

***CORDIOFONTIS* (ASTERACEAE: ASTEREAE),
A NEW GENUS OF HIMALAYAN SPECIES SEGREGATED FROM *ASTER***

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ABSTRACT

Five *Aster* species from the Himalayan region comprise ***Cordiofontis*** Nesom, **gen. nov.** — four from Pakistan to Nepal and one from adjacent China: ***Cordiofontis flexuosa*** (Royle ex Lindl.) Nesom, **comb. nov.**, ***Cordiofontis laka*** (C.B. Clarke) Nesom, **comb. nov.**, ***Cordiofontis longipetiolata*** (Y. Ling) Nesom, **comb. nov.**, ***Cordiofontis nepalensis*** (Grierson) Nesom, **comb. et stat. nov.**, and ***Cordiofontis peduncularis*** (Wall. ex Nees) Nesom, **comb. nov.** The genus is distinct in its rhizomatous-perennial, herbaceous habit, hairy but eglandular vestiture, mostly cordate-petiolate leaf blades with basally dilated-sheathing petioles, solitary or few heads on few-bracteate peduncles in a loose corymb, herbaceous outer phyllaries, fusiform and eglandular achenes, and biseriate pappus of acute-tipped bristles. Molecular data place *Cordiofontis* (represented so far in molecular sampling only by *C. longipetiolata*) in an unresolved position among species and species groups of the Psychrogeton branch of subtribe Asterinae. A key to the species, formal typification, and images of types and representative specimens are provided.

Molecular data of Li et al. (2012) and Farhani et al. (2018) place the Chinese species *Aster longipetiolatus* Y. Ling (= *Kalimeris longipetiolata*) in an unresolved position among species and species groups of the Psychrogeton branch of subtribe Asterinae (Nesom 2020a), which includes *Psychrogeton*, *Callistephus*, the *Aster diplostephioides* group (described in this series as the genus *Tibetiodes*), the *Aster albescens* group (described in this series as the genus *Sinosidus*), and others.

Aster longipetiolatus was transferred by Nesom (1993) with other Asian species into the otherwise American genus *Doellingeria*, but molecular data indicate that *Doellingeria* is strictly North American and that *A. longipetiolatus* is not closely related to the Asian species once included there. Instead, the species morphologically closest to *A. longipetiolatus* (Hengduan Mountains of Sichuan and Yunnan, China) are primarily Himalayan in distribution (Pakistan and Kashmir to Tibet, Nepal, and Indian states) and, as hypothesized here following earlier observations of Grierson (1964), constitute a monophyletic group. As part of the broader attempt to more clearly define *Aster* L. (e.g., Nesom 2020a, 2020b), these five species are recognized here as a separate genus.

CORDIOFONTIS Nesom, **gen. nov.** **TYPE:** *Cordiofontis peduncularis* (Wall. ex Nees) Nesom

Distinct in its rhizomatous-perennial, herbaceous habit, eglandular vestiture, stems often zig-zag at the nodes, leaves mostly cordate-petiolate, blades of proximal with basally dilated-sheathing petioles, heads solitary or few on few-bracteate peduncles in a loose corymb, outer phyllaries completely herbaceous, and fusiform, strigose, eglandular achenes with a biseriate pappus of acute-tipped bristles.

Perennial herbs from a short, thick, fibrous-rooted rhizome, colonizing by longer, slender rhizomes (the latter not commonly included in herbarium collections). **Stems** erect, often zig-zag at nodes, 15–100 cm tall, glabrous to sparsely villous proximally, becoming long-villous on inflorescence branches, eglandular. **Leaves** cauline, largest at midstem, blades cordate or ovate to broadly lanceolate or elliptic-lanceolate, often discoloured (paler abaxially), glabrous to hirsute or hirsute-villous, eglandular, margins serrate to serrate-dentate, often coarsely so, venation camptodromous and prominently reticulate, petioles long and narrow, those of at least the proximal leaves dilated-winged

and sheathing at the base. **Heads** solitary or few in a loose corymb, on few-bracteate peduncles. **Involucres** shallowly campanulate to cupulate; phyllaries in 2–3 subequal series, lanceolate, outer green-herbaceous, inner stramineous with hyaline margins or sometimes with an herbaceous apical patch; receptacles epaleate. **Ray flowers** 18–45, ligules 12–25 mm long, purple to bluish. **Disc flowers** bisexual, fertile, corollas 3.5–7 mm long. **Achenes** obovate, 3–4.5 mm long, weakly compressed with 2 marginal veins, strigose, eglandular; pappus biseriate, inner series of barbellate, acute-tipped bristles about as long as the disc corollas (half as long in *C. flexuosa*), outer of bristles or bristle-like scales 0.3–1 mm long (in *C. longipetiolata*, pappus of only the short, outer series).

