12 cm long or more, 8–13 mm across, sometimes fusiform, distally gradually narrowed and with slender extension. Most parts of plant bristly; *bristles* to 3 mm long. *Stem* (below uppermost leaf) simple, 0.4–4.0 cm long. *Leaves* all basal, dimorphic (as shown in Fig. 48); rosette leaves on vegetative shoots with distinct long petioles and ovate or elliptic lamina, central leaves of flowering plants with indistinct

short petiole and oblong, oblanceolate or narrowly elliptic lamina. *Petiole* pale green, linear or broadly linear, 1.5–4.5 cm long, 1.5–4.0 mm wide; *lamina* oblong, oblanceolate, elliptic or ovate, 1.5–6.0 cm long, 7–18 mm wide, base attenuate or cuneate, occasionally rounded in ovate lamina, margin entire, sometimes coarsely undulate, apex obtuse or acute, upper surface green or yellowish green with canescent sheen, lower surface somewhat paler, both surfaces densely hairy with shorter and narrower bristles, entirely covered with raised and thickened reticulation formed by adjacent epidermal cell walls (Fig. 94–95) resulting in canescent appearance of leaves. *Inflorescence* scapose, occasionally with central scapes connate to various degree in less windy habitats, few lowest (outermost) flower buds occasionally borne on diminutive scapes and much smaller and abortive; *scapes* 4–18 cm long in flower, to 28 cm long in fruit, densely or moderately hairy with retrorse, patent or occasionally ascending bristles. *Flowers* (4 or)5–13, facing laterally or half nodding, dish- or bowl-shaped in fine weather, 2.8–4.5 cm across. *Calyx* 1.0–1.6 cm long, usually densely bristly. *Petals* 5 or 6, occasionally 4 or 7, purple or violet, obovate, broadly to narrowly obovate, 1.8–3.1 cm long, 0.8–2.7 cm wide, base cuneate, margin entire, sometimes irregularly crenate near apex, apex rounded, obtuse or triangular. *Stamens* numerous; *filaments* similar to petals, filiform, 4–8 mm long; *anthers* pale yellow or dull orange, ellipsoid, 0.8–1.0 mm long; thecae straight or slightly incurved. *Ovary* ellipsoid, 4–7 mm long, densely, moderately or sparsely hairy with ascending bristles, occasionally glabrous, often with 3 or 4(or 5) dark purple streaks; *style* 1–2 mm long in flower, to 4 mm long in fruit; *stigma* capitate, ca. 1 mm across; lobes 3 or 4, rarely 5, 1.0–2.5 mm long in flower, to 4 mm long in fruit, erect in fruit. *Capsules* obovoid or narrowly obovoid, 0.9–2.3 cm long, 3.5–11.0 mm across, densely, moderately, or sparsely hairy with retrorse, patent, or ascending bristles, occasionally glabrous; carpels 3 or 4, rarely 5, dehiscent in upper 1/3–1/4. *Seeds* dark brown, 1.3–2.0 mm long.

Distribution: CHINA. N Sichuan: Heishui Xian (黑水县), Hong-yuan Xian (红原县), Xiaojin Xian (小金县), Mian-yang Shi (绵阳市). SE Qinghai: Jiuzhi Xian (久治县). 3900–4400 m elevation.

Habitat and ecology: southwest-, south-, and southeast-facing windy alpine slopes; usually with other herbs and grasses, occasionally among dwarf shrubs such as *Salix* or *Potentilla* (*Dasiphora*); rooting in blackish soil composed of old plants mixed with stones.

Additional specimens examined: CHINA. SE Qinghai, Jiuzhi Xian (久治县), **Region 28:** Nianbaoyuze Shan (年保玉则山), above Emu Cuo (鄂木措), 4400 m, 3 July 2013, Y. Niu (牛洋) QH2013048 (KUN). N Sichuan, Heishui Xian (黑水县) and Hong-yuan Xian (红原县), **Region 35:** Hong-yuan Xian, near the top of Yanggong Shan (羊拱山) pass, 32°14'01"N, 102°35'56"E, 4200 m, 24 August 2011, T. Yoshida K76 (KUN, TI); same locality, 16 July 2013, T. Yoshida K92 (KUN, TI); Heishui Xian, eastern side of Yanggong Shan, 32°13'13"N, 102°36'18"E, 3900 m, 26 June 2018, T. Yoshida K122 (KUN, TI). NW Sichuan, Maerkang Xian (马尔康县) and Xiaojin Xian (小金县), **Region**



FIGURES 49–52. **49.** *Meconopsis pleurogyna* W.T. Wang with connate central scapes; on eastern side of Yanggong Shan, 3900 m. Photograph by T. Yoshida, June 26, 2018. **50.** Habitat of *Meconopsis pleurogyna* W.T. Wang on eastern side of Yanggong Shan, 3900 m. Photograph by T. Yoshida, June 26, 2018. **51.** *Meconopsis pleurogyna* W.T. Wang on Yanggong Shan, 4200 m. Photograph by T. Yoshida, July 16, 2013. **52.** *Meconopsis pleurogyna* W.T. Wang on Yanggong Shan, 4200 m. Photograph by T. Yoshida, August 24, 2011.



FIGURES 53–56. **53.** *Meconopsis pleurogyna* W.T. Wang on Mengbi Shan, 4000 m. Photograph by T. Yoshida, June 27, 2018. **54.** *Meconopsis pleurogyna* W.T. Wang on Mengbi Shan, 4000 m. Plant on right has connate central scapes. Photograph by T. Yoshida, June 27, 2018. **55.** *Meconopsis pleurogyna* W.T. Wang above Emu Cuo, Nianbaoyuze Shan, 4400 m. Photograph by Y. Niu (牛洋), July 3, 2013. **56.** Habitat of *Meconopsis pleurogyna* W.T. Wang above Emu Cuo, Nianbaoyuze Shan, 4400 m. Photograph by Y. Niu, July 3, 2013.

36: Maerkang Xian, Mengbi Shan (梦笔山), 4150 m, 29 June 1983, Z. X. Tang (汤宗孝) 1201 (PE); Xiaojin Xian, southwestern side of Mengbi Shan (梦笔山), 31°42'28"N, 102°18'55"E, 4150 m, 25 August 2011, T. Yoshida K77 (KUN, TI); same locality, 27 June 2018, T. Yoshida K123 (KUN, TI).

According to Wang (2019), *Meconopsis pleurogyna* is related to *M. lhasaensis* Grey-Wilson in subgenus *Cunmminsia* (Prain) Grey-Wilson section *Racemosae* C.Y. Wu & H. Chuang, but the relationship of *M. pleurogyna* to *M. lhasaensis* is rather obscure. *Meconopsis lhasaensis* has thicker and harder bristles (spine-like hairs), a racemose inflorescence (never scapose), lowermost flowers bracteate, and capsules more or less ellipsoid; *M. pleurogyna* has thin, brittle bristles, scapose inflorescence with occasional central scapes connate to various degrees, flowers on connate scapes ebracteate, and capsules obovoid or narrowly obovoid. We consider *Meconopsis pleurogyna* to be related to *M. lancifolia* (Franch.) Franch. ex Prain in section *Forrestianae* C.Y. Wu & H. Chuang series *Forrestianae* C.Y. Wu & H. Chuang, as treated here. *Meconopsis pleurogyna* differs from the related *M. lancifolia* in the dimorphic leaves (all alike in the latter) and scapose inflorescence (usually racemose in the latter). Wang (2019) used the longitudinally ribbed ovary as a key character and for the specific epithet, *pleurogyna*. However, ribbed (streaked) ovaries are common in some species such as *M. purpurea*, *M. wengdaensis*, and *M. lepida* in series *Forrestianae* and is not useful as a key character to separate species.

Meconopsis aprica T. Yoshida & H. Sun, *sp. nov.* TYPE: CHINA. NW Sichuan, Ganzi Xian (甘孜县): Zhuoda La (卓达拉), 31°24'14"N, 99°57'58"E, 4650 m, 28 June 2016, T. Yoshida K106 (Holotype: KUN; Isotypes: KUN, TI). Fig. 1, 57–61, 97–100.

