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Taxonomic Studies on the Sino-Himalayan *Saxifraga* (1): Section Ciliatae Series Lychnitideae, and *Saxifraga excellens* Harry Sm. and Resembling Species

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The genus *Saxifraga* is highly diverse in the Sino-Himalayan region, and our taxonomic knowledge of the group is still insufficient. This is the first of a series of papers concerning the taxonomy of *Saxifraga*, and deals with 1) the delimitation of section Ciliatae series Lychnitideae (Engl. & Irmsch.) Gornall and 2) *S. excellens* Harry Sm. and similar species. 1) *Saxifraga* series Lychnitideae consists of four species, *S. lychnitis* Hook. f. & Thomson, *S. nigroglandulifera* N. P. Balakr., *S. pseudohirculus* Engl., and *S. viscidula* Hook. f. & Thomson. A new combination *S. lychnitis* var. *oresbia* (J. Anthony) S. Akiyama & H. Ohba is proposed. 2) Three species with reddish or reddish purple petals of *Saxifraga* section Ciliatae are compared. *Saxifraga bergenioides* C. Marquand differs from *S. excellens* Harry Sm. and *S. pardanthina* Hand.-Mazz. in having pedicels and sepals with brownish curled hairs against those with short, black tipped glandular hairs of the two other species. *Saxifraga pardanthina* differs from *S. excellens* mainly by the spotted petals with cordate base and reflexed sepals. A recent collection of *S. excellens*, endemic to Nepal and known only from a few specimens, allowed us to observe and illustrate it in detail.

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

Saxifraga is one of the most diverse genera in the Sino-Himalayan region. Smith (1958, 1960), Hara (1979), Pan (1992) and many other workers have contributed to the taxonomy of *Saxifraga* of the region, but the taxonomy of the genus is still insufficient, especially in the delimitation of species described or recorded from both the Himalaya and the Tibet-SW China regions. Since 1983 we have studied the genus and made field observations throughout the entire region, including the Himalaya, Tibet and SW China (Sichuan and Yunnan) (Ohba 1984, 2002, Ohba and Wakabayashi 1987, Akiyama et al. 1998, 1999, 2002, Ohba and Akiyama 1999), and have also examined other collections in various herbaria, A, B, BM, E, GH, K, L, LE, KUN, KYO, P, PE, TI, TNS and others. Ohba cooperated in the treatment of *Saxifraga* during preparation of the Flora of China treatment of *Saxifraga* with J.-T. Pan and R. Gornall (Gornall et al. 2000, Pan et al. 2001). Akiyama is preparing the treatment for the forthcoming Flora of Nepal with R. Gornall and Ohba.

In this series of papers we intend to provide evidence on species delimitation, variation, distribution, and specimens of

Saxifraga in the region.

(1) Section Ciliatae series Lychnitideae

Saxifraga section Ciliatae Haw. (syn. Hirculus (Haw.) Tausch.) shows great diversity in the Sino-Himalayan region. The subdivision of the section has been proposed by various workers (Hooker and Thomson 1858, Engler and Irmscher 1912, 1913, 1916, Engler 1930, Gornall 1987, Pan 1991, 1992, Pan et al. 2001, etc.).

Engler and Irmscher (1912) established section Hirculus subsection Lychnitideae as a group with linear-oblong petals more than 3 times longer than wide. They classified three species, *S. lychnitis*, *S. viscidula* and *S. pseudohirculus* into this subsection (Engler and Irmscher 1913, 1916). Engler (1930) followed Engler and Irmscher (1913, 1916). Gornall (1987) regarded Engler and Irmscher's subsection Lychnitideae as a series in the section Ciliatae.

Pan (1991, 1992) modified Gornall's infrageneric system and regarded Lychnitideae as a series in subgenus Hirculus section Ligulatae subsection Nutantes. Pan (1991, 1992) classified three species, *S. lychnitis*, *S. oresbia* and *S. nigroglandulifera* in series Lychnitideae but excluded *S. viscidula* and *S. pseudohirculus*. Engler and Irmscher (1912, 1913, 1916), Engler (1930) and Gornall (1987) classified *S. nutans* Hook. f. & Thomson, now known as *S. nigroglandulifera*, in the monotypic subsection or series Nutantes. Pan (1991, 1992) used the name 'Nutantes Engl. & Irmsch.' as the name for the subsection in which the series Lychnitideae is classified with other four series including series Tanguticae J. T. Pan. Akiyama et al. (1998) regarded series Nutantes as a synonym of series Lychnitideae, since *S. nigroglandulifera* shares several features with the species of that series.

Pan (1991, 1992) placed *S. pseudohirculus* in series Tanguticae. Series Tanguticae which is distinct from series Lychnitideae in having glabrous or brownish hairy (sometimes with glandular hairs) spreading sepals at anthesis, and petals with two calloses. *Saxifraga pseudohirculus* much more closely approaches *S. viscidula* and *S. nigroglandulifera* than do the other species classified in series Tanguticae by Pan (1991, 1992), especially in having short glandular hairy pedicels and persistent, glandular hairy, petiolate basal leaves. *Saxifraga yarlungzangboensis*, described from Tibet and classified in series Yarlungzangboenses [as *Yaluzangbuenses*], is considered to be conspecific with *S. viscidula* Hook. f. & Thomson from E Himalaya and Tibet. Pan (1991, 1992) did not treat *S. viscidula*, because he erroneously omitted this from the Chinese flora.