A chromosome number of $n = 27$ has been reported for *Cordiofontis peduncularis* (Gupta & Gill 1988, 1989; Gupta et al. 1989); $n = 9$ has been reported for *C. flexuosa* (Gupta & Garg 1987; Gupta et al. 1989; Jee et al. 1987).

Key to the species of *Cordiofontis*

1. Leaves sessile to short-petiolate; pappus bristles half as long as the disc corolla **Cordiofontis flexuosa**
1. Leaves long-petiolate; pappus extremely short or bristles as long as the disc corolla.
 2. Pappus a series of scale-like bristles less than 1 mm long; Sichuan and Yunnan, China **Cordiofontis longipetiolata**
 2. Pappus of barbellate bristles as long as the disc corollas; Himalayan region from Pakistan and Kashmir to Tibet, Nepal, and Indian states.
 3. Stems 15–20 cm high; phyllaries in 3 series **Cordiofontis laka**
 3. Stems 10–90 cm high; phyllaries in 2 series.
 4. Stems mostly 30–90 cm high; leaf blades cuneate to rounded or truncate at base; phyllaries equalling or slightly longer than the disc corolla length **Cordiofontis peduncularis**
 4. Stems mostly 10–15 cm high; leaf blades subcordate at base; phyllaries about twice as long as the disc corollas **Cordiofontis nepalensis**

1. **Cordiofontis peduncularis** (Wall. ex Nees) Nesom, **comb. nov.** *Aster peduncularis* Wall. ex Nees, Gen. Sp. Ast., 24. 1832. **TYPE: INDIA. Uttarakhand.** *Aster peduncularis* Wallich 2967/77, Kamoan RB, *N. Wallich* (holotype: K-Wallich, Fig. 1; isotype: G-DC).

Amphirhapis peduncularis DC., Prodr. 5: 344. 1836. **TYPE: INDIA. Uttarakhand.** *Aster peduncularis* Wallich 2967/77, Kamoan RB, *N. Wallich* (holotype: G-DC; isotypes: BM, E, K-2 (ex herb. Benthamianum & ex herb. Hookerianum), K-W). Types are cited here following Hind (2008).

Himalayas from Pakistan and Kashmir to Himachal Pradesh, Uttarakhand, and Nepal. Figures 1, 2, 3, 14. Hind (2008) provided a history of the name, a detailed morphological description, a line drawing with details, and notes on garden cultivation.

2. **Cordiofontis nepalensis** (Grierson) Nesom, **comb. et stat. nov.** *Aster peduncularis* subsp. *nepalensis* Grierson, Notes Roy. Bot. Gard. Edinb. 26: 95. 1964. **TYPE: NEPAL.** Between Jumla and Garjigoth, 10,000 ft, 8 Aug 1952, *O. Polunin, W.R. Sykes, & L.H.J. Williams 5016* (holotype: E, Fig. 4; isotype: BM, Fig. 5).

Nepal endemic. Figures 4, 5, 6.

3. **Cordiofontis flexuosa** (Royle ex Lindl.) Nesom, **comb. nov.** *Calimeris flexuosa* Royle ex Lindl. in DC., Prodr. 5: 258. 1836. *Aster thomsonii* C.B. Clarke, Comp. Ind., 48. 1876 [nom. nov., not *Aster flexuosus* Nuttall 1818]. **TYPE: INDIA. Kashmir.** Cachemire, 1833, *M. Royle 113*

(holotype: G-DC, Fig. 11). Protologue: "In Indiae orient. prov. Mussonee legit cl. Royle pl. exs. n. 113." Citation of the authority for *Calimeris flexuosa* follows that suggested by IPNI.

Diplopappus asperulus DC., Prodr. 5: 277. 1836. *Aster asperulus* (DC.) Hook. f., Fl. British India 3: 252. 1881 (not *Aster asperulus* Wall. ex Nees 1832, nom. nud.; not *Aster asperulus* Torrey & Gray 1841). **TYPE: INDIA. Uttarakhand.** *Aster asperulus* Wallich 2968/78, Kameron, *N. Wallich* (holotype: G-DC G00494320; isotypes: BM, K-Wallich, Fig. 13).