Meconopsis aprica differs from the related *M. pleurogyna* W.T. Wang in the uniform leaves (dimorphic in the latter), lamina less than 9 mm wide (to 19 mm wide in the latter), surfaces of the lamina without prominently raised and thickened reticulation formed by epidermal cell walls (prominently raised and thickened reticulation formed by epidermal cell walls in the latter), flowers fewer than 6 (to 12 in the latter), petals larger, to 4.2 cm long, 3.7 cm wide (less than 3.1 cm long, 2.7 cm wide in the latter) and usually prominently concave (only slightly concave in the latter), filaments to 12 mm long (less than 8 mm long in the latter), ovary densely bristly with bristles in close contact with each other (densely, moderately, or sparsely bristly, or occasionally glabrous, in the latter) and capsules narrowly ellipsoid (obovoid or narrowly obovoid in the latter).

Herbs, monocarpic, 12–25 cm tall in flower. *Taproot* hard and woody, elongate, to 6 cm long or more, 6–10 mm across, sometimes fusiform, distally gradually narrowed and with slender extension. Most parts of plant bristly; *bristles* to 3 mm long. *Stem* (below uppermost leaf) diminished, 3–5 mm long. *Leaves* all basal, petiolate; *petiole* pale green, linear or broadly linear, 1.5–4.0 cm long, 1.0–3.5 mm wide; *lamina* rather thick, linear-oblong, strap-shaped,

narrowly oblanceolate, 1.5–6.0 cm long, 3–9 mm wide, base attenuate, margin entire, sometimes coarsely undulate, apex obtuse or acute, upper surface green or dark green, lower surface somewhat paler, both surfaces moderately, densely, or sparsely bristly. *Inflorescence* scapose, occasionally lowest (outermost) flower bud borne on diminutive much smaller and abortive scape; *scapes* 8–19 cm long in flower, densely, moderately, or sparsely hairy with retrorse (occasionally patent) bristles. *Flowers* 4–6, ascending, facing upward or laterally, parabola-shaped, bowl-shaped, or dish-shaped in fine weather, 4.0–7.5 cm across. *Calyx* pale green, occasionally tinged dark purple, 1.3–1.6 cm long, densely or moderately bristly; bristles sometimes with thick, blackish base. *Petals* 5–7, purple, occasionally tinged dark red near base, broadly obovate, rounded or obovate, usually prominently concave, 2.5–4.5 cm long, 1.1–3.8 cm wide, base cuneate, margin entire, occasionally crenate and undulate near apex, apex usually rounded, occasionally obtuse. *Stamens* numerous; *filaments* more deeply colored or similar to petals, sometimes bluish distally, filiform, 7–12 mm long; *anthers* pale yellow or whitish, ellipsoid or oblong, 1.0–1.5 mm long; *thecae* straight. *Ovary* pale green, often with 3–5 dark purple stripes, occasionally partly tinged dark purple, ellipsoid or ovoid, 4–7 mm long, densely hairy with whitish ascending bristles in close contact with each other; *style* 0.5–1.5 mm long in flower, often tinged dark purple near base; *stigma* narrowly ovoid, 1.5–2.0 mm across; lobes 3–5, often 4, 2–3 mm long in flower, to 5 mm long in fruit, erect in fruit. *Capsules* narrowly ellipsoid, 1–2 cm long, 3–5 mm across, densely or moderately bristly. *Seeds* unknown.

Distribution: CHINA. NW Sichuan: Ganzi Xian (甘孜县), known only from the vicinity of the type locality, 4150–4900 m elevation.

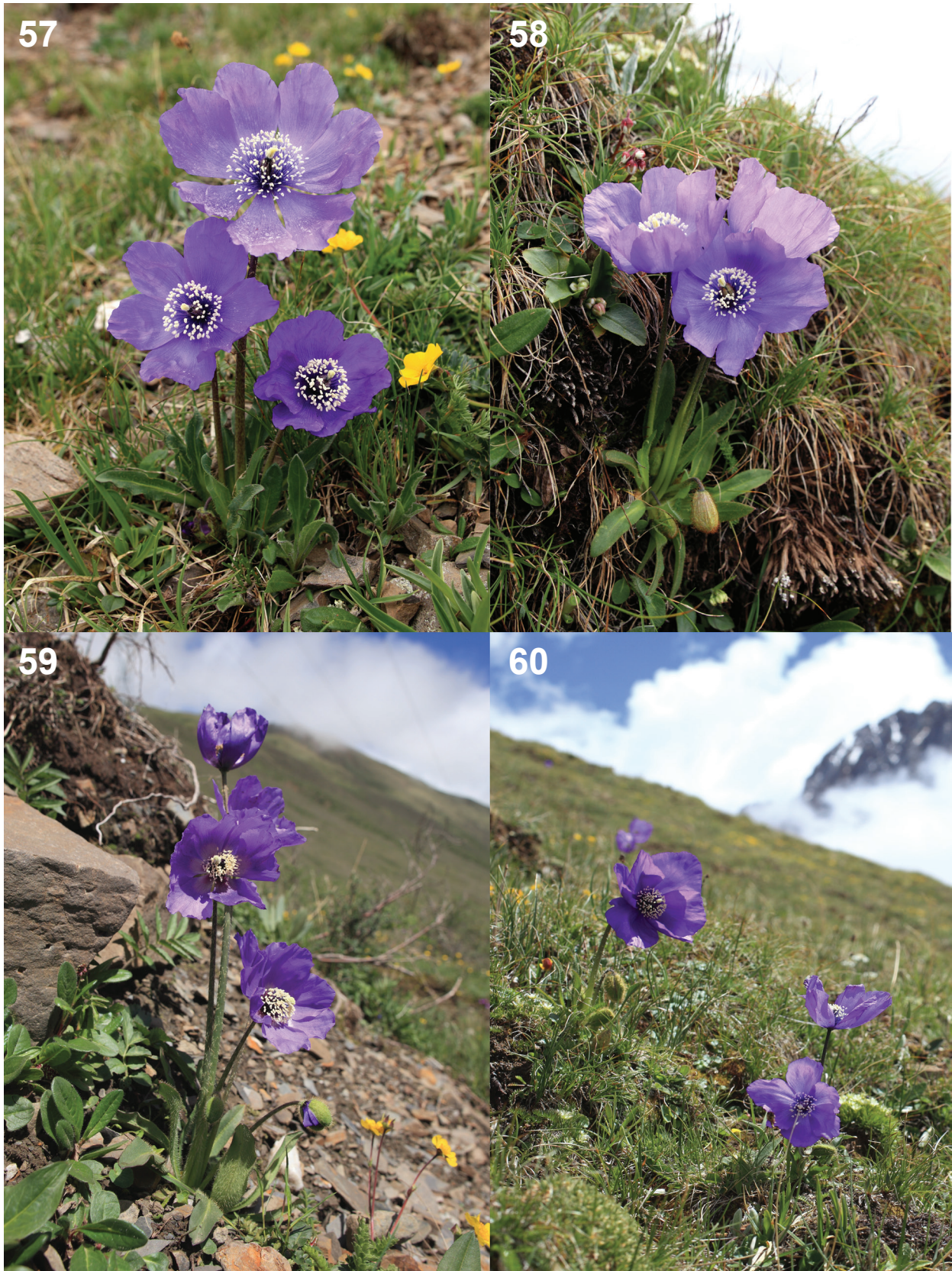
Habitat and ecology: south-, southwest-, and southeast-facing, windy and relatively dry, stony slopes thinly covered with herbs and grasses; rooting in sandy soil among stones. Flies frequent the flowers in fine weather.

Additional specimens examined: CHINA. NW Sichuan, Ganzi Xian, around Zhuoda La, **Region 24:** S of Ganzi on road (Gan-Bai Lu) to Baiyu, first pass after Ganzi, 31°24'14"N, 99°57'58"E, 4785–4900 m, 3 August 2015, Boufford *et al.* 34065 (A); Zhuoda La, 31°24'14"N, 99°57'58"E, 4650 m, 28 June 2016, T. Yoshida K106 (KUN, TI).

