

Inquiries about taxonomy of the Sino-Himalayan *Saxifraga* (Saxifragaceae)

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Abstract The ranges of distribution for *Saxifraga diapensia* Harry Sm., *S. dhwojii* (Harry Sm.) S. Akiyama et H. Ohba, *S. implicans* Harry Sm. and *S. jacquemontiana* Decne. are presented. The lectotype of *Saxifraga diapensia* Harry Sm. is here selected. Notes on *Saxifraga sphaeradena* Harry Sm. and *S. implicans* Harry Sm. are provided. *Saxifraga sphaeradena* subsp. *dhwojii* Harry Sm. is regarded as a distinct species, *S. dhwojii* (Harry Sm.) S. Akiyama et H. Ohba.

Key words: China, Himalaya, *Saxifraga*, Sino-Himalaya, Tibet

Saxifraga is one of the most diversified genera in the Sino-Himalayan region, with more than 200 species. The Sino-Himalayan region is the centre of diversification of sections *Ciliatae* and *Porphyron*. The taxonomy of section *Ciliatae* is still controversial.

We have examined specimens of *Saxifraga* section *Ciliatae* from the Sino-Himalayan region preserved in various herbaria worldwide since 1991. From our observations we were able to determine the range of distribution of several so-called rare species, such as *Saxifraga diapensia* Harry Sm. and *S. jacquemontiana* Decne.

Pan (1991, 1992) classified *Saxifraga diapensia* along with *S. hookeri* Engl. et Irmsch., *S. sphaeradena* Harry Sm., *S. parnassifolia* D. Don and *S. bulleyana* Engl. et Irmsch. in ser. *Bulleyane* of sect. *Ciliatae*. Pan *et al.* (2001) later broke down the series without comment. We have discuss the morphological differences and the relationships of the species classified in ser. *Bulleyane* by Pan (1991).

Saxifraga sphaeradena Harry Sm. and *S. implicans* Harry Sm., which were described on the basis of Ludlow and Sherriff's collections from SE Tibet, have not been examined.

The delimitation of sect. *Ciliatae* ser. *Bulleyane*

Pan (1991) established ser. *Bulleyane* in sect. *Ciliatae* to include *Saxifraga bulleyana* Engl. et Irmsch., *S. hookeri* Engl. et Irmsch., *S. sphaeradena* Harry Sm., *S. parnassifolia* D. Don and *S. diapensia* Harry Sm. Pan (1992) followed this in the Flora Reipublicae Popularis Sinicae. Pan *et al.*, in the Flora of China, (2001) did not use any subdivisions under sections in *Saxifraga*. Series *Bulleyana* has not been critically studied.

Saxifraga bulleyana has numerous, not glaucous leaves spaced at close intervals, of which the basal ones are caducous, and both the proximal and distal ones are nearly equal to the median ones in shape and size. The pedicels have both short glandular hairs and brown curled hairs. These features differ greatly from all other species in the series, but approach those of *S. auriculata* Engl. et Irmsch., *S. brachyphylla* Franch., *S. hypericoides* Franch., *S. yezhiensis* C. Y. Wu and allied species.

Saxifraga diapensia Harry Sm. is unique in having leaves densely crowned at the base and persistent until fruiting and in having solitary

flowers. Except for these two species, *S. bulleyana* and *S. diapensia*, all other species are similar and morphologically approach *S. diversifolia* classified in sect. *Ciliatae* ser. *Caveanae* J. T. Pan, *S. implicans* in sect. *Ciliatae* ser. *Stellariifoliae* (Engl. et Irmsch.) J. T. Pan, and *S. dianxibeiensis* in sect. *Ciliatae* ser. *Heterocladooides* J. T. Pan.

1) *Saxifraga diapensia* Harry Sm.

Saxifraga diapensia (Fig. 1) has dense blackish brown tipped glandular hairs on pedicel and margins of the cauline leaves and is characterized by abaxially gibbous sepals and the relatively long pedicel, and belongs to *S. diversifolia* group. *Saxifraga diapensia* lacks brownish curled hairs.

Saxifraga diapensia was described by Harry Smith based on specimens he collected in northern and northwestern Sichuan in 1924. Although Smith compared his collections with *Saxifraga nigroglandulosa* Engl. et Irmsch., *S. caveana* W. W. Sm. described from Sikkim is more similar in having nearly leafless flowering stems. Also *Saxifraga caveana* shares *S. diapensia* with gibbous sepals and flowering stems with a solitary flower. Hara (1978) and Grierson (1987) united *S. diapensia* with *S. caveana*, but Pan *et al.* (2001) distinguished *S. diapensia* from *S. caveana* by the petals with two callosities. Specimens collected by Wu *et al.* 10367 and 103705 of *S. diapensia* in Yunnan have ecallous petals. Smith (1924) illustrated an ecallous petal taken from *Smith 3331*, which we select here as the lectotype of *S. diapensia*. A remarkable point is that *S. diapensia* has ascending or suberect sepals while *S. caveana* has reflexed sepals. *Saxifraga diapensia* is distributed in Sichuan, Yunnan and Tibet, while *S. caveana* occurs in S. and SE. Tibet, Bhutan, Sikkim, and Nepal. At present we refrain from making taxonomic changes until further information is available. The more than 30 specimens of *S. diapensia* we examined show the range to be northeast of the Himalaya and the Hengduan Mountains (Fig. 2).

Saxifraga diapensia Harry Sm. in Acta Hort. Gothob. **1**: 10 (1924). Pan in Fl. Reip. Pop. Sin. **34**(2): 139 (1992). Pan *et al.* (2001) in Fl. China **8**: 306 (2001). [Figs. 1, 2]

Lectotype (here selected): N. Sichuan (North Sze-ch'uan): Dongrergo, between snow patches, 4800–5000 m. Harry Smith 3331 (UPS).