Saxifraga sect. **Ciliatae** ser. **Lychnitideae** (Engl. & Irmsch.) Gornall in Bot. J. Linn. Soc. **95**: 276 (1987) – J. T. Pan in Acta Phytotax. Sin. **29**: 17 (1991), as subgen. Hirculus sect. Ligulatae subsect. Nutantes ser. Lychnitideae – Akiyama & al. in Bull. Natn. Sci. Mus. Tokyo, ser. B, **24**: 67(1998).

Saxifraga sect. Hirculus subsect. Lychnitideae Engl. & Irmsch. in Notes Roy. Bot. Gard. Edinburgh **5**(24): 129 (1912); in Bot. Jahrb. **48**: 588 (1913); in Engl., Pflanzen-reich, Heft **67**: 132 (1916), as grex – Engl. in Engl. & Prantl, Pflanzen-fam. 2 ed. **18**a: 133 (1930).

Saxifraga sect. Hirculus subsect. Nutantes Engl. & Irmsch. in Notes Roy. Bot. Gard. Edinburgh **5**(24): 129, 139 (1912); in Bot. Jahrb. **48**: 590 (1913); in Engl., Pflanzenreich, Heft **67**: 134 (1916), as grex – Engl. in Engl. & Prantl, Pflanzen-fam. 2 ed. **18**a: 133 (1930) – J. T. Pan in Acta Phytotax. Sin. **29**: 17 (1991), as subgen. Hirculus sect. Ligulatae subsect. Nutantes, excl. ser. Tanguticae, Jainzhuglaenses and Jacqumontianae.

Saxifraga sect. Ciliatae ser. Nutantes (Engl. & Irmsch.) Gornall in Bot. J. Linn.

Soc. **95**: 276 (1987).

Saxifraga subgen. Hirculus sect. Ligulatae subsect. Nutantes Engl. & Irmsch. ser. Yarlungzangboenses J. T. Pan in Acta Phytotax. Sin. **29**: 18 (1991), as Yaluzangbuenses.

Type species: *Saxifraga lychnitis* Hook. f. & Thomson.

This series consists of four species and is characterized by the linear to narrowly oblong or oblanceolate to obovate petals, the more or less densely brownish hairy calyx and pedicels, and the gradually descendent leaves. The species in the series Lychnitideae are distinguishable by a combination of several characters.

Key to the species of *Saxifraga* section Ciliatae series Lychnitideae

1. Basal leaves petiolate, blade elliptic or ovate or oblong
   2. Flowers secund; leaves subglabrous, blade of basal leaves 1.5–4 cm long .... 2) *S. nigroglandulifera*
   2. Flowers in many sided; leaves glandular pubescent, blade of basal leaves less than 1.5 cm long ..... 3) *S. pseudohirculus*
1. Basal leaves sessile or nearly so, spatulate
   2. Petals 5–7-nerved, ca. 7 mm long; basal leaves lanceolate-spatulate, cauline leaves narrowly oblong or linear .... 4) *S. viscidula*
   2. Petals 3(or 4)-nerved, 8.5–11 cm long; basal leaves spatulate to ovate-spatulate to ovate, cauline leaves oblong-elliptic to lanceolate-oblong or elliptic .... 1) *S. lychnitis*
      3. Petals narrowly oblong, 8.5–9 mm long ..... 1a) *S. lychnitis* var. *lychnitis*
      3. Petals narrowly obovate, 10–11.7 mm long .....1b) *S. lychnitis* var. *oresbia*

1) **Saxifraga lychnitis** Hook. f. & Thomson in J. Linn. Soc. Bot. **2**: 68 (1857) – C. B. Clarke in Hook. f., Fl. Brit. India **2**: 391 (1878) – H. Hara, Enum. Flow. Pl. Nepal **2**: 153 (1979) – Pan & al., Fl. China **8**: 306 (2002).

1a) Var. **lychnitis**

Type: Sikkim, regio alp., Lama Kirngra, 14000 ped. (J. D. Hooker s. n., July 24, 1849, Herb. Hook., K–holo).

Distr. Himalaya (Kumaon to Bhutan), Tibet and SW China (Yunnan).

Specimens examined. **Kumaon**: Barji kang Nap, 14700 ft. (Strachey & Winterbottom 14, K).