Various forms of a hybrid between *Meconopsis aprica* and *M. wengdaensis* grow intermixed on a roadside flat densely covered with dwarf herbs and grasses and scattered dwarf shrubs on the northern flank of Zhuoda La, 31°25'28"N, 99°57'50"E, at 4150 m elevation.

Meconopsis inaperta T. Yoshida & H. Sun, *Harvard Papers in Botany* 23 (2): 317. 2018. Type: CHINA. NW Sichuan, Baiyu Xian (白玉县): western side of Ganbailu Yakou (甘白路丫口) near Acha (阿察), 31°06'25"N, 99°26'17"E, 4000 m, 16 July 2017, T. Yoshida K120 (Holotype: KUN; Isotype: TI). Fig. 1, 62–63.

Distribution: CHINA. W Sichuan: Baiyu Xian (白玉县), Litang Xian (理塘县), Yajiang Xian (雅江县), 3950–4200 m elevation.



FIGURES 57–60. *Meconopsis aprica* T. Yoshida & H. Sun at the type locality. Photograph by T. Yoshida, June 28, 2016.

61



62



63



64



FIGURES 61–64. **61.** Flower of type specimen of *Meconopsis aprica* T. Yoshida & H. Sun, *T. Yoshida K106*. **62.** *Meconopsis inaperta* T. Yoshida & H. Sun at the type locality. Photograph by T. Yoshida, July 16, 2017. **63.** *Meconopsis inaperta* T. Yoshida & H. Sun at the type locality. Photograph by T. Yoshida, July 16, 2017. **64.** *Meconopsis henrici* Bureau & Franch. on Zheduo Shan, 4200 m. Photograph by T. Yoshida, July 1, 2018.

Additional specimens examined: CHINA. W Sichuan, Yajiang Xian, **Region 22:** Kazi La Shan (卡子拉山), 30°01'05"N, 100°48'42"E, 4150 m, 19 June 2017, *T. Yoshida K112* (KUN). W Sichuan, Baiyu Xian, **Region 23:** western side of Ganbailu Yakou near Acha, 31°06'25"N, 99°26'17"E, 4000 m, 16 July 2017, *T. Yoshida K120* (KUN, TI).

Series Henricanae C.Y. Wu & H. Chuang, *Acta Bot. Yunnan.* 2 (4): 376. 1980, emended to exclude *M. barbisetata*, *M. concinna*, *M. neglecta*, and *M. wumungensis*.

Inflorescence scapose. Filaments, at least innermost ones, dilated toward the base. Hairs on ovary simple. Three species are included: *Meconopsis henrici* Bureau & Franch., *M. huanglongensis* T. Yoshida & H. Sun, and *M. psilonomma* Farrer.

KEY TO SPECIES OF SERIES HENRICANAE

- 1a. Flowers cup-shaped even in fine weather *M. psilonomma*
 1b. Flowers opening flat or dish-shaped in fine weather. 2
 2a. Flowers 2–12; all filaments similarly dilated in lower half. *M. henrici*
 2b. Flower 1; inner filaments dilated toward base, outermost filaments often scarcely dilated *M. huanglongensis*

Meconopsis henrici Bureau & Franch., *J. Bot. (Morot)* 5: 19. 1891. TYPE: CHINA. W Sichuan: Tatsienlu [Kangding, 康定], *P.G.E. Bonvalot & Henri d'Orleans s.n.* (Holotype: P). Fig. 1, 64–67.

Synonym: *M. principis* Bulley, *Fl. & Silva* 3: 84 (1905); *M. wardii* Kingdon-Ward, *Gard. Chron.* Ser. 3, 72: 268. 1922. *nomen nudum*.

M. henrici var. *genuina* G. Taylor, *The Genus Meconopsis*: 80. 1934.

Herbs, monocarpic, 8–25 cm tall in flower, to 30 cm tall in fruit. *Taproot* napiform or dauciform, occasionally shortly elongate, 1.5–7.0 cm long, 4–12 mm across, contracted at junction with stem, distally with slender roots. Most parts of plant bristly; *bristles* usually pale colored, occasionally straw-colored, rather weak, to 4 mm long. *Stem* (below uppermost leaf) simple, 0.3–2.5 cm long. *Leaves* crowded near base of stem, petiolate; *petiole* membranous, linear or broadly linear, 0.4–4.5 cm long, 1.0–2.3 mm wide; *lamina* rather thick, lanceolate, oblong or elliptic, or lowest small leaves ovate, 1.5–10.0 cm long, 0.4–1.5 cm wide, base attenuate, margin usually entire, sometimes coarsely wavy, rarely coarsely toothed, apex acute or obtuse, both surfaces densely hairy with weaker and shorter bristles. *Inflorescence* scapose, central scapes rarely connate in various degree; *scapes* 1–3 mm across when dried, with dense retrorse bristles. *Flowers* 1 per scape, 2–12, often 3–6, rarely solitary per individual, laterally facing, dish-shaped in fine weather, 3.0–5.5 cm across. *Calyx* 1.0–1.5 cm long, densely hairy. *Petals* 4–8, often 6, mauve or purple, obovate, broadly obovate or elliptic, 1.8–3.6 cm long, 0.8–2.7 cm wide, base cuneate, margin entire or sometimes undulate and denticulate near apex, apex rounded or occasionally obtuse. *Stamens* numerous; *filaments* 0.7–1.7 cm long, lower half usually pale, dilated to 0.8 mm wide, somewhat boat-shaped, overlapping and surrounding ovary, upper half purple, filiform, usually erect along style; *anthers* orange, ellipsoid or globose, 0.7–1.0 mm long. *Ovary* ellipsoid, 4–7 mm long, densely hairy with ascending whitish bristles;

