Bull. Natn. Sci. Mus., Tokyo, Ser. B, **28**(4), pp. 141–148, December 20, 2002

New and Noteworthy Species of *Bistorta* (Polygonaceae) from the Sino-Himalayan Region

Futoshi Miyamoto[1], Shinobu Akiyama[2], Su-Kong Wu[3], and Hideaki Ohba[4]

[1] Department of Agriculture, Tokyo University of Agriculture, 1737 Funako, Atsugi, Kanagawa, 243–0034 Japan
E-mail: miya@nodai.ac.jp
[2] Department of Botany, National Science Museum, Tokyo, 4–1–1 Amakubo, Tsukuba, Ibaraki, 305–0005, Japan
E-mail: akiyama@kahaku.go.jp
[3] Herbarium, Kunming Institute of Botany, Academia Sinica, Kunming, Yunnan 6650204, China
[4] Department of Botany, University Museum, University of Tokyo, 7–3–1 Hongo, Bunkyo-ku, Tokyo, 113–0033 Japan
E-mail: ohba@um.u-tokyo.ac.jp

Abstract Two new species of *Bistorta* (Polygonaceae), *B. albiflora* and *B. tubistipulis* are described from the Sino-Himalayan region of China. *Bistorta albiflora* differs from *B. vivipara* (L.) S. F. Gray by the partly paniculate, conically shaped racemes, the decumbent flowering stems, the U-shaped rhizomes and the apiculate bracts. *Bistorta tubistipulis* is distinguished from *B. sherei* by the tubular stipule of the cauline leaves. *Bistorta sherei*, described from Nepal, was newly found from Bhutan and China (Tibet and Yunnan). Its circumscription is revised.
Key words: *Bistorta*, China, Sino-Himalayan region, Tibet, Yunnan.

The genus *Bistorta* is characterized by a solitary inflorescence, ligneous rhizomes and eciliate stipules (Gross, 1913). *Bistorta* is distributed in the temperate and alpine regions of the northern hemisphere, chiefly in the central Asiatic and Sino-Himalayan regions. *Bistorta* is one of the important genera in the alpine flora of the Sino-Himalayan region. During field observations of the Sino-Himalayan flora in the Hengduan mountains, southwest China and Tibet, between 1996 and 2000 (see Ikeda and Miyamoto, 1996, 1998 and 1999, Miyamoto, 2000, Akiyama *et al.*, 2001, Miyamoto and Ikeda, 2001), we found some notable species of *Bistorta* in Sichuan, Yunnan and Tibet.

This paper deals with two new species, *Bistorta albiflora* and *B. tubistipulis*, and revises *B. sherei*.

1) **Bistorta albiflora** Miyam. & H. Ohba, sp. nov. [Figs. 1 and 4]

Affinis *Bistortae viviparae* (L.) S. F. Gray, sed a qua racemes conicis parte paniculatis caulibus floriferis decumbentibus, rhizomatibus duplicatis et bractea apiculata bene differt.

Type: CHINA. Sichuan: Daocheng, around Gongga Shan, 28°26′N, 100°22′E, alt. 4500 m (S. K. Wu, H. Ikeda, S. Akiyama, F. Miyamoto & W. Chen 459, 6 Aug. 1997, KUN-holotype, TI, TNS-isotypes).

Rhizome swollen, conspicuously U-shaped, covered with old leaf sheaths. Flowering stems decumbent, 10–25 cm long, pale red, partly greenish. Radical leaves 3–6, oblong, petiole 3–7 cm long, red, blade oblong, 3–10 cm long, 0.5–1.5 cm wide, apex mucronate or acute. Cauline leaves 2 or 3; blade linear-lanceolate to oblong, 1–6 cm long; stipules of lower leaves 2–4 cm long, stipule of uppermost leaf 0.5–2.0 cm long,

