

Saxifraga brachypoda D. Don and its Allies Collected in the
Sino-Himalayan Region (Saxifragaceae)

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Abstract *Saxifraga brachypoda* D. Don, *S. wallichiana* Sternb. and *S. wardii* W.W. Sm. are distinguished by the shape of the petals and the leaves and the presence (or absence) of axillary buds. Two new combinations are proposed in *S. brachypoda*, var. *eglandulosa* and var. *gouldii*.

Key words: *Saxifraga*, Himalaya, Yunnan

Introduction

The species diversity in sections and subsections Ciliatae, Serpyllifoliae, Rosulares and Flagellares in the genus *Saxifraga* is one of the remarkable features of the Sino-Himalayan alpine flora. Since Don (1821) published ‘*A Monograph of the Genus Saxifraga*’, a great number of species have been described and revised from this region (Seringe, 1830; Sternberg, 1810; 1822; 1831; Franchet, 1889–1890; Engler and Irmscher, 1912; 1916 & 1919; Smith, 1913; H. Smith, 1924; 1958; 1960; Marquand, 1929; Handel-Mazzetti, 1931; Fischer, 1940; Grierson, 1987; Pan, 1991; 1992; etc.).

To understand chromosome evolution and morphological diversity in *Saxifraga* in the Sino-Himalayan alpine flora, we conducted field research in the Himalaya and SW China since 1983 (e.g. Wakabayashi & Ohba 1988).

Saxifraga brachypoda D. Don and its allies are characterized by their caespitose, simple stems which are leafy throughout and often with scaly buds in the axils, the solitary (or sometimes a few) yellow flower, and the spinulose-dentate (often with a gland apically) leaves. But the specific delimitation of this group is rather difficult. *Saxifraga brachypoda* D. Don was described in 1821 on the basis of Wallich’s collection from Nepal, and in 1830 *S. fimbriata* Ser. (non D. Don) and *S. glandulosa* Ser.

were described also based on Wallich's collections. Sternberg (1831) proposed the new name *S. wallichiana* for *S. fimbriata* Ser. Later *S. wardii* W.W. Sm. (1913), *S. megalantha* Marquand (1929), *S. gouldii* C.E.C. Fisch. (1939), and *S. gouldii* var. *eglandulosa* H. Sm. (1960) were described from Yunnan, Tibet and Bhutan.

Recently Grierson (1987) treated *S. wallichiana* and *S. gouldii* var. *eglandulosa* as synonyms of *S. brachypoda*, and *S. wardii* as a distinct species. In contrast Pan (1992) treated *S. wallichiana* as a distinct species and *S. gouldii* var. *eglandulosa* as a synonym of *S. wardii*. The specific delimitation of these species is still controversial. To clarify species delimitation an investigation of the morphological characters of *S. brachypoda*, *S. wallichiana*, *S. wardii*, and *S. gouldii* (incl. var. *eglandulosa*) are needed.

In 1999 two of the authors (S. A. and S.-K. W.) collected *S. wardii* at Mt. Meili Xueshan, NW of Deqin ('Atuntsi'), near the type locality, which allowed us to compare the morphology of *S. wardii* in detail with *S. brachypoda*, *S. wallichiana* and *S. gouldii* var. *eglandulosa*.

Observations

Stems. *Saxifraga brachypoda* and its allies are characterized by the caespitose, simple stems that are leafy throughout. The stems are 4–19 (–26) cm long in *S. brachypoda*, 8–25 cm long in *S. wallichiana*, (7–)10–15 cm long in *S. gouldii* var. *gouldii* and *S. gouldii* var. *eglandulosa*, and 5–10 cm long in *S. wardii*. In some plants of *S. brachypoda* collected in Bhutan, Sikkim, Darjeeling and E. Nepal stems with axillary buds and/or axillary branches only on the basal parts were creeping.

Axillary buds. One to a few axillary buds are in the cauline leaf axils of *S. brachypoda*, several to ca. 10 or more are in the leaf axils of *S. wallichiana*. *Saxifraga wardii* and *S. gouldii* var. *eglandulosa* have no axillary buds in the axils of cauline leaves, but have them on the basal part of the stem. Some plants of *S. brachypoda* collected in Bhutan, Sikkim, Darjeeling and E. Nepal also have no axillary buds in the axils of cauline leaves, but have them on the basal part of the stem.

Leaves. The leaves of *Saxifraga brachypoda* and its allies are spinulose (often with an apical gland on each spine). The leaves on the apical part of the stem are lanceolate, acuminate at the apex, subcordate to truncate at the base, and sparsely spinulose on the margins and with or without glands in *S. brachypoda* (Fig. 1 a), narrowly obovate, acuminate at the apex, subcordate to truncate at the base, and moderately spinulose on the margins with or without glands in *S. wallichiana* (Fig. 1 d & e), lanceolate, acute at the apex, subcordate to truncate at the base, and regularly spinulose on the margins and with or without glands in *S. gouldii* var. *eglandulosa*, and elliptic, acute at the apex, truncate to subcordate at the base, distinctly cartilaginous and regularly spinulose on the margins with or without glands in *S. wardii* (Fig. 1 f). In some plants of *S. brachypoda* from Bhutan, Sikkim, Darjeeling and E. Nepal

without axillary buds on the middle part of the stem the leaves are linear to linear-lanceolate, acute at the apex, slightly attenuate at the base and sparsely spinulose on the margins and with or without glands (Fig. 1 b & c). The margins are distinctly cartilaginous in *S. wardii*, while marginal sipules are cartilaginous in *S. brachypoda*, *S. wallichiana* and *S. gouldii* var. *eglandulosa*.