Specimens examined: **Tibet.** Tze la, 15000 ft., alpine turf and rocky slopes (Kingdon-Ward 12246, 22 Aug. 1935, BM). **S. Tibet.** Truka La, Mago, 15000 ft., in clumps amongst rocks et boulders on summit of pass (Ludlow and Sherriff 815, 5 Aug. 1934, BM). Kongbo, Dryang la, 14000 ft., on cliffs (Ludlow, Sherriff and Elliot 14281, 8 Aug. 1947, BM). Kongbo La, Chagul Chu, 14000 ft., in large clump on rocky ledges (Ludlow and Sherriff 2398, 19 July 1936, BM). **SE. Tibet.** Pero La, Tsangpo valley, 29°30'N 95°0'E, 15500 ft. (Ludlow, Sherriff and Taylor 5191, 9 July 1938, BM). Kongbo, Budi Tsepo La (Ludlow, Sherriff and Elliot 14417, 21 Aug. 1947, BM). Bimbi La, Tsari Chu, Tsari, 28°45'N 93°26'E, 14000 ft. (Ludlow Sherriff and Taylor 6327, 14 Oct. 1938, BM). Kongbo, Mira La, Nyang Chu, 29°30'N 94°15'E, 15500 ft., on open bloch boulder scree, in moss (Ludlow, Sherriff and Taylow 6071, 14 Aug. 1938, BM). Kongbo Prov., Mira La, Nyang Chu, Puchu, 29°30'N 94°15'E, 16000 ft. (Ludlow, Sherriff and Taylor 6079, 16 Aug. 1938, BM). Kongbo Prov., Kulu Phu Chu, near Paka, 29°16'N 94°26'E, 15–16000 ft. (Ludlow, Sherriff and Taylor 6516, 23 Sept. 1938, BM). Kongbo Prov., Kucha La, Kulu Phu Chu, near Paka, 29°15'N 94°25'E, on open cliff edges (Ludlow, Sherriff and Taylor 5935, 25 July 1938, BM). Kongbo Prov., Pasum La, Druk-la Chu, 30°28' N93°22'E, 17000 ft., amongst boulders (Ludlow, Sherriff and Taylor 6916, BM). Kongbo, Lochen, 15500 ft. (Ludlow, Sherriff and Elliot 15674, 2 Sept. 1947, BM). Kongbo, Pungkar, 14500 ft., on rocks (Ludlow, Sherriff and Elliot 15539, 1 Aug. 1947, BM). Kongbo, Dosbong La, 13500 ft., on cliff (Ludlow, Sherriff and Elliot 14368, 16 Aug. 1947, BM). Kongbo, Dryang La, 14000 ft., on cliff (Ludlow, Sherriff and Elliot 14281, 8 Aug. 1947, BM).



Fig. 1. *Saxifraga diapensia* Harry Sm. (Wu et al. 103521, TNS).

Nambu La, Pome, 30°0'N 94°30'E, 13500 ft., on boulders (Ludlow, Sherriff and Taylor 6943, BM). **Sichuan** (Sikang). Taofu distr., Mt. Yara,

north distr. in glacea granites, alt. ca. 4850 m (H. Smith 11569, 29 Aug. 1934, BM). Between Tain-ing (Ngata) and Maoniu (Ndröme), Zungkong

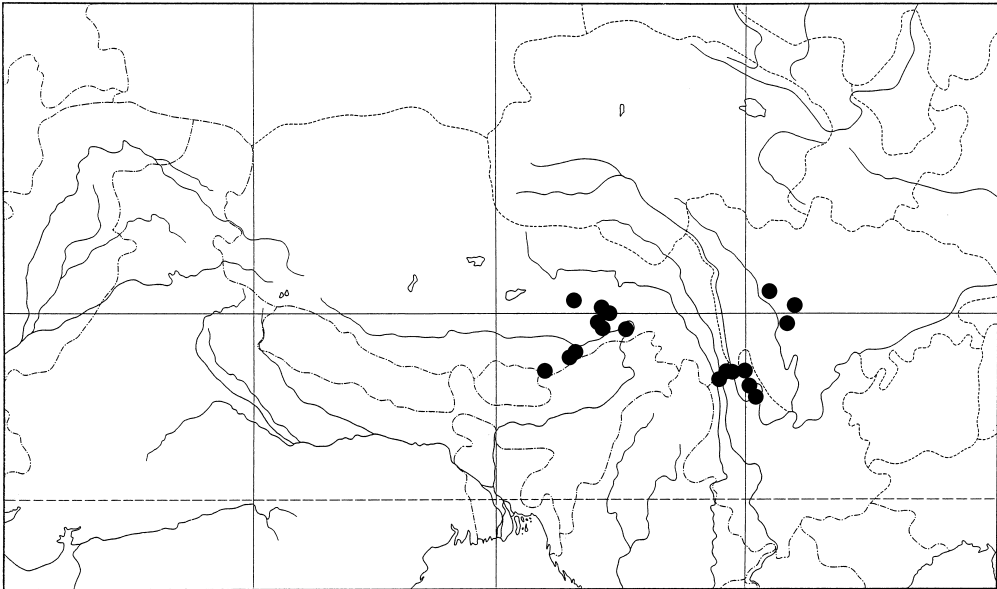


Fig. 2. Geographic range of *Saxifraga diapensia* Harry Sm.

La, in fissuris rupium, alt. 4500–4700 m (H. Smith 12563, 30 Sept. 1934, BM). Kangting (Tachienlu) distr., Tapaoshan, alt. 46–4800 m, in fissuris rupium (H. Smith 11456, 22 Aug. 1934, A, BM). Ngaala, Tsa-wa-rung, alt. 3800 m (C. W. Wang 66076, Aug. 1935, A); loc. cit. 3850 m (C. W. Wang 77036A, Aug. 1935, A). SW. Szechuan, Mount Konka, Risonquemba, Konkaling, alt. 3960–5335 m (J. F. Rock 16835, Aug. 1928, BM). **Yunnan.** Chungtien area (Forrest 30840, BM). Doker-la, Mekong-Salween divide, 28°20'N, 12600 ft., open stony pasture (Forrest 14573, Aug. 1917, BM). NW. Yunnan. Mountains of Moting, northeast of the Yangtze-Mekong watershed, 14000 ft. (J. F. Rock 10325, June 1923, BM). Mount Habashan, north of Ndaku, north of the Likiang Snow Range, Yangtze drainage basin, 14000 ft. (J. F. Rock 9701, July 1923, A). N. flank of Haba Snow Range, on open hill (K. M. Feng 2169, 24 Aug. 1939, A). Zhongdian Xian, Haba Xueshan, Haba Hai, alt. 4400 m (Wu *et al.* 103671, 10 Aug. 1999, KUN, TI). Deqin Xian, Meili Xueshan, Meilishi – Suola (Wu *et al.* 103521, 20 Aug. 1999, KUN, TI, TNS). Deqin Xian, Meili Xueshan, Suola, alt. 4720 m (Wu *et al.* 103705, 20

Aug. 1999, KUN, TI). Doker-la, A-tun-tze, alt. 3500 m (C. W. Wang 64938, 3–5 Aug. 1935, A). Huann-fu-ping, A-tun-tze, alt. 3700 m (C. W. Wang 68890, Aug. 1935, A). In rupestribus humosis mont. in reg. Gunghisn, alt. 4000 m (C. Schneider 3024, Sept. 1914, A). Mekong-Salvin Divide, Sila, mt. rocky slope, alt. 4200 m (T. T. Yü 22283, 11 Aug. 1938, A); loc. cit., mt. rocky slope, alt. 4000 m (T. T. Yü 22371, 16 Aug. 1938, A). Sine loc. (T. T. Yü 9340, A).

2) *Saxifraga sphaeradena* Harry Sm. and subsp. *dhwojii* Harry Sm.

Smith (1960) described *Saxifraga sphaeradena* based on the collections from Lukuthang, Mago in S. Tibet, near the border with Bhutan and compared it with *S. subamplexicaulis* Engl. et Irmsch. Pan (1991, 1992) and Pan *et al.* (2001) reported *S. sphaeradena* from S. Tibet.

Saxifraga sphaeradena resembles *S. implicans*, *S. parnassifolia*, *S. hookeri* and *S. diversifolia* in habitat, shape of leaves, and other features. From these, however, *S. sphaeradena* differs in having ovate-cordate leaves, somewhat glaucous on the lower surface.