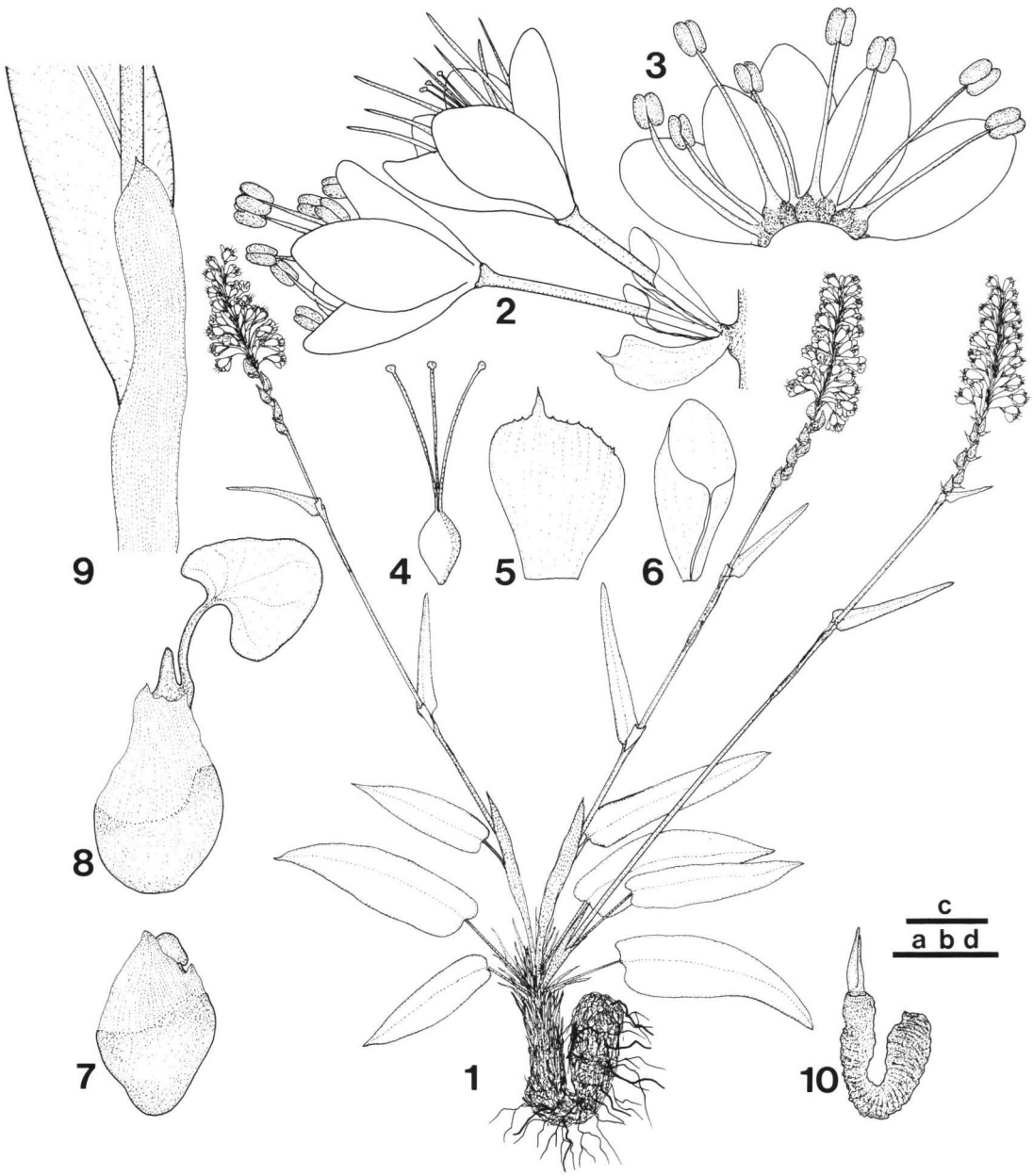

Fig. 1. *Bistorta albiflora* (holotype). 1: Habit of plant. 2: Flowers. 3: Perianth and stamens. 4: Pistil. 5: Bract. 6: Bracteole. 7 & 8: Gemma. 9: Stipule of cauline leaf. 10: Rhizome. Scales: a (2 cm) for 1 & 10; b (2 mm) for 2, 3, 7 & 8; c (1 mm) for 4, 5 & 6; d (4 mm) for 9.

membranaceous, brown, apex acute, base rounded to slightly cordate, margin entire, upper surface glabrous, deep green, lower surface glabrous, pale green. Racemes solitary, partly paniculate, conical, 1.5–5 cm long, 0.5–2 cm wide, with proliferous flowers in lower part. Flowers many, dense, white, usually paired, pedicel 3–5 mm long, gradually shorter apically, pale pink or green; bracts 1, membranaceous, obovate, apex apiculate, upper margin denticulate, yellowish

brown, 1.5–2.5 mm long, 1.8–2.2 mm wide; bracteoles 1, membranaceous, widely ovate, obtuse, 1.7–2.5 mm long, 1.3–1.8 mm wide. Perianth segments 5, ovate, 2.8–3.5 mm long, 1.8–2.2 mm wide, apex rounded. Stamens 8; filaments 2–3.3 mm long, white, anthers 0.6–0.8 mm long, 0.3–0.4 mm wide, dark purple before dehiscence, light brown after dehiscence; nectary glands at base, brown. Pistil 2.6–4 mm long; stigmas 3, 0.1–0.15 mm long; styles 2–2.6 mm long, white; ovary trigonous, 0.6–1.4 mm long, green to dark red. Gemma 2–3.5 mm long, 1.8–2.5 mm wide.