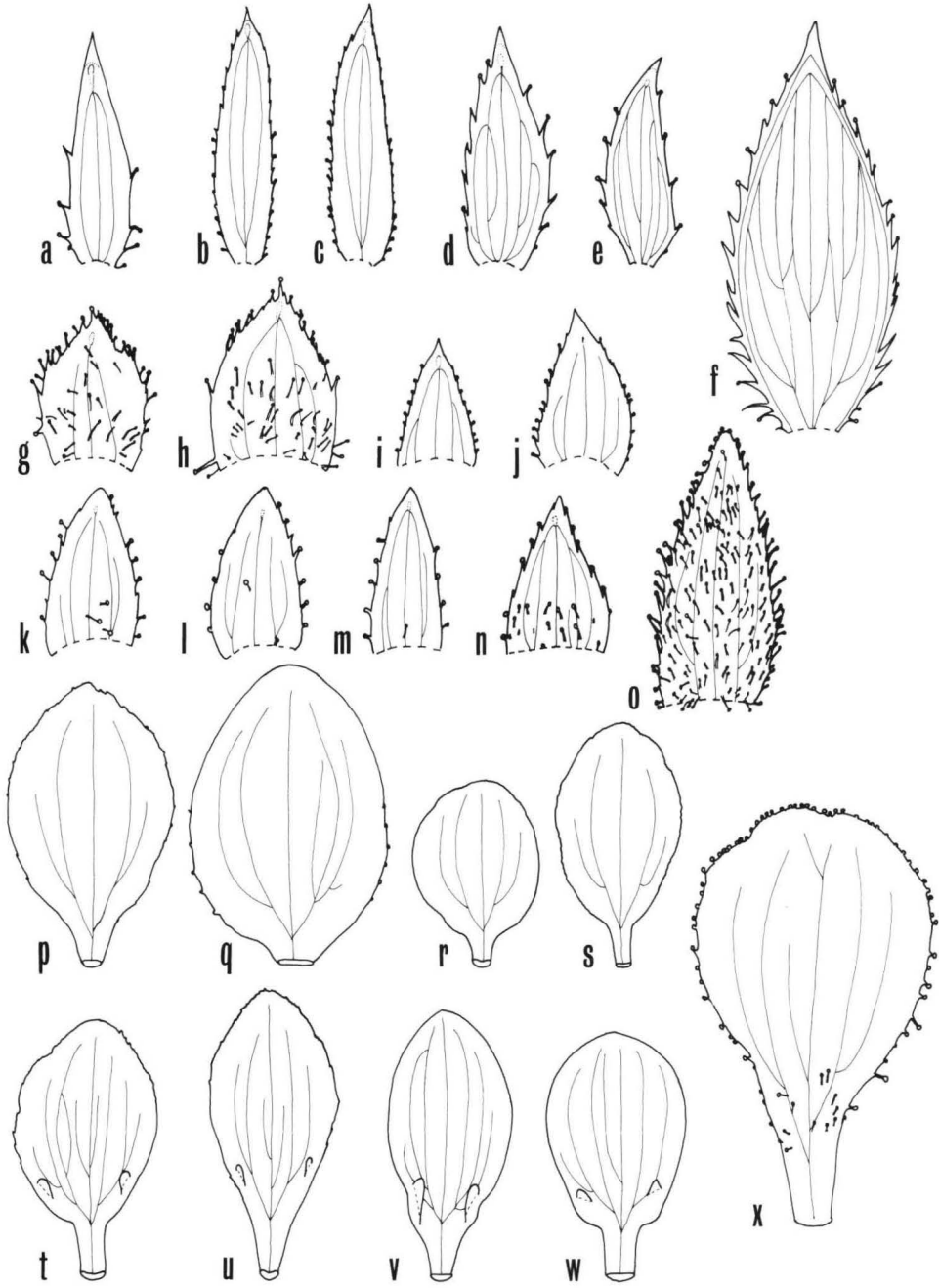
The leaves on the middle part of the stem are largest, 7–12 (–15) mm long and (1–)1.5–2.5(–3) mm wide, and usually 3-veined in *S. brachypoda*, (6–)8–15 mm long and 2.5–4.5(–5) mm wide, and with more than 7 veins in *S. wallichiana*, ca. 10 mm long and ca. 1.5 mm wide, and 3-veined in *S. gouldii* var. *eglandulosa*, and 9–11 mm long and 3–5 mm wide in *S. wardii*. In some plants of *S. brachypoda* from Bhutan, Darjeeling and E. Nepal without axillary buds on the middle part of the stem the leaves are 6–12 mm long and 1–1.5(–2) mm wide, attenuate at the base and 3-veined.

Uppermost part of the stem. The uppermost part of the stem is densely glandular hairy. The length between the ultimate leaf and the flower is 8–19(–25) mm in *S. brachypoda*, 3–9 mm in *S. wallichiana*, 3–6 mm in *S. gouldii* var. *eglandulosa*.

Sepals. The sepals are (3–)4–5 mm long, (2–)2.5–3.5 mm wide, ovate, glandular hairy on the margins, and sparsely to moderately glandular hairy or nearly glabrous on the outer surface in *S. brachypoda* (including plants from Bhutan, Sikkim, Darjeeling and E. Nepal) (Fig. 1 g–j), (3–)3.5–4.5 mm long, 2–3 mm wide, ovate to narrowly ovate, sparsely glandular hairy on the margins, and nearly glabrous or sparsely glandular hairy basally in *S. wallichiana* (Fig. 1 k–n), 4–5 mm long, ca. 3 mm wide, ovate to narrowly ovate, densely glandular hairy on the margins and outer surface in *S. gouldii* var. *eglandulosa*, and ca. 7.5 mm long, ca. 3.5 mm wide, narrowly ovate, densely glandular hairy on the margins and outer surface in *S. wardii* (Fig. 1 o).

Petals. The petals are 5–8 mm long, 3.5–5 mm wide, elliptic to ovate, obtuse at the apex, slightly attenuate at the base, very finely glandular and laciniate on the margins, glabrous on both surfaces, and without warts in *S. brachypoda* (including plants from Bhutan, Sikkim, Darjeeling and E. Nepal) (Fig. 1 p–s), 6.5–8 mm long, 3.5–4 mm wide, elliptic to obovate, obtuse at the apex, clawed or attenuate at the base, glabrous on both sides, and with 2 warts in *S. wallichiana* (Fig. 1 t–w). The margins are very finely laciniate in Nepalese plants (Fig. 1 t & u) but entire in Chinese plants (Fig. 1 v & w). The petals are 8–10 mm long, 3–5 mm wide, elliptic, obtuse at the apex, attenuate at the base, very finely to distinctly laciniate on the margins, glabrous on both sides, and without warts in *S. gouldii* var. *eglandulosa*, and ca. 11 mm long, ca. 7 mm wide, obovate, slightly retuse at the apex, attenuate at the base, distinctly glandular (brown) on the margins, glabrous on the inner surface, sparsely glandular hairy on the outer surface basally, and without warts in *S. wardii* (Fig. 1 x).

Stamens. The stamens are longer than or nearly equal to the pistils, and the anthers are not shriveled (with pollen) in *S. brachypoda*, *S. wallichiana*, *S. gouldii* var. *eglandulosa* and *S. wardii*. In some flowers of *S. brachypoda* and *S. wallichiana* the stamens are shorter than the pistils (nearly half), and the anthers are shriveled and



without pollen.

Discussion

Engler and Irmscher (1916) described *S. brachypoda* as having the minutely glandular-ciliate petal margins, but Fischer (1939) wrote that ‘Don in the original description in Trans. Linn. Soc. **13**, 378 makes no mention of such glands, nor can I find any in the Wallich sheets in the Kew Herbarium...’ Later, the petals of *S. brachypoda* were drawn to be entire (Pan, 1992). From this study it is clear that the petals of *S. brachypoda* are very finely glandular or laciniate in Nepalese plants (Fig. 1 p & q). It is uncertain that this character is specific or shows some infraspecific variation, as in *S. wallichiana* (mentioned below) because we have inadequate materials from China to resolve this issue.

Saxifraga wallichiana is distinguished from *S. brachypoda* by the presence of warts, as pointed by Pan (1992). Both Chinese and Nepalese *S. wallichiana* have the petals with two warts, but the margins of the petals are different. In Chinese plants the margins are entire (Fig. 1 v & w), while in Nepalese plants they are very finely laciniate (Fig. 1 t & u). In other characters, the Chinese and Nepalese plants cannot be distinguished. Grierson’s treatment of *S. wallichiana* as a synonym of *S. brachypoda* is not acceptable and these two species should be treated as distinct.