Smith (1960) described *S. sphaeradena* subsp.

dhwojii from Jata Pokhni (probably an error of “Pokhari”), Nepal, based on Lall Dhwoj 0625 (BM). Subspecies *dhwojii* was distinguished from subsp. *sphaeradena* by the clawed petals with 2- or 4-callosities (Petala . . . in unguem distinctum 1 mm vel ultra longum contracta, elevatim 2- vel 4-callosa). All the specimens we examined have widely oblong or ovate clawed petals with basal callosities (Figs. 3a, b) and differ from that of subsp. *sphaeradena*, which has

obovate, sessile, ecallous petals. The shape and presence of callosities of the petals are constant and stable, and the differences between subsp. *sphaeradena* and subsp. *dhwojii* are sufficient to separate them as different species. Thus, we regard subsp. *dhwojii* as a distinct species, *S. dhwojii* (Harry Sm.) S. Akiyama et H. Ohba (Fig. 4). Pan (1992) reported subsp. *sphaeradena* to have petals with 4 callosities. Pan’s subsp. *sphaeradena* is therefore considered to be *S.*

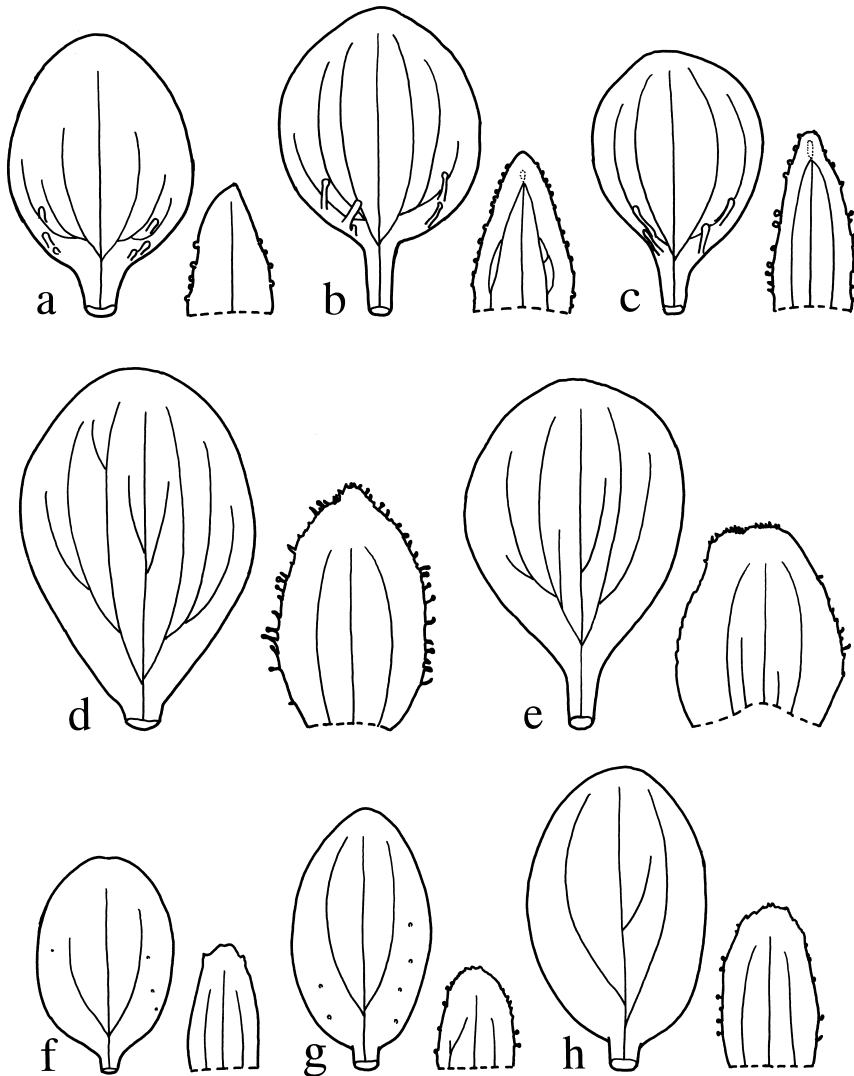


Fig. 3. Petals and sepals of *Saxifraga dhwojii* (a, b), *S. parnassifolia* (c), *S. diversifolia* (d, e) and *S. implicans* (f–h). a: F. Miyamoto *et al.* 9420151. b: F. Miyamoto *et al.* 9584275. c: H. Ohba *et al.* 8320716. d: H. Ohba *et al.* 8351226. e: F. Miyamoto *et al.* 9592492. f: Wu *et al.* 103685. g: Wu *et al.* 764. h: Wu *et al.* 103679. All $\times 5$.