Additional specimens examined: CHINA. Xizang (Tibet): Baxoi Xian, around Rawu, 3900 m (S. Akiyama *et al.* 105104, 28 July 2000, TI); Qamdo Xian, Qamdo–Degqen, 4500 m (S. Akiyama *et al.* 105186, 8 Aug. 2000, TI). Yunnan: Deqe, around Daxue Shan, 28°35′N, 99°51′E, alt. 4400 m (S. K. Wu *et al.* 1602, 29 Aug. 1996, KUN, TI); Zhongdian, Hong Shan, 28°06′N, 99°54′E, alt. 4400 m (S. K. Wu *et al.* 103034, 31 July–4 Aug. 1999, KUN, TI). Sichuan: Daocheng, around Gongga Shan, 4600 m (S. K. Wu *et al.* 1572, 24 Aug. 1996, KUN, TI); Daocheng, around Gongga Shan, 4570 m (S. K. Wu *et al.* 464 & 465, 8 Aug. 1997, KUN, TI); Siaojin, Ganhaizi–Eastern slope of Mts. Xiaxue Tangshan–Ganhaizi, 31°04′N, 102°52′E, 3800 m (H. Ikeda *et al.* 100849, 2 Sept. 1998, KUN, TI).

Bistorta albiflora is similar to *B. vivipara* (L.) S. F. Gray in having proliferous buds on the lower part of the racemes and has been confused with that species. It differs from *B. vivipara* in having conical, partly paniculate racemes, decumbent flowering stems, U-shaped rhizomes and apiculate bracts. The pedicel of the lowest flower of *B. albiflora* is two or more times longer than in *B. vivipara*. Flowers of *B. albiflora* are usually white, while those of *B. vivipara* are pale red or pink. *Bistorta vivipara* in the Sino-Himalayan region is characterized by cylindrical racemes and erect or ascending flowering stems and acuminate or cuspidate bracts. The two species usually grow in different habitats. *Bistorta albiflora* occurs on scree slopes and flood plains while *B. vivipara* is on grassland slopes and under lower shrubs.

2) **Bistorta tubistipulis** Miyam. & H. Ohba, sp. nov. [Figs. 2 and 5]

Polygonum macrophyllum D. Don var. *stenophyllum* auct. non (Meisn.) A. J. Li in Wu, C. Y. (ed.), Fl. Xizang. **1**: 613 (1983) pro parte, excl. typo.

Bistorta sherei similis, sed folii caulium stipulis tubularibus differt.

Type: CHINA. Sichuan: Daocheng, Bowa Shan, 28°53′N, 100°17′E, alt. 4400 m (S. K. Wu, H. Ikeda, F. Miyamoto, M. Wakabayashi, Y. Yang & T. Kikuchi 1499, 16 Aug. 1996, KUN-holotype, TI-isotype).

Rhizome swollen, bulbous, covered with old leaf sheaths. Flowering stems 1–3(–5), erect, 4–20 cm long, green or partly reddish. Radical leaves, 3–6; petiole 0.5–1.5 cm long; blade linear, 3–7 cm long, 1.0–1.5 mm wide, apex acute, base narrowly decurrent, margin entire, upper surface glabrous, deep green, lower surface glabrous, pale green. Cauline leaves 1–3, blade linear, 0.3–3 cm long; lower stipules tubular, 5–15 mm long, uppermost stipule 0.8–1.0 mm long, membranaceous, pale brown, apex truncate. Raceme solitary, cylindric, 0.5–2.5 cm long, 0.5–1.1 cm wide. Flowers many, dense, white or red, solitary at each node, pedicel 1.5–2 mm long; bracts obovate, membranaceous, apex acuminate, yellowish brown, 1.8–2.3 mm long, 1.2–1.6 mm wide; bracteoles membranaceous, oblong, apex obtuse, 1.7–2.2 mm long, 1–1.6 mm wide. Perianth segments 5, ovate, 2–2.5 mm long, 1.1–1.3 mm wide, apex rounded. Stamens 8; filaments 2–2.8 mm long, white, anthers 0.5–0.7 mm long, 0.3–0.4 mm wide, dark purple before dehiscence, light brown after dehiscence; nectary glands at base, brown. Pistil 1.9–2.2 mm long; stigmas 3, 0.08–0.1 mm long; styles 1.2–1.6 mm long, white; ovary trigonous, 0.6–0.8 mm long, green to dark red.

