

A New Species and a New Variety of *Bistorta* (Polygonaceae) from the Sino-Himalayan Region

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Abstract A new species and a new variety of *Bistorta* (Polygonaceae), *B. attenuatifolia* and *B. sinomontana* var. *pubifolia*, are described from the Sino-Himalayan region. *Bistorta attenuatifolia* is similar to *B. sinomontana* (Sam.) Miyam., from which it differs by radical leaves with narrowly cuneate base. *Bistorta sinomontana* var. *pubifolia* is characterized by leaves with brown very short soft hairs on lower surface.

Key words: *Bistorta attenuatifolia*, *Bistorta sinomontana*, China, Sino-Himalayan region, Tibet, Yunnan.

The genus *Bistorta* is one of the important genera in the Sino-Himalayan region but the diversity has not been well studied taxonomically in East Tibet. During our study of the Sino-Himalayan flora in the Hengduan Mountains, southwest China and Tibet, we have described two new species, *Bistorta albiflora* Miyam. & H. Ohba and *B. tubistipulis* Miyam. & H. Ohba (Miyamoto *et al.* 2002). In 2000 we surveyed in East Tibet (Miyamoto and Ikeda 2001), and found an unknown *Bistorta* similar to *B. sinomontana*. Moreover we found an undescribed variety in our collections from the Sino-Himalayan region between 1996 and 2000.

Bistorta sinomontana (Sam.) Miyam. is characterized by the woody creeping rhizomes and the radical and basal cauline leaves with winged petiole. *Bistorta sinomontana* distributed in Tibet, Yunnan and Sichuan (Li *et al.* 2003). This species is similar to *B. amplexicaulis* (D. Don) Greene. Yonekura and Ohashi (2002) treated *B. sinomontana* as subspecies of *B. amplexicaulis*.

It is because the shape of leaves of the both species varies continuously. However, *B. sinomontana* is distinguishable from *B. amplexicaulis* in having lanceolate to obovate bracts. The shape of those of *B. amplexicaulis* is widely obovate.

1) ***Bistorta attenuatifolia*** Miyam. & H. Ohba,
sp. nov. [Figs. 1 and 3]

Polygonum sinomontanum Sam.: A. J. Li in C. Y. Wu, Fl. Xizang 1: 612 (1983) pro. parte, excl. typo; Fl. Ripubl. Popul. Sin. 25(1): 44 (1998) pro parte, excl. typo.

Ex affinitate *Bistortae sinomontanae* (Sam.) Miyam. foliis basi anguste cuneatis differt.

Type: CHINA. Xizang (Tibet): Baxoi Xian, Rawu–Baxoi, 29°31'N, 96°45'E, alt. 3890 m (S. Akiyama, M. Wakabayashi, F. Miyamoto, H. Ikeda, S. K. Wu, X. Chen, L. Gao, J. Yue and Yang Zhen 105176, 4 Aug. 2000, KUN-holotype, TI, TNS-isotypes)

Rhizome horizontally creeping, 1–1.5 cm

diam., brown to pale brown, covered with old leaf sheaths. Flowering stems erect or ascendent, sometimes branched in the upper part, 40–60 cm long, pale red, partly greenish. Leaves deep green on upper surface, pale green on lower surface. Radical leaves 2–8; petiole 3–7 cm long, red, partly greenish, narrowly winged; blade linear-lanceolate to linear, 8–13 cm long, 0.5–1(–2) cm wide, apex acuminate, base narrowly cuneate, margin entire, glabrous on both surfaces. Cauline leaves 4–6, sessile or petiolate; petiole to 3 cm long; blade linear-lanceolate to linear, 2–10 cm long, apex acuminate, base narrowly cuneate, margin entire, glabrous on both surfaces; stipules of lower leaves 3–6 cm long, stipule of uppermost leaf 0.5–1 cm long, membranaceous, brown. Racemes 1–3(–4), cylindrical, 2–4 cm long, 1–1.5 cm wide. Flowers many, dense, pale pink to deep pink, pedicel 2–6 mm long, pale pink or green; bract 1, membranaceous, lanceolate to linear-lanceolate, apex acute, yellowish brown, 4–6 mm long, 1–1.6 mm wide; bracteoles 2–4, membranaceous, ovate, acute, 2–5 mm long, 0.6–2 mm wide. Perianth segments 5, obovate, 3–5 mm long, 1.5–2.5 mm wide, apex rounded. Stamens 8; filaments 2.8–4 mm long, pale pink; anthers 0.8–1 mm long, 0.3–0.4 mm wide, deep pink before dehiscence, light brown after dehiscence; nectary glands at base deep pink. Pistil 4–6.5 mm long; stigmas 3, 0.1–0.15 mm long; styles 3.3–4 mm long, pale pink; ovary trigonous, 1.5–2 mm long, green to pale pink. Achene trigonous, spindle-shaped, 4–5 mm long, 2–2.5 mm wide, apex apiculate, brown.