When Smith (1960) described *S. gouldii* var. *eglandulosa* he mentioned that ‘The new variety agrees perfectly with the typical one except that the upper part of the petal is finely laciniate instead of bearing marginal glands. ... Var. *eglandulosa* may thus be geographically distinct; or it may represent the normal condition of the species, and var. *gouldii* a rare modification.’ We had an opportunity to examine the type specimen and the paratype of *S. gouldii* var. *eglandulosa*. The size of the plants and the shape of the leaves, the sepals and the petals of *S. gouldii* var. *eglandulosa* are indistinguishable from those of *S. brachypoda*, but the former can be distinguished by the absence of axillary buds in the middle and apical part of the stems. As mentioned in the introduction Grierson treated *S. gouldii* (incl. var. *eglandulosa*) as a synonym of *S. brachypoda*, while Pan treated it as a synonym of *S. wardii*. Consequently it is reasonable to treat *S. gouldii* var. *eglandulosa* as conspecific with *S. brachypoda*, but as a distinct variety, var. *eglandulosa*. Some plants of *S. brachypoda* collected in Bhutan, Darjeeling and E. Nepal have linear to linear-lanceolate leaves and are char-

Fig. 1. *Saxifraga brachypoda* (a, g, h, p & q), *S. brachypoda* var. *eglandulosa* (b, c, i, j, r & s), *S. wallichiana* (d, e, k–n & t–w) and *S. wardii* (f, o & x). a–f: Cauline leaves near stem apex. g–o: Sepals. p–x: Petals. a, g & p: Nepal (Wakabayashi *et al.* 9720272). h & q: Nepal (Miyamoto *et al.* 9440121). b, i & r: Nepal (Ohashi *et al.* 775509). c, j & s: Darjeeling (Hara, 17 Sept. 1964). d, k & t: Nepal (Miyamoto *et al.* 9584152). l & u: Nepal (Wakabayashi *et al.* 9720186). e, m & v: China (Wu *et al.* 754). n & w: China (Kato *et al.* 1849). f, o & x: China (Wu *et al.* 103526). All $\times 5$.

acterized by the absence of axillary buds on the middle parts as in var. *eglandulosa*. These cannot be distinguished from the latter.

Saxifraga gouldii, characterized by the petals 'decorated with a single row of small, sessile or shortly stipitate black glands which are continued for a varying distance along the sides' (Fischer, 1939), is known from only Bhutan and Tibet. According to the original description, *S. gouldii* has stems up to 26 cm long and 'broadly ensiform' leaves (6–15 mm long, 2–3 mm wide). We examined the type and paratype specimens and noted that with the exception of the marginal black glands of the petals *S. gouldii* does not differ from *S. brachypoda* var. *eglandulosa*. It is therefore reasonable to treat *S. gouldii* as another variety of *S. brachypoda*.

Saxifraga wardii is characterized by the glandular margins of the petals and the absence of axillary buds in the cauline leaf axils as mentioned by Grierson (1987) and Pan (1992). This species is also characterized by the short stems (5–10 cm long) and the size and shape of the leaves (9–11 mm long, 3–5 mm wide, elliptic, acute at the apex, truncate to subcordate at the base, distinctly cartilaginous and regularly spinulose on the margins and with or without glands). The treatment by Grierson (1987) and Pan (1992) of *S. wardii* as a distinct species, is acceptable.

Taxonomic treatment

Saxifraga brachypoda D. Don in Trans. Linn. Soc. **13**: 378 (1821); Prodr. Fl. Nepal.: 209 (1825). Clarke in Hook. f., Fl. Brit. Ind. **2**: 396 (1878). Engler & Irmscher in Notes Roy. Bot. Gard. Edinburgh **5**(24): 140 (1912); in Bot. Jahrb. Syst. **48**: 591 (1912); in Engl., Pflanzenr. IV-117 (Heft 67): 136 (1916). Hand.-Mazz., Symb. Sin. **7**(2): 422 (1931). Hara, Fl. E. Himal.: 116 (1966); in Hara & Williams, Enum. Flow. Pl. Nepal **2**: 151 (1979). J. T. Pan in Acta Phytotax. Sin. **16**(2): 14 (1978); in Acta Biol. Plateau Sin. **1**: 28 (1983); in Wu (ed.), Index Fl. Yunnan. **1**: 234 (1984); in Wu (ed.), Fl. Xizang. **2**: 466, fig. 154 18–23 (1985); in Fl. Reipubl. Popularis Sin. **34**(2): 145, fig. 36 10–15 (1992). Polunin & Stainton, Fl. Himalaya: 132, 467 (1984). Grierson in Grierson & Long, Fl. Bhutan **1**(3): 503 (1987). Stainton, Fl. Himalaya Sup.: 20, Pl. 38 (1988). Ohba & Akiyama, Alp. Fl. Jaljale Him.: 30 (1992). Type: Nepal (Wallich, Herb. Lambert [not found, see Fischer (1939)]). [Figs. 1a, g, h, p, q, and 2]

Saxifraga glandulosa Wall. [Numer. List: 442 (1829), nom. nud.] ex Ser. in DC., Prodr. **4**: 45 (1830). Types: Nepal. Gossaingsthan [Gosainkund] (Wallich 442, Herb. DC.). Kumaon [Kamoon] (Wallich 442A, Herb. DC.).

Specimens examined. China. Yunnan. Tali Range, lat. 25°40'N, 11–12000 ft. (Forrest 11688, Sept. 1913, TI); Chih-tse-lo, 3000 m (Tsai 54153, 4 Sept. 1933, A); Mekong-Salwin Divide, Sewalongba, 3400 m (Yü 22515, 26 Aug. 1938, A). Tibet. Changi, 12000 ft. (Cutting & Vernay 119B, 24 Sept. 1935, A). Bhutan. Me La, 14000 ft. (Ludlow & Sherriff 450, 8 Aug. 1933, TI); Chomolhari lhakan, 4150 m (Nishioka, 6 Sept. 1966, TI). Nepal. Gossaingsthan [Gosainkund] (Wallich 442, TI, isosyntype