Additional specimens examined: CHINA. Xizang (Tibet): Dengqen Xian, Dengqen–Pongda, alt. 4370 m (S. Akiyama *et al.* 105191, 9 Aug. 2000, KUN, TI); Bomi (Xizang research

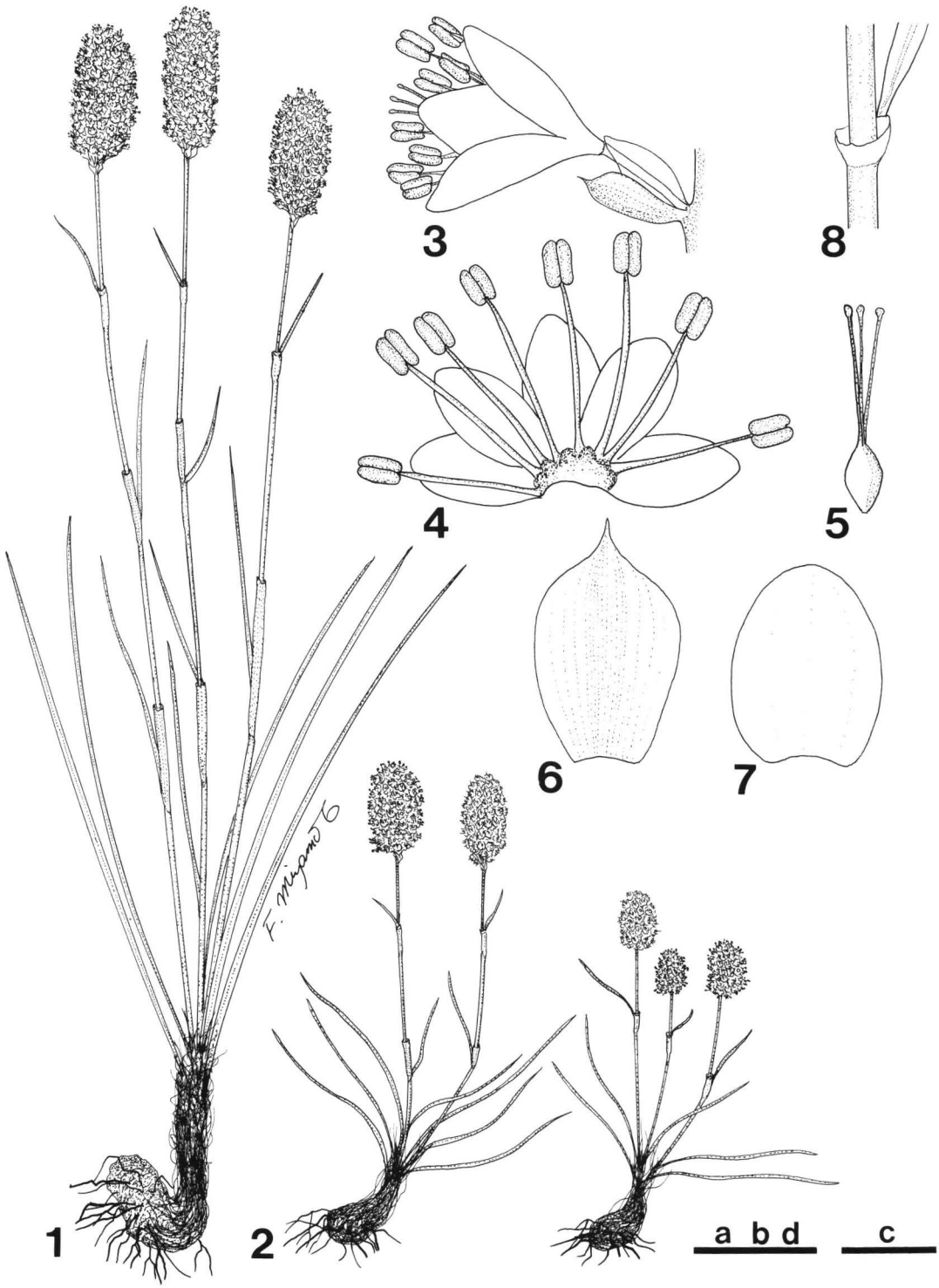

Fig. 2. *Bistorta tubistipulis* (holotype). 1 & 2: Habit of plant. 3: Flowers. 4: Perianth and stamens. 5: Pistil. 6: Bract. 7: Bracteole. 8: Stipule of uppermost cauline leaf. Scales: a (2 cm) for 1 & 2; b (2 mm) for 3 & 4; c (1 mm) for 5, 6 & 7; d (4 mm) for 8.