Additional specimens examined: CHINA. Xizang (Tibet): Gyamda Xian, 3600 m (Tibet research team 12518, 27 Jul. 1975, PE); loc. cit. 3600 m (Tibet research team 12304, 22 Jul. 1976, KUN); Gongjo Xian, 3650 m (Yan 91-497, 30 Jun. 1991, PE); loc. cit., 3800 m (Tibet research team 12591, 3 Aug. 1976, PE); Zaya Xian, Gyitang, 3800 m (Tibet research team 12278, 12288, 7 Jul. 1976, PE); loc. cit., 3600 m (Tibet research team 12327, 8 Jul. 1976, PE); Chamdo Xian, 3000 m (Plateau research team 12794, 15 Aug. 1986, PE); Zogang Xian, Langla Shan–Nianla Shan, alt.

4050 m (S. Akiyama *et al.* 105057, 19 Jul. 2000, KUN, TI, TNS). Sichuan: Dege, Gengqing, 3500 m (collector unknown 7255, 3 Jul. 1979, PE); Dege (Cui 5110, 5 Aug. 1951, PE); Garze (Chong 5126, 27 Jul. 1952, PE).

Bistorta attenuatifolia is similar to *B. sinomontana* (Sam.) Miyam. in having horizontal creeping rhizomes and the nodes with three to five flowers. But *B. attenuatifolia* differs from *B. sinomontana* in having radical and cauline leaves with narrowly cuneate base. Distributions of the both species are separated (Fig. 3). *B. attenuatifolia* is distributed in easternmost Tibet and northwest Sichuan. In this area *B. sinomontana* has not been found. The area where *B. attenuatifolia* occurs is arid and has poor vegetation. On dry scree slopes spiny shrubs, such as *Sophora viciifolia*, *Caragana opulens* and *Rhamnus* sp., grow together with this species (Miyamoto and Ikeda 2001).

2) ***Bistorta sinomontana*** (Sam.) Miyam. in Bull. Natn. Sci. Mus. Tokyo ser. B, **25**: 153 (1999). [Figs. 2 and 3]

Polygonum sinomontanum Sam. in Hand.-Mazz., Symb. Sin. **7**: 177 (1929).

Bistorta amplexcaulis (D. Don) Greene subsp. *sinomontana* (Sam.) Yonek. & H. Ohashi in J. Jap. Bot. **77**: 73, f. 11 (2002).

Type: CHINA. Sichuan: Tachienlu, alt. 9000–13500 ft. (A. E. Pratt 494, κ -syntype)

Rhizome horizontally creeping, 0.8–2 cm diam., dark brown to brown, covered with old leaf sheaths. Flowering stems erect or ascendent, branched, 30–110 cm long, pale red, partly greenish. Leaves deep green on upper surface, pale green or brown on lower surface. Radical leaves 2–4(–6) or absent; petiole 3–25 cm long, red or green, winged; blade lanceolate to ovate-lanceolate, sometime linear-lanceolate, 5–15 cm long, (1.2–)2–5 cm wide, apex acute to acuminate, base truncate to cordate, rarely cuneate, margin entire, upper surface glabrous, lower surface glabrous to pubescent. Cauline leaves 3–8, sessile or petiolate; petiole to 5 cm, winged; blade lanceolate to linear, 2–12 cm long, apex acumi-



Fig. 1. *Bistorta attenuatifolia* (holotype). 1: Habit of plant. 2: Flowers. 3: Perianth and stamens. 4: Pistil. 5: Achene. 6: Bract. 7: Bracteole. Scales: a (2 cm) for 1; b (4 mm) for 2; c (2 mm) for 3, 4, 5, 6 and 7.