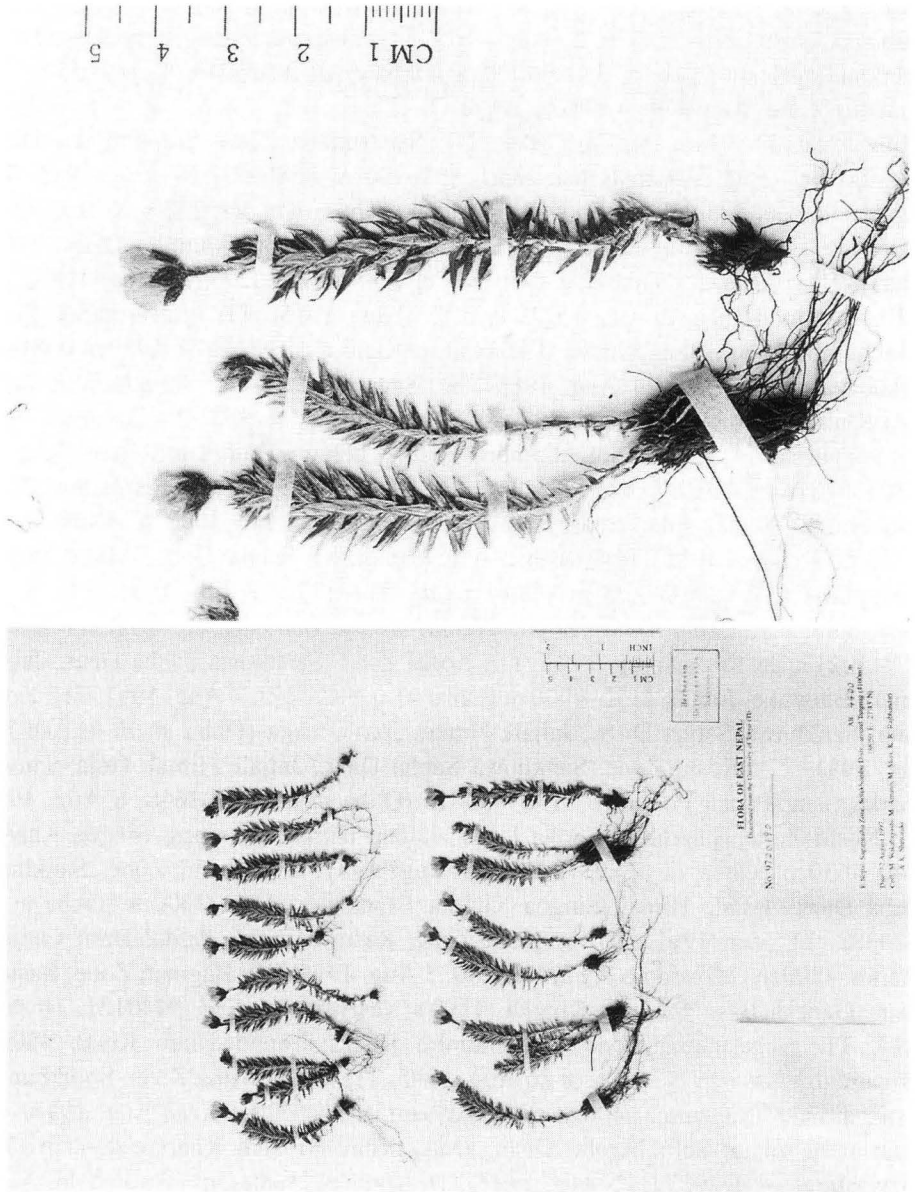


Fig. 2. *Saxifraga brachypoda* D. Don. Nepal (Wakabayashi *et al.* 9720190, TI).

of *Saxifraga glandulosa* Wall. ex Ser.). Lamrak, 10000–14000 ft. (Dhwoj 167, in 1929, TI); Jata Pokhin, 14000–15000 ft. (Dhwoj 0624, in 1930, TI); Gosainkund, Thale Patil–Rock Shelter I, 3400 m (Kanai & Malla 674759, 24 Aug. 1969, TI); E. Nepal, Piling La, 4350 m (Ohashi *et al.* 773679, 11 Aug. 1977, TI); 4400 m (Ohashi

et al. 772285, 11 Aug. 1977, TI); E. Nepal, Topke Gola–Jalang Chhyongo, 3600–4300 m (Ohashi *et al.* 772579, 20 Aug. 1977, TI); Janakpur Zone, Ramechhap Distr., Dubikharka–Baula Pokhari, 3720–4000 m (Ohba *et al.* 8520044, 9 July 1985, TI); Janakpur Zone, Ramechhap Distr., Thare Og–Thare Teng–Thare Og, 4150–4260 m (Ohba *et al.* 8580446, 24 July 1985, TI); Sagarmatha Zone, Solukhumbu Distr., Sete–Taktor, 2550–3400 m (Ohba *et al.* 8530930 & 8580973, 19 Aug. 1985, TI); Sagarmatha Zone, Solukhumbu Distr., Mopung–Thosa Kharka, 2800–3670 m (Ohba *et al.* 8581071, 21 Aug. 1985, TI); Sagarmatha Zone, Solukhumbu Distr., Thosa Kharka–Beni Kharka (Dambuk), 4000 m (Ohba *et al.* 8520296, 22 Aug. 1985, TI); 3670–4350 m (Ohba *et al.* 8571945, 22 Aug. 1985, TI); Sagarmatha Zone, Solukhumbu Distr., Beni Kharka–Tschokarma–Beni Kharka, 3970–4950 m (Ohba & Wakabayashi 8531050, 24 Aug. 1985, TI); Sagarmatha Zone, Solukhumbu Distr., Beni Kharka–below DudhKund, 3970–4450 m (Ohba *et al.* 8531101, 26 Aug. 1985, TI); Sagarmatha Zone, Solukhumbu Distr., below DudhKund–Beni Kharka, 4450–3970 m (Ohba & Wu 8531179, 30 Aug. 1985, TI); Sagarmatha Zone, Solukhumbu Distr., Pike Bhanjyang–Pike Dongshar, 3500–4000 m (Ohba *et al.* 8531330, 6 Sept. 1985, TI); Koshi Zone, Sankhuwa Sabha Distr., Milke Danda, Chhippon–Gidde, 2980–3500 m (Ohba *et al.* 9110117, 19 July 1991, TI); Koshi Zone, Sankhuwa Sabha Distr., Jaljale Himal, around Banduke, ca. 4150 m (Ohba *et al.* 9110213, 25 July–3 Aug. 1991, TI); Koshi Zone, Sankhuwa Sabha Distr., Jaljale Himal, Banduke–Jomle, 4150–4000 m (Ohba *et al.* 9120213, 4 Aug. 1991, TI); Koshi Zone, Sankhuwa Sabha Distr., Jaljale Himal, Jomle–Goja (Ohba *et al.* 9110307, 5 Aug. 1991, TI); Koshi Zone, Sankhuwa Sabha Distr., Jaljale Himal, Goja–Shuwan Kharka (near Panch Pokhari), 4130–4300 m (Ohba *et al.* 9130264b, 6 Aug. 1991, TI); Koshi Zone, Sankhuwa Sabha Distr., Jaljale Himal, Bomrang–Singoa Kharka, 4140–4630 m (Ohba *et al.* 9110426, 10 Aug. 1991, TI); Koshi Zone, Sankhuwa Sabha Distr., Jaljale Himal, Singoa Kharka–Pahakhola, 4140–2400 m (Ohba *et al.* 9120382, 11 Aug. 1991, TI); Bagmati Zone, Rasuwa Distr., Paldol Base Camp–a Kharka, 4200 m (Miyamoto *et al.* 9420150, 3 Aug. 1994, TI); Bagmati Zone, Rasuwa Distr., Ganesh Base Camp–a Kharka, 4190 m (Miyamoto *et al.* 9440121, 10 Aug. 1994, TI); Sagarmatha Zone, Solukhumbu Distr., around Dudh Kund, 4500 m (Miyamoto *et al.* 9592436, 25 & 26 Aug. 1995, TI); Sagarmatha Zone, Solukhumbu Distr., around Tangnang, 4400 m (Wakabayashi *et al.* 9720190, 12 Aug. 1997, TI); Sagarmatha Zone, Solukhumbu Distr., Dudh Kund–Mosom Kharka, 4540 m (Wakabayashi *et al.* 9720272, 25 Aug. 1997, TI). Kumaon [Kamoon] (Wallich 442A, TI, isosyntype of *Saxifraga glandulosa* Wall. ex Ser.).