team 5868, 13 Sept. 1960, KUN). Sichuan: Mu-li, Wa-chin, Wa-ling-se, alt. 4100 m (T. T. Yü 6481, 20 June 1937, KUN); Daocheng, Bowa shan, 4700 m (Sichuan research team 3611, 22 July 1973, KUN); Daocheng, Haizi, 29°28′N, 100°13′E, alt. 4350 m (S. K. Wu *et al.* 1528, 18 Aug. 1996, KUN, TI); Daocheng, around Wuming Shan, 29°20′N, 100°02′E, alt. 4250 m (S. K. Wu *et al.* 422, 28 July 1997, KUN, TI); Xiangcheng, Wuming Shan, alt. 4300 m (Xizang research team 4947, 17 Aug. 1981, KUN); Xiangcheng, Wengshui, 4300 m (Xizang research team 4106, 15 Aug. 1981, KUN); Xiangcheng, 3700 m (Xizang research team 4698, 12 Aug. 1981, KUN).

Bistorta tubistipulis is apparently related to *B. sherei* H. Ohba & S. Akiyama from Nepal in having linear leaves, but differs by the tubular stipules of the cauline leaves. *Bistorta sherei* has long auriculate stipules. This species is also similar to *B. macrophylla* (D. Don) Soják, but differs by linear radical leaves and the nodes with a solitary flower. *Bistorta macrophylla* has ovate-lanceolate radical leaves and paired flowers. The flowers are white or red within a single population. This new species occurs on grazed grassland slopes.

Bistorta tubistipulis was identified as *Polygonum macrophyllum* D. Don var. *stenophyllum* (Meisn.) A. J. Li by Li (1983). But the specimens determined by Li in 1997 as *Polygonum macrophyllum* var. *stenophyllum* consist of *B. tubistipulis* and *B. sherei*.

3) **Bistorta sherei** H. Ohba & S. Akiyama, Alp. Fl. Jaljale Himal: 11, f. 2 (1992). Miyamoto in Contr. Fl. Ganesh Himalaya.: 21 (1999).

[Figs. 3 and 5]

Type: NEPAL. Koshi Zone, Sankhuwa Sahba District, Jaljale Himal, Jomle–Goja, 87°30′E, 27°30′N, alt. 4150 m (H. Ohba, S. Akiyama, H. Ikeda, T. Kikuchi, S. Noshiro, Y. Omori, M. N. Subedi & M. Wakabayashi 9120235, 5 Aug. 1991, TI-holotype).

[Revised description]

Rhizome swollen, bulbous, covered with old leaf sheaths, dark brown. Flowering stems 1 or 2(–3), erect or ascending, 2–15 cm long. Radical leaves 3–8; petiole 1–3 cm long; blade linear, 2–15 cm long, 1.8–5 mm wide, apex acute, base narrowly decurrent, margin entire, upper surface glabrous, deep green, lower surface glabrous, pale green. Cauline leaves 1–3, blade linear, 1–6 cm long; stipules membranaceous, long auriculate, lower 1–2.5 cm long, uppermost 0.5–1.2 cm long. Raceme solitary, cylindric, 0.5–3 cm long, 0.5–1.2 cm wide. Flowers many, dense, red or pale pink to deep pink, always solitary at each node, pedicel 0.8–1.6 mm long; bracts 1, oblong to lanceolate, membranaceous, apex acuminate, pale brown, 1.2–3.5 mm long, 0.7–1 mm wide; bracteoles 1, membranaceous, obovate, apex irregularly serrate or acute, 1.8–3.3 mm long, 1.5–2 mm wide. Perianth segments 4 (or 5), oblong, 2.8–4 mm long, 1.2–2 mm wide, apex rounded. Stamens 6 (or 8); filaments 1.3–3.5 mm long, pale pink, anthers 0.5–0.6 mm long, 0.3–0.5 mm wide, deep purple before dehiscence, light brown after dehiscence; nectary glands at base dark brown. Pistil 1.5–2 mm long; stigmas 3, 0.05–0.1 mm long; styles 0.5–1 mm long, pale pink; ovary trigonous, 0.5–0.8 mm long, pale green. Achene trigonous, ovoid, 2–2.5 mm long, 1–1.2 mm wide, pale brown.