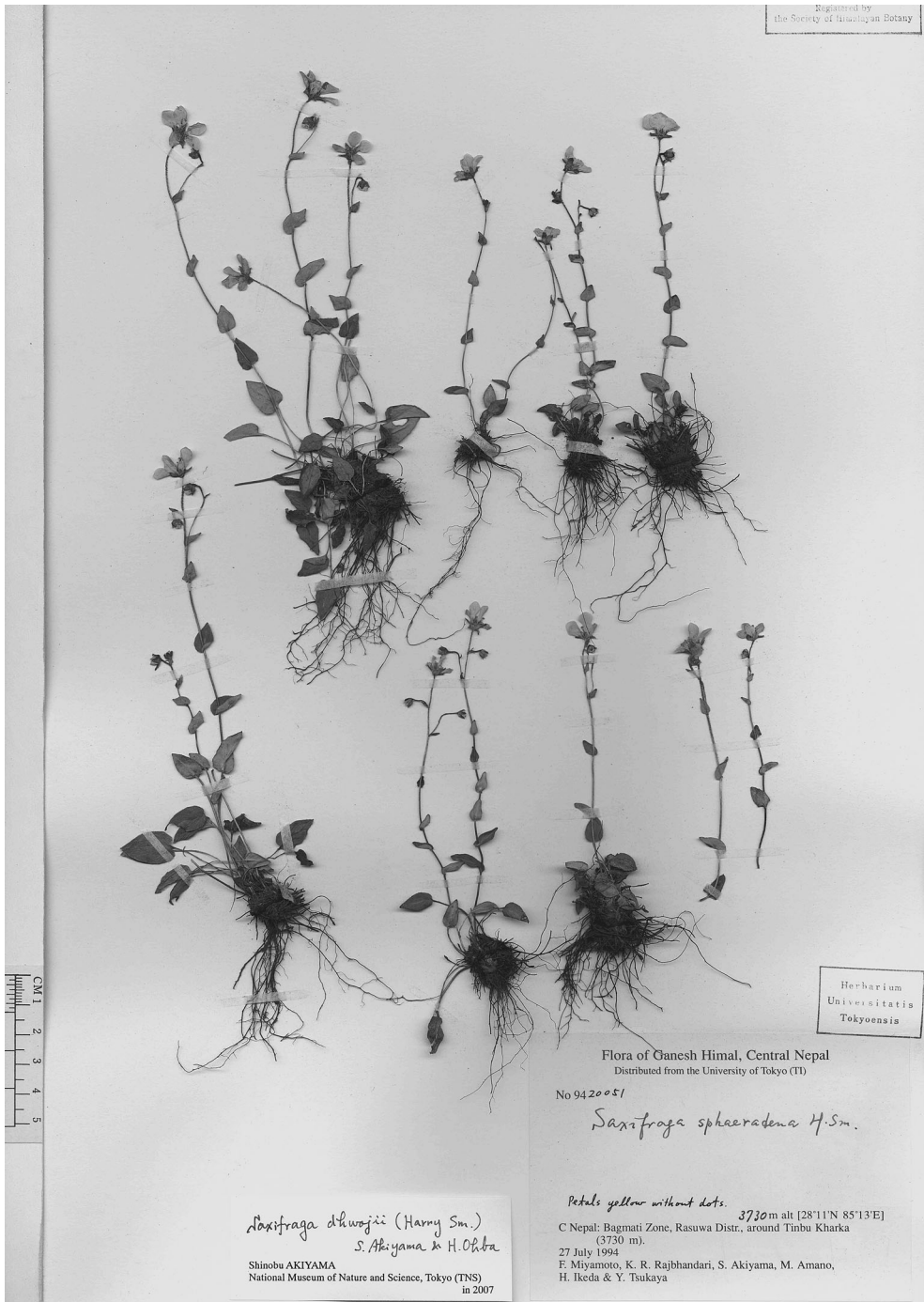


Fig. 4. *Saxifraga dhwojii* (Harry Sm.) S. Akiyama et H. Ohba (F. Miyamoto *et al.* 9420051, TI).

dhwojii.

Saxifraga dhwojii is apparently a common species on scree and gravelly slopes in alpine

meadows especially in E Nepal eastward from 86°15'E (Fig. 5). It is distinct and no transitional or intermediate forms with other species have

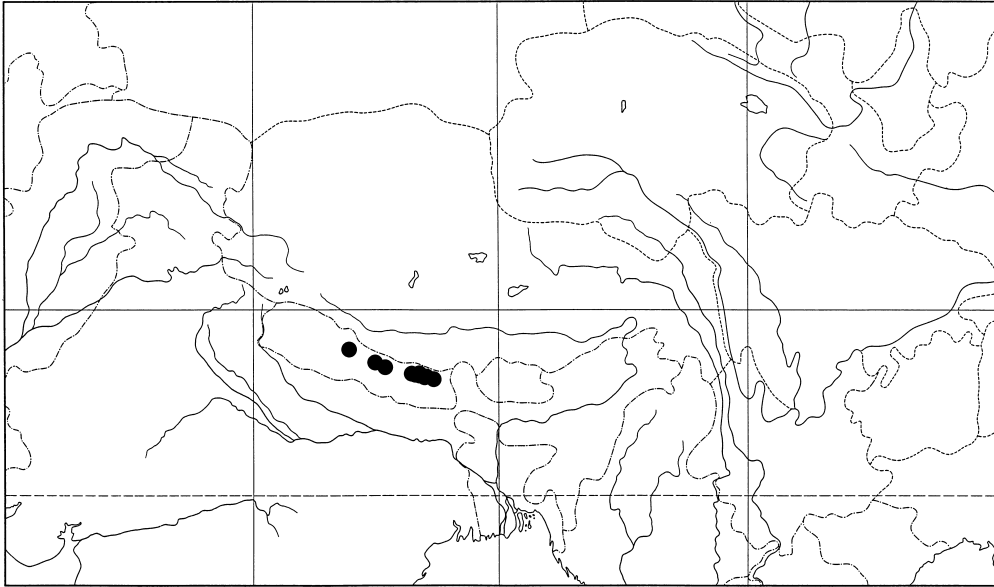


Fig. 5. Geographic range of *Saxifraga dhwojii* (Harry Sm.) S. Akiyama et H. Ohba

been found.

Saxifraga sphaeradena Harry Sm. in Bull. Brit. Mus. Nat. Hist. **2**(9): 235 (1960), as subsp. *sphaeradena*. H. Hara in H. Hara et Williams, Enum. Flow. Pl. Nepal **2**: 154 (1978), as subsp. *sphaeradena*. Grierson in Fl. Bhutan **1**(3): 511 (1987). Pan *et al.* in Fl. China **8**: 297 (2001), as subsp. *sphaeradena*. [Figs. 3a, 3b, 4, 5]

Type: Tibet. SE Tibet, Lukuthang, Mugo, alt. 4050 m. Ludlow and Sherriff 807 (BM – holo).

Saxifraga dhwojii (Harry Sm.) S. Akiyama et H. Ohba, stat. nov.

Saxifraga sphaeradena Harry Sm. subsp. *dhwojii* Harry Sm. in Bull. Brit. Mus. Nat. Hist. **2**(9): 236 (1960). H. Hara in H. Hara et Williams, Enum. Flow. Pl. Nepal **2**: 154 (1978). Grierson in Fl. Bhutan **1**(3): 507 (1987), in syn. of *Saxifraga parnassifolia* D. Don. Pan in Fl. Reip. Pop. Sin. **34**(2): 140 (1992). Pan *et al.* (2001) in Fl. China **8**: 297 (2001).

Saxifraga sphaeradena Harry Sm. subsp. *sphaeradena* auct. non Harry Sm: Pan in Fl. Reip. Pop. Sin. **34**(2): 140 (1992), excl. type.

Type: Nepal. Jata Pokhni, alt. 4200–4500 m.

Lall Dhwoj 0625 (BM – holo).

Specimens examined. **Nepal**. Dolakha Distr., Bitta Kharka – a valley – Patale Pokhari, 27°50'N 86°23'E (H. Ohba *et al.* 8331970 and 8351411, 12 Sept. 1983, TI). Dolakha Distr., Kyalche – Dongang – Thandingma, 27°54'N 86°19'E (H. Ohba *et al.* 8331720 and 8351202, 1 Sept. 1983, TI). Dolakha Distr., Na – Yalung Kharka, 4500 m (H. Ohba *et al.* 8320655, 7 Sept. 1983, TI). Dolakha Distr., Pam Lhang – Bitta Kharka, 27°50'N 86°24'E, alt. 4100 m (H. Ohba *et al.* 8320691, 10 Sept. 1983, TI). Dolakha Distr., Thandingma – Nimare – Beding, 27°54'N 86°22'E (H. Ohba *et al.* 8331774, 2 Sept. 1983, TI). Manang Distr., Yak Kharkaa – Churi Lattar – Thorung Phedi, 28°43'N 83°58'E, alt. 4060 m (M. Mikage *et al.* 9450144, 18 Aug. 1994, TI). Ramechhap Distr., around Neju, 27°44'N 86°31'E, alt. 3651 m (H. Ohba *et al.* 8520229 and 8570987, 31 July 1985, TI). Ramechhap Distr., around Thare Og, 27°45'N 86°28'E (H. Ohba *et al.* 8520169, 8520174, and 8580478, 25 July 1985, TI). Ramechhap Distr., Jata Pokhari – east side of Jata Pokhari – Botase Kharka – Jata Pokhari, 27°43'N 86°25'E (M. Wakabayashi 8520098, 16 July 1985, TI).