Note. *Saxifraga brachypoda*, which ranges across the Himalaya from Tibet to Yunnan, is common in Nepal but rather rare in Yunnan.

var. **eglandulosa** (H. Sm.) S. Akiyama, H. Ohba & S.K. Wu, comb. nov.

[Figs. 1b, c, i, j, r, s, 3, and 4]

Saxifraga gouldii C.E.C. Fisch. var. *eglandulosa* H. Sm. in Bull. Brit. Mus. (Nat.

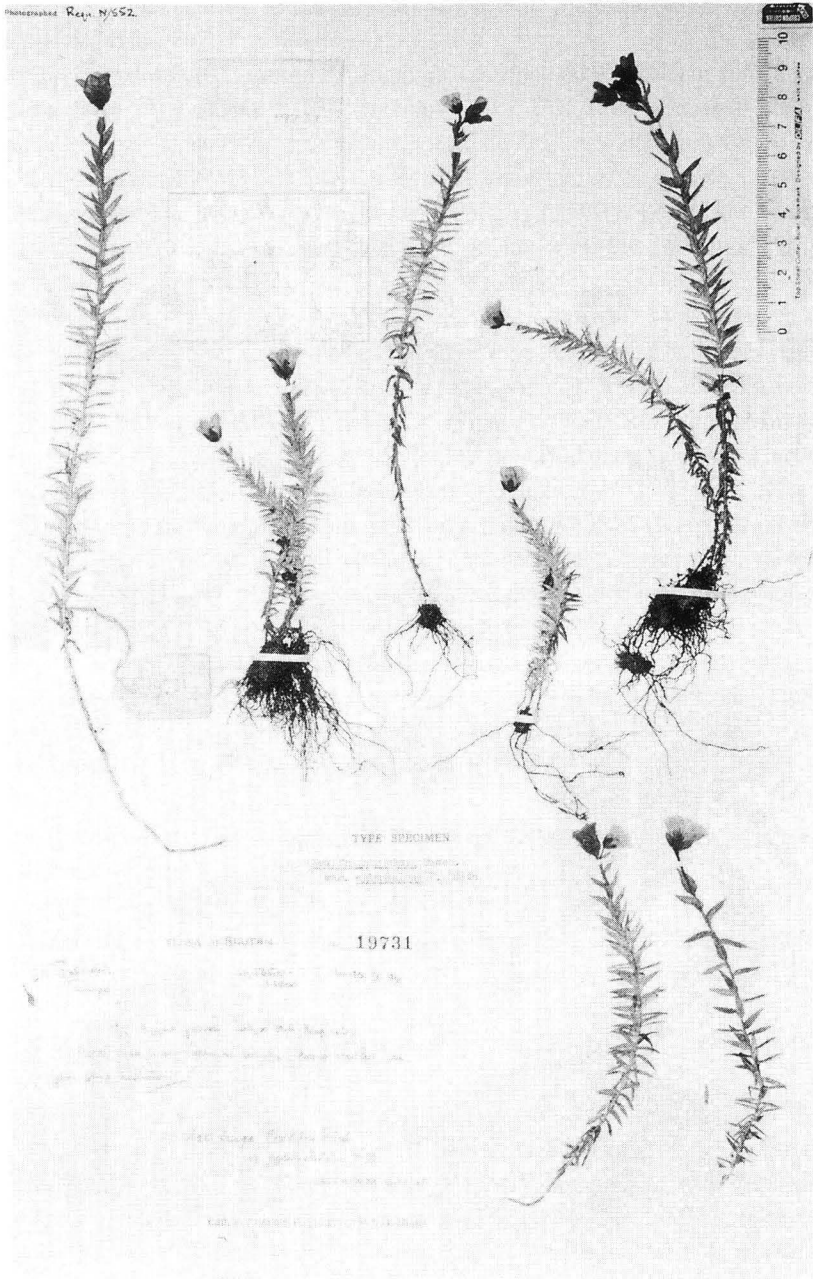


Fig. 3. *Saxifraga brachypoda* D. Don. var. *eglandulosa* (H. Sm.) S. Akiyama, H. Ohba & S.K. Wu. Bhutan (Ludlow, Sherriff & Hicks 19731, BM, holotype of *S. gouldii* C.E.C. Fisch. var. *eglandulosa* H. Sm.).