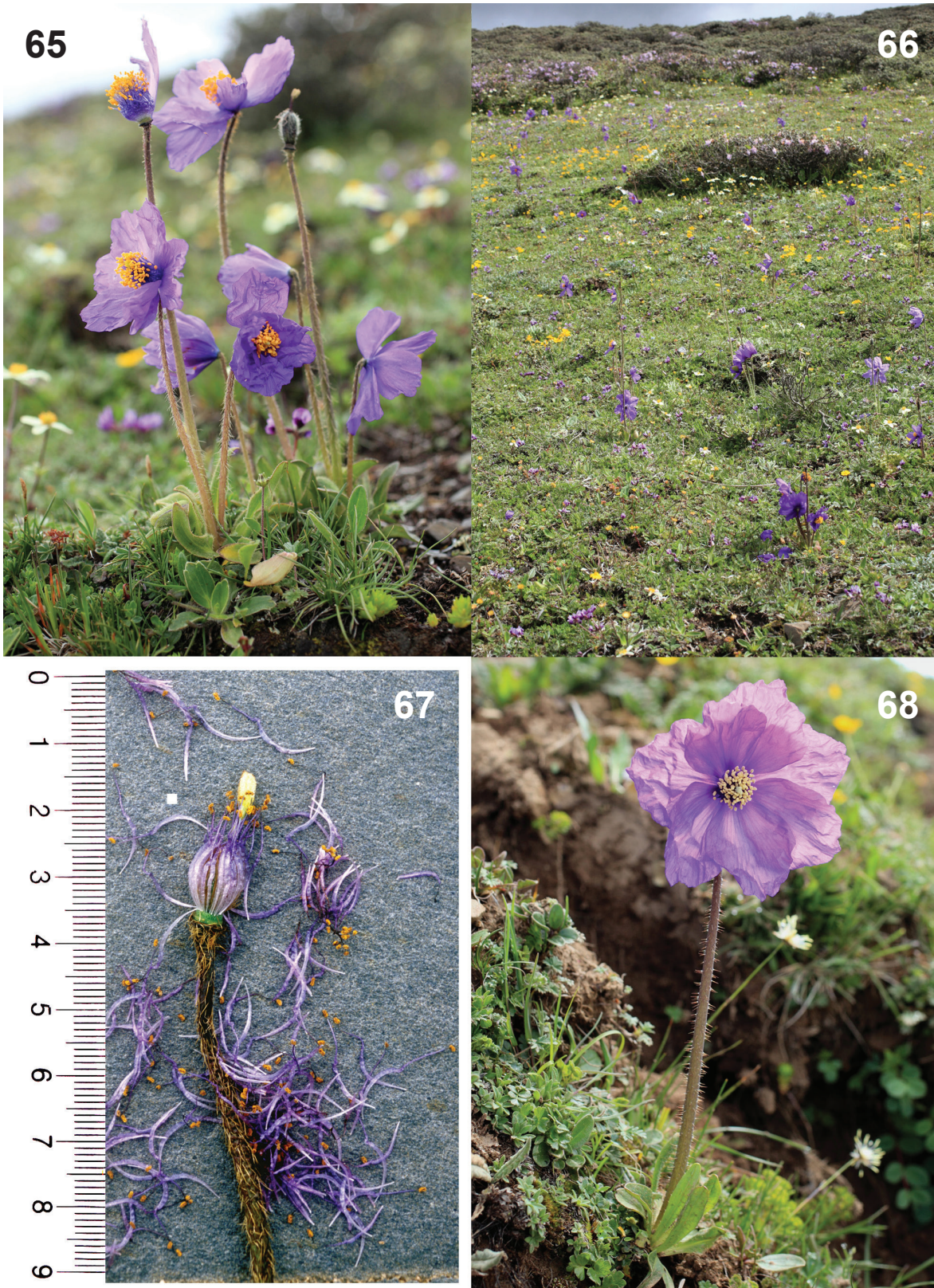
C. Grey-Wilson (2014, p. 306) wrote, “In both *M. henrici* and *M. sinomaculata* [*M. psilonomma* var. *sinomaculata* in this paper] and to some extent *M. psilonomma* also, the most prominently dilated filaments are those of the outer stamens and they are not so obviously air-filled but simply expanded in the lower half, and neither do the stamens form a protective jacket around the ovary.” However, the outermost filaments of *M. psilonomma* Farrer, including *M. psilonomma* var. *sinomaculata* (Grey-Wilson) H. Ohba, are sometimes scarcely dilated, whereas the innermost filaments are usually dilated toward the base. The dilated parts of the filaments are considered to provide a protective jacket for the ovary, even if they are not air-filled.

style 1–3 mm long in flower, to 7 mm long in fruit; *stigma* capitate, ca. 1 mm across; lobes 3–5, to 3 mm long in fruit. *Capsules* obovoid, 1.0–2.3 cm long, 4–7 mm across, densely bristly. *Seeds* unknown.

Distribution: CHINA. W Sichuan: Kangding Shi (康定市) and Muli Xian (木里县), 3800–4500 m elevation.

Habitat and ecology: alpine slopes of various aspects; with herbs, grasses, mosses, and scattered dwarf shrubs such as *Rhododendron nivale* Hook. f. subsp. *boreale* M.N. Philipson & Philipson, rarely on bare slopes; sometimes with dwarf shrubs; rooting in humid blackish, stony soil. Flies frequent the flowers in fine weather.

Additional specimens examined: CHINA. SW Sichuan, Muli Xian, **Region 5:** Litang [理塘]- Yalong [Yalong, 雅砻] divide, 28°20'N, 101°05'E, 8 July 1921, *F. Kingdon-Ward 4421* (E); southwestern Szechwan [Sichuan], Muli Kingdom, between Baurong and Kulu, west of the Yalong River [Yalong Jiang, 雅砻江], 4660 m, July 1929, *J. F. Rock 17829* (E, P); S Muli, Wa-chin, Wulinsi (屋林司), 4100 m, 20 June 1937, *T. T. Yü* (俞德俊) 6484 (KUN). W Sichuan, Kangding Shi, **Region 40:** Se-Tchuen [Sichuan], avant Ta Tsien Lou [Kangding], *P. G. E. Bonvalot & Henri d'Orléans s.n.* (P); Ta p'as chang, NE of Tachienlu [Kangding], 12,000–15,000 ft, 7 July 1908, *E. H. Wilson 3028* (E, K); Sikang [Xikang, 西康], Kangting (Tachienlu) distr., Yülingkong [Yulin Gou, 榆林沟], in montibus Yachiagan [Yajiageng, 雅加梗], located on the northern ridge of Gongga Shan, 贡嘎山], ca. 4000 m, 24 July 1934, *Harry Smith 10676* (BM); same locality, *Harry Smith 10688* (BM); Sikang, Kangting (Tachienlu) distr., Tapaoshan, ca. 4500 m, 22 August 1934, *Harry Smith 11509* (BM); Szechuan [Sichuan], Tatsienlu [Kangding], summit of mountain, June 1938, *McLaren's Collectors AC6* (E, P); west Szechuen and Tibetan Frontier, chiefly near Tachienlu, 9,000–13,500 ft, before 1890, *A. E. Pratt 600* (BM, K); Bois à Tongolo [Dong-e-luo, 东俄洛; the region around Xindouqiao, 新都桥], June–July 1891, *J. A. Soulié 25* (P); Principauté de Kiala [Jiarong, 嘉绒], Thibet oriental, 1891, *J. A. Soulié 29* (P); Thibet Oriental,



FIGURES 65–68. **65.** *Meconopsis henrici* Bureau & Franch. on Zheduo Shan, 4200 m. Photograph by T. Yoshida, July 1, 2018. **66.** Habitat of *Meconopsis henrici* Bureau & Franch. on Zheduo Shan, 4200 m. Photograph by T. Yoshida, July 1, 2018. **67.** Flower of *Meconopsis henrici* Bureau & Franch. dissected to show dilated stamens, on Zheduo Shan, 3950 m. Photograph by T. Yoshida, July 21, 2010. **68.** *Meconopsis huanglongensis* T. Yoshida & H. Sun during fine weather at type locality. Photograph by T. Yoshida, July 11, 2016.

Ta-tsien-lou [Kangding], Principauté de Kiala, 1893, *J. A. Soulié* 523 (P), Tatsienlou, Thibet oriental, June–July 1894, *J. A. Soulié* 2090 (P); Thibet Oriental, Tongolo environs Bois, June 1894, *J. A. Soulié* 2434 (P); Thibet Oriental, Tongolo, 1893, *J. A. Soulié s.n.* (P); plantes du Setchuen [Sichuan] oriental, [without collection date], *J. A. Soulié s.n.* (P); Xikang (西康), Kangding (康定), 13 July 1930, *G. Huang* (黄给平) *et al.* 1393 (KUN); Sichuan Zheduo Shan Yakou (四川折多山丫口), 4150 m, 20 July 1959, *Nanshui Beidiao Team* (南水北调队) 2084 (KUN); Sichuan, Kangding Shi (康定市), Zheduo Shan (折多山), 4200 m, 9 August 1976, *Yunnan Botanical Institution* (云南省植物研究所) 805 (KUN); Zheduo Shan, 30°04'27"N, 101°48'15"E, 4250 m, 21 July 2010, *T. Yoshida K43* (KUN); same locality, 13 July 2013, *T. Yoshida K95* (KUN); upside of Kangding Airport, 30°09'43"N, 101°43'58"E, 4200 m, 29 June 2018, *T. Yoshida K125* (KUN).

Meconopsis angustipetala was described as a new species related to *M. henrici* on the basis of a specimen without collector, *PE 1306833* (PE), collected on 31 July 1982 on the mountain behind Gongga Temple, Shade Xiang, Kangding Xian (康定县沙德乡贡嘎寺后山), 4700 m. According to Wang, *M. angustipetala* differs from *M. henrici* in the glabrous leaves with narrow blade to 7 mm wide and the narrow petals to 8 mm wide. Although we have not examined the specimen, we consider it to be a form of *M. henrici*. If confirmed, the range of Region 40 in Fig. 1 should be extended somewhat toward the south.