Ramechhap Distr., Thare Og – Thare Teng – Thare Og, 27°45'N 86°28'E (H. Ohba *et al.* 8580452, 24 July 1985, TI). Rasuwa Distr., around Seto Kund, 28°16'N 85°08'E, alt. 3930 m (F. Miyamoto *et al.* 9420219, 10 Aug. 1994, TI). Rasuwa Distr., around Tinbu Kharka, 28°11'N 85°13'E, alt. 3730 m (F. Miyamoto *et al.* 9420051, 27 July 1994, TI). Rasuwa Distr., Khodang Danda – Gul Bhanjyang – Latsu, 27°57'N 85°29'E (H. Hara *et al.* 729361, 29 Aug. 1972, TI). Rasuwa Distr., Paldol Base Camp – a Kharka, 28°14'N 85°12'E, alt. 4300 m (F. Miyamoto *et al.* 9420151, 3 Aug. 1994, TI). Rasuwa Distr., Singum Gompp – Gosainkund, 28°06'N 85°21'E (H. Hara *et al.* 723959, 23 Aug. 1972, TI). Rasuwa Distr., Thale Patil – Hile Dhap – Mangen, 28°01'N 85°30'E (H. Hara *et al.* 723960, 27 Aug. 1972, TI). Sankhuwasawa Distr., Goja (Goja Kharka) – Shuwan Kharka (near Panch Pokhari), 27°35' 87°32' (H. Ohba *et al.* 9110322, 6 Aug. 1991, TI). Sankhuwasawa Distr., Jomle – Goja (Goja Kharka), 27°34'N 87°30'E (H. Ohba *et al.* 9110318 and 9110918, 5 Aug. 1991, TI). Sankhuwasawa Distr., Shuwan Kharka (near Panch Pokhari) – Topke Gola, 27°37'N 87°34'E (H. Ohba *et al.* 9110363, 7 Aug. 1991, TI). Sankhuwasawa Distr., Shuwan Kharka (near Panch Pokhari) – Topke Gola, 27°37'N 87°34'E (H. Ohba *et al.* 9120287, 7 Aug. 1991, TI). Solukhumbu Distr., around Beni Kharka (Dambuk), 27°42' 86°35' (H. Ohba *et al.* 8520304, 23 Aug. 1985, TI). Solukhumbu Distr., around Pike Dongshar, 27°30'N 86°27'E (H. Ohba *et al.* 8572429, 7 Sept. 1985, TI). Solukhumbu Distr., around Tangna, 27°44'N 86°51'E, alt. 4500 m (F. Miyamoto *et al.* 9584226, 21 Aug. 1995, TI). Solukhumbu Distr., Beni – Lekhani – Tambakhani – Loding Khola – Loding, 27°32'N 86°34'E (H. Ohba *et al.* 8531305, 4 Sept. 1985, TI). Solukhumbu Distr., Beni Kharka – Sarkari Pati, 27°40'N 86°35'E (H. Ohba *et al.* 8531249, 8572159, 8572186, and 8581286, 2 Sept. 1985, TI). Solukhumbu Distr., Beni Kharka (Dambuk) – Dikitscho – below DudhKund, 27°40'N 86°35'E (H. Ohba *et al.* 8531093, 26 Aug. 1985, TI). Sokukhumbu Distr., Beni Kharka (Dambuk) – Dikitscho – upper DudhKund, 27°40'N 86°35'E, alt. 4120 m (M. Wakabayashi *et al.* 8541190, 26 Aug. 1985, TI). Solukhumbu Distr., Beni Kharka (Dambuk) – Tschokarma – Beni Kharka, 27°40'N 86°35'E (H. Ohba and M. Wakabayashi 8531054, 24 Aug. 1985, TI). Solukhumbu Distr., Dudh Kund – Hinku Khola – Thasing Dingma, 27°42'N 86°50'E, alt. 3770 m (F. Miyamoto *et al.* 9584275, 27 Aug. 1995, TI). Solukhumbu Distr., Horsola Kharka – Tangnag, 27°41'N 86°49'E, alt. 3980 m (M. Wakabayashi *et al.* 9720182, 11 Aug. 1997, TI). Solukhumbu Distr., Loding – Pikebuk – Pike Bhanjyang, 27°32'N 86°32'E (H. Ohba *et al.* 8520395, 8531315, and 8572316, 5 Sept. 1985, TI). Solukhumbu Distr., Mopung – Thosa Kharka, 27°40'N 86°35'E (H. Ohba *et al.* 8581058, 21 Aug. 1985, TI). Solukhumbu Distr., Mosom Kharka – Bhedi Kharka, 27°40'N 86°49'E, alt. 3740 m (M. Wakabayashi *et al.* 9720264, 22 Aug. 1997, TI). Solukhumbu Distr., Mosom Kharka – Rangdu Kharka – Hinku Khola – Tashing Dingma, 27°40'N 86°49'E, alt. 3300 m (M. Wakabayashi *et al.* 9720288, 26 Aug. 1997, TI). Solukhumbu Distr., Pike Bhanjyang – Pike – Pike Dongshar, 27°32'N 86°29'E, alt. 3700 m (H. Ohba *et al.* 8520398, 8531331, 8572383bis, 8581395, 8581400, 8591400, 6 Sept. 1985, TI). Solukhumbu Distr., Pike Dongshar – Ngawur – Goligaon – Namikhil, 27°30'N 86°27'E (H. Ohba *et al.* 8531364, 9 Sept. 1985, TI). Solukhumbu Distr., Sete – Kata Bisana – Goyem – Lamjura Bhanjyang – Taktor, 27°34'N 86°26'E (H. Ohba *et al.* 8581016, 19 Aug. 1985, TI). Solukhumbu Distr., Tangnag – Horsola Kharka – Mosom Kharka, 27°43'N 86°50'E, alt. 4020 m (M. Wakabayashi *et al.* 9720248, 21 Aug. 1997, TI). Solukhumbu Distr., Thosa Kharka – Khonglemo Deorali – Beni Kharka (Dumbuk), 27°36'N 86°34'E, alt. 3700 m (H. Ohba *et al.* 8530986, and 8581108, 22 Aug. 1985, TI). Taplejung Distr., Bomrang (Bomrang Kharka) – Pamphule Deurali – Singoa Kharka, 27°39'N 87°33'E (H. Ohba *et al.* 9110472, 10 Aug. 1991, TI).

3) *Saxifraga implicans* Harry Sm.