nate, base truncate to cordate, margin entire, upper surface glabrous, lower surface glabrous to pubescent; stipules of lower leaves 2–6 cm long, stipule of uppermost leaf 1–3 cm long, membranaceous, brown. Racemes 1–4(–6), cylindrical, 2–7 cm long, 0.8–2 cm wide. Flowers many, dense, pale pink to deep pink, pedicel 0.2–1 cm long, pale pink to green; bract 1, membranaceous, lanceolate to obovate, apex acute to apiculate, yellowish brown, 4–6 mm long, 1.5–2 mm wide; bracteoles 2–4, membranaceous, ovate to obovate, obtuse, 2–4 mm long, 1–2.5 mm wide. Perianth segments 5, obovate, 4–6 mm long, 1.5–2.8 mm wide, apex rounded. Stamens 8; filaments 2.5–4.3 mm long, pale pink; anthers 0.7–1.1 mm long, 0.4–0.8 mm wide, deep pink before dehiscence, light brown after dehiscence; nectary glands at base, deep pink. Pistil 5–7 mm long; stigmas 3, 0.1–0.15 mm long; styles 3–4.2 mm long, pale pink to pale green; ovary trigonous, 1.8–2.5 mm long, pale green. Achene trigonous, spindle-shaped, apiculate at apex, 4–5 mm long, 2–2.8 mm wide, brown.

Bistorta sinomontana is distributed in Tibet, Yunnan and Sichuan. This species occurs in *Abies-Picea* forests in elevations between 3000 and 4000 m. On the banks we found *Koenigia*, *Polygonum molle*, *Geum aleppicum*, *Salvia* aff. *przewalskii* and *Senecio chrysanthemoides* with *B. sinomontana* (Miyamoto and Ikeda 2001).

2-a) var. **sinomontana** [Fig. 3]

This variety is characterized by the deep green leaves with glabrous upper surface and pale green and glabrous or subglabrous lower surface.

Additional specimens examined: Xizang (Tibet): Gongbo'gyamda, 3660 m (S. Akiyama *et al.* 105194, 13 Aug. 2000, KUN, TI); Miling Xian, 3100 m (Qin-zan research team 74-1976, 26 Aug. 1974, PE); Miling, 3300 m (collector unknown 4081, 20 Jul. 1972, PE); Miling Xian, Jiage, 3250 m (Qin-zan research team 74-5313, 21 Sept. 1974, PE); Miling, Jiagetai, 3200 m (collector unknown 3756, 12 Jul. 1972, PE); Miling Xian, Hou shan, 3100 m (Xizang research team 750891, 27 Jul. 1975, PE); Milling, 3200 m (col-