KEY TO VARIETIES OF *MECONOPSIS PSILONOMMA*

- 1a. Petals pale purple or lavender purple, without prominent blotch at base; thecae dull orange var. *psilonomma*
 1b. Petals purple or deep purple, with prominent dark purple blotch at base; thecae blackish purple, dull orange, or dull yellow 2
 2a. Thecae and style blackish purple var. *sinomaculata*
 2b. Thecae dull orange or dull yellow; style pale green, sometimes tinged purple 3
 3a. Plants 30–55 cm tall in flower; flowers cup-shaped; filaments slightly dilated toward base and tightly or loosely surrounding ovary var. *zhaganaensis*
 3b. Plants 15–30 cm tall in flower; flowers bowl-shaped; filaments scarcely dilated or slightly dilated toward base, radiating or loosely surrounding ovary var. *calcicola*

Meconopsis psilonomma var. *psilonomma*. Fig. 1, 71–72.
 Synonym: *Meconopsis henrici* Bur. & Franch. var. *psilonomma* (Farrer) Taylor, *The Genus Meconopsis* 81 (1934).

Distribution: CHINA. S Gansu: Zhuoni Xian (卓尼县) and Diebu Xian (迭部县), eastern Die Shan (迭山), head of Dayugou (大峪沟) valley, 3500–3800 m elevation.

Additional specimens examined: CHINA. S Gansu, Diebu Xian, **Region 30:** Gansu Min Shan, Donsari Khikha at the head of Dayugou (大峪沟), 34°18'12"N, 103°26'21"E, 3750 m, 24 July 2016, *T. Yoshida K109* (KUN, TI). S Gansu, Zhuoni Xian, **Region 31:** Min Shan, above Ardjeri, 30 July 1914, *R. Farrer* 255 (E, K); Mt. Lissedzadza, 12,500 ft, 7 July 1925, *J. F. Rock* 12613 (A, BM, E, K).

Meconopsis psilonomma var. *sinomaculata* (Grey-Wilson) H. Ohba, *J. Jap. Bot.* 81(5): 296. 2006. Fig. 1, 73–74.
 Basionym: *M. sinomaculata* Grey-Wilson, *Plantsman*, n. s., 1 (4): 221. 2002. TYPE: CHINA. N Sichuan, Songpan

Meconopsis huanglongensis T. Yoshida & H. Sun, *Harvard Papers in Botany* 23 (2): 313. 2018. TYPE: CHINA. N Sichuan, Songpan Xian (松潘县): Xueshanliang (雪山梁), near Huanglong (黄龙), 32°44'23"N, 103°44'02"E, 4000 m, 11 July 2016, *T. Yoshida K107* (Holotype: KUN; Isotype: TI). Fig. 1, 68–70.

Distribution: CHINA. N Sichuan: Songpan Xian, around Xueshanliang near Huanglong, 3900–4100 m elevation.

Additional specimens examined: CHINA. N Sichuan, Songpan Xian (松潘县), **Region 34:** Top of Pass “Deng Zhanzwa” toward Huanglong Si [黄龙寺], 32°45'08"N, 103°44'46"E, 2 July 2000, *SBQE* (Sino-British Qinghai Alpine Garden Society Expedition) 594 (E); Xueshanliang, near Huanglong, 32°44'23"N, 103°44'02"E, 4000 m, 28 July 2014, *T. Yoshida K98* (KUN, TI); same locality, 11 July 2016, *T. Yoshida K107* (KUN, TI).

Meconopsis psilonomma Farrer, *Gard. Chron.* 3 (57): 110. 1915. TYPE: CHINA. S Gansu: Min Shan [岷山], above Ardjeri [Ajiao, 阿角], 30 July 1914, *R. Farrer* 255 (Holotype: K [lost]; Isotype: E); S Gansu, Mt. Lissedzadza, 12,500 ft, 7 July 1925, *J. F. Rock* 12613 (Epitype, designated by Yoshida and Sun (2017); Isoepitypes: BM, E, K).

Meconopsis psilonomma Farrer was revised by Yoshida and Sun (2017).

Distribution: CHINA. S Gansu and N Sichuan, 3400–4150 m elevation.

Xian (松潘县): top of Gonggan Len [Gonggaling, 贡嘎岭], 33°00'46"N, 103°42'53"E, 3400–3600 m, 29 June 2000, *SBQE* (Sino-British Qinghai Alpine Garden Society expedition) 500 (Holotype: E; Isotypes: E, GB, HNWP, WSY).

Distribution: CHINA. N Sichuan: Songpan Xian (松潘县) and Jiuzhaigou Xian (九寨沟县), around Gonggaling (贡嘎岭), 3400–3750 m elevation.

Additional specimens examined: CHINA. N Sichuan, Songpan Xian, **Region 33:** top of Gonggan Len [Gonggaling], from Jiuzhaitou to Songpan, west-side, 33°00'46"N, 103°42'53"E, 3,400–3600 m, 29 June 2000, *SBQE* 500 (E, GB, HNWP, WSY); same locality, 30 June 2000, *SBQE* 511 (E); same locality, *SBQE* 513 (E); top of Huangshen Guan, 45 km east [mistaken for west according to the coordinates] from Chuanzhusi [川主寺], 32°57'41"N, 103°20'52"E, 1 July 2000, *SBQE* 569 (E); on western side of Gonggaling pass, 33°02'58"N, 103°41'42"E, 3700 m, 9 July 2017, *T. Yoshida K116* (KUN, TI).



FIGURES 69–72. **69.** Habitat of *Meconopsis huanglongensis* T. Yoshida & H. Sun during foggy weather at type locality. Photograph by T. Yoshida, July 8, 2017. **70.** Dissected flowers of *Meconopsis huanglongensis* T. Yoshida & H. Sun at the type locality. Photograph by T. Yoshida, July 11, 2016. **71.** *Meconopsis psilonomma* Farrer var. *psilonomma* at Donsari Khikha, Gansu Min Shan, 3750 m. Photograph by T. Yoshida, July 24, 2016. **72.** *Meconopsis psilonomma* Farrer var. *psilonomma* at Donsari Khikha, Gansu Min Shan, 3750 m. Photograph by T. Yoshida, July 24, 2016.