Tiri-Garhwal: Rhudughera, 15–16000 ft. (Duthie 672, June 20, 1883, K); Dudu Gadh under Srikanta, 15–16000 ft. (Duthie 672[sic], Aug. 9, 1883, K)

Nepal: C Nepal, Yalung Kharka–Yalung La, 4800 m, on mossy stones and moss-covered bed by/in streams (Ohba & al. 8351373, Sept. 8, 1983, TI); Yalung Kharka–Pam Lhang, 4800 m (Ohba & al. 8341241, 8351373, 8331942, 8320665 [2n = 16], Sept. 8, 1983, TI). E Nepal, Sagarmatha Zone, Solukhumbu Distr., Rato Odara–Chhomalang Base camp, 4500 m, on exposed place or on mossy rocks on banks by stream (Miyamoto & al. 9580272, 9592247, Aug. 11, 1995, TI); loc. cit., 4540 m, barren place (Miyamoto & al. 9584159, Aug. 11, 1995, TI); loc. cit., 5000 m, on exposed place (Miyamoto & al. 9592281, Aug. 11, 1995, TI); loc. cit., 5225 m, rocky place (Miyamoto & al. 9596316, Aug. 11, 1995, TI); Sagarmatha Zone, Solukhumbu Distr., around Dig Kharka, 4470 m (Wakabayashi & al. 9720206, Aug. 14, 1997, TI); Sagarmatha Zone, Solukhumbu Distr., Beni Kharka–Tschokarme, 4550 m (Ohba & Wakabayashi 8531220, 8520372 [2n = 16], Sept. 1, 1985, TI); Sagarmatha Zone, Solukhumbu Distr., around Beni Kharka, 3970 m (Ohba & al. 8531213, Aug. 31, 1985, TI); Khung Khola headwaters, ca. 5200 m (Grey-Wilson & Phillips 622, Aug. 11, 1973, K).

Sikkim: Naku Chu, Llonak, 17000 ft. (Smith & Cave 1943, Aug. 3, 1909, K); Llonak, 15000 ft. (Smith & Cave 2688, Aug. 4, 1909, K); Chapopla, 16000 ft. (Ribu & Rhomoo 5242, K); Janki La (King's coll. s. n., Aug., 1877, K); Lungnak La, 16000 ft., on bank (Cave 58, Aug. 29, 1947, K); Donki La and southwards to Samdong (L. R. Wager 342, Aug. 17, 1933, K); N Distr., Phaklung, Lasha Chhu Valley, 4620 m, hummocky marsh (Long & Noltie EENS 332, July 15, 1956, E, TI).

Bhutan: Yala, Pyla, Gilela areas, 15000 ft. (Gould 1334, Aug. 1, 1938, K).

Tibet: S. Tibet, Melong Gompa, 16–17000 ft. (B. J. Gould 2222, July 2, 1939, K).

Himalaya-Tibet border: Mount Everest Exped., 15000 ft. (A. F. R. Wollaston 79, July, K).

Fig. 1. *Saxifraga lychnitis* var. *oresbia* (Kingdon-Ward 4939, E, holotype of *Saxifraga oresbia* J. Anthony). Scale indicates 5 cm.

Bhutan-Tibet border: East of Phari, ca. 16000 ft. (Gould 1405, Aug. 1, 1938, K).

Yunnan: N.W. Yunnan, Haba snow Range, open hill (K. M. Feng 2174, Aug. 24, 1939, A).

The range of *Saxifraga lychnitis* is the most extensive of the series Lychnitideae and covers nearly the whole range of the series. *Saxifraga lychnitis* is rather common in E Himalaya (especially Nepal and Sikkim), and often gregarious in alpine meadows, but is rather rare in Tibet and SW China (Yunnan). No specimens from Sichuan have been examined. The flowers are nodding throughout the flowering season.

1b) Var. **oresbia** (J. Anthony) S. Akiyama & H. Ohba, stat. nov. [Fig. 1]

Saxifraga oresbia J. Anthony in Notes Roy. Bot. Gard. Edinburgh **18**: 28 (1933) – Pan, Fl. Reipubl. Pop. Sin **34**(2): 199 (1992) – Pan & al., Fl. China **8**: 306 (2002).

Type: Sichuan (Szechuan), Litang–Yaling divide, 14000 ft. (Kingdon-Ward 4939, Sept. 1921, E–holo).

Distr.: SW Sichuan.

Specimens examined. **SW Sichuan**: Win-chuan, Tsao-puh, 14800 ft. (S. Y. Hu 2637, Aug. 7, 1942, A); Daocheng, Bowa Shan, 4460 m (Wu & al. 686, Aug. 16, 1996, TI, KUN); Daocheng, Haizi, 4550 m (Wu & al. 717, Aug. 17, 1996, TI, KUN).

Variety *oresbia* is distinguished from var. *lychnitis* by the narrowly obovate petals and lanceolate or oblong to elliptic sessile leaves. Hu 2637 differs from the typical form in having pedicels without glandular hairs and ovate or elliptic petals. Wu & al. 686 and 717 more closely approach var. *lychnitis*. Specimens collected in Lumbasumba Himal, E Nepal; the interior of Topke Gola and Thudam, around Lamni Nama, 4300 m, on rocks by streams (Ohashi & al. 773810, Aug. 15, 1977, TI) and Lama Chunghu-Samdan, 4380 m, open mossy places by streams (Kanai & al. 720719, P. R. Shakya 1706, June 24, 1972, TI), are also transitional between vars. *lychnitis* and *oresbia*.

2) **Saxifraga nigroglandulifera** N. P. Balakr. in J. Bombay Nat. Hist. Soc. **67**: 59 (1970) – Pan & al., Fl. China **8**: 306 (2001). [Fig. 2A]

Saxifraga nutans Hook. f. & Thomson in J. Linn. Soc. Bot. **2**: 69 (1857), not D. Don (1822) et Adams (1834) – H. Hara, Enum. Flow. Pl. Nepal **2**: 154 (1979). Type: Sikkim, regio temp., 10–13000 ped. (J. D. Hooker s. n., K–holo; A–iso).