Saxifraga implicans Harry Sm. (Fig. 6) is closely related to *S. hookeri* Engl. et Irmasch.,

but distinguished by the reflexed sepals at flowering and the clawed petals with 6–8 or no callosities. In these two species the persistence of basal

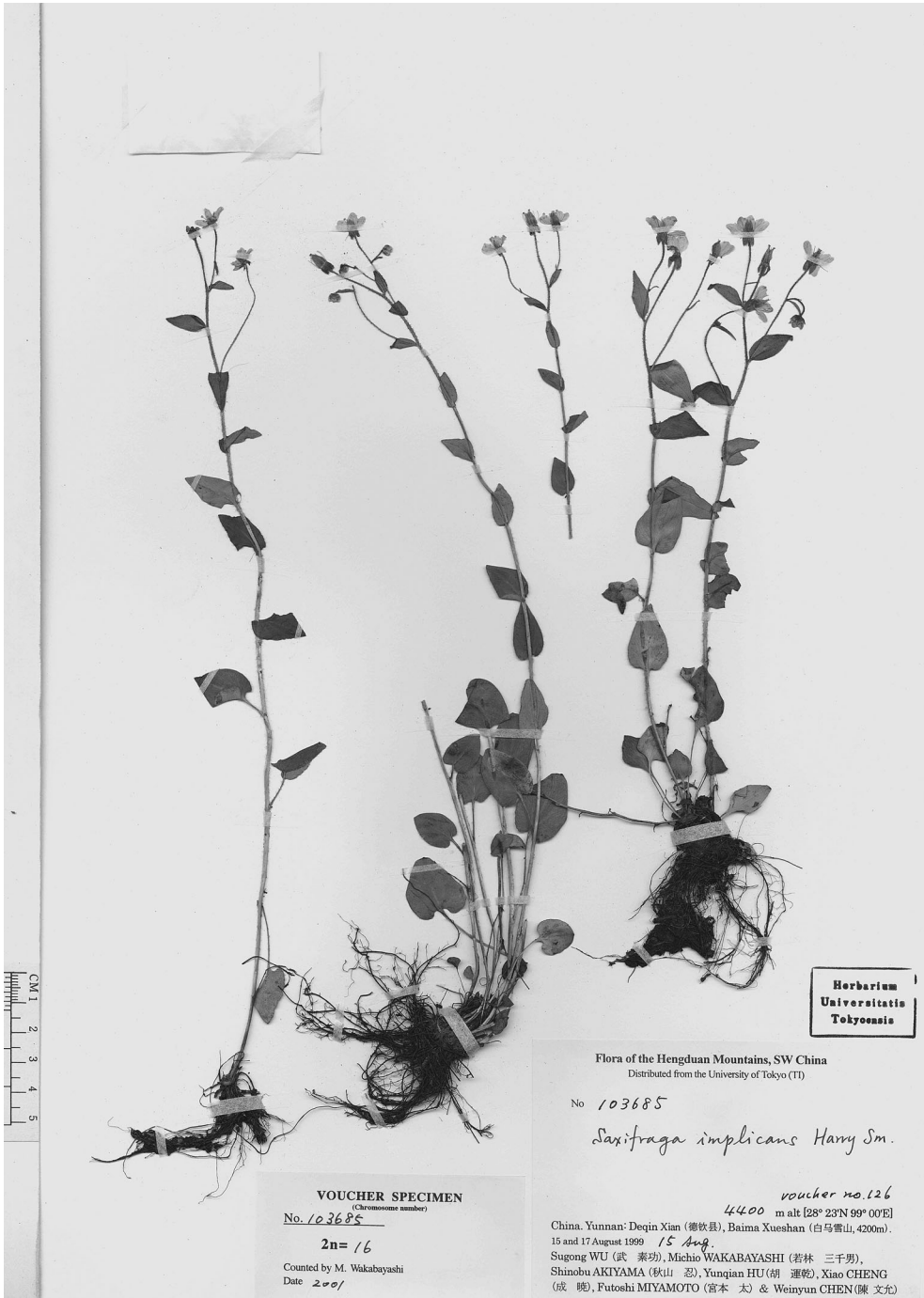


Fig. 6. *Saxifraga implicans* Harry Sm. (Wu et al. 103685, TI).

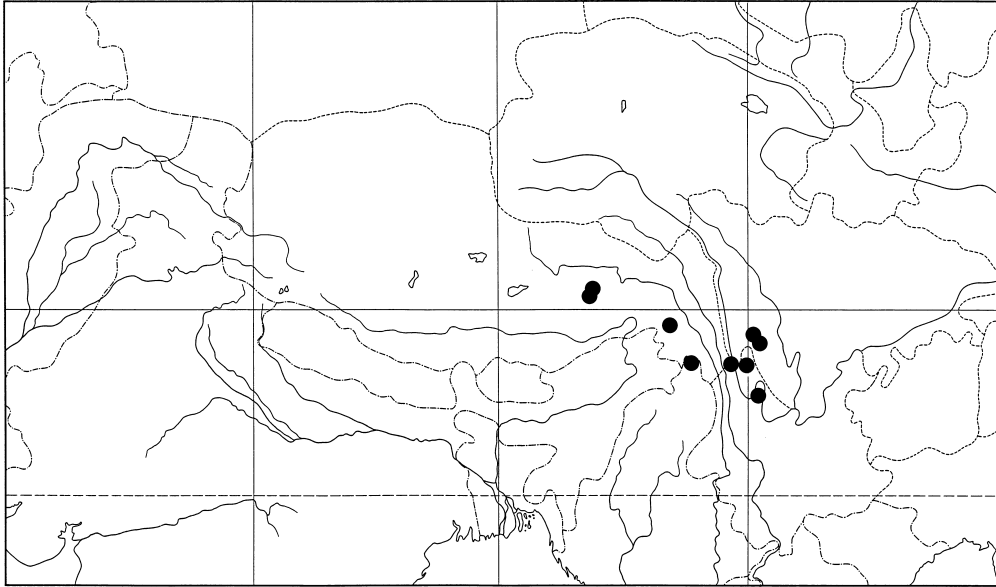


Fig. 7. Geographic range of *Saxifraga implicans* Harry Sm.

leaves is not stable. *Saxifraga implicans* approaches *S. diversifolia* also, but clearly differs in having more median and distal leaves, narrowly ovate basal leaves with truncate base and subacute apex, and the clawed petals usually with callosities (Figs. 3f–h). *Saxifraga parnassifolia* D. Don (Fig. 3c) differs from *S. implicans*, and also *S. hookeri* and *S. diversifolia* (Figs. 2d, 2e) by the petals with 2 or 4 thorn-like outgrowths near the base and the sepals with veins always confluent into verruca below the apex. *Saxifraga implicans* can be distinguishable from *S. subaequifoliata* Irmsch. by the extremely smaller distal cauline leaves and inflorescences with less than 10 flowers. As a conclusion *Saxifraga implicans* is considered to be distinct species in the *Ciliatae*, distributed in Sichuan, Yunnan and Tibet (Fig. 7).

***Saxifraga implicans* Harry Sm.** in Bull Brit. Mus. Nat. Hist. 2(9): 231 (1960). Pan in Fl. Reip. Pop. Sin. 34(2): 116 (1992), with var. *weixiensis* C. Y. Wu. Pan *et al.* (2001) in Fl. China 8: 298 (2001). [Figs. 3f–h, 6, 7]

Type: Tibet. SE Tibet, Kongbo, Nyoto Sama, 13000 ft., in open forest among rocks. Ludlow, Sherriff *et Elliot* 15582, 10 Aug. 1947. (BM –

holo).