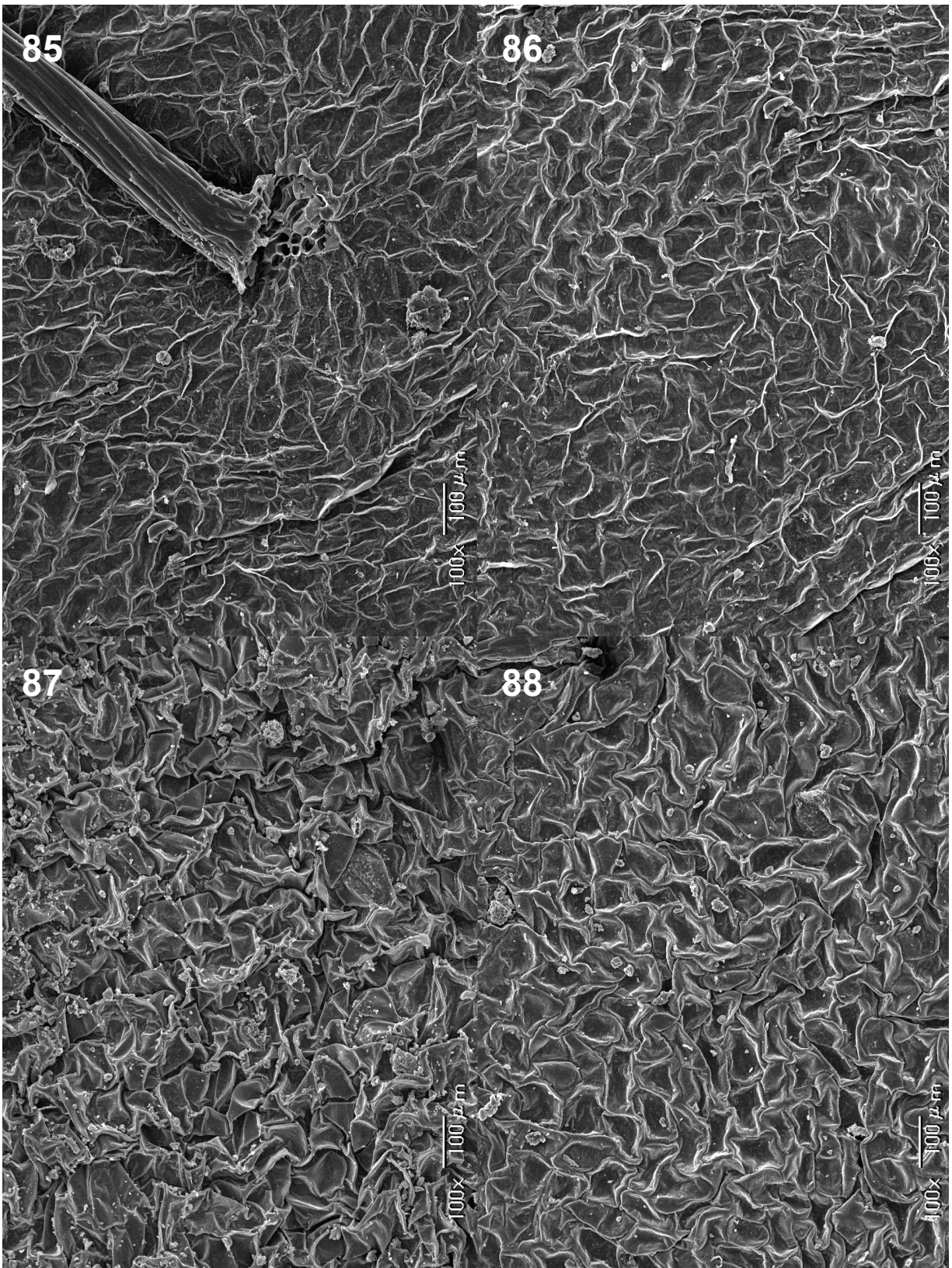
FIGURES 73–76. **73.** *Meconopsis psilonomma* Farrer var. *sinomaculata* (Grey-Wilson) H. Ohba on Gonggaling, 3700 m. Photograph by T. Yoshida, July 9, 2017. **74.** *Meconopsis psilonomma* Farrer var. *sinomaculata* (Grey-Wilson) H. Ohba on Gonggaling, 3700 m. Foreground petals were removed to show the stamens. Photograph by T. Yoshida, July 9, 2017. **75.** *Meconopsis psilonomma* Farrer var. *zhaganaensis* T. Yoshida & H. Sun at the type locality. Photograph by T. Yoshida, July 24, 2014. **76.** *Meconopsis psilonomma* Farrer var. *zhaganaensis* T. Yoshida & H. Sun at the type locality. Plants with young fruits. Photograph by T. Yoshida, July 23, 2014.



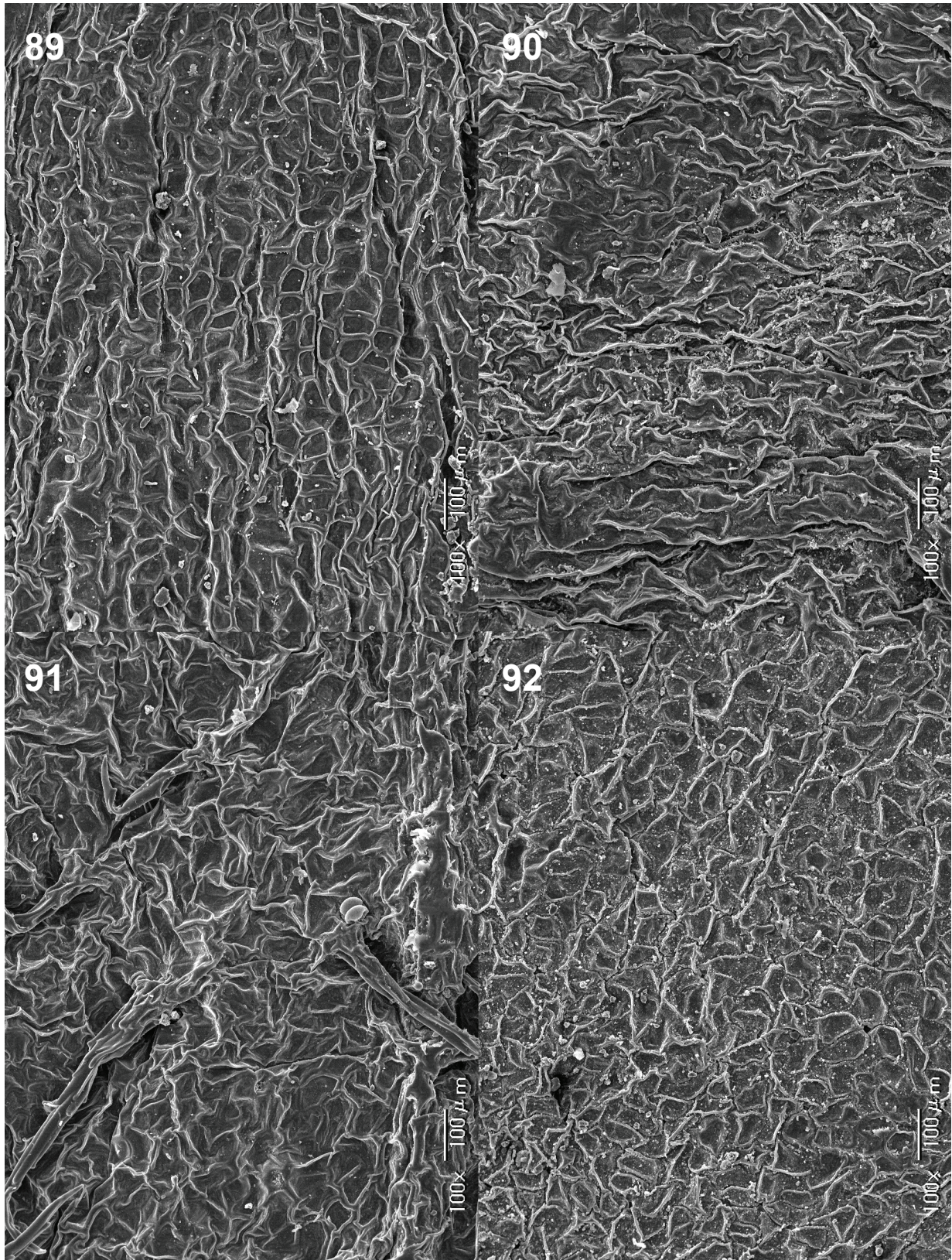
FIGURES 77–80. **77.** *Meconopsis psilonomma* Farrer var. *calcicola* T. Yoshida & H. Sun at the type locality. Photograph by T. Yoshida, July 24, 2014. **78.** *Meconopsis psilonomma* Farrer var. *calcicola* T. Yoshida & H. Sun at the type locality. Photograph by T. Yoshida, July 24, 2014. **79.** *Meconopsis barbisetata* C.Y. Wu & H. Chuang ex L.H. Zhou at Luanshitou Yakou, 4000 m. Photograph by T. Yoshida, June 23, 2016. **80.** Mature ovary of *Meconopsis barbisetata* C.Y. Wu & H. Chuang ex L.H. Zhou with dense, minute, dark purple branched hairs, at Luanshitou Yakou, 4000 m. Photograph by T. Yoshida, July 11, 2017.