Distr. E Himalaya (Nepal and Sikkim), Tibet and SW China (Yunnan and Sichuan).

Specimens examined. **Nepal**: Tegar, N of Mustang, 1500 ft. (Stainton, Sykes & Williams 2221, A); Tamur Valley, Yangma Khola, NE of Walunchung Gola, 14000 ft. (Stainton 1081, July 23, 1956, A, BM); Barbung Khola, E of Charhkka, ca. 4500 m (Grey-Wilson & Phillips 459, July 31, 1973, K); Khung Khola headwater, ca. 5000 m (Grey-Wilson & Phillips 623, Aug. 16, 1973, K).

Fig. 2. A. *Saxifraga nigroglandulifera* (S Tibet: Nyalam–Zhangmu, 3690 m, Aug. 22, 2001). B. *S. excellens* (E Nepal: Sagarmatha Zone. Solukhumbu distr., Thasing Dingma–Chhatarwa, 3800 m, Aug. 28, 1995). Photo by F. Miyamoto. C. *S. bergenioides* (S Tibet: Maizhokunggar Xian, Mt. Milha Shan, 4920 m, Aug. 6, 2001).

Sikkim: Giagong, 16000 ft. (Prain s. n., Sept. 1903, K); N Sikkim (L. R. Wager s. n., July 23–27, 1923, K); Thanga, 14000 ft. (Ribu 2920, in 1909, K); Tangu, 14000 ft. (Smith & Cave 2279, Aug. 8, 1900, K).

Tibet: S Tibet, Le La, Chayul-Charme Rd., 15000 ft. (Ludlow & Sherriff 2450, July 27, 1936, BM); Salween-Tsangpo divide, NE of Shinden Gompa (Kingdon-Ward 10727a, in 1933, BM); S of Gyalam, 14000 ft. (Kingdon-Ward 12277, Aug. 31, 1935, BM); SE, Nye La, Ozogang District Kham, 14900 ft. (J. Hambury-Tracy s. n., Sept. 10, 1936, BM); Vicinity of Lhasa, 13000 ft. (H. E. Richardson 262, July 1939, BM); E of Lhasa (H. J. Walton s. n. in 1904, K); Kyi Chu Valley, 15 miles E of Lhasa (H. J. Walton s. n. in Sept., 1904, K); Chala, near Lhasa, 15500 ft. (Ludlow & Sherriff 8995, Aug. 5, 1942, BM); Nangtse, 20 miles W of Lhasa, 14500 ft. (Ludlow & Sherriff 982b, July 28, 1943, BM); Hills, north of Lhasa, 15000 ft. (Ludlow & Sherriff 9082, Sept. 19, 1942, BM); SE Tibet, Gorpo La, N of Dongkar, 15500 ft. (Ludlow & Sherriff 822, Aug. 15, 1938, BM); Reting, 60 miles N of Lhasa, 14500 ft. (Ludlow & Sherriff 11134, Aug. 19, 1944, BM); near Kampa, 14500 ft. (C. S. Catting & A. S. Vernay 106B, Sept. 11, 1935, K); above Sigma Rhangchung, 11500 ft. (F. Spencer Chapman 181, Aug. 21, 1936, K); Zogang–Dongdala Shan, 4650 m (Akiyama & al. 105852, 18 July 2000, TI, KUN); Nyalam–Zhangmu, 3690 m (Akiyama & al. 106553, 22 Aug. 2001, TI, KUN).

Western China: Yung Ning (McLaren's collector 155 in Sept. 1933, BM, K); loc. sine descr., 13–14000 ft. (Wilson 3595, July 19, 1903, BM, K).

Yunnan: Eastern flank of Likiang Range (Forrest 6599, 1910, E, BM, MO); loc. cit., 11–12000 ft. (Forrest 2621, July 1906, BM, K); Mountains NE of Atuntze, 12–13000 ft. (Forrest 20150, Sept. 1921, BM); in reg. Chung-tien, 3400 m (C. Schneider 3663, July 1914, K); Chung-tien. Mountains west of Hsiao Chung-tien, 10500 ft. (J. F. Rock 24634, BM, MO); loc. cit. (J. F. Rock 25264, K); Zhongdian, Haba Xueshan, Haba Hai, 4020 m (Wu & al. 103476, 9 Aug. 1999, TI, KUN); Mount Habashan, north of Ndaku, north of Likiang Snow Range, Yangtze Drainage Basin, 14000 ft. (J. F. Rock 9639, July 1933, BM); Mont. niveor. prope Lichiang, 3800 m (C. Schneider 1812, June 16, 1914, K).

Sichuan (including Sikang): Kangting (Tachienlu) distr., Yülingkong, mont. orient., Gomba La, ca. 3900 m, in prato alpino (H. Smith 10729, July 22, 1934, BM); Taofu (Dawo) distr., Montes orient. Lhamo Mondek La, ca. 4600 m (H. Smith 12329, Sept. 22, 1934, BM); Daocheng, Bowa Shan, 4460 m (Wu & al. 688, Aug. 16, 1996, TI, KUN); Daocheng, around Gongga Shan, 4430 m (Wu & al. 847, Aug. 5, 1997, TI, KUN); Xiaojin, Ganhaizi–southwestern slope of Mt. Siguniang–Ganhaizi, 4100 m (Ikeda & al. 100417, Sept. 1, 1998, TI, KUN).