Pakistan, India (Kashmir, Himachal Pradesh, Uttarakhand, Uttar Pradesh,). Figures 11, 12, 13, 14, 15. A detailed and technical description of this species is provided in Kletter and Kriechbaum (2001).

Cordiofontis flexuosa (as *Aster thomsonii*) was said to be one of the parents of the garden hybrid *Aster* × *frikartii* Silva Tar. & C.K. Schneid. (Freiland-Staud., ed. 4. 1927), created by the Swiss gardener Carl Ludwig Frikart in 1918. The other was said to be *Aster amellus* L., the type species of *Aster* L. In all, Frikart created four different cultivars from this cross, which now appear even more remarkable as they are intergeneric hybrids. Other examples of intergeneric hybrids in Astereae are given by Nesom (1994).

4. **Cordiofontis laka** (C.B. Clarke) Nesom, **comb. nov.** *Aster laka* C.B. Clarke, Comp. Ind., 49. 1876. **TYPE**: "Western Himalaya, Laka, near Dhurmsala, 10,000-11,000 ft, 17 Oct 1874, C.B. Clarke 23869 (holotype: K, Fig. 10). Protologue: "Ad Laka prope Dhurmsala in Himalaya boreali-occidentali ad 11000 ped. alt. mense Oct. florens."

India (Kashmir, Himachal Pradesh).

5. **Cordiofontis longipetiolata** (C.C. Chang) Nesom, **comb. nov.** *Aster longipetiolatus* C.C. Chang, Sunyatsenia 6: 22. 1941. *Kalimeris longipetiolata* (C.C. Chang) Y. Ling, Fl. Reipubl. Popularis Sin. 74: 108. 1985. *Doellingeria longipetiolata* (C.C. Chang) Nesom, Phytologia 75: 457. 1993 [1994]. **TYPE: CHINA. Sichuan.** [label has "Precise locality not known"], 30 Jun 1936, *K.L. Chu* 3023 (holotype: PE image, Fig. 9; isotypes: P-Fig. 8, SYS, W-Fig. 7). Protologue: "Pao-Hsing-Hsien, Mai-Li-Chuan, Ning-Chang-Kao, 2500 m, along the stream."

Aster trichanthus Hand.-Mazz., Oesterr. Bot. Zeit. 90: 125. 1941. **TYPE: CHINA. Sichuan.** Pao-hsing-hsien, 30 Jun 1936, *K.L. Chu* 3023 (holotype: W, Fig. 7; isotypes: P-Fig. 8, PE, Fig. 9, SYS). Protologue: "W.-Setschwan: Paohsing (Mupin)."

China (Sichuan, Yunnan).

This species is set apart geographically from the others and dilated-sheathing petiole bases are seen only on the basalmost leaves — it may not belong here, in which case it would be justifiably recognized as a monotypic genus, based on its isolated evolutionary position according to the molecular data.

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Figure 1. *Cordiofontis peduncularis*. Holotype of *Aster peduncularis* Wall. ex Nees (Wallich 2967/77, K-Wallich).



Figure 2. *Cordiofontis peduncularis*. Representative collection, Uttarakhand (E).



Figure 3. *Cordiofontis peduncularis*. Representative collection, Himachal Pradesh (E).



Figure 4. *Cordiofontis nepalensis*. Holotype (E).



Figure 5. *Cordiofontis nepalensis*. Isotype (BM).



Figure 6. *Cordiofontis nepalensis*. Representative collection, Polunin et al. 5436 (E).



Figure 7. *Cordiofontis longipetiolata*. Chang 3023 (W). Holotype of *Aster trichanthus* and isotype of *Aster longipetiolatus*.



Figure 8. *Cordiofontis longipetiolata*. Chang 3023 (P). Isotype of *Aster trichanthus* and isotype of *Aster longipetiolatus*. Basal leaves have petioles with a dilated, clasping base.