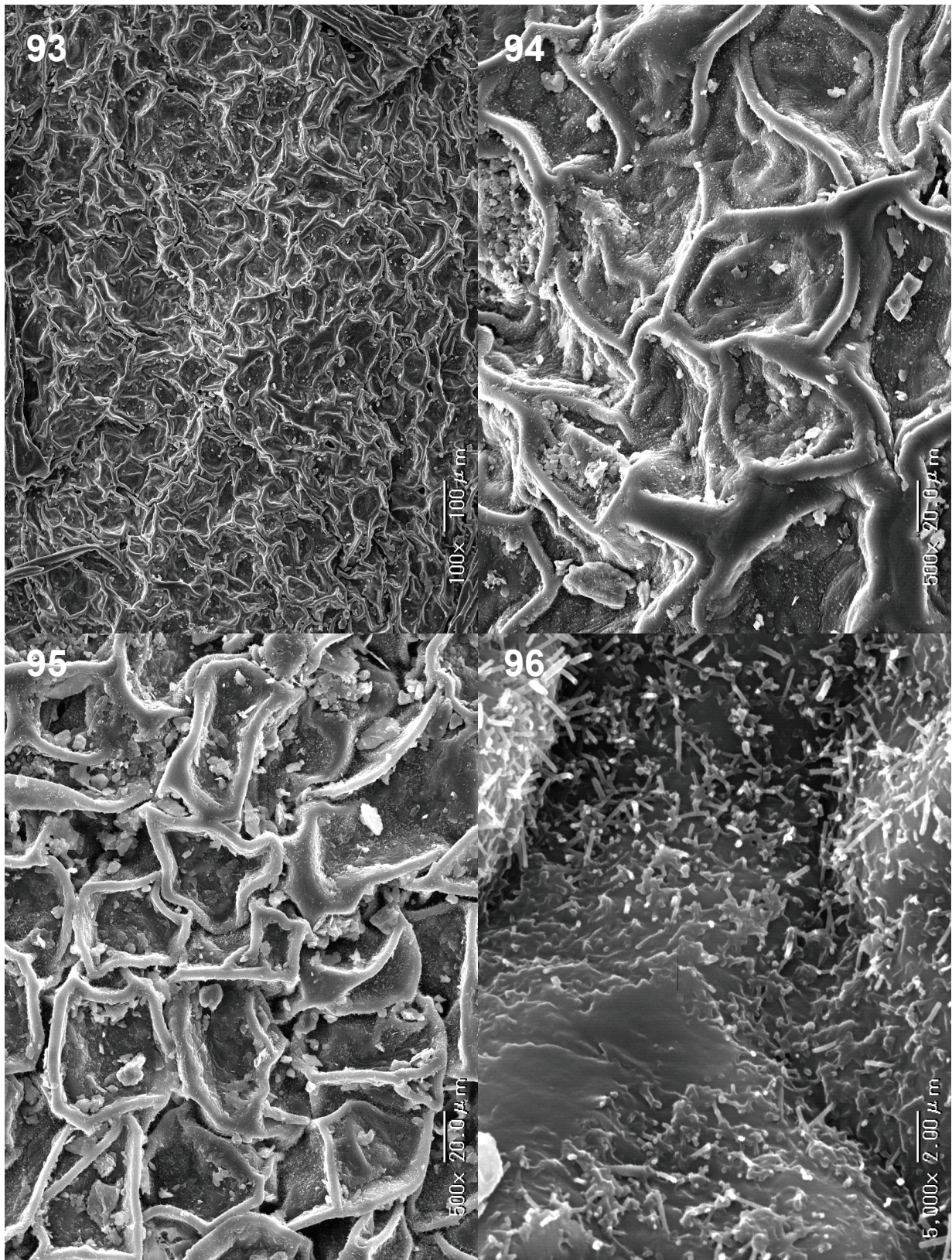
FIGURES 81–84. **81.** *Meconopsis hispida* T. Yoshida & H. Sun at the type locality. Photograph by T. Yoshida, June 20, 2016. **82.** *Meconopsis hispida* T. Yoshida & H. Sun on the western side of Yanggong Shan, 3900 m. A flower opened to show the ovary on the right and a young fruit on the left. Photograph by T. Yoshida, July 18, 2017. **83.** *Meconopsis trichogyna* T. Yoshida & H. Sun at the type locality. Photograph by T. Yoshida, July 14, 2017. **84.** Open flower of *Meconopsis trichogyna* T. Yoshida & H. Sun at the type locality with petals and stamens removed to show hairiness of ovary. Photograph by T. Yoshida, July 14, 2017.



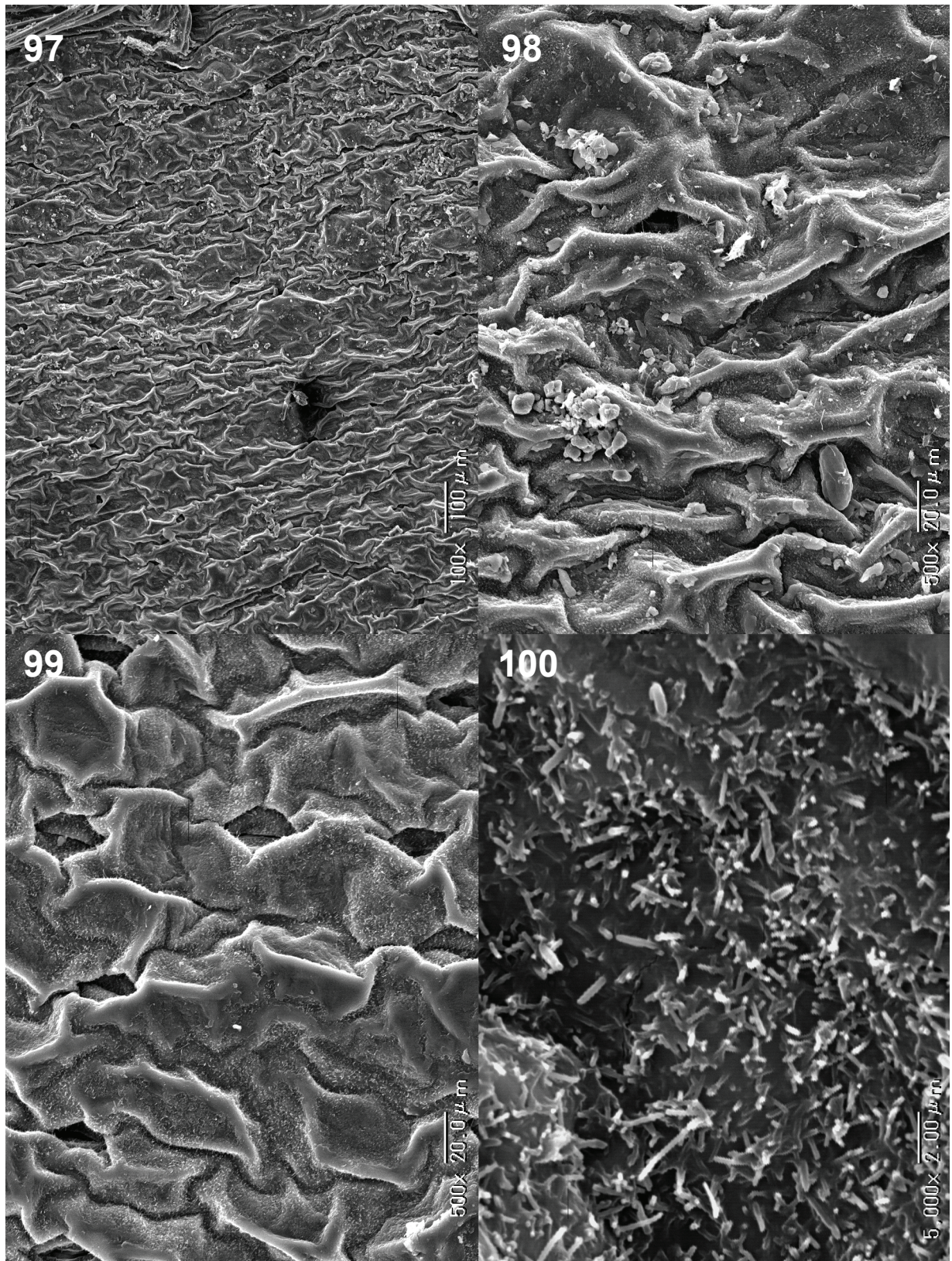
FIGURES 85–88. Scanning electron microscope images of upper surface of dried leaves at 100x magnification. **85.** *Meconopsis forrestii* Prain (T. Yoshida K29). Cross section at base of a bristle composed of agglutinated long and thin cells is visible. **86.** *Meconopsis forrestii* Prain (T. Yoshida K29). Reticulation formed by cell walls of epidermis is indistinct. **87.** *Meconopsis lancifolia* (Franch.) Franch. ex Prain subsp. *lancifolia* (T. Yoshida K127). Epidermis finely cracked by desiccation. **88.** *Meconopsis lancifolia* subsp. *shikaensis* T. Yoshida & H. Sun (T. Yoshida K129).