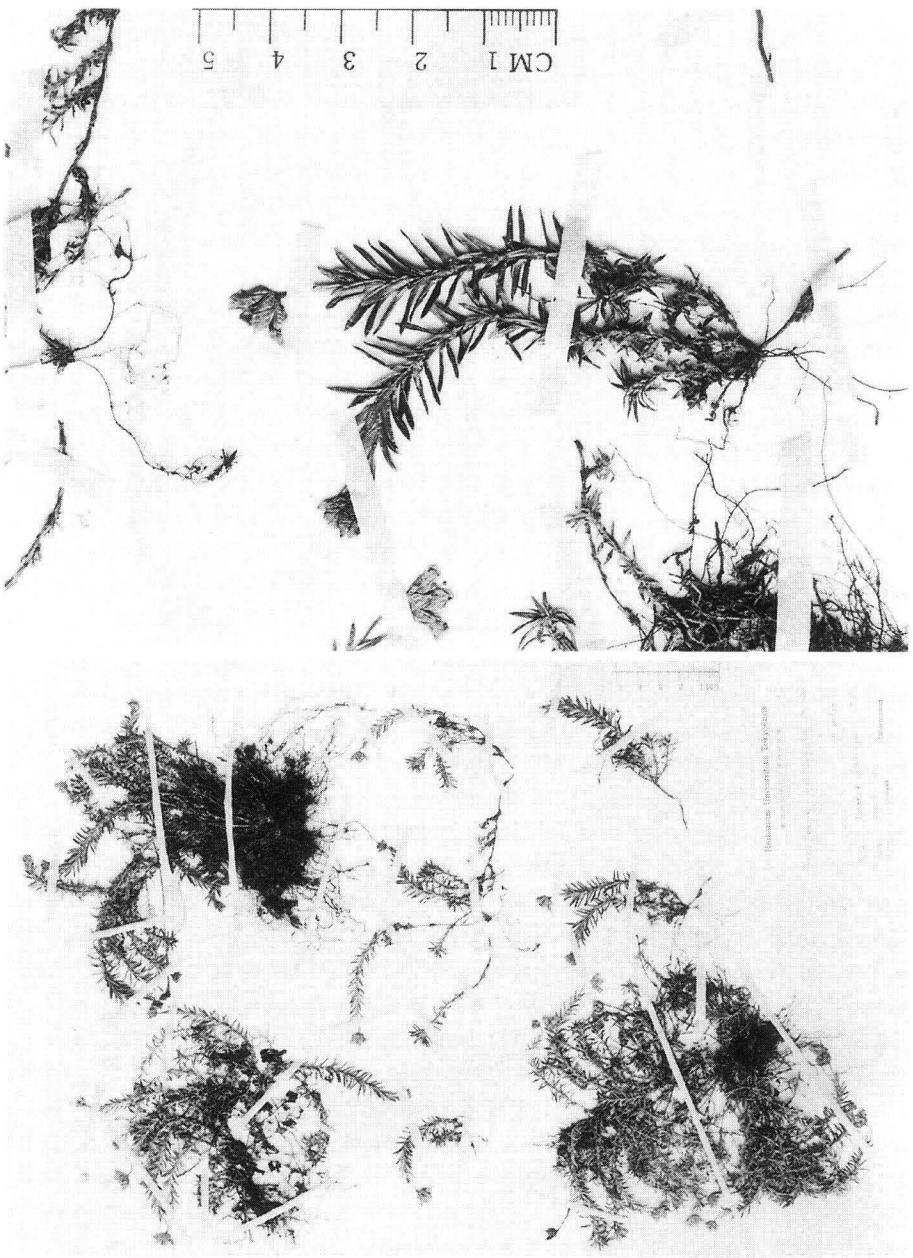


Fig. 4. *Saxifraga brachypoda* D. Don. var. *eglandulosa* (H. Sm.) S. Akiyama, H. Ohba & S.K. Wu. Darjeeling (Hara, 17 Sept. 1964, TI).

Hist.), Bot. **2**(9): 249 (1960). Type: Bhutan. Tolegang, Tsampa, 4050–4200 m (Ludlow, Sherriff & Hicks 19731, holo-BM, iso-CAL).

Specimens examined. Bhutan. Tolegang, Tsampa, 4050–4200 m [13500–14000 ft.] (Ludlow, Sherriff & Hicks 19731, 10 Sept. 1949, BM, holotype of *S. gouldii* var. *eglandulosa* H. Sm.; CAL, isotype); Bumthang Chu, Ju La, 4200 m [14000 ft.] (Ludlow, Sherriff & Hicks 16915a, 21 July 1949, BM, paratype of *S. gouldii* var. *eglandulosa* H. Sm.); Between Me La and Cho La, 4050 m [13500 ft.] (Ludlow, Sherriff & Hicks 21412, 21 Aug. 1949, A); Samtengang–Ritang, 1900–2600 m (Hara *et al.* 3417, 11 Apr. 1967, TI). Sikkim. 12000 ft. (Ribu in 1908, TI). Darjeeling. Sandakphu–Gatribas (Hara s.n., 17 Sept. 1964, TI); Below Sandakphu, 3400 m (Hara s.n., 17 Sept. 1964, TI); Sandakphu, 3600 m (Hara s.n., 17 Sept. 1964, TI). Nepal. E. Nepal, Tinjuray, 2900 m (Hara *et al.* 6303270, 27 Oct. 1963, TI, TNS); Hati Sar–Minchin Dhap, 2900 m (Hara *et al.* 6303271, 28 Oct. 1963, TI); Minchin Dhap–Mul Pokhari (Hara *et al.* 630272, 29 Oct. 1963, TI); Batasay–Bhuspate Danra (Hara *et al.* 6303273, 1 Dec. 1963, TI, TNS); Cahuke–Tute (Ohashi *et al.* 774161, 1 Sept. 1977, KATH, TI); Jhangdang Kharka–Thulo Tingsang, 3150–3200 m (Kanai *et al.* 672940, 24 Sept. 1970, KATH, TI); Kuri–Charikot, 3250–1950 m (Kanai *et al.* 674659, 29 Sept. 1970, KATH, TI); Above Sauwala Khola, 12000 ft. (Stainton, Sykes & Williams 4418, 15 Sept. 1954, TI).

Note. Variety *eglandulosa* is usually caespitose but sometimes the basal part of the stems are creeping. This variety is restricted to eastern Nepal, Sikkim, Darjeeling and Bhutan.

var. **gouldii** (C.E.C. Fischer) S. Akiyama, H. Ohba & S.K. Wu, comb. et stat. nov. [Fig. 5]

Saxifraga gouldii C.E.C. Fischer in Kew Bull. 1939: 664 (1940). Type: Bhutan. Chira, 5100 m (Gould 1310, holo-K).

Specimens examined. Bhutan. Chira, 5100 m [14200 ft.] (Gould 1310, Aug. 1938, K, holotype of *S. gouldii* C.E.C. Fischer). Tibet. Gautsa to Phari, 4300–5200 m [12000–14300 ft.] (Gould 1467, 13 Aug. 1938, K, paratype of *S. gouldii* C.E.C. Fischer).

Note. Variety *gouldii* is characterized by the glandular margins of the petals. It is restricted to Bhutan and Tibet.

Saxifraga wallichiana Sternb., Rev. Saxifr. Suppl. **2**: 21, t. 22 (1831). J. T. Pan in Acta Biol. Plateau Sin. **1**: 28 (1983); in Wu (ed.), Index Fl. Yunnan. **1**: 234 (1984); in Wu (ed.), Fl. Xizang. **2**: 466, fig. 154 24–29 (1985); in Fl. Reipubl. Popularis Sin. **34**(2): 147, fig. 37 1–6 (1992). Type: Same as *Saxifraga fimbriata* Wall. ex Ser.

[Figs. 1d, e, k–n, t–w, and 6]

Saxifraga fimbriata Wall. [Numer. List: 443 (1829), nom. nud.] ex Ser. in DC. Prodr. **4**: 45 (1830), non D. Don (1821). Types: Nepal. Gossaingsthan [Gosainkund] (Wallich 443, Herb. DC.). Kumaon [Kamoon] (Wallich 443A, Herb. DC.).

Saxifraga brachypoda D. Don var. *fimbriata* (Ser.) Engl. & Irmsch. in Bot. Jahrb.