lector unknown 3573, 26 Jun. 1972, PE); Nyingchi, West side of Jila shan, 3200–3750 m (Xizang research team 751122, 2 Aug. 1975, PE); Nyingchi Xian, Nixi, 3040 m (Zhang and Lang 1023, 28 Jul. 1965, PE); Nyingchi, 3300 m (Kui *et al.* 1783, 21 Sept. 1980, PE); Nyingchi, 3100 m (collector unknown 3255, 15 Jun. 1972, PE); Nyingchi, Sezhailla Shan, 3500 m (S. Akiyama *et al.* 105224, 18 Aug. 2000, KUN, TI); Bomi, Tongmai, 3100 m (Kui *et al.* 1671, 16 Sept. 1980, PE); Lhorong (5370a, 12 Sept. 1952, PE); Markham, 4000 m (Xizang research team, 12041, 27 Jun. 1976, PE); Sikang, Hima-la, Tsawarung, 3400 m (C. W. Wang 65995, Aug. 1935, PE). Yunnan: Zongdian, Nixigongshe, alt. 3300–3400 m (Qin-zan research team 1498, 30 Jun. 1981, KUN); Zongdian, 3500–3700 m (K. M. Feng 23240, 25 Aug. 1959, KUN, PE); Heqing, 3400 m (R. C. Ching 23973, 23974, 23 Aug. 1923, KUN); Naire, alt. 3900 m (Wu 4239, 8 Aug. 1976, KUN); Lijiang, 2800 m (T. T. Yü 15267, 7 Jul. 1937, KUN); Lijiang, 3000 m (K. M. Feng 21448, 7 Sept. 1955, KUN); Lijiang (R. C. Ching 30909, 29 Jul. 1940, KUN, PE); Lijiang, Yulongguw Shan, 3500 m (collector unknown 6313, 2 Aug. 1960, PE); Lichiang, Nguluko, 2600 m (T. T. Yü 15380, 27 Jul. 1937, KUN, PE); loc. cit., 2800 m (T. T. Yü 15267, 5 Jul. 1937, PE); Likiang Snow Range (R. C. Ching 30472, 3 Aug. 1939, KUN, PE); loc. cit. (R. C. Ching 21104, 4 Aug. 1939, KUN, PE); Likang Hsien, 2500 m (C. W. Wang 71648, Jun.–Jul. 1935, KUN, PE); Lijiang 3300 m (collector unknown 9802, 7 Jul. 1960, PE); Lijiang, Ganhaizi, 3200 m (H. Ohba *et al.* 340, 12 and 13 Sept. 1987, TI); Lijiang, Yunshan Ping, 3200 m (S. K. Wu *et al.* 1461, 1466, 10 Aug. 1996, KUN, TI); loc. cit., 3000–3100 m (M. Kato *et al.* 1838, 31 Jul. 1988, TI); Wei-si, Ye-Chih, 3600 m (C. W. Wang 68328, Aug. 1935, KUN); Atun-ze, 2700 m (C. W. Wang 69866, Sept. 1935, PE); loc. cit., 2700 m (C. W. Wang 69912, Sept. 1935, KUN, PE); Atuntze, Yangtsatung Uyahanala, 3250 m (T. T. Yü 9999, 31 Aug. 1937, KUN, PE); Deqe, Tianchi, 3600 m (S. K. Wu *et al.* 1480, 12 Aug. 1996, KUN, TI); Yangbi, a Fruit Garden—Cangshan, 3500 m (S. K. Wu *et al.* 467, 16 Aug. 1997,