The flowers of *Saxifraga nigroglandulifera* eventually nod and the petals are oblanceolate or narrowly oblong. We have seen no specimens transitional with other species.

3) **Saxifraga pseudohirculus** Engl. in Bot. Jahrb. Syst. **48**: 590 (1912) – Pan, Fl. Reipubl. Pop. Sin **34**(2): 204 (1992) – Pan & al., Fl. China **8**: 305 (2001).

Type: S Tibet, Chumbi (Dungboo [Dr. King's Collector], CAL, not seen).

Saxifraga hirculoides Engl. ex Maxim. in Bull. Acad. Sci. St.-Pétersb., Sér. 3, **29**: 112 (1883), not Decne. (1844). Type: China occidentalis, prov. Kansu in regione alpina declivitatis borealis jugi ad austrum fluminis Tetung, 10–12000's [3–4000 m] (N. M. Przewalski 648, July 20/1 Aug., 1880, LE–holo).

S. pseudohirculus Engl. var. *shensiensis* Engl. & Irmsch. in Bot. Jahrb. Syst. **48**: 590 (1913). Types: N Shaanxi (Nord-Shensi), T'ai-par-shan (G. Giraldi 5441–5447, B–syn, not seen); Distrikt Pao-Ki-seen, auf dem Miao-Wang-san (G. Giraldi 5448, B–syn, not seen).

S. pseudohirculus Engl. var. *tenuiflora* Harry Sm. in Acta Hort. Gothob. **1**: 12 (1924). Types: Sichuan (N Szechuan), Dongrergo, 4300 m (H. Smith 3515, Aug. 8, 1922, UPS–syn; K–isosyn), loc. cit., 4100 m (H. Smith 3520, Aug. 9, 1922, UPS–syn; BM–isosyn), loc. cit. (H. Smith 3911, UPS–syn, not seen).

S. selgenensis K. S. Hao in Bot. Jahrb. Syst. **68**: 604 (1938). Type: Xinjiang, Kokonor, auf dem Selgen, um 4800 m (K. S. Hao 938, Aug. 21, 1930, PE).

S. balongshanensis T. C. Ku in Bull. Bot. Res., Harbin **9**(4): 7 (1989). Type: Sichuan, Wenchuan, Mt. Balongshan, 4–4350 m (K. Y. Lang, L. Q. Li & Y. Fei 1125, Aug. 18,

1982, PE–holo).

S. longipetala T. C. Ku in Bull. Bot. Res., Harbin **9**(4): 10 (1989). Type: Sichuan, Kangding, Mt. Zheduoshan, 4000 m (K. C. Kuan & al. 1066, July 28, 1963, PE–holo).

S. spathulifolia T. C. Ku in Bull. Bot. Res., Harbin **9**(4): 11 (1989). Type: Sichuan, Xiaojin, Shepiliangzi, 4400 m (X. S. Zhang & Y. X. Ren 6555, Aug. 13, 1958, PE–holo).

Distr.: Tibet, Qinghai, Gansu, Shaanxi and Sichuan.

Specimens examined. **Tibet**: Cha La, near Lhasa, 15000 ft., among rocks on grassy hillside (Ludlow & Sherriff 8988, Aug. 4, 1942, BM); Hills S. of Lhasa, 15500 ft. (Ludlow & Sherriff 2885, Aug. 19, 1943, BM); Hills north of Lhasa, 15500 ft., grassy uplands (Ludlow & Sherriff 9025, Aug. 21, 1942, BM); Kongbo Province, Phu Chu, near Paka, 14000 ft., 29º15´, 94º25´, on open grassy hillside (Ludlow, Sherriff & Taylor 5962, July 27, 1938, BM); Salween –Tsangpo divide, N.E. of Shinden Gompa, 15–16000 ft., dry ground (Kingdon-Ward 10729, Aug. 11, 1933, BM); E Tibet, Grassland between Labrang and Yellow River, near camp, Wanrgen Valley, 12200 ft. (J. F. Rock 14527, July 29, 1926, A, K); Above Singma Khangchung, 11500 ft. (Spencer Chapman 580, Aug. 31, 1936, A).

SE Tibet-Yunnan border: Tsarung border, 13000 ft., along water courses (J. F. Rock 23462, Oct.–Nov. 1932, A).

Qinghai: Maqin (Maqên) Xien, Xihalong Guo, between Jungong (Gyumgo) and Maqin on S side of the Huang He, 35–3600 m, on wet slopes (Ho, Bartholomew & Gilbert 288, A, BM); Dawu Xiang, SE of Maqin, 3920 m, alpine meadow with *Hedysarum* and N facing slope with very dense turf and frequent dwarf shrubs, mostly *Potentilla* (Ho, Bartholomew & Gilbert 518, A, BM); Heit Shan, Dawu xiang, at pass between Jungong (Gyumgo) and Maqin, 4220 m, alpine meadow, disturbed by grazing (Ho, Bartholomew & Gilbert 654, BM).