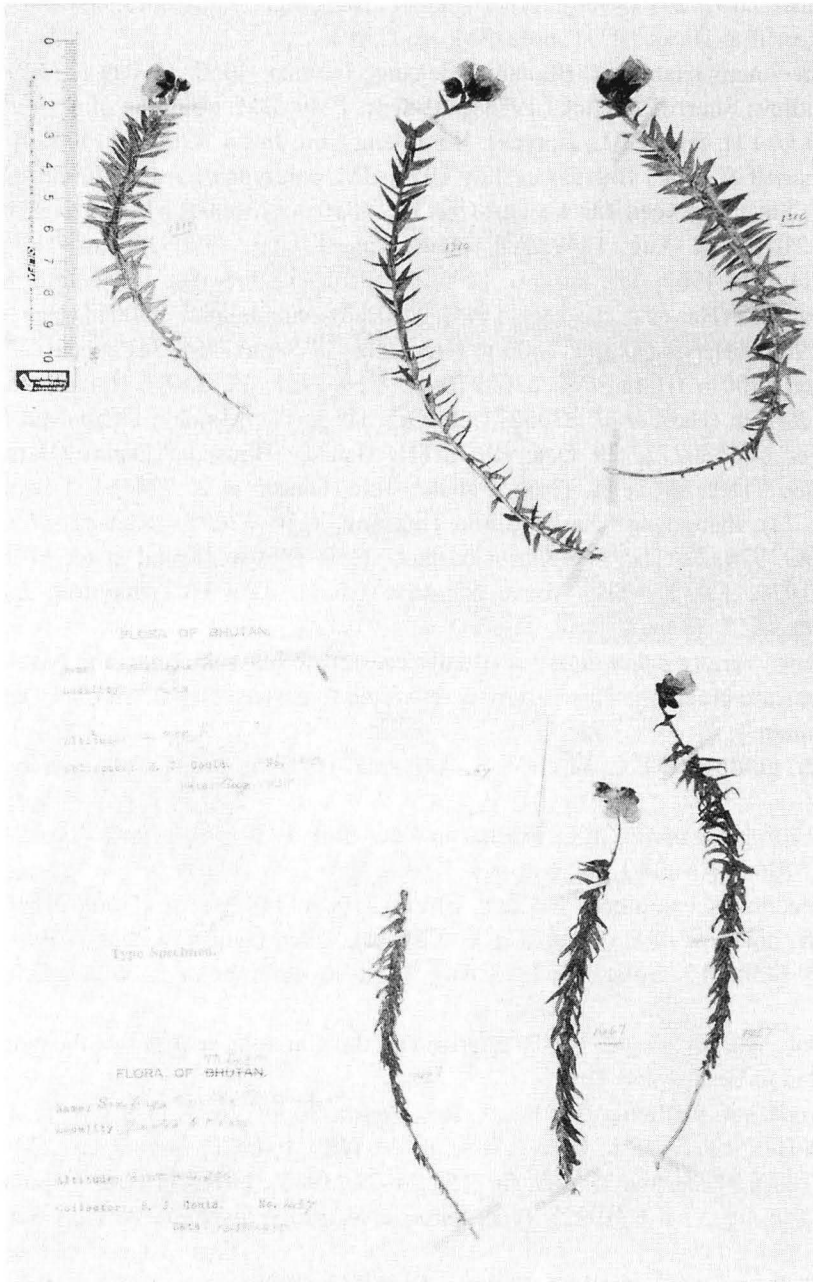


Fig. 5. *Saxifraga brachypoda* D. Don. var. *gouldii* (C.E.C. Fischer) S. Akiyama, H. Ohba & S.K. Wu. Bhutan. Chira, 5100 m [14200 ft.] (Gould 1310, Aug. 1938, K, holotype of *S. gouldii* C.E.C. Fischer) (upper three plants).

Lichiang Range, Lat. 27°15'N, 11000–12000 ft. (Forrest 2867, Sept. 1906, TI); E. flank of the Lichiang Range (Forrest 6627, in 1910, TI); Chien-chuan-Mekong divide, Lat. 26°30'N, Long. 99°44'E, 11000 ft. (Forrest 22211, Aug. 1922, TI); Lijiang, Yulongshan (Yulong Xueshan), 3650–4000 m (Ohba *et al.* 517, 17–26 Sept. 1987, KUN, TI); Lijiang, Yulongshan (Yulong Xueshan), 3700 m (Ohba *et al.* 1004, 17–26 Sept. 1987, KUN, TI); Lijiang County, Qilanbiao, Yulong Xueshan, 3500–3900 m (Kato *et al.* 1849, 1 Aug. 1988, KUN, TI); Deqe: around Daxue Shan, 4050 m (Wu *et al.* 781, 29 Aug. 1996, KUN, TI). Sichuan. Xiangcheng Xian, around Da Xue Shan (near Yunnan-Sichuan border), 3970–4420 m (Wu *et al.* 1115, 25 Sept. 1994, KUN, TI); Xiangcheng Xian, around Da Xue Shan (near Yunnan-Sichuan border), 3970–4420 m (Wu *et al.* 1122, 25 Sept. 1994, KUN, TI); Daocheng, Haizi (near Daocheng), 4000 m (Wu *et al.* 698, 17 Aug. 1996, KUN, TI); Daocheng, around Gongga Shan (Zhong Niuan, a pasture), 3960 m (Wu *et al.* 728, 21 Aug. 1996, KUN, TI); Daocheng, around Gongga Shan, 4170 m (Wu *et al.* 754, 23 Aug. 1996, KUN, TI); Daocheng, around Gongga Shan, 3920–4910 m (Wu *et al.* 2350, 24 Aug. 1996, KUN, TI). Sikkim. Tauqu, 13500 ft. (Smith & Cave 2559, 15 Aug. 1909, TI). Nepal. Karnali Zone, Marghor Lagna, 3600 m (Rajbhandari & Roy 4118, 29 July 1979, TI); Singum Gompa–Gosainkund, 3200–4200 m (Kanai *et al.* 723945, 23 Aug. 1972, TI); Rolwaling Khola, Thandingma–Beding, 3200–3600 m (Ohba *et al.* 8331759, 2 Sept. 1983, TI); Rolwaling Khola, Beding–Na, 3600–4050 m (Ohba *et al.* 8351292, 4 Sept. 1983, TI); Janakpur Zone, Ramechhap Distr., around Thare Og, 4150 m (Ohba *et al.* 8520170, 23 July 1985, TI); Janakpur Zone, Ramechhap Distr., Thare Og–Phedi Kharka–Thare Og, ca. 4150 m (Ohba 8530517, 26 July 1985, TI); Janakpur Zone, Ramechhap Distr., Thare Og–Neju, 3651–4877 m (Ohba *et al.* 8570928, 30 July 1985, TI); Janakpur Zone, Ramechhap Distr., around Neju, 3651 m (Ohba *et al.* 8520236, 31 July and 1 Aug. 1985, TI); Janakpur Zone, Ramechhap Distr., Neju–above Luk Kharka–Neju, 3651–4600 m (Ohba 8530669, 1 Aug. 1985, TI); Janakpur Zone, Ramechhap Distr., Neju–Choarma, 3651–2760 m (Ohba *et al.* 8530694 & 8580672, 2 Aug. 1985, TI, TNS; 8571122, 2 Aug. 1985, TI); Bagmati Zone, Rasuwa Distr., Yure Kharka–Tinbu Kharka, 3700 m (Miyamoto *et al.* 9420040, 26 July 1994, TI); Sagarmatha Zone, Solukhumbu Distr., Rato Odara–Chhomalang Base Camp, 4550 m (Miyamoto *et al.* 9584152, 11 Aug. 1995, TI); Sagarmatha Zone, Solukhumbu Distr., Chhomalang Base Camp–Rato Odara, 4500 m (Miyamoto *et al.* 9592319, 18 Aug. 1995, TI); Dhawalagiri Zone, Mustang Distr., Chabarbu (Thorung Phedi)-Jharkot, 4060 m (Mikage & Yonekura 9552444, 24 Sept. 1995, TI); Sagarmatha Zone, Solukhumbu Distr., around Tangnag, 4300 m (Wakabayashi *et al.* 9720186, 12 Aug. 1997, TI); Sagarmatha Zone, Solukhumbu Distr., Khare–Tangnag, 4320 m (Wakabayashi *et al.* 18 Aug. 1997, TI). Garhwal. Valley of Flowers (Kobatake 96, 7 Aug. 1988, TI).