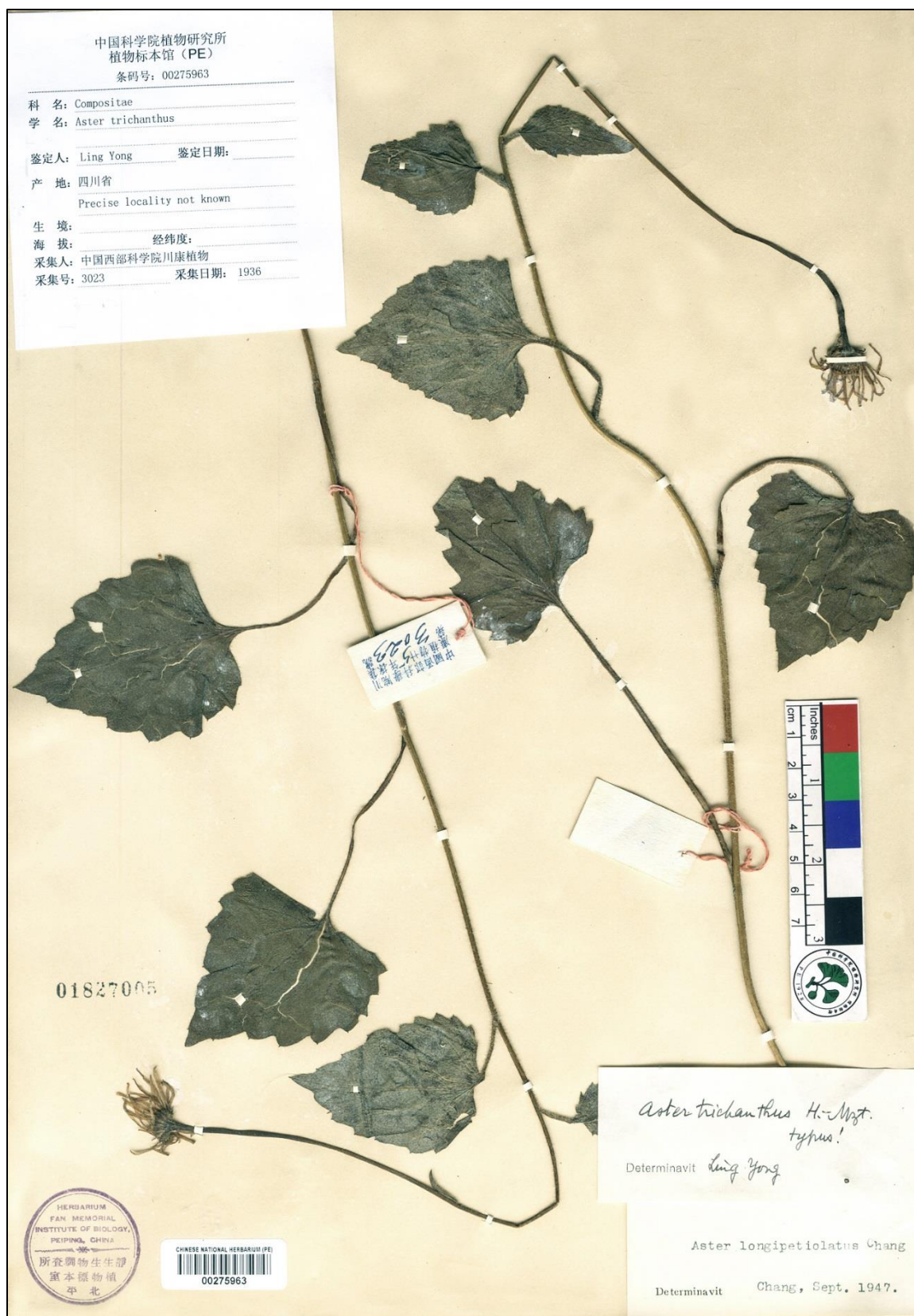


Figure 9. *Cordiofontis longipetiolata*. Chang 3023 (PE). Holotype of *Aster longipetiolatus* and isotype of *Aster trichanthus*.