Specimens examined. **Tibet.** Shinden Gompa, Nagong river, 12–13000 ft., on granite cliffs in the shade (Kingdon-Ward 10791, 26 Aug. 1933, BM). **SE. Tibet.** Kongbo, Doré Nye Chu, 13000 ft., on dry ground (Ludlow, Sherriff and Elliot 15570, 6 Aug. 1947, A, BM). Kongbo Prov., Pangkar, Drukla Chu, 11500 ft., in burch forest in deep shade (north face) (Ludlow, Sherriff *et Taylor* 6875, 21 Aug. 1938, BM). Northern slope of Mt. Kenichunpo, north of Sikitung, upper Salwin River, 12500 ft., on rocks, alpine region (J. F. Rock 22144, May–June 1932, BM). Prov. Tsarung, northern slope of Mt. Kenishunpo, north of Sikitung, Upper Salwin River, 11–12000 ft., among rocks (J. F. Rock 22144, 22151, May–June 1932, A). **Burma-Tibet Frontier.** Sources of the Irrawaddy, Adung Valley, 28°20'N 97°40'E, 12000 ft. (F. Kingdon-Ward 9870, 28 July 1931, BM). **E. Tibet and SW. China.** (Forrest 30583, BM). **Sichuan** (Sikang or Szechuan). Chi-na-tung, Tsa-wa-rung, 2800 m (C. W. Wang 65277, Aug. 1935, A). Daocheng, 4010 m (Wu *et al.* 722, 19 Aug. 1996, TI). Daocheng, around Gongga Shan, 3920 m (Wu *et al.* 727, 21 Aug. 1996, TI). Huei-li Hsien (T. T. Yü 1592, 17 Sept.

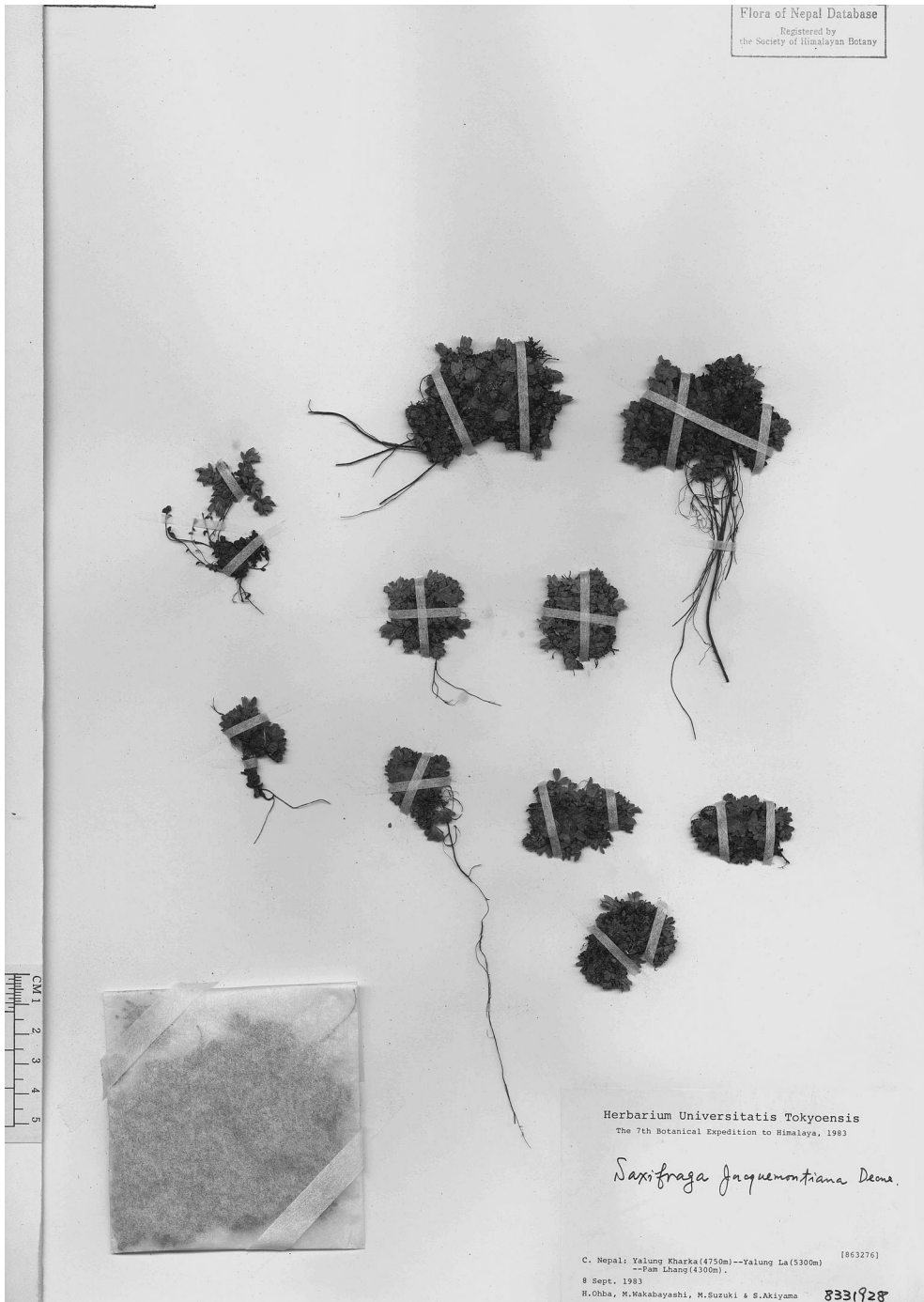


Fig. 8. *Saxifraga jacquemontiana* Decne. (H. Ohba *et al.* 8331928, TI).

1932, A). Muli, Mt. Mitzuga, 4300 m (J. F. Rock 48131, Sept. 1929, A). Yien-pein Hsien, 3200 m (T. T. Yü 1714, 16 Oct. 1932, A). Yunnan.

Chungtien, Shianrentung, 3600 m, under thickets (T. T. Yü 13750, 18 Oct. 1937, A); sine loc. (T. T. Yü 15517, A). Chungtien, Tehgoh, 3200 m (T. T.

Yü 13818, Sept. 1935, A). S. Chungtien, Wu-tso on Yangtze bank, 3000 m (K. M. Feng 3327, 12 Nov. 1939, A). A tun-tze, Bai-mar-shan, 3500 m (C. W. Wang 69683, A). Ma-on-shan, W end of Likiang valley (R. C. Ching 21388, 31 Aug. 1939, A). E. Likiang, Tai-ngo-koo (R. C. Ching 21642, 19 Sept. 1939, A). Likiang Snow Range (R. C. Ching 30588, 3 Sept. 1939, A). In prato ... in mont. ivosis prope Lichiang, 3600 m (C. Schneider 3023, 1 Sept. 1914, A). Lijiang, east side of Mt. Yu-long-shui-shan, between Mahuang-ba and Wu-dou-di, 3345–3750 m (J. Murata *et al.* 603, 17 Aug. 1990, A).