Additional specimens examined: NEPAL. Annapurna Himal, Seti Khola, 13500 ft. (Stainton *et al.* 6561, 30 July 1954, BM, TI); Bagmati Zone, Raswa Distr., Pabil Kharka–a Kharka, 28°15′N, 85°97′E, alt. 4160 m (F. Miyamoto *et al.* 9410227, 7 Aug. 1994, TI); Bagmati Zone, Raswa Distr., a Kharka (near Seto Kund)–Burindan Kharka, 28°16′N, 85°06′E, alt. 4050 m (F. Miyamoto *et al.* 9410230, 8 Aug. 1994, TI); Janakpur Zone, Ramcchap Distr., Baula Pokhari–Chhu Ningma, 80°23′E, 27°40′N–86°23′E, 27°41′N, alt. 3960–4040 m (H. Ohba *et al.* 8530236 & 8570379, 11 July 1985, TI); Janakpur Zone, Ramechhap Distr. Jata Pokhari–north of Jata Pokhari–Jata Pokhari, 86°25′E, 27°43′N, 4220–4400 m (N. Kurosaki 8570573, 19 July 1985 TI); Jaljale Himal, Goja–Shuwan Kharka, 87°30′E, 27°35′N, alt. 4130–4300 m (H. Ohba *et al.* 9110331, 6 Aug. 1991, TI).