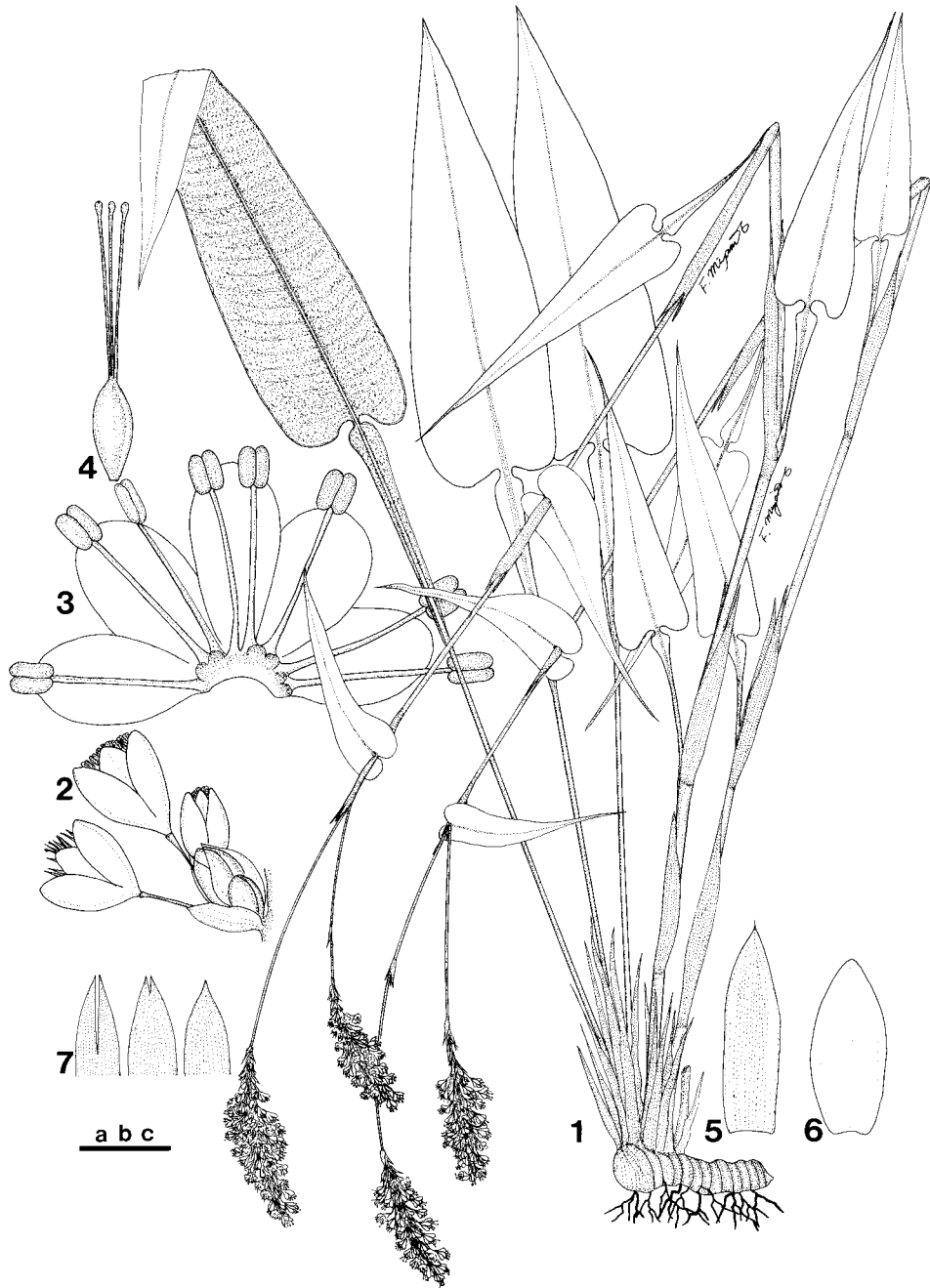


Fig. 2. *Bistorta sinomontana* var. *pubifolia* (holotype). 1: Habit of plant. 2: Flowers. 3: Perianth and stamens. 4: Pistil. 5: Bract. 6: Bracteole. 7: Stipules of cauline leaves. Scales: a (2 cm) for 1; b (4 mm) for 2 and 7; c (2 mm) for 3, 4, 5 and 6.

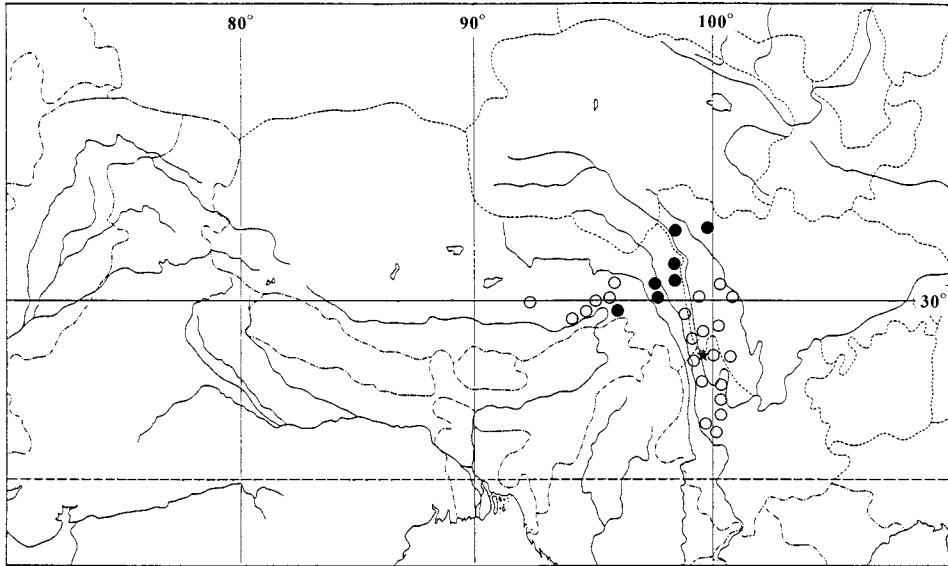


Fig. 3. Distribution map of *Bistorta attenuatifolia* (black circles), *B. sinomontana* var. *sinomontana* (white circles) and var. *pubifolia* (black star).