Gansu (Kansu): SW Kansu, Upper Tebb Country (J. F. Rock 13089, A, K); Kansu occident, Lou Kio wa ssen (Abbé E. Licent 4782, Aug. 28, 1918, K); La Chang K'ou, near Sining, 30–3300 m, shaded slopes (R. C. Ching 622, July 24–25, 1923, A); China occidentalis, Regio Tangut (Prov. Kansu) (N. M. Przewalski in 1880, K).

Shaanxi (Shensi): Taipeishan (W. Purdom in 1910, K).

Sichuan [Sikang]: Kangting distr., Tapaoshan, in jugo occid., ca, 4800 m, in rupibus calcareis (H. Smith 11256, Aug. 20, 1934, A, BM); loc. cit., 4200 m, in prato alpino (H. Smith 11209, Aug. 3, 1934, A, BM); Kangting distr., Cheto La, 42–4400 m, in prato alpino (H. Smith 11040, Aug. 3, 1934, A, BM); Kangting distr., Tapaoshan, west range, ca. 4300 m, in prato alpino (H. Smith 11303, Aug. 20, 1934, BM); Kangting distr., Tapaoshan, west range, ca. 4700 m, in rupibus calcareis (H. Smith 11294, Aug. 20, 1934, BM); Taofu distr., mont. orient., Lhamo Mondeh La, ca. 4000 m, in prato herboso-praticoso (H. Smith 12274, Sept. 21, 1934, BM); Tachienlu, 9-13500 ft. (A. E. Pratt 616 & 613, BM); Reg. bor.-occid., inter Merge et Zanskar, ca. 4300 m, in rupibus calcareis (H. Smith 4335, Sept. 4, 1922, BM); Reg. bor.-occid., inter Kerge et Lanker, ca. 4300 m, in rupibus calcareis (H. Smith 4335, Sept. 4, 1922, K); Sungpan Hsien, at grassy slope (W. P. Fang 4023, Aug. 8, 1928, K). W Szechuan and Tibet Frontier, chiefly near Tachienlu, 9000–13500 ft. (A. E. Pratl 613, K).

Saxifraga pseudohirculus with its numerous, erect flowers is unique in the series Lychnitideae. The ensiform or oblanceolate to narrowly oblong petals, and the pedicels and calyx with dense dark brown glandular hairs support its placement in the series Lychnitideae. *Saxifraga cacuminum* Harry Sm. approaches *S. pseudohirculus*, but differs in having aristate basal leaves with the margins and lower surface hispidulous, and solitary flowers. The characters of the basal leaves of *S. cacuminum* indicate its affinity to *S. aristulata* Hook. f. & Thomson and closely related species. To decide its taxonomic status, further information is necessary.

4) **Saxifraga viscidula** Hook. f. & Thomson in J. Linn. Soc. Bot. **2**: 68 (1857) – C. B. Clarke in Hook. f., Fl. Birt. India **2**: 391 (1878).

Type: Sikkim, regio alp., 13–15,000 ped. (J. D. Hooker s. n., K–holo; A–iso).

Saxifraga yarlungzangboensis J. T. Pan in Acta Phytotax. Sin. **16**(2): 26 (1978) – Pan & al., Fl. China **8**: 305 (2002), syn. nov. Type: Xizang, (Xizang Medicinal Expd. 4440, HNWP–holo, not seen).

Distr.: E Himalaya (Sikkim) and SE and E

Tibet.

Specimens examined. **Eastern Himalaya**: Pa-Sum-Kye La, 14–15,000 ft. (Kingdon-Ward 6127, Aug. 25, 1924, BM).

Tibet: Tse La, 16000 ft., on alpine turf slopes (Kingdon-Ward 12261, Aug. 22, 1935, BM); S. E. Tibet, Kongbo Province, Kyabden, Nyang Chu, 13–14000 ft., on grassy cliff ledges and open steep grass slopes (Ludlow, Sherriff & Taylor 6184, Aug. 23, 1938, BM); S. E. Tibet, Traka La, Mago, 14500 ft., in stony moraine slopes (Ludlow & Sherriff 816, Aug. 5, 1934, BM); S. E. Tibet, Cha La, Dongkar, 14000 ft., open stony hillside (Ludlow & Sherriff 840, Aug. 18, 1934, BM).

In *Saxifraga yarlungzangboensis* the glandular hairs on the petals, the only feature distinguishing it from *S. viscidula*, vary from nearly absent to moderate.

(2) *Saxifraga excellens* Harry Sm. and resembling species

Of the Sino-Himalayan *Saxifraga*, only three species with reddish or reddish purple petals are known in section Ciliatae. They are *S. excellens* Harry Sm., *S. bergenioides* C. Marquand and *S. pardanthina* Hand.-Mazz.

Saxifraga excellens differs from *S. bergenioides* in having dense, short, black tipped glandular hairs on the pedicels. *Saxifraga bergenioides* has only brownish curled hairs on the same structures. The presence of glandular hairs and curled hairs is stable and constant within a species. Pan et al. (2001) used these differences in hairs as an important character to distinguish the main groups classified under Key 3 and Key 6 in section Ciliatae. Moreover, these two species differ in the posture of the flowers, which is erect or nodding. Smith (1960) established a monotypic grex Cinctae in section Ciliatae based on *Saxifraga excellens* characterized by the basally connate filaments. But basal connate filaments are also found in several dissimilar species.