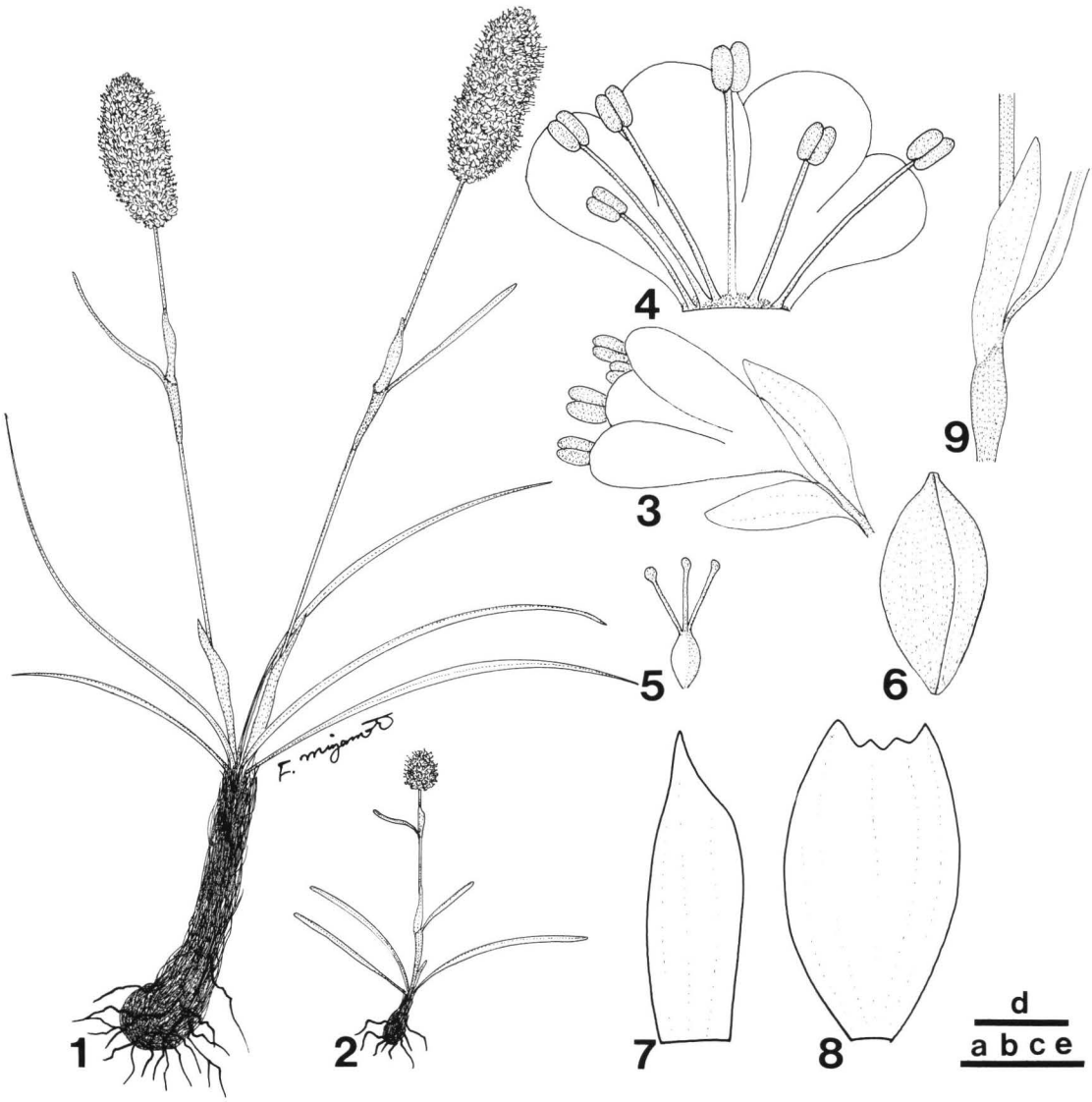

Fig. 3. *Bistorta sherei*. 1 & 2: Habit of plant (1: S. Akiyama *et al.* 105211, 2: F. Miyamoto *et al.* 9410227). 3: Flowers. 4: Perianth and stamens. 5: Pistil. 6: Achene. 7: Bract. 8: Bracteole. 9: Stipule of cauline leaf. Scales: a (2 cm) for 1 & 2; b (2 mm) for 3 & 4; c (1 mm) for 5; d (1 mm) for 6, 7 & 8; e (4 mm) for 9.

BHUTAN. Pangotang, Tsampa, alt. 14000 ft. (F. Ludlow *et al.* 19343, 4 July 1943, K). CHINA. Xizang (Tibet): Nyingchi Xian, Sezhaila Shan, alt. 4500 m (S. Akiyama *et al.* 105211, 17 Aug. 2000, KUN, TI); Gyaca, 4700–4800 m (Xizang research team 751410, 9 Aug. 1975, KUN); Zhamo [Bomi], 3000 m (unknown collector 401, 10 Aug. 1960, KUN). Yunnan: Mekong-Salwin Divide, alt. 4200 m (T. T. Yü 22288, 11 Aug. 1938, KUN); Kang-pu, Wei-si-Hsien, alt. 3500 m (C. W. Wang 64534, July 1935, KUN).

Distribution: Nepal, Bhutan and China (Tibet & Yunnan).

Bistorta sherei H. Ohba & S. Akiyama, described from Jaljale Himal in East Nepal (1992), characterized by having linear leaves and long auriculate stipules, is newly recorded from Bhutan and China.

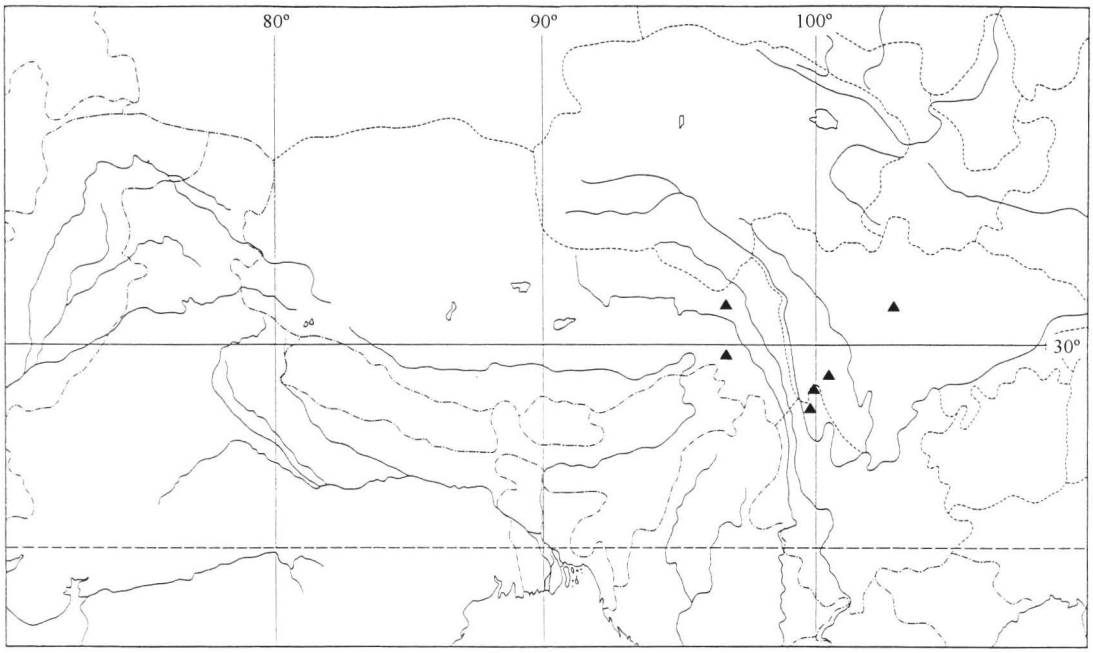

Fig. 4. Distribution map of *Bistorta albiflora*.