***Saxifraga jacquemontiana* Decne.**

Saxifraga jacquemontiana, described by Decaisne on the basis of a Jacquemont collection from Kashmir in 1844, is a small cushion-forming species of the Himalaya and Tibet (Fig. 8). The relationships of *S. jacquemontiana* are still unclear, but *S. paiquensis* J. T. Pan and *S. jainzhuglaensis* J. T. Pan are regarded as allied taxa. *Saxifraga paiquensis*, described from SE. Tibet, is closely similar to *S. jacquemontiana* in the glandular ciliate margins of the basal leaves. *Saxifraga paiquensis* was distinguished from *S.*

jacquemontiana in having leaves with a glandular (not aristate) apex and short glandular hairy basal leaves. These differences, however, probably fall within the range of variation of a single species. *Saxifraga jainzhuglaensis*, also described from Tibet, apparently differs from *S. jacquemontiana* in having widely spreading sepals and clawless petals without callosities.

Pan (1991, 1992) classified *Saxifraga jacquemontiana* in the monotypic ser. *Jacquemontianae* J. T. Pan. in sect. *Ligulatae* Haw. Pan attached great significance to the cushion-like habit, the leafy shoots with a woody base, the flowering stems 3–4 mm long and embedded among the rosulate leaves, and the solitary flowers.

Saxifraga jacquemontiana has a rather wide distribution, from the western Himalaya (Kashmir) to eastern Himalaya (Bhutan), and south-eastern Tibet (Fig. 9).

***Saxifraga jacquemontiana* Decne.** in Jacquemont, *Voy. Inde* 4 (Bot.): 68 (1844). Clarke in Hook. f., *Fl. Brit. Ind.* 2: 395 (1878). Engl. et Irmsch. in Engl., *Pflanzenr.* IV–117 (Heft 67): 156 (1916). Marquand in *J. Linn. Soc. Bot.* 48: 178 (1929). H. Hara in H. Hara et Williams,

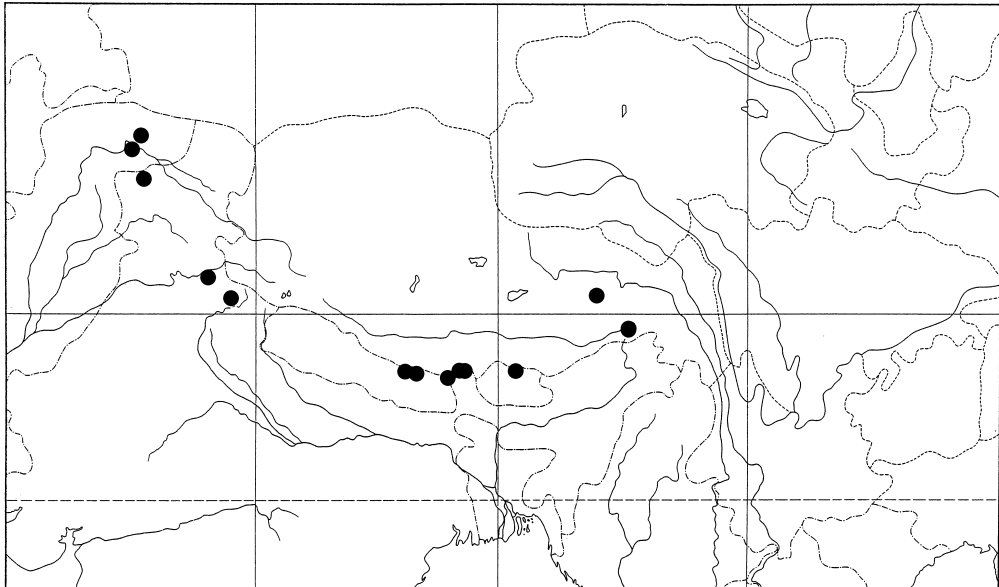


Fig. 9. Geographic range of *Saxifraga jacquemontiana* Decne.

Enum. Flow. Pl. Nepal **2**: 153 (1978). Grierson in Fl. Bhutan **1**(3): 514 (1987). Pan in Fl. Reip. Pop. Sin. **34**(2): 208 (1992). Pan *et al.* in Fl. China **8**: 322 (2001). [Figs. 8, 9]

Specimens examined: **Kashmir**. W. Kashmir. Kishenganga Valley and the road to Nanga Parbat via the Gangabal Lakes, Zojibal Pass, top, 13500 ft. (R. R. and I. D. Stewart 18196, 10 Aug. 1939, A). Kishenganga Valley and the road to Nanga Parbat via the Gangabal Lakes, Burzil Pass, top, 13800 ft. (R. R. and I. D. Stewart 19083, 27 Aug. 1939, A). Gilgit Road, Deosai Plains, Baltistan and Ladak, Thalle La, Baltistan, 15–16000 ft. (R. R. Stewart 20725, 15 Aug. 1940, A). Gilgit Road, Deosai Plains, Baltistan and Ladak, Burji La, Deosai side, 15000 ft. (R. R. Stewart 20153, 31 July 1940, A). Baltistan, Lal Pir, 135000 ft. (W. Koelz 9516, 10 Aug. 1936, A). **Punjab**. Simla Hill States, Rupin Pass, Dhasla Dhar Range (31°22'N 78°09'E), 14000 ft., on open rocky hillsides (Sherriff 7503, 2 Aug. 1939, A). **Garhwal**. Chor Noti, 16000 ft. (Strachey and Winterbottom 13, pro parte, A). **Nepal**. Arun-Tamur Watershed, Lumba Sumba Himal, N.N. of Walunchung, 16000 ft., on rocy grand gravel (Stainton 1027, 17 July 1956, A, BM). Dolakha Distr., Yalung Kharka – Yalung La – Pam Lhang, 27°50'N 86°25'E (H. Ohba *et al.* 8320664, 8320683, 8331928, and 8351379, 8 Sept. 1983, TI). Solukhumbu Distr., around Khare, 27°44' N 86°53'E, alt. 4680 m (M. Wakabayashi *et al.* 9720218, 16 Aug. 1997, TI). Solukhumbu Distr., Panch Pokhari – Seto Pokhari, 27°51' 86°56', alt. 5230 m (F. Miyamoto *et al.* 9584185, 16 Aug. 1995, TI). **Sikkim**. Regio Alp., 16–18000 ped. (J. D. Hooker s. n., A). North Distr., Lakes on SE side of Sebu La, sandy flats on lake shore, 27°55'N 88°39'E, alt. 5040 m (D. G. Long and H. J. Noltie 399, 22 July 1996, E, TI). West Distr., Goecha La, near summit, 27°36'N 88°11'E, alt. 4870 m (D. G. Long *et al.* 652, 22 July 1992, E, TI). **Bhutan**. Mar-

lung, 14500 ft. (Ludlow, Sherriff and Hicks 19362, 6 July 1949, BM). **Tibet**. Lochen La, 16–17000 ft. (F. Kingdon-Ward 12234, 20 Aug. 1935, BM). **SE. Tibet**. Kongbo Prov., Budi Tsepo La, 13000 ft., in mats on rocks (Ludlow, Sherriff and Elliot 14425a, 21 Aug. 1947, BM). Budi Tsepo La, 135000 ft., on rocks (Ludlow, Sherriff and Elliot 15270a, 18 June 1947, BM).

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