Pan (1992) placed *Saxifraga bergenioides* and *S. pardanthina* Hand.-Mazz. in series Hirculoideae of section Ciliatae along with *S. hirculoides* Decne., *S. subamplexicaulis* Engl. & Irmsch., *S. linearifolia* Engl. & Irmsch., *S. erectisepala* J. T. Pan, and *S. lepidostolonosa* Harry Sm. because of its curled brownish hairs, sepals with three inconfluent nerves and petals without calluses. However, these two are different from all others in the series in having the reddish or reddish purple petals.

Saxifraga pardanthina from SW China (Yunnan and Sichuan) resembles *S. excellens* in having dense, short, black tipped glandular hairs on pedicels and the outer surface of sepals and hypanthium, but differs greatly in the reflexed sepals, cordate based ovate petals, and in the middle to upper cauline leaves not amplexicaul. We agree with Pan's treatment on *S. atropurpurea* J. Anthony as a synonym of *S. pardanthina*. *Saxifraga pardanthina* has rather dense blackish purple spots throughout petals, but *S. excellens* and *S. bergenioides* have petals without any spots and calluses.

The reddening of petals is considered to occur independently in several groups in section Ciliatae, and to be inappropriate for establishing any infrageneric taxa based on this. We refrain from further systematic arrangement of these taxa because of a lack of information.

1) **Saxifraga bergenioides** C. Marquand in J. Linn. Soc. Bot. **48**: 176 (1929) – Pan & al., Fl. China **8**: 314 (2001). [Figs. 2C, 3]

Type: S. E. Tibet, Sang La, 4500–4800 m [15–16,000 ft.], amongst boulders and on cliffs on the exposed side of the mountains (Kingdon Ward 5912, July 8, 1924, K–holo, iso).

Distr. Tibet, endemic to SE Tibet (Kongbo and Takpo Provinces).

Specimens examined. **SE Tibet**: Kongbo Province, Valley above Tripe, Tsangpo Valley, 13500 ft., on grassy slopes and screes (Ludlow, Sherriff & Taylor 5420, July 26, 1938, K); Pasum La, Drukla Chu, 16000

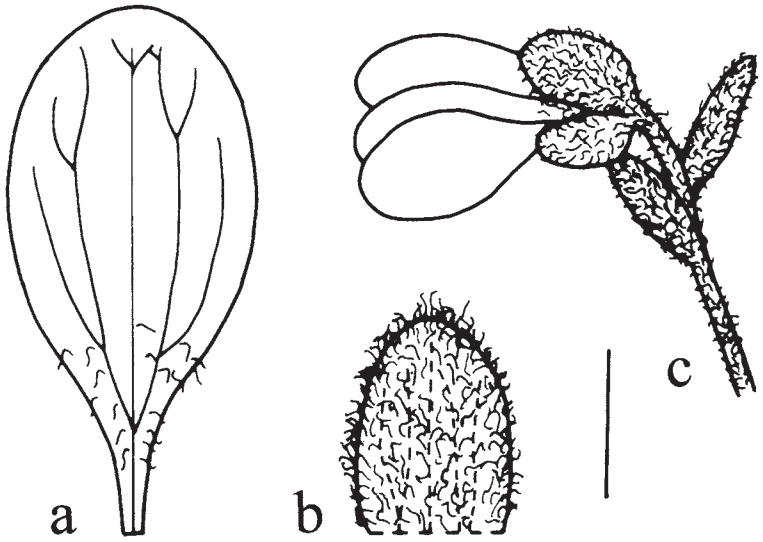

Fig. 3. *Saxifraga bergenioides* (Akiyama & al. 104533, Aug. 17, 2000, TI). a. Petal. b. Sepal. c. Flower. Bar indicates 3 mm for petal and sepal, and 6 mm for flower.

ft., in cleft of rocks (Ludlow, Sherriff & Taylor 6896, Aug. 23, 1938, K); Nambu La, 15000 ft., on dry ground (Ludlow, Sherriff & Elliot 15417, July 13, 1947, K); Buchu, Lechen La, 13000 ft., on dry ground (Ludlow, Sherriff & Elliot 15553, Aug. 4, 1947, K); Nyima La, Rong Chu, 14500 ft., on grassy rock shelf (Ludlow, Sherriff & Taylor 5122, July 4, 1938, K); Tsari, Tsari chu, Bimbi La, 13500 ft., on mossy rock shelves (Ludlow, Sherriff & Taylor 6321, Oct. 14, 1938, K); Tsari, Sexx La, 14500 ft., rocky situations (Ludlow & Sherriff 1952, July 27, 1936, K); Mira La, Puchu, 14–15000 ft., on steep grassy open hillside (Ludlow, Sherriff & Taylor 6153, Aug. 15, 1938, K); Nam La, 14500 ft., amongst rocks (Ludlow, Sherriff & Elliot 14479, Sept. 1, 1947, K); Kulu Phuchu, near Paka, 14–15000 ft., common on open (Ludlow, Sherriff & Taylor 5950, July 27, 1935, K); Mira La, Nyang Chu, 13500–14000 ft., among rhododendrons on steep hillside (Ludlow, Sherriff & Taylor 6057, Aug. 13, 1938, K); Le La, Chagul-Charme, 15000 ft., on open rocky hillside (Ludlow & Sherriff 2285, July 4, 1936, K). Takpo Province, Tse La, Langong, 14000 ft., on moss covered rocks beside stream (Ludlow, Sherriff & Taylor 5617, June 21, 1938, K); Tse La, 16000 ft., in shade, under bushes, alpine region (Kingdon-Ward 12248, Aug. 22, 1935, K); Maizhokunggar Xian, Mt. Milha Shan, 4920 m (Akiyama & al. 106407, Aug. 6, 2001, TI, KUN, TNS); Nyingchi, Sezhaila Shan, 4500 m (Akiyama & al. 104533, Aug. 17, 2000, TI, KUN).