KUN, TI); Yanghi Xian, W side of Diancang Shan mountain range, 25°50'N, 99°59'E, 2700 m (B. Bartholomew *et al.* 643, 30 Jun. 1984, A); Dali (H. C. Wang 4788, May 1945, PE); Mt. Jizu Shan (T. N. Lioi 22059, 22065, 21 Oct. 1946, PE); Heqing, 3500 m (R. C. Ching 23973, 23 Aug. 1929, PE); loc. cit., 3400 m (R. C. Ching 23974, 23 Aug. 1929, PE); Lichaiang Lange (G. Forrest 5982, 1910, PE); without precise locality (K. K. Tsoong 2478, 26 Sept. 1919, PE). Sichuan: Muli, 3600 m (T. T. Yü 7188, 12 Jul. KUN, PE); Muli, Lealang–Kangtin, 2400 m (T. T. Yü 7458, 30 Jul. 1937, PE); Yajiang, 3600 m (collector unknown 02692, 2 Aug. 1959, PE); Yajiang 3800 m (Wang 4880, 13 Jul. 1974, PE); Yajiang, 3600 m (Jiang 02692, 2 Aug. 1959, PE); Kangding, 3500 m (Guan and Wang 637, 17 Jul. 1963, PE); Danba 3000 m (collector unknown 5558, 21 Aug. 1958, PE); Derong (De 4112, 20 Sept. 1973, PE); Xi-angcheng (collector unknown 1277, 5 Sept. 1972, PE); Batang (collector unknown 1608, 7 Aug. 1972, PE); Daocheng, Daocheng–Daxue shan Yakou, 3400 m (S. K. Wu *et al.* 1582, 26 Aug. 1996, KUN, TI); Xiangchen, around Wuming shan, 3650 m (S. K. Wu *et al.* 426, 427, 29 Jul. 1997, KUN, TI); Xinlong, 3950 m (Li 06497, 26,

Jun. 1974, PE).

2-b) var. **pubifolia** Miyam. & H. Ohba, var. nov.

[Figs. 2 and 3]

A typo foliis infra fusco puberulis differt.

Type: CHINA. Yunnan: Deqe, Napa Hai, 27°55'N, 99°35'E, 3600 m (S. K. Wu, H. Ikeda, F. Miyamoto, M. Wakabayashi, Y. Yang and T. Kikuchi 1486, 13 Aug. 1996, KUN-holotype, TI, TNS-isotypes).

Var. *pubifolia* differs from var. *sinomontana* by the leaves with dense brown very short soft hairs on lower surface.

Additional specimens examined: CHINA. Yunnan: Zongdian, 3300–3400 m (Qin-zan research team 1498, 30 Jun. 1981, KUN); Zongdian, 3900 m (Wu 4239, 8 Aug. 1976, KUN).

Key to *Bistorta sinomontana* and its allied species

1. Base of radical leaves and basal cauline leaves cordate to truncate, rarely cuneate
2. Petioles not winged; bracts widely obovate *B. amplexicaulis*
2. Petioles winged; bracts lanceolate to obovate *B. sinomontana*

3. Leaves glabrous or subglabrous on lower surface var. *sinomontana*
3. Leaves pubescent on lower surface var. *pubifolia*
1. Base of radical leaves and basal cauline leaves narrowly cuneate; bracts lanceolate to linear-lanceolate *B. attenuatifolia*

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References

Li, A., Bao, B., Grabovskaya-Borodina, A. E., Hong, S.,

- McNeill, J., Mosyakin, S. L., Ohba, H. and C. Park. 2003. Polygonaceae. In: Wu, Z. *et al.* (eds.), *Flora of China* **5**: 277–350.
- Miyamoto, F. and H. Ikeda. 2001. Field research in the Sino-Japanese-American expedition to Southeast Tibet, 2000. *Newslet. Himalayan Bot.*, no. 28, 3–12.
- Miyamoto, F., Akiyama, S., Wu, S. K. and H. Ohba. 2002. New and noteworthy species of *Bistorta* (Polygonaceae) from the Sino-Himalayan region. *Bull. Natn. Sci. Mus., Tokyo, Ser. B*, **28**(4): 141–148.
- Yonekura, K. and H. Ohashi. 2002. Taxonomic studies of *Bistorta* (Polygonaceae) in the Himalayas and adjacent regions (2). *Bistorta amplexicaulis* (D. Don) Greene and its allies, with special reference to the ochreae and leaf sheathes of cauline leaves. *J. Jap. Bot.*, **77**: 61–81.