FIGURES 89–92. Scanning electron microscope images of upper surface of dried leaves at 100x magnification. **89.** *Meconopsis lancifolia* subsp. *eximia* (T. Yoshida K132). Reticulation formed by cell walls of epidermis is somewhat distinct. **90.** *Meconopsis lancifolia* subsp. *xiangchengensis* (R. Li & Z.L. Dao) T. Yoshida & H. Sun (T. Yoshida K114). **91.** *Meconopsis purpurea* T. Yoshida & H. Sun (T. Yoshida K124). Surface covered by many smaller bristles. **92.** *Meconopsis wengdaensis* T. Yoshida & H. Sun (T. Yoshida K104).



FIGURES 93–96. Scanning electron microscope images of surface of a dried leaf from a specimen of *Meconopsis pleurogyna* W.T. Wang, *T. Yoshida K122*. Reticulation formed by cell walls of epidermis is prominent. **93.** Upper surface of leaf at 100x magnification. **94.** Upper surface of leaf at 500x magnification. Reticulation raised and thickened. **95.** Lower surface of the leaf at 500x magnification. Reticulation raised and thickened and more prominent than on upper surface. **96.** Lower surface of the leaf at 5000x magnification. More studies are needed to clarify structures of epidermis visible in the image.



FIGURES 97–100. Scanning electron microscope images of the surface of a dried leaf from the type specimen of *Meconopsis aprica* T. Yoshida & H. Sun, *T. Yoshida K106*. Reticulation formed by cell walls of epidermis is indistinct. **97**. Upper surface of leaf at 100x magnification. **98**. Upper surface of the leaf at 500x magnification. **99**. Lower surface of leaf at 500x magnification. **100**. Lower surface of the leaf at 5000x magnification. Surface appears to be densely covered with minute fibrous emergences to 5 μm long. More studies are needed to clarify epidermal structures visible in image.

Meconopsis psilonomma var. *zhaganaensis* T. Yoshida & H. Sun, *Harvard Papers in Botany* 22 (2): 183. 2017. TYPE: CHINA. S Gansu, Diebu Xian (迭部县): W of Zhagana (扎尕那), 34°15'27"N, 103°06'10"E, 3700 m, 23 July 2014, *T. Yoshida K96* (Holotype: KUN; Isotype: TI). Fig. 1, 75–76.

Distribution: CHINA. S Gansu: Diebu Xian, western Die Shan (迭山), 3500–3800 m elevation.

Additional specimen examined: CHINA. S Gansu, Diebu Xian, **Region 29:** W of Zhagana, 34°15'27"N, 103°06'10"E, 3700 m, 23 July 2014, *T. Yoshida K96* (KUN, TI).

Meconopsis psilonomma var. *calcicola* T. Yoshida & H. Sun, *Harvard Papers in Botany* 22 (2): 183. 2017.

TYPE: CHINA. S Gansu, Diebu Xian (迭部县): W of Zhagana (扎尕那), 34°16'14"N, 103°03'57"E, 4050 m, 24 July 2014, *T. Yoshida K97* (Holotype: KUN; Isotype: TI). Fig. 1, 77–78.

Distribution: CHINA. S Gansu: Diebu Xian, western Die Shan (迭山), 4000–4150 m elevation.

Series *Barbisetae* T. Yoshida & H. Sun, *Harvard Papers in Botany* 23 (2): 325. 2018.

Hairs on ovary branched near base. Three species are included: *Meconopsis barbisetata* C.Y. Wu & H. Chuang ex L.H. Zhou, *M. hispida* T. Yoshida & H. Sun, *M. trichogyna* T. Yoshida & H. Sun.

KEY TO SPECIES OF SERIES *BARBISETAE*

- 1a. Inflorescence short racemose, with basal flowers; flowers opening widely; hairs on ovary with root-like branches at base and several rounded ridges on surface *M. trichogyna*
 1b. Inflorescence a solitary scape and solitary flower; flower cup-shaped 2
 2a. Hairs on ovary straight, ascending, with branches at base and with many longitudinal ridges on surface, apex sharply pointed; branches of hairs often gradually upturned. *M. hispida*
 2b. Hairs on ovary usually incurved, with branches in lower half and with several rounded longitudinal ridges on surface, apex rather obtuse; branches of hairs retrorse, imbricate, not upturned. *M. barbisetata*

Meconopsis barbisetata C.Y. Wu & H. Chuang ex L.H. Zhou, *Acta Phytotax. Sin.* 17 (4): 113–114. 1979. TYPE: CHINA. SE Qinghai, Jiuzhi Xian (久治县): eastern bank of Xiemu Cuo (斜木措), north side of Nianbao Shan (年保山), 4400 m, 1971, *Guoluo Team* (果洛队) 438 (Holotype: HNWP). Fig. 1, 79–80.

Meconopsis barbisetata C.Y. Wu & H. Chuang ex L.H. Zhou was revised by Yoshida and Sun (2018).

Distribution: CHINA. SE Qinghai: Jiuzhi Xian (久治县) and Banma Xian (班玛县), 3650–4100 m elevation.

Additional specimens examined: CHINA. SE Qinghai, Banma Xian, **Region 27:** Makehe (玛可河) Forest Reserve, southern side of Nianbao Yuze (年保玉则), 32°47'53"N, 101°04'42"E, 3650 m, 25 June 2016, *T. Yoshida K103* (KUN, TI). SE Qinghai, Jiuzhi Xian, **Region 28:** eastern bank of Xiemu Cuo, north side of Nianbao Shan, 4400 m, 1971, *Guoluo Team* (果洛队) 438 (HNWP); Jiuzhi (久治), July 1974, *Guoluo Grassland Station* (果洛草原站) 289 (HNWP); Sangchi Shan (桑赤山), 33°22'03"N, 101°19'18"E, 3950 m, 21 June 2016, *T. Yoshida K100* (KUN, TI); Luanshitou Yakou (乱石头丫口), 33°25'23"N, 101°13'30"E, 4000 m, 23 June 2016, *T. Yoshida K101* (KUN, TI).

Meconopsis hispida T. Yoshida & H. Sun, *Harvard Papers in Botany* 23 (2): 323. 2018. TYPE: CHINA. N Sichuan, Hongyuan Xian (红原县): western side of Yanggong Shan (羊拱山), 32°13'22"N, 102°35'04"E, 3850 m, 20 June 2016, *T. Yoshida K99* (Holotype: KUN; Isotype: TI). Fig. 1, 81–82.

Distribution: CHINA. N Sichuan: Hongyuan Xian and Heishui Xian (黑水县), Yanggong Shan, 3750–4000 m elevation.

Additional specimen examined: CHINA. N Sichuan, Hongyuan Xian, **Region 35:** western side of Yanggong Shan, 32°13'22"N, 102°35'04"E, 3850 m, 20 June 2016, *T. Yoshida K99* (KUN, TI).

Meconopsis trichogyna T. Yoshida & H. Sun, *Harvard Papers in Botany* 23 (2): 325. 2018. TYPE: CHINA. NW Sichuan, Dege Xian (德格县): Dege Haizi Shan (德格海子山), 32°03'13"N, 99°00'43"E, 4450 m, 14 July 2017, *T. Yoshida K119* (Holotype: KUN; Isotype: TI). Fig. 1, 83–84.

Distribution: CHINA. NW Sichuan: Dege Xian (德格县), 4400–4550 m elevation.

Additional specimen examined: CHINA. NW Sichuan, Dege Xian, **Region 26:** Dege Haizi Shan, 32°03'13"N, 99°00'43"E, 4450 m, 14 July 2017, *T. Yoshida K119* (KUN, TI).

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