The distribution is extremely narrow and limited to Kongbo and Takpo provinces in SE Tibet.

2) **Saxifraga excellens** Harry Sm. in Bull. Brit. Mus. (Nat. Hist.), Bot. **2**(9): 230 (1960) – H. Hara, Enum. Flow. Pl. Nepal **2**: 152 (1979). [Figs. 2B, 4]

Type: Nepal, Annapurna Himal, Mardi Khola, 12500 ft. (Stainton, Sykes & Williams 8460, 18 Sept. 1954, BM–holo; iso).

Distr. Nepal, endemic to C and E Nepal.

Specimens examined. **E Nepal**: Sagarmatha Zone. Solukhumbu distr., Thasing Dingma–Chhatarwa, 3800 m, on mossy rocks in *Abies* forest (Miyamoto & al. 9580471, Aug. 28, 1995, TI); loc. cit., 3750 m (Miyamoto & al. 9596499, Aug. 28, 1995, TI).

These collections agree well with the type collected in C Nepal, except for the shape of the apex of the sepals and petals.

3) **Saxifraga pardanthina** Hand.-Mazz. in Symb. Sin. **7**: 418 (1931) – Pan, Fl.

Fig. 4. *Saxifraga excellens* (Miyamoto & al. 9580471, Aug. 28, 1995, TI). Bar indicates 3 cm for plant, and 3 mm for flower, sepal and petal.

Reipubl. Pop. Sin. **34**(2): 85 (1992) – Pan & al., Fl. China **8**: 301 (2001).

Type: Sichuan (Setschwan), in temperierte Stufe der Berge zwischen Yenyüen und Kwpi, auf Sandsteinerde am wegrande gege nüber Tangetu und in Gebüschen unter Hwangliangdse, 3050–3250 m (Handel-Mazzetti 5475, Oct. 1914, W–holo†, not seen).

Saxifraga atrosanguinea J. Anthony in Notes Roy. Bot. Gard. Edinburgh **18**: 27 (1933). Type: Yunnan, Chien-chuan-Mekong divide, 12000 ft. (G. Forrest 22379, Sept. 1922, E–holo).

Specimens examined. **Sichuan**: SW Szechuan, Muli, mountains of Kulu, 4600 m (J. F. Rock 18188, Sept. 1929, A); Mt. Mitzuga, 4150 m (J. F. Rock 18320, Sept. 1929, BM).

Yunnan: NW Yunnan, Yangtze-Yungning divide, 12000 ft. (G. Forrest 20576, Aug. 1921, BM–isopara of *S. atrosanguinea* J. Anthony).

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秋山　忍[a]，大場秀章[b]：**Sino-Himalaya 地域産ユキノシタ属（ユキノシタ科）の分類学研究（1）：Ciliatae 節 Lychnitideae 列及び *Saxifraga excelens* Harry Sm. と類似種**

筆者らは中国・ヒマラヤ地域のユキノシタ属について，現地と標本による変異性の観察結果などにもとづく分類学的研究を行なってきた．本論文では，1）Ciliatae 節 Lychnitideae 列及び，2）*Saxifraga excellens* Harry Sm.と類似種を扱った．

1）Lychnitideae 列に分類される種の範囲についてはいくつかの見解があったが，花序を頂生し，しかもその花数が少なく，茎葉は下方に次第に小形化し，花弁は線形から狭長円形あるいは倒披針形、萼などに褐色の密毛を有するなどの属性を共有する *Saxifraga lychnitis* Hook. f. & Thomson, *S. viscidula* Hook. f. & Thomson, *S. nigroglandulifera* N. P. Balakr. (= *S. nutans* Hook. f. & Thomson), *S. pseudohirculus* Engl.の 4 種からなるとする見解を述べた．中国四川省西南部から記載された *S. oresbia* J. Anthony を *S. lychnitis* の変種とし，新学名を提唱した．各種・変種ごとにこれまでに検した標本のデータを示し，異名や変異性について若干の言及を行なった．

2）表記地域産 Ciliatae 節では紅紫色または赤色の花弁をもつ種は *S. bergenioides* C. Marquand, *S. excellens* Harry Sm., *S. pardanthina* Hand.-Mazz.の 3 種だけである。この 3 種について比較を行った．*Saxifraga excellens* はネパール特産の稀産種であるが 1995 年にネパール東部 Hinku 及び Hunku 地域で新たに見出されたので，詳細な観察を行い，全形等を図示した．

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