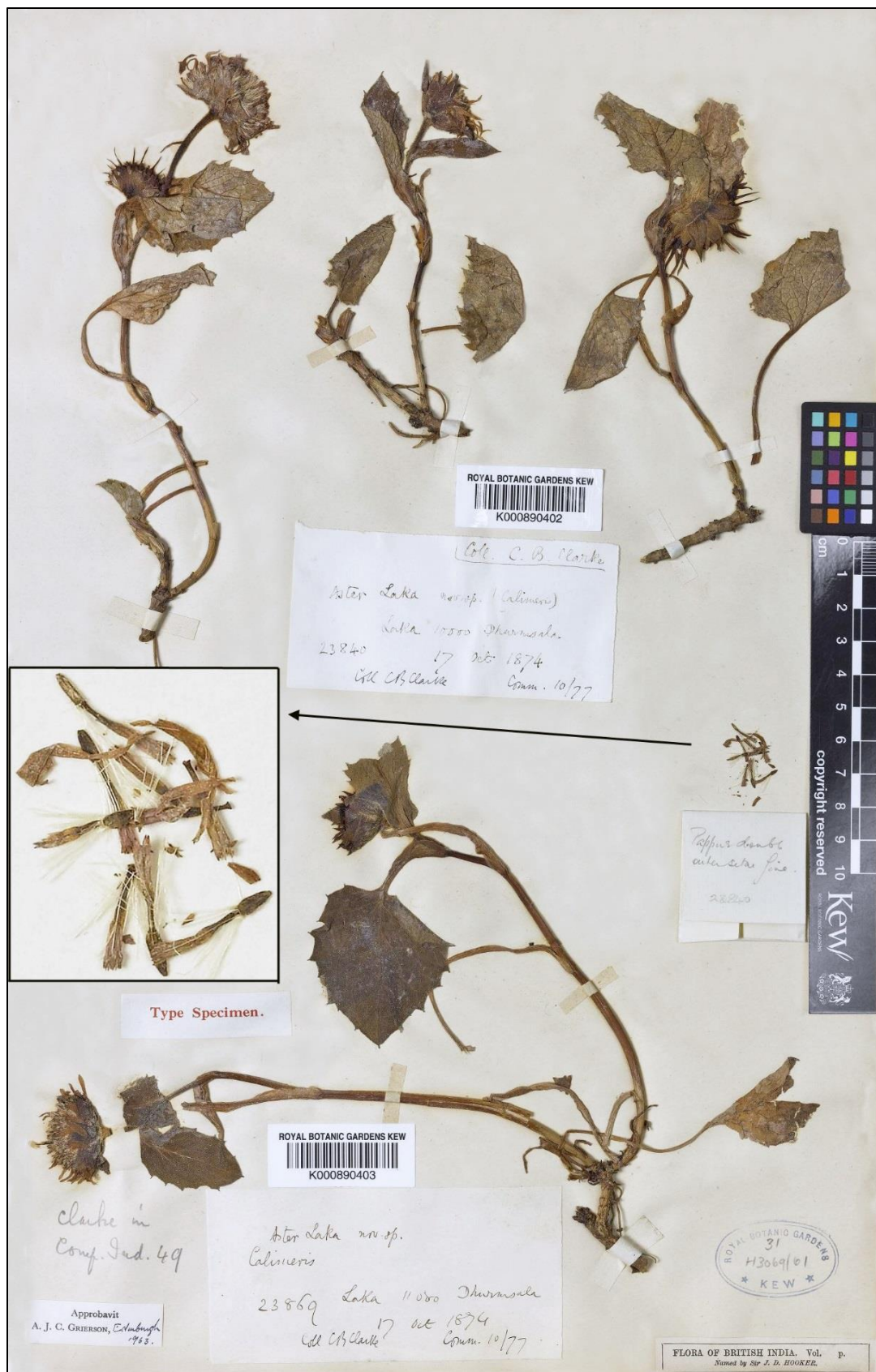


Figure 10. *Cordiofontis laka*. Holotype of *Aster laka* (K).



Figure 11. *Cordiofontis flexuosa*. Holotype, *Calimeris flexuosa* Royle ex Lindl. in DC. (G-DC).



Figure 12. *Cordiofontis flexuosa*. Representative collection, Simlen, Himalaya, Thomson s.n. (BM).



Figure 13. *Cordiofontis flexuosa*. Isotype of *Diplopappus asperulus* DC. (*Aster asperulus* of Wallich, 2968/78, K-W).



Figure 14. *Cordiofontis flexuosa*. Representative collection (E).



Figure 15. *Cordiofontis peduncularis*. Beth Chatto's Plants & Gardens (website).



Figure 16. *Cordiofontis flexuosa*. Lidderwat in Jammu & Kashnmir. Photo by J.D.A. Stainton (Royal Botanic Garden Edinburgh).