Note. *Saxifraga wallichiana* occurs in the Himalaya in India, Nepal, Sikkim, Tibet and Yunnan and is common in Nepal and Yunnan.

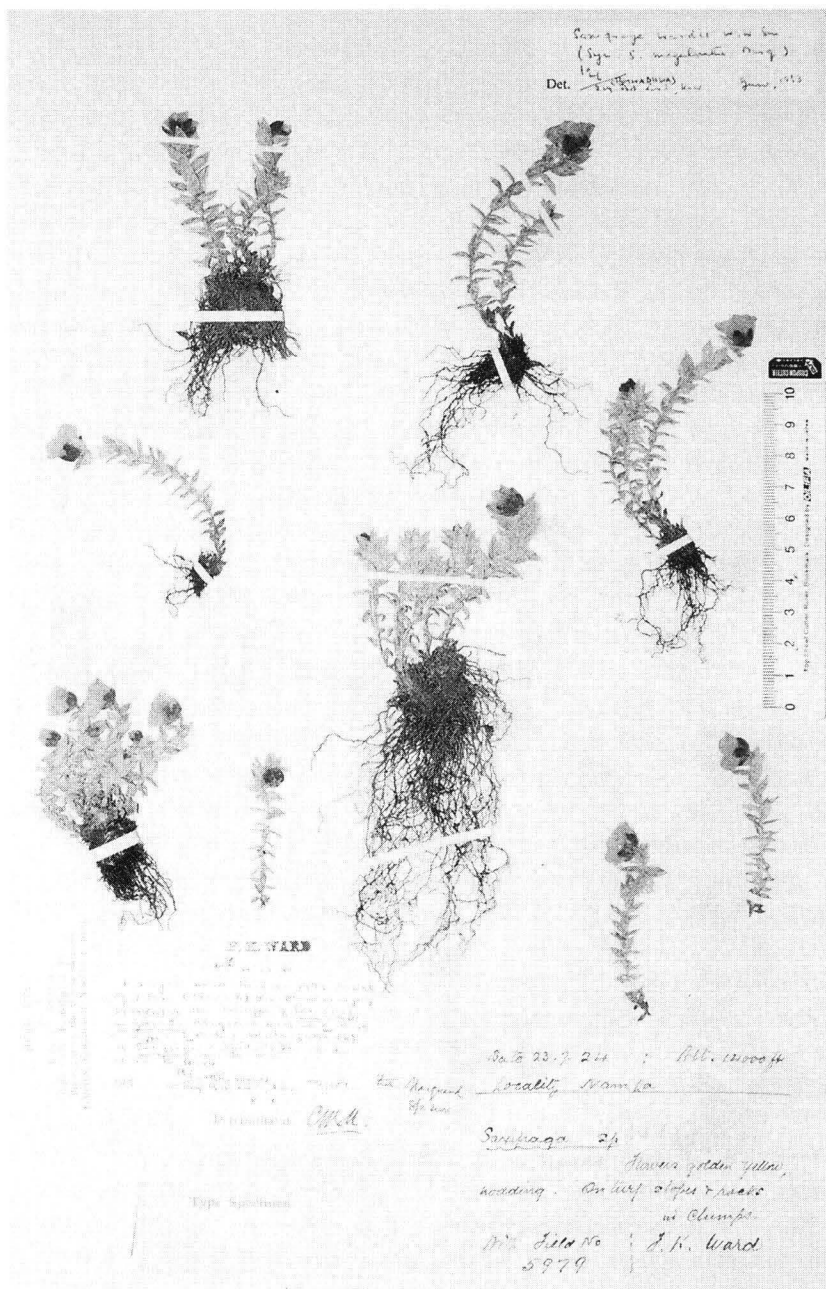


Fig. 8. *Saxifraga wardii* W.W. Sm. Tibet (F. Kingdon Ward 5979, K, holotype of *S. megarantha* Marquand).



Fig. 9. *Saxifraga wardii* W.W. Sm. China (Wu *et al.* 103526, TNS).

Saxifraga wardii W.W. Sm. in Notes Roy. Bot. Gard. Edinburgh **8**: 134 (1913). J. T. Pan in Acta Biol. Plateau Sin. **1**: 29 (1983); in Wu (ed.), Index Fl. Yunnan. **1**: 246 (1984); in Wu (ed.), Fl. Xizang. **2**: 468, fig. 154 7–12 (1985); in Fl. Reipubl. Popularis Sin. **34**(2): 147, fig. 37 1–6 (1992). Grierson in Grierson & Long, Fl. Bhutan **1**(3): 505 (1987). Type: China. N.W. Yunnan, near Atuntsi [Deqin], 14000 ft. (F. Kingdon Ward 46, holo-E). [Figs. 1f, o, x, and 7–9]

Saxifraga megalantha Marquand in J. Linn. Soc. Bot. **48**: 179 (1929). Type: S.E. Tibet. Nam La, eastern extremity of the Himalaya, 4200 m (F. Kingdon Ward 5979, holo-K, iso-CAL & E).

Specimens examined. China. Yunnan. (Yü 9295, A); N.W. Yunnan, near Atuntsi [Deqin], 14000 ft. (F. Kingdon Ward 46, Sept. 1911, E, holotype of *S. wardii* W.W. Sm.); A-tun-tze [Deqin], Bai-mar-shan, 3500 m (Wang 69568, Sept. 1935); A-tun-tze [Deqin], Huann-fu-ping, 3500 m (Wang 69053, Aug. 1935, A); Mountains of Moting, northeast of the Yangtze-Mekong watershed, 14000 ft. (Rock 10319, June 1923, A); Deqin. Mt. Meili Xueshan, 4400 m (Wu *et al.* 103526, 20 Aug. 1999, KUN, TI, TNS). Tibet. S.E. Tibet. Nam La, eastern extremity of the Himalaya, 4200 m [14000 ft.] (F. Kingdon Ward 5979, K, holotype of *S. megalantha* Marquand; CAL & E, isotypes).

Note. *Saxifraga wardii* is restricted to Tibet and Yunnan and is rather rare.

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