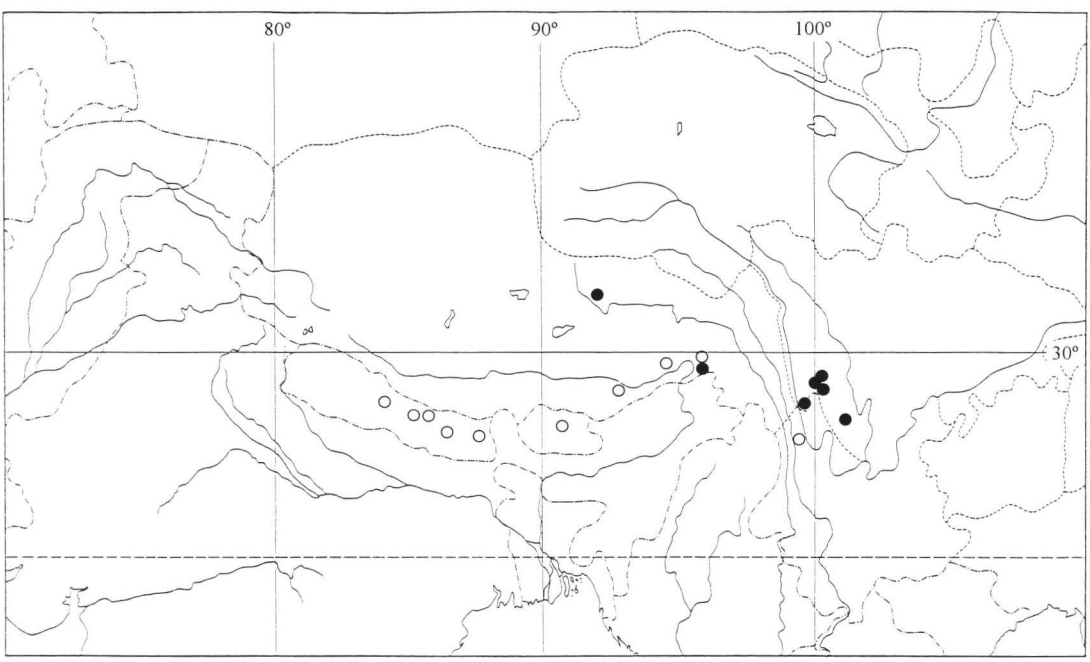

Fig. 5. Distribution map of *Bistorta tubistipulis* (black circles) & *B. sherei* (white circles).

We greatly appreciate Dr. David E. Boufford, the Harvard University Herbaria, for reading the manuscript. This study was supported by a Grant-in-Aid from the Japan Society for the Promotion of Science, no. 14255005 (to H. Ohba) in 2002.

Reference

Akiyama, S., Boufford, D. E. and S. Wu. 2001. The Sino-Japanese-American expedition to Tibet, 2000. *Newslet. Himalayan Bot.*, (28): 1–2.

Gross, H. 1913. Remarques sur les Polygonées de l'Asie Orientale. *Bull. Géogr. Bot.*, **23**: 7–32.

Ikeda, H. and F. Miyamoto. 1996. A botanical research in the Hengduan Mountains, SW China, in 1996. *Newslet. Himalayan Bot.*, (20): 1–5.

Ikeda, H. and F. Miyamoto. 1998. 1997 Botanical research in the Hengduan Mountains, SW China. *Newslet. Himalayan Bot.*, (23): 1–5.

Ikeda, H. and F. Miyamoto. 1999. 1998 Botanical research in the Hengduan Mountains, SW China. *Newslet. Himalayan Bot.*, (25): 1–4.

Li, A. J. 1983. Polygonaceae. In: Wu C. Y. (ed.), Flora Xizangica, **1**: 593–627.

Miyamoto, F. 2000. Japan-China Botanical Research in the Hengduan Mountains, SW China, in 1996. *Newslet. Himalayan Bot.*, (26): 8–15.

Miyamoto, F. and H. Ikeda. 2001. Field Research in the Sino-Japanese-American Expedition to Southeast Tibet, 2000. *Newslet. Himalayan Bot.*, (28): 3–12.